



# **Review of the Regulatory Framework for Fixed-Mobile Convergence in Hong Kong**

**The Consultancy Report by Ovum Limited**

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# Executive Summary

## E.1 INTRODUCTION

This study identifies the regulatory barriers to the implementation of fixed-mobile convergence (FMC) in Hong Kong and describes how those barriers will operate to hinder the development of FMC. With a view to removing these barriers, the study addresses the possible revisions of the existing regulatory framework and proposes approaches that increase economic benefits while reducing regulation. The study then sets out the steps needed to achieve the potential benefits described, and the timetable for implementing them.

## E.2 FMC

There are four main stages of FMC development:

- **Stage 1: price bundling** of fixed and mobile services. Bundles are delivered to customers at discounts, often via a single bill. The services and the networks which provide them remain separate
- **Stage 2: service convergence** in which a few common services are offered over both fixed and mobile networks e.g. a single voice mailbox or linked email
- **Stage 3: device convergence** in which a common device offers both fixed and mobile network access with seamless handover
- **Stage 4: network convergence** in which fixed and mobile services run over a common IP transport network and use a common platform for service creation and control - the IMS<sup>1</sup>

The final stage is the most important. It involves the deployment of a common services platform that allows for the development of integrated services. Users can access these from a range of devices over both fixed and mobile networks and which leads to "anywhere anytime" services where the subscriber is always best connected in terms of bandwidth, quality of service and price charged.

## E.3 PROGRESS IN IMPLEMENTING FMC

We have assessed progress in implementing FMC in six countries that best represent the range of initiatives that have been considered, or actually put in place, for FMC regulation. The summary at Figure E1 compares Hong Kong and the case study countries in terms of the extent to which they have each implemented the four stages of FMC.

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1 IP multi-media sub-system

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**Figure E1 - FMC Development in Hong Kong and Case Study Countries**

| <i>Country</i> | <i>Price bundling</i> | <i>Common services</i> | <i>Converged devices</i> | <i>Network Integration</i> |
|----------------|-----------------------|------------------------|--------------------------|----------------------------|
| Hong Kong      | Yes                   | Limited                | No                       | No                         |
| Australia      | Yes                   | Limited                | No                       | No                         |
| Denmark        | Yes                   | Yes                    | Trials                   | No                         |
| Italy          | Yes                   | Yes                    | Trials                   | No                         |
| UK             | No                    | Yes                    | Yes                      | No                         |
| Singapore      | No                    | No                     | No                       | No                         |
| USA            | Yes                   | Yes                    | Trials                   | No                         |

Source: Ovum

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Based on discussions with a range of operators, we conclude that:

- Stage 4 FMC, using integrated networks, is part of a general move to next generation IP networks. We expect this form of FMC to develop at the same rate as the roll out of next generation networks (NGNs)
- Running mobile as well as fixed network services over the NGN significantly strengthens the case for NGN investments, and the benefits which these investments generate, since the common costs of the NGN are then shared over a much wider set of services than if the NGN offers fixed services alone
- Generally Italy, Denmark and the United States are taking the lead in moving along the path of staged development that we have outlined
- Even in the leading countries demand for FMC is still uncertain.

#### **E.4 BENEFITS OF FMC**

Potentially FMC generates substantial economic benefits. By 2011 we expect to see a fundamental change in the way telecommunications services are delivered in much of the developed world. We expect that operators will use next generation IP networks to deliver bundles of services like quadruple play<sup>2</sup> over a common core IP transport network controlled by a centralised server. Stage 4 FMC, which involves integration of fixed and mobile networks, is an important part of this convergence. Operators who implement FMC of this kind should enjoy substantial competitive advantage over other NGN operators who do not implement FMC, both in terms of lower unit costs and a wider range of richer services.

FMC of this kind should generate economic benefits of three main types:

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<sup>2</sup> Fixed voice telephony, mobile voice telephony, broadband access and TV

- **productive efficiency** gains through lower unit costs. For example:
  - BT in the UK expects cost savings of around €1.3 billion per annum by 2010 through rationalisation of its many overlay networks into a single IP network. For a market of the size of Hong Kong this is equivalent to cost savings of HK\$1.9 billion per annum
  - Telecom Italia has announced savings of around €1.5 billion per annum through integration of its fixed and mobile arms and expects further savings in future. In a country the size of Hong Kong this translates into savings of HK\$1.8 billion per annum
- **dynamic efficiency** gains as operators offer new integrated services for which there is substantial demand and hence increased consumer surplus. These effects could easily generate economic benefits which rival those of the productive efficiency gains. A single new service which generated HK\$3 billion per year in revenues could generate over HK\$3 billion pa in consumer surplus. Studies on the economic impact of mobile services show that the consumer surplus for such services is typically greater than the service revenues themselves
- **spectrum and radio access network efficiency gains:** In the long term FMC services will become important as a way of delivering high bandwidth services, using unlicensed spectrum wherever possible, and licensed 3G spectrum only where necessary.

## E.5 MARKET CONDITIONS FOR FMC IN HONG KONG

The market conditions for FMC in Hong Kong differ from those in the case study countries on a number of dimensions:

- the mobile price premium in Hong Kong, estimated at 1.05, is well below the United States (2.0), Europe (lowest is Denmark at 2.3), and Australia at 4.1.
- the extent of call fixed mobile substitution (call FMS) is greater in Hong Kong, where around 33% of voice calls originate on mobile networks, compared to, for example, 23% in the UK and 26% in the US.
- there are a number of substantial fixed and mobile operators in Hong Kong. There are five separately owned mobile operators and five fixed operators with substantial numbers of narrowband and broadband lines. As a result the Hong Kong telecommunications market has one of the lowest concentrations of market power in the world.

## E.6 DRIVERS OF FMC DEVELOPMENT

FMC makes most sense for integrated operators running both fixed and mobile networks. Roll out of next generation networks with integrated fixed and mobile services should give integrated operators a substantial competitive advantage over pure fixed or mobile operators. Such a strategy:

- allows the integrated operator to spread its common cost over both fixed and mobile services

- enables the integrated operator to develop a wider range of FMC services more quickly and more cheaply.

For Stage 4 FMC the key technical requirements are standards for fully integrated services, SIP/IMS. The report examines each of the interface and control standards and future development paths. These suggest that essential components for Stage 4 FMC will not be available before 2008.

## E.7 MOST LIKELY SCENARIO FOR FMC IN HONG KONG

From these considerations we have constructed a most likely scenario for the introduction of FMC in Hong Kong, as shown in Figure E2.

**Figure E2 - Ovum's Most Likely Scenario for FMC in Hong Kong**

| Operators                       | 2006                                 | 2007  | 2008  | 2009                                   | 2009 - 2010                      |
|---------------------------------|--------------------------------------|---|---|--|----------------------------------|
| <b>1. Pure Fixed Operators</b>  | Seek mobile partners or acquisitions | Limited bundling                            | FMC Stage 3 strategies - convergent devices | Commence NGN rollout in earnest        | FMC Stage 4 - converged networks |
| <b>2. Pure Mobile Operators</b> | Encourage call FMS                   | Encourage call FMS                          | Seek fixed partners or acquisitions         | Commence NGN rollout in earnest        | FMC Stage 4 - converged networks |
| <b>3. Integrated Operators</b>  | Limited bundling                     | FMC Stage 3 strategies - convergent devices | Commence NGN rollout in earnest             | Early FMC Stage 4 - converged networks | FMC Stage 4 - converged networks |

Source: Ovum

We believe that the most likely scenario is not certain by any means, and that the recommendations in this report will serve to shore up and make more likely the achievement of the timescales involved. Alternative scenarios involve possible deferral of the benefits of FMC. Permitting regulatory barriers to remain will increase the chances of such scenarios being realised.

## E.8 BARRIERS TO FMC IN HONG KONG

There are a number of major asymmetries in the way in which fixed and mobile operators are regulated in Hong Kong. Specifically:

- fixed mobile interconnection charging (FMIC) arrangements mean that mobile subscribers bear the full costs of both fixed to mobile and mobile to fixed calls
- current interconnect arrangements mean that fixed operators can charge significantly more to terminate inbound international calls than mobile operators
- OFTA currently requires mobile operators to pay the full cost of the links used to interconnect with fixed operators
- mobile operators cannot self provide their own transmission links.

These asymmetries of regulatory treatment of fixed and mobile operators are a continuation of the arrangements that were put in place over 15 years ago when mobile services were far less important, relative to fixed services, and were treated, in effect, as value added services. This is not longer the case, with over 40% of operator investment being in mobile operations and 33% of outgoing voice calls being made from mobile networks.

## **E.9 THE LIKELY IMPACT OF REGULATORY ASYMMETRIES**

The regulatory asymmetries in the treatment of fixed and mobile operators in Hong Kong are unusual. As our country case studies show in other parts of the world fixed and mobile operators are, in general, granted equal status and regulation is developed on that basis. In the EU in particular the current regulatory framework was developed using the underlying principle that network operators should be regulated on a technology neutral basis.

One effect of these regulatory asymmetries is to weaken cross-platform facilities based competition between fixed and mobile operators. This is inconsistent with Hong Kong's overall telecommunications' policy of promoting infrastructure competition between networks, a policy which is reflected in its recent decision to withdraw Type II interconnect obligations on PCCW from June 2008.

The asymmetries also affect likely future investments in FMC in three ways:

- they distort future investment by inappropriately raising the costs faced by mobile operators, and lowering the costs faced by fixed operators
- if left unchanged, they lead to future regulatory anomalies. The possibility of such anomalies creates regulatory uncertainty and this uncertainty in turn reduces investment incentives
- they could distort the forms and terms of the industry consolidation which is now taking place in Hong Kong and which FMC might accelerate.

## **E.10 THE CASE FOR REMOVING THE REGULATORY ASYMMETRIES**

Our research and analysis indicates that:

- there is now a general move towards the rollout of next generation IP networks that deliver converged services. Stage 4 FMC is an important part of this trend
- this development should lead to a wider range of services being delivered to end users at significantly lower unit costs. In a market like Hong Kong this could generate annual benefits of HK\$3 billion by 2010
- the investment required for this development is substantial
- there is a good chance that the regulatory asymmetries in Hong Kong will lead to distorted and/or delayed investment in NGNs in Hong Kong
- at the same time the asymmetries weaken the cross platform competition between fixed and mobile operators.

*So we recommend that:*

- *the regulatory asymmetries in the treatment of fixed and mobile operators should be removed, and*
- *fixed and mobile operators are regulated in future on a technology neutral basis*

## **E.11 FIXED MOBILE INTERCONNECTION CHARGING ARRANGEMENTS**

### **E.11.1 Problems with current arrangements**

The current FMIC arrangement is shown in Figure E3. There are four main problems with it.

**First** this model is not consistent with the combination of two principles:

- OFTA's cost causation principle which requires that the party who causes the cost pays it
- the requirement that, if Hong Kong is to maximise the opportunity to develop fixed-mobile convergence services and not to hinder infrastructure based competition, then it should treat fixed and mobile operators as having equal status when they exchange traffic.

But if the fixed and mobile operators are seen as networks exchanging traffic, the cost causation argument is very different. From this perspective both callers and called parties on both fixed and mobile networks cause costs by making and continuing to receive the calls made in either direction. So the current FMIC arrangements do not allocate costs in a way which follows cost causation.

**Secondly** the current model provides no incentive for fixed operators to deal with voice spam on fixed to mobile calls.

**Thirdly** the current model generates two types of transaction costs which, in combination, are significant. These are of two kinds:

- the cost of negotiating and/or determining the interconnect prices. These are substantial given the number of operators in Hong Kong
- the cost of billing, reconciling and collecting the interconnect charges generated.

**Finally** the current arrangements do not provide a graceful migration path to convergence. The precise form of future interconnect arrangements is, as yet, unclear. But it seems likely that many next generation networks will use bill and keep (BAK) arrangements, just as equivalent IP networks in today's Internet do. Current FMIC arrangements in Hong Kong are very different from BAK. In addition, with FMC devices the terminal acts as a fixed phone in the home or office<sup>3</sup> and as a mobile phone at other times. Wholesale charging for calls which switch from fixed to mobile modes, perhaps in mid call, is complex, if not impossible, under current FMIC arrangements.

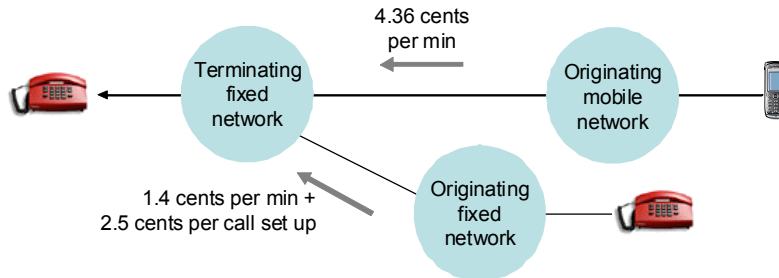
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<sup>3</sup> For example using a WiFi connection

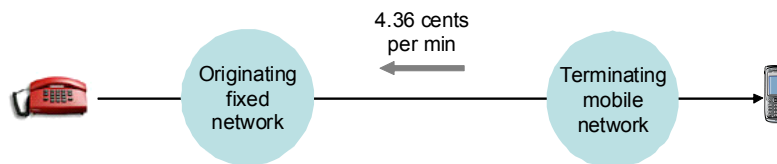
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**Figure E3: FMIC arrangements in HK**

**M2F and F2F calls**



**F2M calls**




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### E.11.2 The impact of withdrawing current FMIC regulation

Given the problems set out above we need to consider alternative FMIC charging arrangements. The first possibility is simply to withdraw current regulation. This includes both the requirement for any-to-any interconnect between operators so as to provide voice telephony and the interconnection charging principles set in the TA Statement 7 which specify the interconnect charging arrangements of Figure E3.

The effect of withdrawing the any-to-any interconnect requirement for voice services is impossible to predict with certainty. But there is evidence that it could substantially damage Hong Kong telecommunications. Withdrawal of the any-to-any interconnect requirement may not lead to a breakdown in full interconnection between consumers. But if it were to do so the social and economic consequences would be both highly undesirable and inconsistent with the Government's policy to make Hong Kong the pre-eminent telecommunications hub in the region. Withdrawal of the any-to-any requirement would also generate substantial market uncertainty. Given these arguments we recommend that **OFTA preserves the requirement for any-to-any interconnect between networks for voice telephony.**

Withdrawal of current guidance is likely to lead to FMIC charging based on BAK arrangements – in the form of each party refusing to pay the other for interconnect. There are two things wrong with this outcome:

- *First*, the effort which might be put in to attempting to reach negotiated settlement could substantially raise the cost of operating a network in Hong Kong
- *Secondly*, the absence of regulatory guidance on FMIC creates market uncertainty and so reduces investment incentives.

For these reasons we recommend that OFTA ***continues to offer guidance on what default arrangements<sup>4</sup> it would prefer if it were required to determine an FMIC agreement.*** We consider below what form this default might take.

## **E.12 ALTERNATIVE FMIC MODELS FOR HONG KONG**

We have evaluated a number of alternatives to current Hong Kong FMIC arrangements. This includes the current arrangements for FMIC in the US, UK and Singapore.

We have evaluated the models above, together with a model not found in any of the study countries - BAK - against seven criteria. The overall assessment of the models resulting from our evaluation is shown in Figure E4. The evaluation indicates that:

- the current Hong Kong model is now not in the best interests of Hong Kong. The regime does not follow cost causation principles especially when mobile services can no longer be viewed as value added services; it generates substantial transaction costs; it positively encourages voice SPAM on fixed to mobile calls; and it does not provide a graceful evolution path towards future developments like next generation networks and FMC. Its main merit is that it involves no change
- we can also reject the EU model (in which the calling party's network pays) on three main grounds. It generates very high transactions costs; there is strong empirical evidence that it results in lower calling rates and reduced economic welfare when compared with other models; and again it does not provide a graceful evolution towards future developments
- of the other three models the BAK model scores best. In many ways it scores in a similar way to the US model. But it has one major advantage – it generates very low transaction costs. Its only disadvantage is that it provides weaker incentives than the US model for the fixed operators to deal with voice spam on fixed to mobile calls.

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<sup>4</sup> The arrangements which would apply if one of the negotiating parties sought a determination, OFTA accepted there were grounds for making a determination, and neither of the parties supplied justification for some other form of interconnect charging arrangements

**Figure E4: Overall assessment of the four regimes**

| Assessment criterion   | Regime   |           |        |           |          |
|--|----------|-----------|--------|-----------|----------|
|  | HK now   | Singapore | US     | EU        | BAK      |
| Removes asymmetry in FMIC charging?                          | No       | No        | Yes    | Yes       | Yes      |
| Compliance with cost causality                               | No       | Partly    | Yes    | Yes       | Yes      |
| High calling rates?  | Yes      | Yes       | Yes    | No        | Yes      |
| Transaction costs  | Medium   | Medium    | Medium | Very high | Very low |
| Incentives to police voice spam                              | Negative | Weak      | Yes    | Yes       | Weak     |
| Graceful migration to likely NGN interconnect                | No       | No        | Partly | No        | Yes      |
| Simple interconnect charging for dual mode terminal services | No       | No        | Yes    | No        | Simplest |
| Redistribution effects                                       | Nil      | Medium    | High   | Very high | High     |

## E.13 MOVING TO A BAK MODEL

### E.13.1 Objections to BAK

Before recommending a BAK model for FMIC charging we need to consider the following issues:

- the cost of change. The cost of changing to a BAK model is minimal. The operators simply suspend interconnect charging arrangements when they exchange traffic.
- the likely impact of the change on operators and end-users. Moving to the BAK model will lead to a reduction in interconnect revenues for the fixed operators of approximately \$600 million per annum. The fixed operators currently receive \$600 million per annum<sup>5</sup> from the mobile operators in interconnect revenues. With the loss of such revenue fixed operators will come under pressure to raise prices or reduce discounts, which will be constrained by fixed mobile substitution and the emergence of triple / quadruple play packages. On the other hand, mobile operators will save a corresponding amount each year and, given the competitive nature of the mobile market, customers should see compensating price reductions. So in the short term most citizens will see little change in their telecommunications bills. In the long term a move to BAK should encourage investment and cross platform competition. So, provided a competitive telecommunications industry is maintained in Hong Kong, these changes should lead to the average citizen enjoying a wider range of better functionality services at lower prices.

<sup>5</sup> Statistic supplied by OFTA

- how well a BAK model works when traffic flows between networks is out of balance. Both the calling and receiving parties cause the cost of end to end calls. So, for economic efficiency, the cost of calls should be shared between the interconnecting networks. This signals the costs caused to the two operators which can then signal these costs to their subscribers through appropriate retail pricing. Under BAK an operator could charge subscribers who simply receive calls in a way which reflects the costs of terminating calls on its network. The subscriber would, in turn, then take action (e.g. refusing calls or curtailing calls) to control the charges in a way which reflects the value of the calls to him. So his behaviour would be economically efficient. Indeed, as we move to FMC services, the economic efficiency of BAK would increase.
- the problem of establishing efficient points of interconnection. If operators implement BAK then they have incentives for near end handover of calls. This would minimise the origination costs of the call that they bear and maximise the termination costs of the call borne by the other party. But there are good reasons to believe that it is not a serious issue in Hong Kong. Interconnect between operators at the transit switch level is well established, the scope for near end handover is limited given the small size of Hong Kong, and the market for transmission across Hong Kong is already highly competitive.

Given this analysis and the assessment of Figure E4 we recommend that ***OFTA should revise its guidelines on FMIC so as to change the default from current arrangements to BAK.***

### **E.13.2 Paying for interconnection links**

Currently the mobile operator bears 100% of the ongoing cost of interconnection links between fixed and mobile networks. We believe that it is in the public interest for ***OFTA to require each originating network to pay for the link capacity required to deliver traffic to the terminating network.*** This proposal has two main advantages over current arrangements:

- It removes further asymmetries in the treatment of fixed and mobile operators, allowing for more rational decision making on investment in fixed-mobile convergence services and strengthening cross platform infrastructure based competition in Hong Kong. This should in turn generate dynamic and productive efficiency gains
- It is consistent with the practices used for fixed to fixed interconnect in Hong Kong and with international best practice for FMIC arrangements

### **E.13.3 Fixed termination charges**

Fixed operators charge different call termination rates when they terminate calls originating on fixed and mobile networks. These arrangements suffer from two main weaknesses:

- The use of discriminatory fixed termination prices (with prices to mobile operators at 60%<sup>6</sup> more than the level of prices to fixed operators) generates a major asymmetry in the treatment of fixed and mobile operators
- The arrangements generate high transaction costs in negotiating, and possibly determining, termination charges. Many of the stakeholders we interviewed in the course of the study made this point. In particular, the entry costs for a new player are raised substantially by the need to negotiate call termination rates with all other players.

If OFTA were to regulate termination prices on an ex post basis then this would tend to increase rather than reduce these transaction costs.

To deal with these problems we recommend that the default for *all Type I interconnect, and not just that required for FMIC, moves to the BAK.*

## E.14 LOCAL ACCESS CHARGES (LAC)

Fixed operators typically charge 12.6 cents per minute to terminate international calls. But they charge only 2.7 cents per minute<sup>7</sup> to terminate calls originating on other local fixed networks. We refer to the difference, 9.9 cents per minute in the case of inbound international calls, as the *LAC premium*.

We have identified a number of problems with the LAC premium, but only one of these is within the scope of the study - namely that it constitutes a further asymmetry in the treatment of fixed and mobile operators. Fixed operators charge a LAC. Mobile operators do not and, in practice, are unable to do so.

As a result of regulation, fixed operators generate a net HK\$103 million per year from the LAC premium while a corresponding revenue stream is not available to mobile operators. This asymmetry may distort future investment decisions on fixed-mobile convergence, weakens cross platform infrastructure based competition, and so reduces the dynamic and productive efficiency gains which are possible through such activities. ***We recommend the abolition of this asymmetry, preferably in a manner that reduces the level of regulatory intervention.***

## E.15 OTHER RECOMMENDATIONS

### E.15.1 Regulatory principles

We recommend that OFTA adopt the following regulatory principles to guide its regulation of FMC developments and, more broadly, the general move to convergence:

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<sup>6</sup> Using the average two-minute call duration in Hong Kong

<sup>7</sup> Using the average two-minute call duration in Hong Kong

**(1) Regulatory forbearance and intervention with proportionality**

*OFTA should intervene when markets fail or the prospect of market failure without prior regulation is substantial, and, when it intervenes, it should use the minimum regulation that is required to deal with the problem*

**(2) Separation of economic and social regulation**

*Regulators should maximise economic welfare subject to generally agreed social constraints*

**(3) Maximising use of competition law**

*OFTA should maximise use of competition law to regulate markets. It should use ex ante regulation, which tends to crowd out competition law, only where there is substantial evidence that forbearance would lead to market outcomes which are clearly not in the public interest.*

**(4) Technology neutral regulation**

*When regulation is required to enable markets to function properly it should be applied without regard for the technology used to deliver the services into the market.*

**(5) Forward looking regulation**

*Regulation needs to anticipate to the extent reasonably possible the circumstances in which markets might operate in future.*

**E.15.2 Other proposals**

In order to remove other regulatory asymmetries and to further promote cross platform competition, we make the following recommendations.

**Access to land and buildings**

For the avoidance of doubt, OFTA should make it clear that it will:

- *consider the term "telecommunications line" in Section 14(1) of the Ordinance to be technologically neutral, and*
- *permit requests for authorisation from both mobile and fixed operators that involve the provision of service to tenants and inhabitants of buildings to be considered under Section 14(1) of the Ordinance when the purpose of the installation is to serve the tenants.*

**Self-provisioning**

We recommend:

- *the removal of licence and other conditions that restrict the ability of mobile operators from self-providing transmission services, including backhaul services between network elements and sites in mobile.*
- *road and civic infrastructure access be made available to mobile operators on the same basis and subject to the same road opening conditions that apply to fixed operators.*

### Licensing

We recommend that, as OFTA develops its unified carrier licences (UCLs):

- *The UCL should provide individual licensees with a general authorisation for the licensee to build networks and offer services subject to some specific constraints*
- *The same authorisation should be issued to all operators – fixed and mobile*
- *Spectrum licences should be issued to operators separately from the general authorisation*

### Number Portability

We recommend that:

- *in the long term OFTA requires all operators, fixed and mobile, to provide both fixed number portability (FNP) and mobile number portability (MNP) services and gives all operators the rights to receive information on ported numbers free of charge. The UCL is the obvious vehicle for implementing this recommendation*
- *in the short term OFTA leaves operators to devise their own market based solutions to deal with current difficulties. In reaching this recommendation we have taken into account the possible impacts of our proposal to move FMIC arrangements to BAK.*

### Moving to a centralised Number Portability database

We recommend that OFTA should:

- *make clear to operators that all will have full number portability (NP) obligations in future so as to enable efficient routing, and that fixed mobile number portability (FMNP) might be introduced at some point (See below for a discussion of this issue)*
- *convene an industry working group to see whether a centralised solution is cheaper and whether there is willingness to cooperate on developing and operating such a solution. This solution might involve all, or most, operators.*
- *ensure that any centralised database operator treats all operators in a non discriminatory way. One way to do this is to make sure that the centralised database is run by a third party, independent from any of the operators*
- *rule that, if a centralised database solution is more expensive or there is only limited interest in cooperation, then the current decentralised arrangements will continue for FNP and MNP.*

### FMNP and the Hong Kong Numbering Plan

We recommend that:

- *OFTA postpones a decision on FMNP for two years before reviewing again<sup>8</sup>.*
- *in the meantime OFTA carries out market research to determine the value that customers might place on information conveyed in particular numbering formats and ranges and on the value of the service itself*
- *the industry working group which examines the case for a centralised NP administrative database takes account of the likely long term need for FMNP*
- *OFTA continues to monitor the utilisation of the numbering plan so as to identify any numbering exhaustion problems at an early date.*

## **E.16 THE OVERALL IMPACT OF OUR PROPOSALS**

### **E.16.1 The balance of costs and benefits**

The costs of implementing our proposals are, with the exception of any decisions on FMNP, minimal. This reflects the fact that they involve withdrawal rather than imposition of regulation

There are significant benefits that are specific to the individual measures. In addition the combined measures generate two overall major benefits:

- They improve FMC investment by removing regulatory uncertainty, reducing inefficient investment and removing potential distortions to industry restructuring which takes place over the next few years. More effective investment should, in turn, enable the potential dynamic and productive efficiency gains from FMC to be realised more quickly in Hong Kong. We estimate a possible NPV of such benefits of \$HK 4.5 billion
- They strengthen OFTA's policy of infrastructure based competition by removing barriers to cross platform competition between fixed and mobile operators. This should enable Hong Kong to enjoy substantial dynamic efficiency gains as infrastructure based operators strive to compete more effectively through innovation.

### **E.16.2 Industry impacts**

In the **short term** we expect our proposals will lead to:

- Loss of revenue currently received by fixed operators
- Saving of payments by mobile operators enabling them to cut prices, so as to maintain market share.

In the **longer term** we expect, partly as a result of our proposals and partly as a result of FMC developments, to see:

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<sup>8</sup> This should provide sufficient time for the industry group to consider the issue; for relevant market research to be conducted; and for other shorter term changes recommended in the report to be implemented so that they can be better factored into the review

- an acceleration in fixed mobile substitution of calls, with the proportion of voice calls originating on the mobile network continuing to grow
- some fixed mobile substitution of access lines. Some subscribers will discontinue their fixed line service and rely entirely on mobile services for access to telecommunications. But we expect this effect to be limited. Most consumers and virtually all business will continue to use fixed line services for broadband access
- pure fixed operators concentrating their marketing effort and investment on the provision of broadband based fixed services e.g. the triple play offering of TV, voice telephony and Internet access for the consumer segment
- integrated operators, with both fixed and mobile networks, to roll out next generation networks which offer FMC services.

### **E.16.3 The impact of our proposals on end-users**

Overall our proposals should make the average citizens of Hong Kong better off. They should enable the telecommunications industry to compete more effectively and create more appropriate incentives for investment in new technologies by both the fixed and mobile operators. These changes should lead to the average citizen enjoying a wider range of better functionality services at lower prices<sup>9</sup>.

## **E.17 IMPLEMENTING OUR PROPOSALS**

### **E.17.1 Bill and Keep (BAK)**

To implement our proposals for BAK charging arrangements for Type I interconnect we recommend the withdrawal of TA Statement No. 7 and its replacement by a new guideline statement on the way in which OFTA would act if operators failed to agree on interconnection terms. The new statement should contain the following, or substantially equivalent, guidance:

*The operators that are potential parties should negotiate a Type I interconnection agreement in good faith when agreements have expired or are otherwise required to be put in place.*

*OFTA will make determinations on interconnection matters only if it is established that interconnection on the offered terms represents a failure of the market to achieve the public interest within the meaning of Section 36A(10) of the Ordinance.*

*OFTA will determine interconnection issues based on the merits and will have regard to the following three rules:*

*(1) That neither network operator shall charge the other network operator for call origination or for call termination (a rule sometimes known as BAK)*

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<sup>9</sup> For example quadruple play packages which provide subscribers with “best connected” service in terms of bandwidth, price, and quality wherever they are in Hong Kong

*(2) That the originating network operator shall bear the costs of transmission of calls to the agreed POI with the terminating operator's network*

*(3) That the terminating network operator shall bear the costs of transmission of calls from the agreed POI to the network termination point.*

This approach maximises the extent to which the operators may develop commercial agreements that best suit their circumstances. It also gives guidance on what will likely result from determination, subject to the merits of the case, and so provides a degree of certainty that BAK will be the likely default outcome.

### **E.17.2 Other proposals**

We set out the detailed implementation arrangements recommended for other proposals in the main report. In general this proposed implementation takes the form of withdrawing regulation and of providing the industry with guidelines on how it may expect OFTA to intervene if required to do so. The exception to this is the proposals for FMNP and changes to the Numbering Plan where the appropriate form of implementation is two years away and is dependent on industry working and market research closer to time.

## **E.18 OVERALL TIMETABLE FOR IMPLEMENTATION**

With the exception of recommendations relating to Number Portability and the Numbering Plan, we recommend that the proposals in this report should be implemented by OFTA as soon as possible, subject to:

- industry consultation and other process requirements
- allowing a transitional period for operators to plan for and manage the cash flow consequences of our proposals, and, in the process, to smooth any impact on end-users.

# 1. Introduction

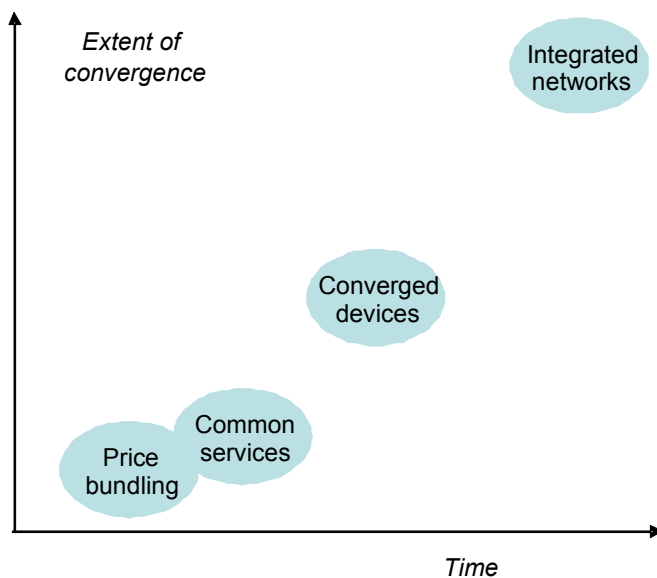
## 1.1 OBJECTIVE

This study identifies the regulatory barriers to the implementation of FMC in Hong Kong and describes how those barriers will operate to hinder the development of FMC. With a view to removing these barriers, the study addresses the possible revisions of the existing regulatory framework and proposes approaches that increase economic benefits while reducing regulation. The study recommends a road map that sets out the steps that need to be taken to achieve the potential benefits described, and the timetable for implementing them. The gist of the scope of consultancy study is given in at Annex 1 to this report.

## 1.2 WHAT IS FIXED-MOBILE CONVERGENCE (FMC)?

91.1 is drawn from Ovum's experience and observation of markets worldwide. Our research indicates that there are four main stages of FMC development as shown in Figure 1.1.

**Figure 1.1 - Stages of FMC Development**



Source: Ovum

Views vary about whether the first two stages – price bundling and common services - are necessary for the subsequent developments of FMC and whether those stages are really FMC in themselves, or are mere preludes to FMC in some countries. We have included these early stages in our analysis for two reasons:

- to understand better the way in which FMC is developing in many countries and to enable us to compare and contrast those developments with the likely development path in Hong Kong
- to provide early indicators of FMC developments. We recognise that there are many possible pathways to a high level of device and network convergence. These are discussed later in the report. For now it is sufficient to note that various forms of service bundling and support systems integration (such as single bill arrangements), whilst arguably not FMC services, may yet be important indicators of the movement towards FMC. We therefore consider these early developments in the study.

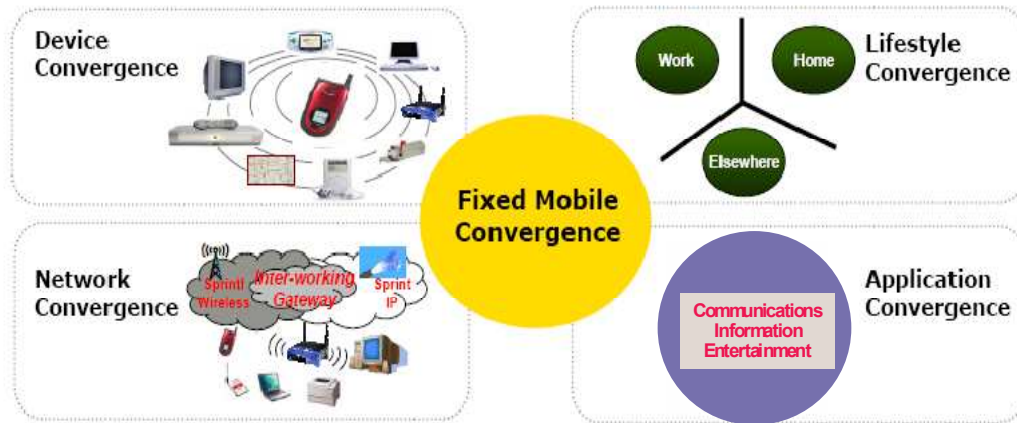
There is little argument about the final stage or goal of FMC, which is the development of a common services platform which allows for the development of integrated services which users can access from a range of devices over both fixed and mobile networks which leads to "anywhere anytime" services where the subscriber is always best connected in terms of bandwidth, quality of service and price charged.

There is a consensus among vendors and operators on this as a goal, and considerable work is being undertaken to achieve it worldwide.

There is a further consensus, as we discuss later in this report, that the development of FMC is a part (but an important part) of the bigger picture associated with the introduction of Next Generation Networks (NGNs) based on IP technology. This conclusion seems to apply to Hong Kong as much as it does elsewhere. Over the past 5 to 10 years the introduction of IP technologies into operator's backbone (or inter-node) networks has mainly been justified on the basis of reduced overall costs compared to circuit switched technologies, together with an enhanced capability to quickly and efficiently implement software-defined services across the network. However, this engineering cost-based business case has not, until recently, been sufficient to justify investment in NGNs at the access level. We examine in this report how the development of FMC and the potential for new FMC service revenues may strengthen the case for NGN deployment.

The convergence of application and networking is illustrated in Figure 1.2.

**Figure 1.2 - FMC, a convergence of lifestyle, application, device and network**



Source: FMCA, IDC, Sprint

### 1.3 BASIS OF FINDINGS

The findings in this report are based on -

- case studies of six countries that best represent the issues we need to consider. Annexes 2 to 7 present the detailed case studies. These look at FMC developments and the regulatory environment in which these developments will evolve in each of the six countries;
- interviews with local major stakeholders that enable us to better understand the market conditions, development status and specific issues of FMC in Hong Kong (see the list of interviewed stakeholders at Annex 8); and
- an assessment for the availability and capability of key technologies enabling FMC development in the next five years. This is based primarily on extensive research programmes by Ovum on FMC over the past six months.

## 2. Current State of FMC: HK and Case Study Countries

### 2.1 PURPOSE

The purposes of this chapter are:

- to assess the extent of FMC development in Hong Kong compared to other countries that were selected as case studies; and
- to examine the extent to which market conditions in Hong Kong favour the development of FMC

### 2.2 COUNTRY CASE STUDIES

Case study countries were selected in order to provide a range of regulatory and developmental contexts for comparison with Hong Kong.

The selection took into account those countries that best represent the range of initiatives that have been considered, or actually put in place, for FMC regulation. The final selection was based on key variables that would seem to be associated with a likelihood of faster FMC. The matrix that we have used is set out in Figure 2.1.

**Figure 2.1 - Case Study Countries**

| <i>FMC Charging arrangements</i>                                  | <i>Incumbent fixed operator has ...</i>         |  |
|---|---|--|
|   | <i>...significant presence in mobile market</i> | <i>...no significant presence in mobile market</i> |
| <i>CPNP (Calling Party's Network Pays in Full)</i>                | Australia, Italy, Denmark                       | United Kingdom,                                    |
| <i>Other (Calling Party's Network Pays in Part or Not at all)</i> | Singapore, United States                        |  |

The matrix is intended to provide a useful and representative set of countries which reflect the key dimensions associated with charging arrangements and dual market dominance

The selected countries were of specific interest as follows:

- in the UK BT's implementation of Blue phone, and the response of regulators to such developments, is of particular interest

- in the US the reciprocal compensation rule for interconnection arrangements has enabled considerable FMC in practice, including FM bundling initiatives
- Denmark is a leader in FM bundling
- Australia and Italy are good examples of CPNP environments in which the incumbent fixed operator has a leading position in the mobile market
- Singapore is a good example of an environment incorporating a partial RPNP arrangement in which the incumbent fixed operator has a leading position in the mobile market

Individual case study profiles for each country are contained in Annexes 2 to 8 inclusive of this report.

## 2.3 HOW FAR HAS FMC DEVELOPED IN HONG KONG?

### 2.3.1 The Four Stages of FMC

As noted in Chapter 1, we have identified four stages of FMC development:

- **Stage 1: price bundling** of fixed and mobile services. Bundles are delivered to customers at discounts, often via a single bill. The services and the networks which provide them remain separate
- **Stage 2: service convergence** in which a few common services are offered over both fixed and mobile networks e.g. a single voice mailbox or linked email
- **Stage 3: device convergence** in which a common device offers both fixed and mobile network access with seamless handover
- **Stage 4: network convergence** in which fixed and mobile services run over a common IP transport network and use a common platform for service creation and control - the IMS<sup>10</sup>

We have compared the development of FMC in Hong Kong against each of the case study countries, as shown in Figure 2.2, using the stages as an analytical framework.

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10 IP multi-media system

**Figure 2.2 - FMC Development in Hong Kong and Case Study Countries**

| <i>Country</i> | <i>Price bundling</i> | <i>Common services</i> | <i>Converged devices</i> | <i>Network Integration</i> |
|----------------|-----------------------|------------------------|--------------------------|----------------------------|
| Hong Kong      | Yes                   | Limited                | No                       | No                         |
| Australia      | Yes                   | Limited                | No                       | No                         |
| Denmark        | Yes                   | Yes                    | Trials                   | No                         |
| Italy          | Yes                   | Yes                    | Trials                   | No                         |
| UK             | No                    | Yes                    | Yes                      | No                         |
| Singapore      | No                    | No                     | No                       | No                         |
| USA            | Yes                   | Yes                    | Trials                   | No                         |

Source: Ovum

Overall FMC is only in its infancy and the scale of revenues which it might generate is not certain. This is reflected in the widely differing predictions of market analysts. For example:

- Pyramid<sup>11</sup> expects FMC services and handsets to generate \$95 billion worldwide in 2009. This represents around 6% of total telecommunications spend
- IDC<sup>12</sup> predicts revenues of only \$17 billion, or 1% of total telecommunications spend, by 2009.

In addition, it is not clear whether FMC revenues of the kind forecast above will come from new growth services, or from cannibalising traditional revenue sources.

### 2.3.2 Price bundling

Price bundling has developed considerably in many of the study countries, often with substantial discounts for taking a bundled offering. In many cases the bundles have been implemented to counteract churn. For example in Australia, both the incumbent, Telstra, and the main entrant, Optus, have offered integrated pricing for their fixed and mobile services. Both operators offer a bundle of minutes for both home and mobile phone services with a value well in excess of the monthly charge.

Price bundling is of concern where the operator is dominant in one market and seeks, through bundling, to gain undue advantage in the other market (fixed or mobile) or in separate markets (such as broadband). Regulators have responded to this issue. For example in Italy, the regulator, Agcom, has proposed an obligation not to unreasonably bundle services to be imposed on Telecom Italia. It plans to introduce a compulsory margin squeeze test for bundles to ensure that Telecom Italia does not leverage its dominance on the fixed voice and

<sup>11</sup> FMC: creating value with successful business models, June 2005

<sup>12</sup> See *Mobile Industry Outlook 2005/06*. Informa, January 2006

access markets to gain market power in other, more competitive, markets, and to guarantee that competitors can replicate the offer economically. It is also allowing only mixed bundles; that is, bundles of services where the services can also be bought separately by consumers.

Overall, then, in the case study countries, bundling has been a means of reducing churn, and, for fixed operators, a way of addressing the continuing effects of fixed mobile substitution (FMS). From the users' point of view, bundling is only attractive if it offers discounts.

In Hong Kong, there is far less evidence of bundling of this kind. Some operators have developed and are promoting bundled offerings. Both the HGC / HTCL group, and the PCCW / Sunday group already offer bundled fixed and mobile services in Hong Kong. We have no independent evidence of the success of these offerings. However, stakeholders have said they believe bundling is less attractive in Hong Kong because -

- Competition has kept the retail price of mobile calls very low and many subscribers have "bucket" plans with significant amounts of free minutes. This reduces the incentive to seek price relief through a combined fixed-mobile plan.
- The mobile premium<sup>13</sup> is substantially less than in the other study countries. When this is taken together with low absolute charges, the market opportunity to bundle is therefore less than case study countries. Based on the value of call plans available in various markets, Ovum's assessment of the approximate mobile premium in each of the study countries is shown in Figure 2.3.

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**Figure 2.3 - Assessment of Mobile Premiums**

| Country        | HK   | EU (Denmark) | US |
|----------------|------|--------------|----|
| Mobile premium | 1.05 | 2.3          | 2  |

Source: Ovum

Note Denmark has the lowest premium in the EU

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### 2.3.3 Common Services

These services are normally provided by integrated operators, running both fixed and mobile networks. Examples of common services include:

- common voicemail for calls to a subscriber's fixed and mobile numbers
- linked and integrated call forwarding services so that calls made to the fixed number are forwarded to mobile numbers or vice versa
- a linked email service in which a subscriber can access email using an interface with the same basic look and feel, whether accessed from his fixed or mobile terminal

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<sup>13</sup> The ratio of the price of a mobile service to the price of the equivalent fixed service

- a photography service, such as that offered by Sunrise in Switzerland, in which the user forwards photos taken on her mobile phone to her PC for storage, or retrieves photos stored on the PC via the mobile phone.

In theory these services provide end users with additional convenience, increase their willingness to pay and so generate additional consumer surplus. But our case studies suggest that demand for these services is, so far, limited.

In Hong Kong there is little evidence of development of such common services, other than call forwarding services, by integrated operators.

### 2.3.4 Converged Devices

Stage 3 of FMC requires substantial investment in new types of dual mode handsets<sup>14</sup> and in developing interfaces and functionality which allow seamless handover of calls as users move from fixed to mobile networks and vice versa. To date the service intelligence which controls the services offered to converged devices resides in the mobile rather than in the fixed network. We expect this to continue in future.

The case studies reveal a number of examples of converged device services, but mostly these are at the stage of early commercial operation. For example:

- Figure 2.4 provides an illustrative example from Sprint PCS in the USA. Mobile users currently make a substantial proportion of calls from the home or office. A recent Swisscom market study indicates that 50% of mobile calls are made at home<sup>15</sup>. These calls take up scarce spectrum and radio access network investment. Moving to dual mode devices would mean that these calls are made over the fixed network. This would release radio access network capacity for use by subscribers on the move and make more efficient use of fixed and mobile network resources over all.
- In the UK the BT Fusion product is an attempt to use a single device to connect to a different network interface when in the home and to deliver calls via the fixed network. Fusion is designed for the handset to work as a standard GSM phone when out of the home environment but as the user enters the home zone the phone connects to a BT hub through Bluetooth UMA. Calls are then routed via the broadband line and calls to UK fixed lines are offered at comparable rates to standard BT landline call charges. From the user perspective, the aims of Fusion are to provide cheaper calls when in the home zone and better in building voice coverage.

The development of converged device services connecting to multiple networks has progressed less in Hong Kong than in some of the study countries because of the low mobile call charge premium. The end user price reduction opportunities afforded by the relatively high mobile call charge premiums do not exist in Hong Kong, as already noted and the integrated operators interviewed did not consider the commercial return to be worthwhile under Hong Kong conditions.

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<sup>14</sup> eg Bluetooth/GSM or WiFi/GSM

<sup>15</sup> See Swisscom presentation to Informa conference on FMC in London, January 2006

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**Figure 2.4 - More efficient use of spectrum by Sprint PCS**

In the US the CATV operators have teamed up with Sprint PCS to offer a converged service based on Sprint PCS in the wide area and the CATV network in the home zone. This is aimed at consumers. It should offer Sprint PCS significant cost savings which it will reflect in the pricing of the package. The cost savings arise as follows:

- in the US many big bucket plans now include free minutes at night and weekend (16.00 to 23.00 hours)
- this generates a peak at around 21.00, when most consumers are at home
- off loading this peak traffic onto the fixed network means that Sprint does not incur costs in providing more radio access network. It also means that Sprint will take longer to use up its allocated spectrum.

It is not yet clear if this offering will succeed.

Source: FMCA, IDC, Sprint

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### 2.3.5 Network convergence

By network integration we mean the use of a common IP transport network and a common service creation and control platform for the provision of fixed, mobile and other services. It now makes growing sense for an integrated operator, running both fixed and mobile networks, to:

- build a new core IP transport network and
- offer users fixed and mobile services over this network using a common service creation and control platform and common operational and customer support systems.

This architecture has a number of advantages over existing networks:

- a single network with a single set of network management and provisioning systems replaces a range of circuit switched, IP, frame relay and ATM networks, reducing cost.
- the centrally located service creation and control system enables faster and cheaper development of new services. This in turn allows the operator to experiment with a much wider range of products than is viable with existing networks and systems, and so discover the service packages for which there is substantial end-user demand.
- the common service platforms allows for the development of integrated services which user can access from a range of devices over both fixed and mobile networks. This leads to “anywhere anytime” services where the subscriber is always best connected in terms of bandwidth, quality of service and tariff charged.

We have been unable to find any example of substantial implementation of network convergence in Hong Kong or any of the case study countries. However, all fixed and integrated operators are reviewing their plans to include provision for NGN IP-based operations in future and the speed of development of integrated fixed-mobile networks is closely linked to such plans.

Plans for network convergence and integration in the context of NGN operations typically extend over the next five years. Some operators have signalled more aggressive rollouts. For example, in late 2005 Telstra announced plans for 70% coverage by 2008. In early 2005 BT announced its 21CN rollout plans for substantial completion by 2009. In Hong Kong, PCCW's rollout plans extend over a longer period - up to 2014 for complete network transformation.

In some countries the regulatory frameworks relating to mandated wholesale access need to be considered further to determine the climate within which final decisions on investment levels and timescales for next generation network roll out will be made. For example:

- In Europe, the European Commission has indicated that it will review the regulatory framework in 2006, and that the arrangements for access to new network infrastructure, including IP-based operations and transmission over fibre paths, will be considered. Many operators appear to be waiting on the outcome of this review.
- In Australia, Telstra announced a major instalment of NGN implementation in November 2005, with plans to extend fibre to the node in five major cities, but "subject to reasonable regulatory outcomes" (that is, subject to there not being a regulated access regime for such infrastructure and services).

### 2.3.6 Overall conclusions on FMC development

Based on discussions with a range of operators, we conclude that:

- Stage 4 FMC, using integrated networks, is just one part of a move to next generation IP networks. We expect this form of FMC to develop at the same rate as the roll out of next generation networks
- Running mobile as well as fixed network services over the NGN significantly strengthens the case for NGN investments, and the benefits which these investments generate, since the common costs of the NGN are then shared over a much wider set of services than if the NGN offers fixed services alone
- Generally Italy, Denmark and the United States are taking the lead in moving along the path of staged development that we have outlined
- The thinking of operators about FMC in Hong Kong is different from that in other countries. FMC development is likely to be at a slower pace for a number of reasons. For example:
  - the subscription fee for mobile services is as low as those for fixed telephony service in Hong Kong
  - the relatively low EBITDA margins of some operators, together with concerns about the level of demand for FMC services, suggests a reduced level of investment in FMC

- Hong Kong has good indoor mobile coverage, reducing the need for dual mode devices and services for both indoor and outdoor operation
- Even in the leading countries demand for FMC is still far from certain.

## 2.4 MARKET CONDITIONS FOR FMC

The market conditions for FMC in Hong Kong and the case study countries largely explain the relative levels of FMC development to date, and, absent change, provide an indication of relative levels of development in future.

We have developed a framework for comparison on a number of dimensions. These are:

- price premiums for mobile
- extent of FMS
- investment conditions
- attractiveness of bundles
- market structure

### 2.4.1 Price premiums for mobile

The mobile premium is very low in Hong Kong. One of the main attractions for Stage 3 FMC services is the use of converged devices so that users avoid mobile prices and pay only fixed service prices for a significant proportion of calls. This attraction is weak in Hong Kong.

Figure 2.5 sets out the evidence on premiums that have guided this conclusion. We regard the results as approximate only, since care has to be taken with the use of price plans for mobile services and of flat rate charging in Hong Kong for fixed calls.

**Figure 2.5 - Mobile Price Premiums - assessments**

| Country   | Date | Premium (*fixed) | Country     | Date | Premium (*fixed) |
|-----------|------|------------------|-------------|------|------------------|
| Hong Kong | 2005 | 1.05             | Australia   | 2004 | 4.1              |
| US        | 2005 | 2.0              | UK          | 2004 | 4.3              |
| Denmark   | 2005 | 2.3              | New Zealand | 2005 | 5.1              |
| France    | 2003 | 2.9              | Switzerland | 2002 | 6.0              |
| Spain     | 2003 | 3.4              | Sweden      | 2003 | 6.1              |
| Portugal  | 2002 | 3.5              | Germany     | 2003 | 7.2              |
| Norway    | 2003 | 3.8              |             |      |                  |

Source: Ovum, Citibank

### 2.4.2 Extent of FMS

We are concerned here with call FMS rather than access FMS. The first relates to the diversion by subscribers of outgoing calls from fixed services to mobile services. The second relates to giving up fixed access lines altogether. Both are occurring in Hong Kong and all case study countries.

The extent of call FMS may be assessed by considering the proportion of total outgoing voice calls that are made using mobile services. Our assessment (see Figure 2.6 below) suggests that Hong Kong is well ahead of the case study countries for which information is available. We consider that this is because competition is greater for mobile services in Hong Kong, leading to lower mobile premiums and low mobile call prices, and high penetration of mobile services. This leads to a greater propensity to use mobile services for calling than in other countries.

**Figure 2.6 - Estimates of proportions of calls originated on mobile services**

| Country   | % of voice traffic<br>originating on mobile<br>networks |
|-----------|---|
| Hong Kong | 33%   |
| UK        | 23%   |
| US        | 26%   |

Source: Ovum, based on available information from each Country

### 2.4.3 Investment conditions

Figure 2.7 compares the returns, expressed as EBITDA margins, of Hong Kong operators with those elsewhere in the world. Returns are important in encouraging further, timely and sustained investment in NGNs and FMC development. We can see that the margins of the mobile operators in Hong Kong are, on average, below equivalent margins elsewhere in the developed world.

In the short run Hong Kong operators continue to make investments at levels which are close to world norms<sup>16</sup> and, as far as we can tell from stakeholder feedback, this investment is focussed on rollout of 3G technologies by mobile operators and on broadband and IP technologies by fixed operators. As Hong Kong's network operators have already invested billions of dollars in their networks they may keep on investing in new technologies so as to explore new revenue streams and compete for a higher market share.

In the longer term, the proposals that are outlined in this report will add to regulatory certainty and will therefore improve the climate in which investments are planned and made.

### 2.4.4 Attractiveness of bundles

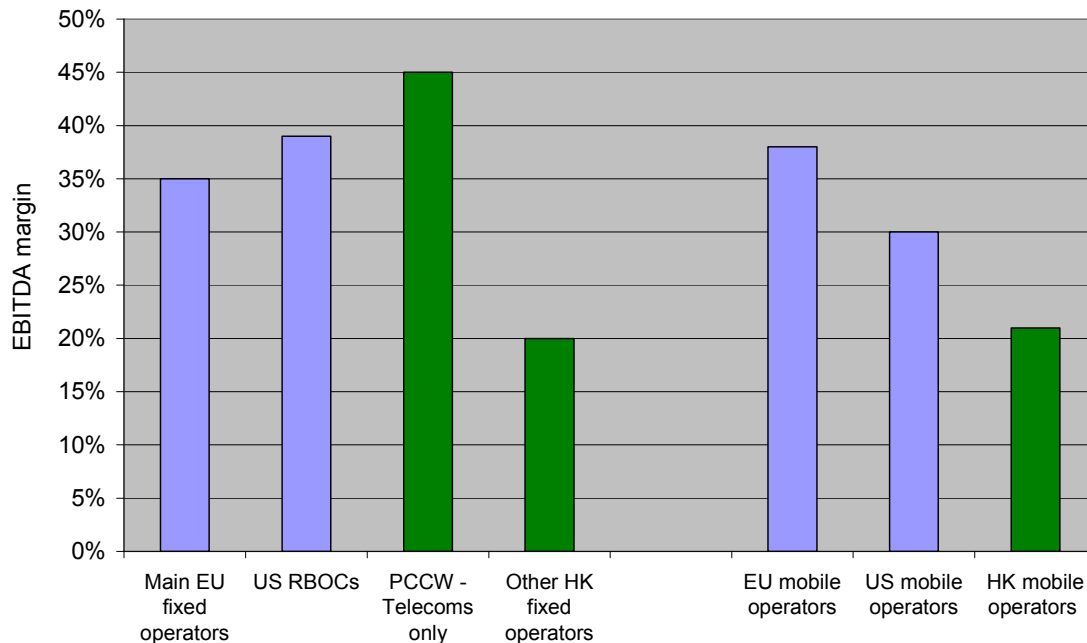
Several stakeholders made the point during the study that end-users may be reluctant to buy fixed-mobile service bundles in Hong Kong, especially compared to their counterparts in other study countries. However there is little empirical evidence to support the point. In fact, it is hard to believe that Hong Kong users would not be as interested in the discounts associated with bundled offerings as elsewhere. It may well be that Hong Kong is no different from the EU, where, according to a recent research by McKinsey<sup>17</sup>, 30% of users are not interested in bundles, but the other 70% are. Lack of mobile bundles may instead reflect the fact that competition has driven down prices to the level where there is limited scope for offering discounts that are attractive to customers.

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<sup>16</sup> For example in 2004 both fixed and mobile operators in Hong Kong made investments equivalent to 17% of revenues.

<sup>17</sup> Developing and Marketing Compelling Converged offers, Pawel Grochowicz, Telecom New Zealand, Informa FMC conference, London, January 2006

**Figure 2.7 - Profitability of Hong Kong and other operators compared, (2004)**



Sources: OFTA statistics, Ovum Euroview, Ovum consulting study, Wireless Intelligence.

### 2.4.5 Market structure and number of players

There are substantial numbers of fixed and mobile operators in Hong Kong. There are five separately owned mobile operators and five fixed operators with substantial numbers of narrowband and broadband lines. As a result the Hong Kong telecommunications market has one of the lowest concentrations of market power in the world<sup>18</sup>.

This multiplicity of players means that, even if the industry were to restructure significantly as a result of FMC, with pairs of fixed and mobile players merging, the level of competition would probably remain satisfactory. This is not the case in many other countries. For example there is considerable concern about the reintegration of Telecom Italia's fixed and mobile arms. Telecom Italia currently has a 90% share of the fixed market and over 40% of the mobile market.

## 2.5 REGULATORY CONDITIONS IN HONG KONG

We have compared the regulatory conditions in Hong Kong with those in the case study countries, using a number of dimensions -

<sup>18</sup> Report on the Effectiveness of Competition in Hong Kong's Telecommunications market in 2005, Spectrum, December 2005

- Fixed Mobile Interconnection (FMIC) arrangements
- Licensing of fixed and mobile operators
- LAC position
- Requirement for FMNP
- Constraints on price bundling
- Constraints on information sharing
- Treatment of MVNO access
- Scarcity of spectrum

Each dimension is described in greater detail below.

### **2.5.1 Fixed Mobile Interconnection (FMIC) arrangements**

Hong Kong is the only country that requires the mobile operator to pay 100% of the interconnection charges for FMIC. In the European Union and in Australia the mobile operator pays a fixed operator a fixed termination charge for mobile to fixed calls and the fixed operator pays a mobile termination charge to mobile operators for termination of fixed to mobile calls. In the US the mobile operator both pays and receives the fixed termination rate on the basis of the 'reciprocal compensation' principle.

In Hong Kong the fixed termination rate is very different for fixed-to-fixed calls and mobile-to-fixed calls, because of the different costing standards applied historically.

The interconnection arrangements in Hong Kong are asymmetric, making interconnect charging for FMC services involving converged devices more difficult than FMIC arrangements used in some other countries, such as the US. We discuss these issues and ways of dealing with them in Chapter 5.

### **2.5.2 Licensing of fixed and mobile operators**

Hong Kong stands out because of the asymmetric conditions that it has adopted for fixed and mobile operator licensing.

In the European Union, licensing of both fixed and mobile operators takes the form of the same general authorisation, with an additional spectrum licence for mobile operators.

In Singapore, the same facilities based operator licence is used for licensing fixed and mobile operators, pursuant to a technology neutrality policy.

In the US, the 1996 Telecommunications Act continues to make a distinction, embedded in the original act of 1934, between

- common carrier services of Title II of the Act (which includes all fixed line services) and radio communications services of Title III of the Act (which includes all mobile services)

- basic fixed telecommunications services and enhanced services which includes Internet services.

This distinction is coming under increasing pressure as technologies develop and IP based services displace circuit switched common carrier services. So there is now considerable debate on when and how to revise the 1996 Act to get rid of these increasingly artificial distinctions.

We see Hong Kong being in an unusual situation. In the EU and Singapore technological neutrality is now a prime principle for licensing. Clearly this is not the case in the US, but US authorities are under increasing pressure to regulate on a technology neutral basis.

### 2.5.3 LAC position

In Hong Kong the fixed operators, but not the mobile operators, charge a premium over local call termination charges for terminating international inbound calls. This makes Hong Kong unique in two respects:

- In none of the other countries studied is there a designated charge on incoming international calls over and above the level of international settlements that applies to termination on fixed networks. In the EU, Australia, Singapore and the US the same termination charge applies to both international and national calls
- In none of the other countries are mobile operators so constrained in their abilities to charge for inbound international calls. The result is an asymmetry that affects the prospects for FMC development.

### 2.5.4 Requirement for FMNP

FMNP has been introduced only in the US. However, the motivation was to deal with number plan exhaustion rather than to enable FMC. The situation in Hong Kong is therefore the norm.

### 2.5.5 Constraints on price bundling

In general regulators have responded to price bundling on an ex post basis after receiving complaints. Typically they have required that only mixed bundles be made available - that is, that customers should be able to obtain the services that make up the bundles separately. Regulators have also been concerned to ensure that the pricing of bundles, usually subject to a discount, remains at a level that is not anti-competitive.

As already noted, the example of Italy is fairly typical of regulator concerns. The regulator, Agcom, plans to introduce a compulsory margin squeeze test for bundles to ensure that Telecom Italia does not leverage its dominance on the fixed voice and access markets to gain market power in other, more competitive, markets, and to guarantee that competitors can replicate the offer economically. It also requires bundles to be mixed.

### 2.5.6 Constraints on information sharing

Sharing of customer and other market information between fixed and mobile operators, and between the fixed and mobile divisions of integrated operator organisations, is an issue that takes a number of forms.

There are few barriers to cross selling and bundling of fixed and mobile products in HK. OFTA now controls prices on an ex-post rather than ex-ante basis to satisfy itself that bundled prices meet the requirements set out in the Telecommunications Ordinance. This is essentially the same as competition law constraints in the US or EU. At the same time OFTA grants general permissions for the sharing of customer profile information between fixed and mobile operators provided the operators can meet data privacy requirements. In contrast many regulators in the EU impose more stringent tests on bundled prices and prohibit the sharing of customer profile information.

The situation with customer service records for data dip and number portability purposes is a different matter. In most other countries fixed and mobile operators are treated the same. They are obliged to make arrangements to redirect calls to ported numbers, whether associated with fixed or mobile services, and may establish their own data bases of changes for the purpose. In Hong Kong only fixed operators are able to establish data bases of both fixed and mobile service ported numbers. Further, mobile operators pay four fixed operators, whose licences were granted in 1995<sup>19</sup>, to include updated information on ported numbers in their data bases. There is nothing to prevent mobile operators from buying fixed number data to add to their mobile service number data bases. However, they would have to negotiate suitable commercial terms with fixed operators - the latter being under no obligation to treat. This is another asymmetry in the treatment of fixed and mobile operators that applies only in Hong Kong. The asymmetry exists because the obligations of mobile and fixed operators are different.<sup>20</sup>

### 2.5.7 Treatment of MVNO access

The conditions set out in the license of the 3G operators in HK give MVNOs more favourable access to network capacity than in other countries. So fixed operators wishing to provide FMC services stand a better chance of developing a viable product than their counterparts in other parts of the world.

There is evidence that the MVNO arrangements have worked well for 2G operators as well. In Hong Kong there are seven 2G MVNO, many of whom have gained a foothold in the market. The ability of 2G MVNOs to negotiate commercially for additional network capacity with operators with mobile network facilities has been confirmed recently.

### 2.5.8 Scarcity of spectrum

The scarcity of spectrum is an actual or potential problem everywhere. At present there appears to be sufficient 3G spectrum in Hong Kong. However, once demand increases and network capacity increases in response, FMC may well be regarded as a suitable means of conserving spectrum in Hong Kong as outlined in Figure 2.5. There is a need for a clear spectrum policy so everyone knows where they stand, and so that they have equal opportunity

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<sup>19</sup> New fixed operators whose licences are granted after 1999 have to include updated information on ported mobile numbers in their data bases at their own cost.

<sup>20</sup> Under current regulation mobile operators are responsible for directing a mobile-to-mobile call to the right mobile network. Fixed operators are responsible for directing all calls between the mobile and the fixed networks.

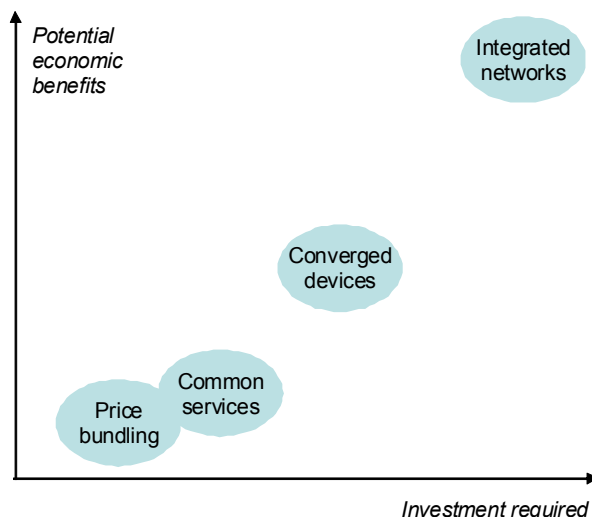
to access spectrum for their needs. This need is now the subject of a separate Spectrum Policy Review being undertaken by CITB and OFTA.

## 2.6 POTENTIAL ECONOMIC BENEFITS OF FMC

The development of FMC looks very likely in the longer term both in Hong Kong and in the case study countries, but the timing of demand is uncertain. Based on review in case study countries we have made the following assessment of likely economic benefits from each of the four stages of FMC development.

The four stages each require different levels of investment by operators and, if successful, generate different levels of economic benefits. Our view is shown in Figure 2.8.

**Figure 2.8 - FMC: potential economic benefits and investment required**



### 2.6.1 Stage 1: Price bundling

Price bundling requires very little investment. But it also generates very modest economic gains. It may, for example, reduce search costs for certain types of end-users and stimulate overall levels of use.

### 2.6.2 Stage 2: Common services on fixed and mobile networks

Common services across fixed and mobile networks require more substantial, but still modest investment. Examples of the types of services in this category are listed in Section 2.3.3 above.

In theory these services provide end users with additional convenience, increase their willingness to pay and so generate additional consumer surplus. But our case studies suggest that demand for these services, and the economic benefits that they have generated, is, so far, limited.

### 2.6.3 Stage 3: Converged devices

Stage 3 of FMC requires substantial investment in new types of dual mode handsets and in developing interfaces and functionality which allow seamless handover of calls as users move between fixed to mobile networks. The potential benefits from services based on converged devices are, like the investment required, considerably greater than for Stages 1 and 2. In particular we expect:

- productive efficiency gains. See Figure 2.4 for an illustrative example from Sprint PCS in the US.
- an increase in consumer surplus. Converged devices offer mobile users better coverage within buildings, higher quality calls, higher bandwidth, and a single personalised device and address book for all calls. In combination this should, at least in theory, provide users with a more convenient and attractive service for which there is a greater willingness to pay.

### 2.6.4 Stage 4: Converged networks

Converged networks require the greatest additional investment (by some way) and potentially offer the largest additional economic benefits.

This architecture of a single converged network has a number of advantages over existing networks:

- replacement of a number of specialised networks by a single network should lead to substantial reductions in both capital and operating expenditure and, with it, major productive efficiency gains
- the faster and cheaper development of new services resulting from deployment of a centrally located service creation and control system, should lead to greater experimentation and testing of services in the market. This in turn should lead to dynamic efficiency gains
- the development of “anywhere anytime” services where the subscriber is always best connected in terms of bandwidth, quality of service and tariff charged. Again this should create dynamic efficiency gains.

These outcomes apply to the delivery of FMC services. But they also apply to a wide range of other services delivered to both consumers and business. For example they drive the current move by PCCW and other operators in Hong Kong to deliver quadruple play<sup>21</sup> or triple play<sup>22</sup> to consumers or the delivery of an integrated set of voice, data, and video services to large enterprises.

The scale of the benefits associated with Stage 4 FMC is hard to judge but they should be very substantial. For example:

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<sup>21</sup> Mobile voice telephone, fixed voice telephony, fast Internet access and TV

<sup>22</sup> Quadruple play less mobile services

- in the UK BT claims that its next generation network - designed to offer mainly fixed services since BT does not own a mobile network - is justified to shareholders on the basis that it will save BT HK\$13 billion per annum in costs by 2010. It plans to invest £10 billion (HK\$ 135 billion) to establish the network by 2009.
- Telecom Italia, in the early stages of integrating the operations of its fixed and mobile networks, claims savings of HK\$13 billion per annum with substantially more savings to come. See Figure 2.9 for details.

**Figure 2.9 - Cost savings from integration of fixed and mobile businesses**

Telecom Italia Mobile and Telecom Italia<sup>23</sup> merged in 2005 and generated efficiency savings of around Euro 1.5 billion per annum from the merger. This breaks down as follows:

- Euro 170 million per annum in better procurement
- Euro 1000 million per annum in more efficient use of network infrastructure eg TI now uses its metronet fibre to provide BTS to BSC links rather than leased lines
- reductions in its universal service costs through use of GSM technology to supply rural customers (erecting a BTS and supplying GSM fixed phones)
- development of a single platform for mobile and fixed value added and content based services
- use of a common IT services platform.

Source: Ovum

- Cesky Telecom announced plans on 1 March 2006 to merge its fixed operations (69.4% owned by Telefonica) with its fully owned mobile subsidiary Eurotel Praha, and to change its name to Telefonica O2 Czech Republic. The new integrated organisation was designed with integrated business and consumer segments, IT and network operations and overall support activities. Through this integration, Telefonica O2 estimates total enhanced revenues and opex synergies of HK\$6.4 billion when the integration is completed at end 2006. The synergies are realised by revenues of new fixed-mobile convergence (FMC) integrated bundles, efficient sales and opex savings in integration of network operations and IT infrastructures. See Figure 2.10 for details.

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23 The fixed arm of the group

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**Figure 2.10 - The synergies from integration of fixed and mobile businesses**

Cesky Telecom and Eurotel Praha announced plans on 1 March 2006 to integrate the fixed and mobile businesses and change name to Telefonica O2 Czech Republic. It would generate total enhanced revenues and Opex synergies of around €760 million. Details of integration are as follows:

- Revenues generated from new integrated fixed-mobile convergence bundles re: voice and broadband consumer sales and integrated business solutions for corporate customers
- Revenue synergies achieved by cross-selling through integrated sales channels, reduced churn and improved retention for mobile and fixed markets
- Opex synergies achieved through unification of IT infrastructure and integration of network operations, maintenance and supervision, and elimination of duplications in support functions.
- The integrated business organisation would have four business units namely, Wholesale, Product Development, Business and Consumer. The business units would be organised by customer segment to increase commercial focus and customer service
- The Operations organisation would integrate mobile and fixed networks with IT to better respond to the latest telecommunications trends

Source: Ovum

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## 3. Likely Future FMC Developments

### 3.1 PURPOSE

In this chapter we will assess the likely pace and form of FMC developments from a supply side perspective. This involves examination of the range of technologies that will provide the likely platforms for FMC and their likely evolution over the next five years.

We believe that the time horizon of 5 years (to 2010) is sufficient for the purposes of the study because:

- this is the planning horizon for many operators in terms of the strategic transformation of their networks to next generation (NGN) working. Even though some operators may have plans beyond 2014, the commitment is associated with the next five years, with increasing flexibility the further the horizon is extended
- forecasting technological developments and cost relationships beyond this horizon is extremely difficult and speculative, and therefore of rapidly diminishing value to this project
- demand patterns that influence further investment in specific technologies are likely to form based on cumulative experience of consumers and responding to the immediate behaviour of service providers in the market place. These patterns cannot be forecast in the detail required beyond 2010.

### 3.2 STRATEGIC DRIVERS FOR FMC

Operators approach FMC from different perspectives, depending upon whether they operate a fixed network only, a mobile network only, or both. In Hong Kong there are operators in all three categories as shown in Figure 3.1.

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**Figure 3.1 - Different types of operator in Hong Kong**

| <i>Category</i>             | <i>Players</i>   |
|-----------------------------|--|
| Fixed only                  | Wharf T&T, HK Broadband                                  |
| Mobile only                 | SmarTone, Peoples  |
| Integrated fixed and mobile | PCCW/Sunday, CSL/New World PCS, Hutchison Global/Telecom |

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#### 3.2.1 Pure fixed operators

Pure fixed operators, like BT in the UK, often see FMC as way of stemming fixed mobile substitution and retaining customers. But they face a major challenge in implementing FMC services, namely, how to acquire the necessary mobile services capability. For FMC Stages 1 to 3 (see Chapter 2) they might:

- negotiate a deal with a mobile operator as BT has done with Vodafone in the UK

- become an MVNO. Regulatory requirements on 3G licensees make this a particularly promising approach in Hong Kong
- build their own mobile capability using new wireless technologies such as WiMax. This third option is highly uncertain. It is as yet unclear whether technologies like WiMax will offer an adequate substitute for cellular mobile services, even in a market as concentrated as Hong Kong. In any case we are unlikely to see commercial deployment of WiMax with full mobility before 2009.

These options are not available for Stage 4 of FMC however. The FMC services which are possible through network integration require a pure fixed operator to acquire or be acquired by a mobile operator.

### 3.2.2 Pure mobile operators

Many pure mobile operators currently have little interest in FMC services. Some mobile operators like Sprint in the US, are interested in FMC services as a way of reducing churn<sup>24</sup> and reducing the need for additional radio access network build for the busy hour as illustrated in Figure 2.5. But many have little short term interest. They continue to win traffic from the fixed network through fixed mobile substitution. As well, they are normally in the process of rolling out in the 3G network. In consequence, their investment is focussed on 3G build and their marketing and sales efforts focussed on migrating customers to the new network and using its enhanced data capability to develop new value added and content rich services.

### 3.2.3 Integrated fixed and mobile operators

FMC makes most sense for integrated operators running both fixed and mobile networks:

- in the short term it is relatively simple for these operators to offer bundles of services and common services – Stages 1 and 2 of FMC. Some fixed operators with recently acquired 3G licences are also using FMC as a way to win mobile market share. (See Figure 3.2 below for an example.)
- integrated fixed and mobile operators are better placed than pure fixed or pure mobile operators to develop Stage 3 FMC services, and
- they are the only type of operator able to deliver Stage 4 FMC.

Roll out of next generation networks with integrated fixed and mobile services should give integrated operators a substantial competitive advantage over pure fixed or mobile operators. Such a strategy:

- allows the integrated operator to spread its common cost over both fixed and mobile services
- enables the integrated operator to develop a wider range of FMC services more quickly and more cheaply.

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<sup>24</sup> Empirical evidence shows that customer churn for bundles of telecommunications services is significantly lower than for single services

If such a strategy succeeds we may well see the industry restructuring with the pure fixed and mobile players merging in order to compete with the integrated players on equal terms. Although M&A activity is ultimately driven by broader circumstances in the market, regulatory clarity will usually be an important factor.

**Figure 3.2 - Using FMC for market entry**

TOT is the biggest fixed operator in Thailand. It recently acquired a 3G licence

TOT is now selling FMC services to large companies in Thailand eg banks, fast food chains

Each sale helps TOT to:

- Move mobile traffic from the networks of the mobile incumbents to its own, largely empty, network
- Win the business of the employees of the enterprise – not just in their role as staff of the enterprise, but also their private use of mobile services
- Reduce the chance that the enterprise will switch telecommunications suppliers

Source: Ovum

### 3.3 KEY TECHNOLOGY COMPONENTS FOR FMC

Different sets of components are required:

- for Stage 3 – wireless interfaces to dual mode phones e.g. Bluetooth, WiFi and WiMax
- for Stage 3 – standards for control of dual mode phones e.g. CTP, UMA, SIP
- for Stage 4 – standards for fully integrated services SIP/IMS

The status and likely pace of development for each standard and the time when commercial products will become available is discussed further below.

### 3.4 WIRELESS INTERFACES TO DUAL MODE PHONES

In order to launch an FMC device every player has to make a number of choices:

- a wireless bearer to provide the in-premises link from the device to the fixed access point. In essence, the choice is down to Bluetooth versus WiFi (and WiMax)
- the standards that will enable the integration of the fixed and mobile elements into a single service and one device. The standards choice here boils down to the Bluetooth CTP, UMA standard, WiFi (and WiMax), and SIP/IMS together with a number of proprietary solutions.

In order to deliver an FMC service based on a single dual-mode device, operators need to choose the wireless bearer to provide the in-premise link between the device and the fixed network. This wireless bearer must complement the cellular network in order to deliver a

service that will work outdoors (using the cellular network) and indoors (using the chosen wireless bearer as a link to a fixed access point).

### 3.4.1 Bluetooth

Bluetooth refers to the Institute of Electrical and Electronic Engineers' (IEEE) 802.15.1 standard. It is promoted by the Bluetooth Special Interest Group (SIG), and comprises companies such as Ericsson, Nokia, Intel, IBM and Microsoft. Bluetooth operates in the licence-free 2.4GHz frequency band.

#### Performance

Bluetooth V1.0 supports data rates of up to 723kbit/s. Bluetooth V1.2 delivers data throughput of 3Mbit/s, while Bluetooth V2.0 is set to raise this to 12Mbit/s. In terms of range. Equipment with Class 2 chipsets can deliver range of 5-10 metres, while that of Class 1 can deliver range of 20-25 metres.

#### Vendor support and availability

Bluetooth is well supported by the main device manufacturers and it is integrated in many mobile devices (although most of it is Class 2 Bluetooth). In this respect it has a head start against WiFi, which is still relatively rare in devices (although this is changing). However, in terms of availability and deployment of access points, WiFi dominates.

### 3.4.2 WiFi

WiFi comprises several 802.11x standards that have been ratified by the IEEE to date, together with a number of standards currently under development.

So far, the 802.11b standard has been the one with the dominant share of 802.11x equipment shipments, although the 802.11g standard is beginning to gain traction in the market.

- **802.11b.** This standard was ratified in July 1999, operates in the 2.4GHz band and offers data speeds of up to 11Mbit/s in a 50 metre range
- **802.11g.** This standard was ratified in June 2003, also operates in the 2.4GHz band but due to its orthogonal frequency division multiplexing (OFDM) modulation it can offer speeds of up to 54Mbit/s, albeit at a shorter range of 25 metres. This standard is compatible with 802.11b

Performance: The high data throughput rates (which will be conditional on the backhaul capacity) are important well for data services, but a major factor for FMC deployment is WiFi's range of 50–100 metres, which is superior to Bluetooth, and more adequate for coverage of both residential and business premises.

#### Vendor support and availability

In terms of availability of WiFi access points/hotspots WiFi is significantly ahead of Bluetooth. All of the major vendors, including Alcatel, Cisco, Ericsson, Juniper, Lucent, Nortel and Siemens continue to build their presence in this space. A number of service providers, independent public WLAN operators and municipal authorities are expanding their network of WiFi hotspots, and many are promoting WiFi as a home networking technology. As a result of

its wide deployment, the prices of WiFi access points have declined. However, in terms of devices, WiFi scores lower than Bluetooth and this has been the key reason BT chose to launch its Fusion services with Bluetooth-supported devices, rather than with WiFi-based ones.

### **Assessment of WiFi**

WiFi has superior range, data throughput, and there are potential synergies between the home/office WiFi and public WiFi hotspots that many operators have rolled out. Not surprisingly most operators tie their plans to WiFi as a bearer. The principal advantage of Bluetooth is in the greater availability of compatible handsets (due to its lower power consumption and cheaper chipsets).

As dual-mode WiFi/cellular devices become available in volumes in the period ahead, most operators are opting for WiFi to support their FMC rollouts. Even BT has integrated both Bluetooth and WiFi in its access points in order to be able to smoothly migrate to WiFi/cellular devices, as they become available.

It should be noted that neither Bluetooth nor WiFi currently support fast handover between access points. There are proprietary solutions that work with particular vendors' hardware and there are also various work items in progress that are focused on overcoming this problem. Currently, it is one of the barriers to deploying FMC solutions in an enterprise context and a number of access points are needed to provide full coverage.

### **3.4.2 WiMAX Standard**

In 2002, The Institute of Electrical and Electronics Engineers Standards Association (IEEE-SA) ratified the IEEE 802.16 standard - a point-to-multipoint broadband wireless access standard for systems in the 10-66GHz and 2-11GHz frequency ranges. The standard covers both the Media Access Control (MAC) and the PHY layers. Contrary to the IEEE 802.11 wireless LAN standard, IEEE 802.16 has been designed to be compatible with European standards (such as ETSI HiperMAN).

Several IEEE working groups have developed amendments to enhance IEEE Standard 802.16, notably IEEE Standard 802.16a, published in April 2003. IEEE Standard 802.16a was an amendment to IEEE Standard 802.16 that covers MAC modifications and additional PHY specifications for 2-11GHz, enabling support for both licensed and licence-exempt bands.

In July 2004, the IEEE ratified the IEEE 802.16-2004, which revises and replaces former 802.16, 802.16a and 802.16-REVd standards. Among other enhancements, this standard introduces support for indoor CPE and MIMO antennas. The next evolution was the addition of mobility features through the development of the 802.16e standard. This standard was approved by the IEEE on 7 December 2005 and is now called 802.16e-2005.

### **Assessment of WiMAX**

WiMAX 802.16-2004 will help broadband (fixed) wireless access (BWA) operators in the markets that they have already operated in. The main advantages will be cheaper equipment and freedom of choice for customer premise equipment (CPE) which allows operators greater bartering power. In the future there will be further advantages as equipment becomes available in a range of frequency bands.

WiMAX is a cost-effective alternative to wired technologies in rural areas and countries where the existing wired infrastructure is poor or even non-existent. However, in developed countries, WiMAX 802.16-2004 will remain a niche market, mainly used to fill in the gaps of DSL or fibre coverage for incumbents. In those under-served areas, new entrants and BWA players have to target businesses that can constitute a lucrative niche market. Thanks to public funding, these operators can also provide WiMAX services to consumers. As well as Internet connectivity services, fixed WiMAX is also an alternative to using traditional and expensive last-mile technologies for supporting backhaul functions. Some service providers plan to combine WiMAX and WiFi, using WiMAX simultaneously as a backhaul solution for their WiFi services and as an extension to offer broadband wireless connectivity services from their WiFi network coverage ('WiMAX hot zones').

Issues of mobile WiMAX 802.16e:

- the standard is still not ratified, and certified 802.16e products are not expected before early 2007;
- the migration path from WiMAX 802.16-2004 to WiMAX 802.16e is not possible in most cases;
- there are still spectrum availability and regulation, particularly licensing, issues to resolve.

#### **Summary of issues**

There are a number of reasons why BWA has not made it beyond a niche technology. If WiMAX can solve all of these then the technology may become very successful. The major issues are:

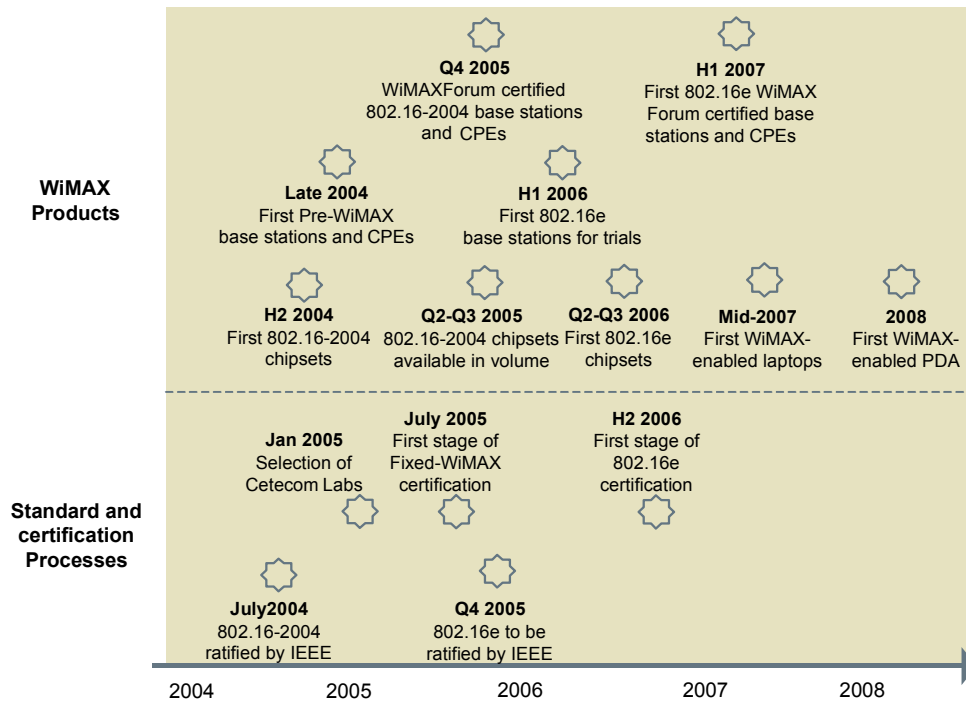
- Frequency allocation (including cost of obtaining licence or obligations of base stations registration, and different frequency allocation in different countries)
- Line of sight (LOS)
- Bandwidth and network planning
- Requirement of engineering installation
- Cost of equipment

#### **WiMAX roadmap**

In terms of standard development, the IEEE 802.16 Working Group has scheduled the ratification of 802.16e as a standard by the end of 2005. The WiMAX Forum is targeting the second half of 2006 to launch the certification testing for 802.16e equipment. This means that the first commercially available, certified products based on 802.16e can be expected in late 2007 or early 2008.

Figure 3.3 provides Ovum's view of the WiMAX roadmap regarding both the standardisation process and product availability.

Figure 3.3 - WiMAX roadmap



Source: Ovum

## 3.5 FMC STANDARDS

### 3.5.1 CTP: the first FMC standard to convergence

CTP is a cordless telephony profile defined within the Bluetooth specification, which allows a Bluetooth-enabled mobile phone to be used as a cordless telephone when it is within range of a Bluetooth CTP access point. CTP is thus a way of adding limited mobility, or 'cordlessness', to the fixed network.

CTP acts as an application on the device – which is sometimes a mobile phone and sometimes a hands-free headset. The simplest implementations use Bluetooth as a local air interface comparable to digitally enhanced cordless telephony (DECT). Here the access point plugs directly into an analogue telephone line. Class 1 Bluetooth chips, which allow communication over ranges of up to 50 metres, are beginning to become available and to be included in mobile devices. This is still not as good as the DECT range, but CTP has the advantage of being present in mobile devices and having access to their address books and presentation capabilities.

Mobile and fixed access is only loosely converged in CTP. The mobile device retains its GSM number, whereas the CTP access point uses the number associated with the fixed line to which it is attached.

### Assessment of CTP

We view CTP's time as a technology has come and gone. It had a window of opportunity because Bluetooth was widely available in handsets and implementing it was relatively simple – no changes were needed in the operator network, for example. However, the services it enabled were very basic, and more sophisticated deployments required proprietary add-ons – to support handover between access points, for example. CTP's early start was also a disadvantage; it offered the prospect of FMC, bypassing the public mobile network, at a time before mobile operators had begun to show interest in FMC. As a consequence the operators were able to persuade handset vendors not to develop or load CTP clients onto devices. We expect that CTP will become increasingly less important.

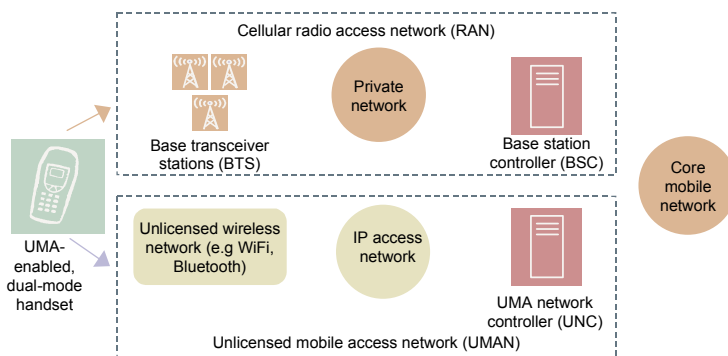
### 3.5.2 UMA: A bearer agnostic standard to seamless convergence

The unlicensed mobile access (UMA) protocol enables seamless handover between GSM cellular and fixed IP-based networks of both voice and data sessions using unlicensed spectrum. Development of the UMA specification began in late 2003 and was finalised in September 2004.

The next development phase for UMA is 'enhanced UMA', which allows the vendors to add more sophisticated features, such as presence functionality and intelligent routing services.

Figure 3.4 shows how UMA works within a UMA network.

**Figure 3.4 - UMA architecture**



Source: UMA Group, Ovum

### Assessment of UMA

Most operators and vendors acknowledge that UMA is a stepping-stone to a fully convergent solution more closely aligned with IP standards, technologies and approaches. The key question for operators is whether its availability right now compensates for its interim nature, and this in turn depends on how long it will be before equipment supporting the alternative SIP-based approach is fully ready.

UMA has some clear advantages other than its current availability. It is closely aligned with the GSM network architecture, and is thus quite easy for most mobile operators to implement technically and commercially.

UMA also has some obvious disadvantages too. Its alignment with GSM means that integration with enterprise deployments is difficult. In particular, there is no handover between one UMA access point and another, making indoor coverage of any large premises almost impossible.

Proponents of the IMS/SIP approach downplay the extent to which the required technical standards are not complete – easy to do since the standards for SIP itself are well established. They also argue that UMA has missed its window of opportunity, and that there is a growing consensus among operators that going straight to SIP is a realistic option.

We believe that operators' transition to all-IP networks will be uneven, and that some mobile-only players will choose to take advantage of the relative simplicity of the UMA. We therefore expect UMA to co-exist with IMS/SIP for the next few years, until at least 2008/2009.

### **3.5.3 IMS and SIP: The future IP- based standard to convergence**

#### **IMS**

IMS stands for 'IP multimedia subsystem'. It is a key element of the current technical standardisation work being co-ordinated by the 3GPP, which is concerned with the provision of IP-based multimedia services over GPRS and UMTS networks.

The primary design goal of IMS is to create a standards-based core network environment that clearly separates the business of multimedia application and service delivery from network specifics, and which clearly separates service control issues from actual service delivery issues. By specifying this kind of architecture using common, open, standard protocols, the 3GPP has aimed to facilitate cost-effective service flexibility, scalability and integration for operators wanting to build a future-proof business on the delivery of multimedia services. The IMS architecture is very tightly scoped, which is to its benefit. For example, IMS is not concerned with application or service creation.

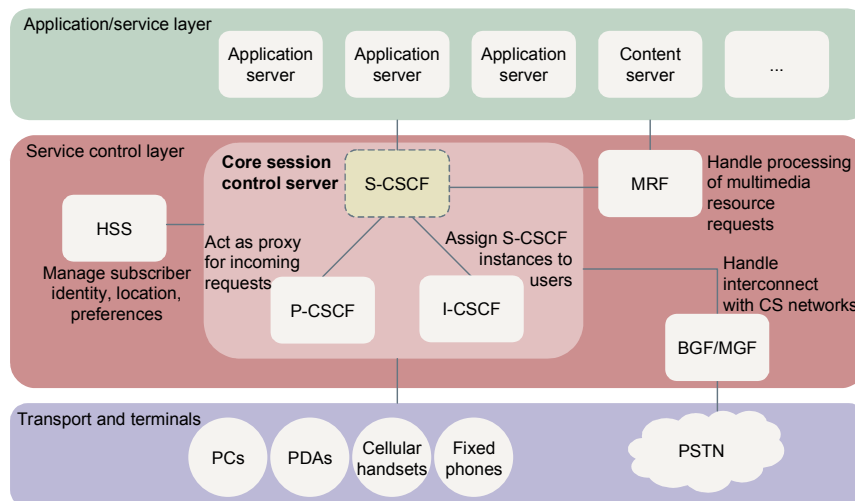
#### **SIP**

SIP was originally envisaged to facilitate the delivery of VoIP telephony services over the fixed Internet, and is managed by the Internet Engineering Task Force.

The session-based nature of SIP is a crucial part of IMS's character and its appeal. Using SIP to orchestrate the management of multimedia sessions, IMS infrastructure allows the user to experience multimedia communication services that are significantly different from the experiences of today.

As it stands, IMS is the only architectural concept that has been offering such important support in the next-generation domain.

Figure 3.5 provides a simplified view of how these IMS components work together in the broader context of an operator's network, service and application infrastructure.

**Figure 3.5 - IMS components**

Source: Ovum

**IMS, SIP: A pathway to quadruple play FMC**

The network-independent and 'Internet friendly' nature of IMS provides a potential route to making FMC for multimedia services a reality. The IMS framework also includes some 'FMC friendly' concepts in service execution, subscriber data management, and QoS support for the corresponding SIP services. This would make it economically and technically feasible for all kinds of service providers to deliver multiple types of multimedia services to subscriber bases, using multiple types of fixed and mobile access network. However, it is important to note that FMC via IMS is only a potential strategy for players and is not necessarily the one that will be used. Other routes to FMC are likely to be cheaper and less painful, at least in the short term.

It is important to stress that a SIP-based approach has the potential to support a much wider range of architectures than is the case with other technologies such as UMA. SIP can be deployed by various kinds of public operators, including both fixed and mobile.

**Assessment of SIP/IMS for FMC**

In the long term IP will be the bedrock on which future telecoms services, including telephony, will be based, and SIP in some form will probably be the foundation. The IMS framework could be the only architectural concept supported by all kinds of players in the industry (mobile, fixed and others), hence it will probably be the environment in which SIP services could be widely deployed. SIP has several advantages over other FMC approaches, notably its deeper integration with the way in which WiFi networks work – as compared with UMA, for example, which is much more integrated with mobile network protocols and architectures.

Some considerable standardisation effort has already been carried out, and SIP can rightly be regarded as an area of technology approaching maturity. However, its deployment in a wireless context, and in particular in conjunction with seamless handover between different radio networks, is another matter. Here, standardisation is not fully complete, even though

some vendors claim that the eventual form and content of the standards is already well understood.

This means that SIP-based solutions for FMC are inevitably pre-standard. It is easy enough to demonstrate that such solutions work reasonably well, but demonstrating interoperability between different vendors' equipment, devices and software will take rather longer.

We do not expect standards-based SIP solutions to be available later in 2006 at the earliest, at which time the major vendors will be scrambling to secure partnership agreements with those start-ups which can show ownership of critical intellectual property rights. Robust commercially available products based on SIP and IMS will take even longer, and will not be reaching the mass market before 2008.

### 3.5.4 Benchmarking the standards

Figure 3.6 compares the protocols used to support FMC. To some extent this is a dynamic comparison, with changes taking place all the time – particularly in respect of operator and vendor backing. Support for UMA versus SIP in particular appears to be finely balanced, with factions supporting both, within operators and vendors.

**Figure 3.6 - CTP, UMA and SIP/IMS compared**

|   | CTP              | UMA               | SIP/IMS          | SCAAN <sup>(11)</sup> |
|---|------------------|-------------------|------------------|-----------------------|
| Seamless handover (mobile and fixed)                | ✗ <sup>(1)</sup> | ✓✓                | ✓ <sup>(2)</sup> | ✓✓                    |
| Voice quality versus mobile                         | ✗                | ✓                 | ✓                | ✗                     |
| Is the protocol standards based?                    | ✓ <sup>(3)</sup> | ✓✓                | ✓                | ✗                     |
| Bearer flexibility                                  | ✗                | ✓✓ <sup>(6)</sup> | ✓✓               | ✗ <sup>(7)</sup>      |
| Operator call control                               | ✗                | ✓✓                | ✓✓               | ✓                     |
| Ease of implementation (operator)                   | ✗                | ✓✓                | ✓✓               | ✓                     |
| Level of vendor backing                             | ✓                | ✓                 | ✓✓               | ✓                     |
| Device availability                                 | ✓                | ✓ <sup>(4)</sup>  | ✗ <sup>(4)</sup> | ✗ <sup>(5)</sup>      |
| Regulation 'friendliness'                           | ✗                | ✓                 | ✓                | ✓                     |
| Support for data applications                       | ✗ <sup>(8)</sup> | ✓✓                | ✓✓               | ✗                     |
| Can it integrate into Enterprise telephony solution | ✓✓               | ✗                 | ✓✓               | ✓✓                    |
| Support for multiple access point handover          | ✗ <sup>(9)</sup> | ✗ <sup>(10)</sup> | ✓                | ✓                     |
| Support for wide area mobility (hotspots)           | ✗                | ✓✓                | ✓✓               | ✗                     |

✗ = No, ✓ = partial/low, ✓✓ = yes/high

Notes:

1. Proprietary extensions add seamlessness
2. SIP itself only provides the addressing and routing capability needed to support seamlessness.
3. Additional radio handover technology is also required.
4. CTP is defined by the Bluetooth SIG, but the protocol itself does not provide all of the specification necessary to delivery a dual-mode service.
5. Lots of verbal support, few commercial products commercially available thus far

6. Only one product available, from Motorola. Despite claims of commercial availability none sold.
  7. GSM only, no CDMA
  8. GSM1900 and 802.11a only
  9. There are proprietary add-ons to enable this
  10. There are proprietary add-ons to enable this
  11. SCAAN is a proprietary solution developed to provide interfaces between the vendors. The solution only works with the Avaya IP PBX and with Proxim WLAN access points, when these two are deployed with a Motorola signalling gateway
- 

### 3.6 FMC DEVICES

With the strong operator interest in dual-mode handsets, there is evidence and substantial drive by all device manufacturers to bring to market lower cost, mid-range dual-mode WiFi/devices that operators crave, particularly fixed and integrated ones, to support their FMC strategies. WiFi capability is set to become a common feature in future mobile handsets although volumes will remain limited in the short term, particularly in the consumer market.

The technical and the cost issues are set to hold back actual volumes for a considerable period of time over the short to medium term. We expect that the availability in volume of mid-range dual-mode handsets will remain limited in the short term. The introduction of dual-mode handsets will target first the business users or high-end consumers. We expect so see a number of models launched in 2006, but high volumes of mid- to low-range WiFi cellular UMA or SIP-enabled devices are likely to be ready to ship in volume in 2007, possibly even in 2008.

### 3.7 FUTURE SUPPLY SIDE FMC DEVELOPMENT

Figure 3.7 summarises our view on the supply side FMC market development in the period to 2010. This is the general scenario that we believe is the most likely worldwide.

We believe that the Most Likely Scenario for Hong Kong, which we will discuss in Section 3.9 below, will have less early emphasis on WiFi and UMA, and activity will be more focussed in 2008 and 2009, when compared to the general scenario.

It is quite likely that Hong Kong might, overall, skip FMC Stage 3 (converged devices) and move directly to FMC Stage 4 (converged networks). Stage 3 is not a necessary pre-cursor to Stage 4, and Stage 4 itself is part of the larger move to NGN operations. Stage 3 is intended to address call FMS. In Hong Kong the low mobile charge premium, coupled with aggressive competition in the mobile market, has taken call FMS to an advanced stage. Stage 3 FMC may be of limited use to fixed operators. Many stakeholders at interview thought so.

### 3.8 SUMMARY ON CURRENT FMC DEVELOPMENTS

The following is a summary of Ovum's global research and tracking of the current fixed-mobile convergence (FMC) technology and service developments

#### 3.8.1 No single right approach to FMC for operators

A number of operators have contemplated that FMC services would make strategic advantages to their business. However, with different complexity of FMC implementations and

FMC device-based services, there is considerable uncertainty as to which technology approach is the right one, in terms of being effective, cost efficient, and ready now, while being forward compatible. Operators who are keen on delivering these services need to make the appropriate choice of wireless in-premises bearer, standard, and the type of devices.

### **3.8.2 WiFi will continue dominate in the short run - although perhaps not in Hong Kong**

With the continuous improvement of range, data throughput and the potential synergies between existing home/office and public hotspots, WiFi is the superior choice for wireless in-premises bearer over the obsolescent CTP (cordless telephony profile) profile and the current Bluetooth. Bluetooth's principal advantage is in its greater availability of compatible handsets, and this has been the reason why some operators such as BT are keen to launch the services for their early implementations.

Hong Kong's topology and physical environment has placed substantial emphasis on development of in-building solutions. We consider that this could reduce the prospects for WiFi as an interim solution in Hong Kong. However, as at January 2006 Hong Kong had a broadly comparable number of WiFi hotspots as other cities, but without the government support that sometimes accompanies hotspot programs elsewhere.<sup>25</sup>

### **3.8.3 Mobile WiMAX will follow the development pattern of Fixed WiMAX**

Fixed WiMAX certified equipment and mature devices will become only available in 2006. This pattern will repeat again for the Mobile WiMAX technology. That's the earliest Mobile WiMAX certified equipment or mature devices will only be available in earliest late 2007 or 2008. We see that a combination of WiFi and Fixed WiMAX technologies (and pre-WiMAX solutions, e.g. WiBro) will co-exist in the markets in the early few years until more promising and mature Mobile WiMAX technology are available. Again, the extent of the co-existence in Hong Kong will be dependent on initial WiFi deployment, which, as discussed already, might be less than, say, Europe.

### **3.8.4 UMA will co-exist with SIP (IMS)**

We believe that unlicensed mobile access (UMA), with all of its limitations, is the only standards-based approach ready now, while the session initiation protocol/IP multimedia sub-subsystem (SIP/MIS) based approach is set to gather pace in the period ahead. However, it will take another couple of years (i.e. around 2008) to fully standardise and ensure inter-operator operability of this approach.

### **3.8.5 Integrated single devices will lag**

While vendor activity to deliver dual-mode WiFi/cellular devices is gathering pace, there are still considerable issues (e.g. space, memory, battery life, cost) to resolve in the short run.

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<sup>25</sup> According to *Computerworld* (Jan., 2006), Seoul had the largest number of hotspots (2,056), followed by Tokyo (1,802), London (1,627), Paris (895), San Francisco (801), Daegu (787), New York (643), Singapore (619), Busan (617) and Hong Kong (605); (<http://www.computerworld.com/mobiletopics/mobile/story/0,10801,107991,00.html>).

Though there are some mid-ranged priced WiFi cellular devices to appear in 2006, scale volumes of these is expected to happen in 2007.

### 3.9 MOST LIKELY SCENARIO FOR FMC IN HONG KONG

The Most Likely Scenario for FMC development in Hong Kong is only the most likely, in our view, compared to other scenarios. This does not make it highly probable in any absolute sense.

The Most Likely Scenario is simply illustrated in Figure 3.8

**Figure 3.7 - FMC technology/supply side market development scenario**

|                                | 2005-2006  | 2007-2008  | 2009-2010   |
|--------------------------------|--|--|---|
| <b>Vendors</b>                 | Major vendors supporting all standards and protocols, hedging bets on technology acceptance.   | UMA adopted as an effective interim standard, increased effort on standardising SIP-based approaches. Start-ups with winning SIP-based solutions acquired by major players.  | Vendors switch most effort to supporting SIP/IMS-based FMC services, all elements of which are now standardised. UMA support wanes, UMA/SIP hybrids supported.  |
| <b>Operators and standards</b> | Trials of CTP, Fixed WiMAX and UMA standards by fixed and integrated operators. Selected implementations of CTP in enterprise implementations. A number of UMA launches in consumer/SME implementations, mostly by fixed and integrated operators.<br><br>Pre-WiMAX (e.g. WiBro) trails in 2006<br><br>SIP/IMS FMC approach standardisation in progress. | Fixed and integrated operators launch FMC devices, mobile operators mostly 'wait and see'. Fixed WiMAX solutions gather pace in municipal networks and emerging economy countries. UMA commercial implementations gather pace, consumer and SME focused. SIP/IMS FMC approach standardisation completed. Selected commercial launches, mostly aimed at enterprise customers. | Fixed and integrated operators drive FMC devices, selected mobile operator launches.<br><br>SIP/IMS commercial launches gather pace, moving from enterprise into consumer targeted services.<br><br>UMA-only implementations waning in latter part, to be replaced by UMA/SIP hybrids and SIP/IMS approaches. Mobile WiMAX solutions begin shape. |
| <b>Bearers and devices</b>     | Device manufacturers working on integrating WiFi to deliver mid-range handsets. Technical issues and costs prevail.<br><br>Selected Bluetooth-based devices available. High to mid-end WiFi devices appear in some volumes in latter part of period: mostly WiFi UMA devices, but few SIP-based devices. Few proprietary hybrids of the two.             | WiFi/Fixed WiMAX overwhelmingly dominates as an in-premise bearer.<br><br>Device vendors overcome technical issues with WiFi/cellular handsets, cost comes down, mid-range devices shipped in volumes.<br><br>WiFi UMA devices still dominate, WiFi SIP devices grow as a proportion of the total. Greater number of UMA/SIP hybrids.  | WiFi/Fixed WiMAX dominates as a bearer. Trials of new wireless standards.<br><br>WiFi SIP devices become majority while early trail of Mobile WiMAX device starts. WiFi UMA devices begin to decline as a proportion of the total, to be replaced by WiFi SIP/UMA hybrid devices.   |

Source: Ovum

**Figure 3.8 - Ovum's Most Likely Scenario for FMC in Hong Kong**

| Operators                       | 2006                                 | 2007  | 2008  | 2009                                   | 2009 - 2010                      |
|---------------------------------|--------------------------------------|---|---|--|----------------------------------|
| <b>1. Pure Fixed Operators</b>  | Seek mobile partners or acquisitions | Limited bundling                            | FMC Stage 3 strategies - convergent devices | Commence NGN rollout in earnest        | FMC Stage 4 - converged networks |
| <b>2. Pure Mobile Operators</b> | Encourage call FMS                   | Encourage call FMS                          | Seek fixed partners or acquisitions         | Commence NGN rollout in earnest        | FMC Stage 4 - converged networks |
| <b>3. Integrated Operators</b>  | Limited bundling                     | FMC Stage 3 strategies - convergent devices | Commence NGN rollout in earnest             | Early FMC Stage 4 - converged networks | FMC Stage 4 - converged networks |

Source: Ovum

### 3.10 ALTERNATIVE SCENARIOS FOR HONG KONG

The Most Likely Scenario could be varied for the purposes of this study to produce alternative scenarios for Hong Kong. The factors that could be varied to produce other scenarios include:

- barriers or delay to the association or merger of fixed and mobile operators
- initial demand for Stage 1 (bundling) and Stage 3 FMC (convergent device services) failing to be sufficient to encourage full development of these stages
- delay in standards setting and ratification
- delay in equipment availability.

The time required for standards development and the production of handsets and other equipment in quantity suggests that, compared to the Most Likely Scenario, alternative scenarios involve delay. The timetables for development of standards may be achieved, but it is very unlikely that timescales will be shortened.

These factors lead us to consider two additional scenarios, one based on delay and one based on the absence of Stages 1, 2 and 3 in Hong Kong's FMC development. These scenarios (Scenarios 2 and 3) are illustrated in Figure 3.9.

**Figure 3.9 - Scenarios 2 and 3 for FMC in Hong Kong****Scenario 2 - Delay (One year)**

| Operators                       | 2006               | 2007                                 | 2008  | 2009  | 2010                                   |
|---------------------------------|--------------------|--------------------------------------|---|---|--|
| <b>1. Pure Fixed Operators</b>  |                    | Seek mobile partners or acquisitions | Limited bundling                            | FMC Stage 3 strategies - convergent devices | Commence NGN rollout in earnest        |
| <b>2. Pure Mobile Operators</b> | Encourage call FMS | Encourage call FMS                   | Encourage call FMS                          | Seek fixed partners or acquisitions         | Commence NGN rollout in earnest        |
| <b>3. Integrated Operators</b>  |                    | Limited bundling                     | FMC Stage 3 strategies - convergent devices | Commence NGN rollout in earnest             | Early FMC Stage 4 - converged networks |

**Scenario 3 - No FMC Stages 1-3 (effectively greater delay)**

| Operators                       | 2006               | 2007               | 2008                                 | 2009                                   | 2010                             |
|---------------------------------|--------------------|--------------------|--------------------------------------|--|----------------------------------|
| <b>1. Pure Fixed Operators</b>  |                    |                    | Seek mobile partners or acquisitions | Commence NGN rollout in earnest        | FMC Stage 4 - converged networks |
| <b>2. Pure Mobile Operators</b> | Encourage call FMS | Encourage call FMS | Seek fixed partners or acquisitions  | Commence NGN rollout in earnest        | FMC Stage 4 - converged networks |
| <b>3. Integrated Operators</b>  |                    |                    | Commence NGN rollout in earnest      | Early FMC Stage 4 - converged networks | FMC Stage 4 - converged networks |

Source: Ovum

### 3.11 KEY MESSAGES ABOUT FMC DEVELOPMENT IN HONG KONG

The most likely scenario for Hong Kong involves:

- the implementation of NGN infrastructure by 2009
- Stage 4 FMC in 2009 to 2010.

On this scenario, completion of NGN implementation will not be achieved in the five year horizon from 2006 to 2010.

However the scenario is heavily dependent on:

- whether the main fixed operators own a mobile subsidiary
- the extent of infrastructure and operational integration that can be achieved with that subsidiary (regulatory factors are important here)

- the pace at which operators can roll out an NGN. FMC will strengthen the business case for implementing NGN, but is not the only factor governing the matter.<sup>26</sup>

The speed of the development of FMC will certainly be subject to the timing and extent of the demand.

The standards that will underpin the development have still to be developed and ratified. However they should be available to allow full Stage 4 FMC development by 2009. WiMax standards will be available from 2007, and WiMax with full mobility will not be available before 2009.

The Most Likely scenario outlined earlier will be shored up by the recommendations made in this study. The alternative scenarios are about delay. The difference between the likelihood of the Most Likely Scenario compared to other scenarios for FMC development in Hong Kong is the increased certainty of the Most Likely Scenario eventuating if our recommendations are adopted.

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<sup>26</sup> The advantages of NGNs are summarised in Section 2.6.4 of this report, together with a discussion on the other factors affecting NGN development.

## 4 Barriers to FMC in Hong Kong

### 4.1 THE MAIN DRIVERS FOR FMC IN HONG KONG

The research set out in Chapter 2 indicates that there are four main stages in the development of FMC:

- Stage 1 - price bundling
- Stage 2 - service convergence
- Stage 3 - device convergence and
- Stage 4 - network convergence.

It also suggests that the main drivers for each of these stages are as follows:

- operators implement price bundling (Stage 1) to reduce customer churn and, in the case of fixed operators, as a limited means of addressing the effects of fixed mobile substitution
- operators implement service convergence (Stage 2) to increase customer lock-in (churn reduction) through the provision of additional supplementary services such as a single voice mailbox and linked email services. Stage 2 FMC requires relatively small investment, but still has to compete against a range of other service development opportunities. Stage 2 FMC is most readily available to integrated operators such as TDC in Denmark and Telecom Italia in Italy, and to fixed operators who have partnered with mobile operators for the purpose, such as BT and Vodafone in the UK.
- operators implement device convergence (Stage 3) so as to reduce call FMS (for fixed operators, such as BT with its Fusion product) and to conserve scarce and expensive bandwidth (in the case of mobile operators, such as Sprint in the US). The drivers work in the context of the arbitrage opportunity made available by mobile retail price premiums that, outside Hong Kong, typically exceed a ratio of 2:1.
- operators are just beginning to implement network convergence (Stage 4). The drivers are:
  - to enable new and additional services, based on convergence, for revenue stimulation and to maintain competitiveness
  - to increase customer retention
  - to lower unit costs by sharing common infrastructure between fixed and mobile operations. The economies of scope that next generation networks (NGNs) offer should enable operators to provide a range of bundled services such as triple and quadruple play packages.

The goal is to provide "anywhere anytime" seamless services in which customers are always best connected in terms of bandwidth, tariff and service quality.

Not all of the above drivers operate in Hong Kong with the same force as elsewhere. In the case of Stages 1 to 3 FMC, the drivers are weaker in Hong Kong than in the case study

countries - even though the regulated access given to MVNOs makes it easier for fixed operators or new entrants to gain access to 3G infrastructure to offer mobile services. The opportunities for arbitrage are less, given the much lower mobile premium, and the opportunity to defend against advanced levels of call FMS through device convergence has probably passed.

In contrast the drivers for FMC Stage 4 are as strong in Hong Kong as elsewhere in the developed world. In addition the scope for maximising benefits from FMC Stage 4 is greater in Hong Kong. In the case study countries the number of substantial fixed and mobile networks is limited and there is a danger of re-monopolisation if the main fixed and mobile networks in the country are integrated. For example in Italy Telecom Italia holds 90% of the fixed market and its mobile subsidiary 40% of the mobile market. In contrast the relatively large number of operators in Hong Kong who are running fixed and mobile network infrastructure increases substantially the possible number of integrated fixed and mobile networks which could be created when compared with the case study countries. So the danger that effective competition will be lost in Hong Kong is much less. This in turn should help to maximise the economic benefits as rival FMC service providers compete for end user spend.

We have identified two Hong Kong specific barriers to Stage 4 FMC:

- the relatively low EBITDA margins (as set out in Figure 2.7 and discussed in the associated text) for some operators in Hong Kong. The incentives to make the substantial investment required for Stage 4 FMC, particularly at an early time, are weak. We are already seeing some consolidation in the industry with the purchase of Sunday by PCCW and the merging of New World PCS and CSL and the current move towards convergence may well encourage more consolidation. This should lead to an improvement in returns and an increase in investment incentives. But consolidation is a matter for the markets. Although consolidation would increase the incentives for operators to invest in FMC, there is little that OFTA can or should do directly to facilitate it.
- the asymmetric regulatory treatment of fixed and mobile operators in Hong Kong. Here OFTA has considerable control over whether and how the asymmetries are removed. We discuss this issue in the remainder of this chapter before analysing individual aspects of the regulatory asymmetries in Chapters 5 to 8.

At the end of this chapter we also provide a brief description of another minor barrier to FMC in Hong Kong – the sharing of customer profile information.

## **4.2 REGULATORY ASYMMETRIES IN THE TREATMENT OF FIXED AND MOBILE OPERATORS**

There are a number of major asymmetries in the way in which fixed and mobile operators are regulated in Hong Kong. Specifically:

- current FMIC arrangements mean that mobile subscribers bear the full costs of both fixed to mobile and mobile to fixed calls
- current interconnect arrangements mean that fixed operators can charge significantly more to terminate inbound international calls than mobile operators

- OFTA currently requires mobile operators to pay the full cost of the links used to interconnect with fixed operators
- mobile operators cannot self provide their own transmission links.

There are also other lesser asymmetries concerning access to property and number portability.

The combined effects of these asymmetries is that mobile operators are treated as if they were value added service providers running services on the infrastructure of fixed operators. These arrangements made good sense when the FMIC arrangement was first adopted in the 1980s. Market conditions then were very different as Figure 4.1 illustrates. But it does not make sense to view mobile operators as value added service providers today. By 2004 mobile operators:

- accounted for over 40% of investment by the local Hong Kong telecommunications industry
- originated about one third of voice calls
- generated over 40% of telecommunications revenues in Hong Kong

These proportions continue to grow steadily.

OFTA has reviewed FMIC arrangements on a number of occasions<sup>27</sup>. On each occasion it ruled that current practices on FMIC arrangements should remain in place. So, as time has gone by and the importance of mobile networks in Hong Kong has increased, the current asymmetric treatment of fixed to mobile operators, while preserving regulatory continuity, has come to represent a growing regulatory intervention in the market. Clearly there is a need, within our study, to review whether this intervention continues to be justified in current market circumstances.

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<sup>27</sup> Most recently in the OFTA statement of March 2002, *Interconnect and related competition issues, Statement 7 (Second Revision) - Carrier to carrier charging principles*

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**Figure 4.1 - The changing role of mobile network services in Hong Kong**

| <i>Dimension</i>                                   | <i>Role of mobile services in HK</i>                                |   |
|--|---|---|
|  | <i>Early 1990s</i>  | <i>Today</i>                                  |
| Target market                                      | Travelling business users, sole traders and rich consumers          | Everyone                                      |
| Mobile premium                                     | Several hundred % above local fixed service prices                  | 5 to 10% above local fixed service prices (1) |
| % of voice traffic originating on mobile terminals | <1%   | >33% (2)                                      |
| Investment   | <5%   | >40% (2)                                      |
| Role relative to fixed services                    | A complementary product boosting fixed network traffic and revenues | A major competitor to fixed network services  |

(1) Based on Ovum review of Prices in Hong Kong; (2) Based on unaudited figures supplied by OFTA

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Hong Kong's regulatory treatment of mobile operators is unusual. As our country case studies show in other parts of the world fixed and mobile operators are, in general, granted equal status and regulation is developed on that basis. In the EU in particular the current regulatory framework was developed using the underlying principle that network operators should be regulated on a technology neutral basis<sup>28</sup>.

Our analysis, set out in detail in Chapters 5 to 8, indicates that the regulatory asymmetries are already causing harm. They mean that:

- mobile operators face higher costs (and fixed operators face lower costs) than is required by cost causation as a result of asymmetric interconnect revenue flows and LAC payments
- this in turn distorts the prices charged by both the fixed and mobile operators and leads to over consumption of the former and under consumption of the latter
- in addition the asymmetries may distort the investment decisions of the fixed and mobile operators. For example fixed operators have weakened incentives to move customers to voice over broadband services under current FMIC arrangements
- mobile operators are unable to make rent/build decisions on fixed number portability (FNP) services or on the provision of transmission links. Instead they are required to rent from the fixed operators.

The effect of these asymmetries is to weaken cross-platform competition between fixed and mobile operators. This is inconsistent with Hong Kong's overall telecommunications' policy of promoting infrastructure competition between networks, a policy which is reflected in its recent decision to withdraw Type II interconnect obligations on PCCW from June 2008.

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<sup>28</sup> See for example Recital 18 of the Framework Directive (2002/21/EC) of March 2002

### 4.3 THE MOVE TO NETWORK CONVERGENCE

When we consider likely developments in telecommunications over the next five years we find that the case for removing the asymmetries between fixed and mobile operators becomes stronger.

By 2011 we expect to see a fundamental change in the way telecommunications services are delivered in much of the developed world. As we discuss in Section 2.6 we expect that operators will use next generation IP networks to deliver bundles of services like quadruple play<sup>29</sup> over a common core IP transport network controlled by a centralised server. Stage 4 FMC, which involves integration of fixed and mobile networks, is an important part of this convergence. Operators which implement FMC of this kind should enjoy substantial competitive advantage over other NGN operators who do not implement FMC, both in terms of lower unit costs and a wider range of richer services.

FMC of this kind should generate economic benefits of three main types:

- **productive efficiency** gains through lower unit costs. For example:
  - BT in the UK expects cost savings of around €1.3 billion per annum by 2010 through rationalisation of its many overlay networks into a single IP network. For a market of the size of Hong Kong this is equivalent to cost savings of HK\$1.9 billion per annum<sup>30</sup>
  - Telecom Italia has announced savings of around €1.5 billion per annum through integration of its fixed and mobile arms and expects further savings in future. Figure 2.9 gives details. In a country the size of Hong Kong this translates into savings of HK\$1.8 billion per annum<sup>31</sup>
  - It is difficult to say to what extent these effects are additive. It is clear that they are different but that there is an overlap. If we assume a 50% overlap then we might expect convergence to lead to productive efficiency gains of around HK\$3 billion per annum by 2011 in a market like Hong Kong
- **dynamic efficiency** gains as operators offer new integrated services for which there is substantial demand and hence increased consumer surplus. It is not possible to quantify the scale of these effects with any precision. But they could easily generate economic benefits which rival those of the productive efficiency gains. A single new service which generated HK\$3 billion per year in revenues<sup>32</sup> could generate over HK\$3 billion pa in consumer surplus. Studies<sup>33</sup> on the economic impact of mobile services show that the

<sup>29</sup> Fixed voice telephony, mobile voice telephony, broadband access and TV

<sup>30</sup> Euro 1.3 billion x \$HK 9.3 x 7 million/(60million x 75% BT market share)

<sup>31</sup> Euro 1.5 billion x \$HK9.3 x 7million/(60million\*90% TI market share)

<sup>32</sup> To put this in perspective, the Hong Kong telecommunications industry generated annual revenues of HK\$45 billion in 2004

<sup>33</sup> See for example *The impact of the Wireless Telecom Industry on the US economy*, CTIA, September 2005

consumer surplus for such services is typically greater than the service revenues themselves

- **spectrum and radio access network efficiency gains** like those already claimed by Sprint in the USA and set out in Figure 2.5. While operators in Hong Kong are only just starting to fill their 3G networks such effects are unimportant. But in the long term FMC services will become important as a way of delivering high bandwidth services, using unlicensed spectrum<sup>34</sup> wherever possible, and licensed 3G spectrum only where necessary.

#### 4.4 INVESTMENTS IN FMC IN HONG KONG

The potential economic benefits for Hong Kong from convergence, and from FMC in particular, are measured in terms of billions of HK\$ per annum. But the investment required for Stage 4 FMC is also substantial.

This creates a problem - the current incentives for Hong Kong's telecommunications operators to invest in converged networks are relatively weak, partly because of the relatively low returns earned by Hong Kong's fixed and mobile operators but also because of the asymmetries in the regulatory treatment of fixed and mobile operators. However, Hong Kong's network operators have already invested billions of dollars in their networks and may keep on investing in new technologies so as to explore new revenue streams and compete for a higher market share. The risk is that this investment may not be sustained if returns continue at current levels.

There are three main ways in which the asymmetries effect likely future investment patterns:

- they distort future investment, just as they have distorted investment over the past few years, by raising the costs faced by mobile operators, and lowering the costs faced by fixed operators
- if left unchanged, they lead to future regulatory anomalies. Operators with fixed licences offering FMC services might be regulated in one way while operators with mobile licences offering the same services are regulated in another, less favourable, way. The possibility of such anomalies may create regulatory uncertainty
- they could distort the forms and terms of the industry consolidation which is now taking place in Hong Kong and which FMC might accelerate.

We do not believe that leaving the regulatory asymmetries in the treatment of fixed and mobile operators in place would deny Hong Kong the benefits of FMC identified in Section 4.3. But

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<sup>34</sup> Such as that as that used by WiFi (do we have to mention WiFi - it has such a limited future, especially in HK)

we do believe it would delay and distort the investment required and so lead to reduced and delayed benefits – the net present cost of which could be measured in billions of HK\$<sup>35</sup>.

#### 4.5 REMOVING THE ASYMMETRIES

The regulatory asymmetries in the treatment of fixed and mobile operators already do harm. And they are likely to do further harm in future by delaying or reducing the benefits of FMC in Hong Kong. So we recommend that:

- unless there are good public interest reasons to the contrary, the regulatory asymmetries in the treatment of fixed and mobile operators are removed and
- fixed and mobile operators are regulated in future on a technology neutral basis

OFTA might remove the asymmetries in one of two ways:

- by removing regulation from both fixed and mobile operators so both are unregulated and market forces operate. This is clearly the preferred option
- by applying regulation in a technology neutral fashion to fixed and mobile operators. This is a second best option but may be required if market mechanisms are considered unlikely to work.

In Chapters 5 to 8 we consider in detail whether there are good reasons to leave the main asymmetries in place and, if not, how best to remove them.

#### 4.6 SHARING OF CUSTOMER PROFILE INFORMATION BETWEEN FIXED AND MOBILE OPERATORS

Some operators reported to us that they are unable to use customer information obtained for the provision of particular services (say the provision of fixed services) for other purposes, and, in particular, for cross-selling of mobile or other services. This was identified as a potential major barrier to testing the demand for, and effectively selling services in, an FMC environment.

The barrier identified is not the general policy for the protection of data privacy, but the specific additional limitations on behaviour included in operator licences. These are illustrated in the draft UCL conditions at Clause 7:

*7.1 The licensee shall not disclose information of a customer except with the consent of the customer, which form of consent shall be approved by the Authority, except for the prevention or detection of crime or the apprehension or prosecution of offenders or except as may be authorised by or under any law.*

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<sup>35</sup> If we assume that FMC generates annual economic benefits of \$3bn by 2011 and that the asymmetries delay such benefits by two years in Hong Kong then, at a discount rate of 5% pa, the NPV of this delay is HK\$4.5 billion ( $\$3bn \cdot 0.95^5 + \$3bn \cdot 0.95^6$ )

*7.2 The licensee shall not use information provided by its customers or obtained in the course of provision of service to its customers other than for and in relation to the provision by the licensee of the service.*

However, OFTA has the power, on a case-by-case basis, to permit customer data to be used for new marketing exercises and for other good reasons, provided that operators comply with the general data privacy law.

We therefore conclude that the means are available to operators to reduce the impact of these limitations and as a result that the impact on FMC development should be low.

## 5. Fixed Mobile Interconnection Charging Arrangements

### 5.1 CURRENT FIXED MOBILE INTERCONNECT CHARGING ARRANGEMENTS

The current fixed mobile interconnect (FMIC) charging arrangements in Hong Kong are asymmetric in three main ways:

- The mobile operators pay to receive fixed to mobile calls rather than receiving a termination payment. Figure 5.1 illustrates. In other countries in the world<sup>36</sup> the mobile operator receives a termination payment
- The mobile operators pay for the interconnection links used to receive traffic from fixed networks as well as paying for the links used to deliver traffic to fixed networks. Under international best practice each operator pays for the cost of the interconnection links used to deliver traffic to the terminating network<sup>37</sup>
- The fixed operators discriminate in the interconnect charge they levy on fixed and mobile operators for terminating traffic. Again Figure 5.1 illustrates. For the same call termination service a fixed operators charges:
  - 1.4 cents per minute plus 2.5 cents per call attempt to fixed operators. So for a two-minute call the charge is 5.3 cents;
  - 4.36 cents per minute to mobile operators. So for a two-minute call the charge is 8.7 cents - roughly 60% more than the level of charge to the fixed operator.

In most countries the operators, whether fixed or mobile, are required to charge a non-discriminatory price for terminating calls on their network.

In this chapter we consider the public interest case for removing each of these three asymmetries and the impact which such changes would have on the main stakeholders.

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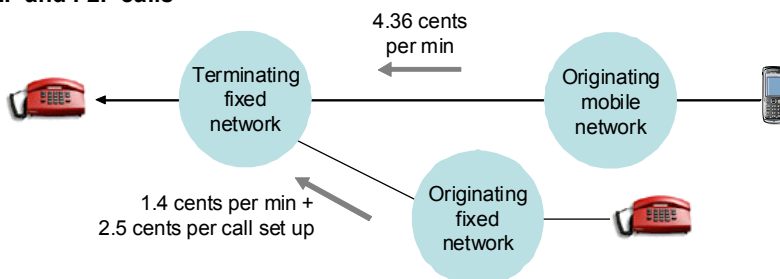
<sup>36</sup> Except Singapore where there is no payment made in either direction for fixed to mobile calls

<sup>37</sup> It is important to distinguish here between who provides the interconnect links and who is responsible for paying for them. Under international best practice a mobile operator might provide the interconnect links in both directions and then charge the interconnecting operator for the link capacity used to deliver calls to it.

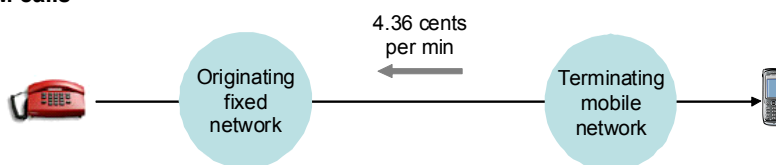
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**Figure 5.1: FMIC arrangements in HK**

**M2F and F2F calls**



**F2M calls**




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## 5.2 PROBLEMS WITH CURRENT FIXED MOBILE INTERCONNECTION CHARGING ARRANGEMENTS

There are four main problems with the current Hong Kong model of charging for fixed to mobile calls.

**First** this model is not consistent with the combination of two principles:

- OFTA's cost causation principle which requires that the party which causes the cost pays it
- the requirement that, if Hong Kong is to maximise the opportunity to develop fixed-mobile convergence services and not to hinder infrastructure based competition, then it should treat fixed and mobile operators as having equal status when they exchange traffic.

The current model is consistent with the cost causation principle if we regard mobile operators as value added service providers accessing customers over the networks of the fixed operators<sup>38</sup>. From this perspective the fixed to mobile traffic generated by the mobile operator is caused by the mobile operators.

But if the fixed and mobile operators are seen as networks exchanging traffic, the cost causation argument is very different. From this perspective both callers and called parties on both fixed and mobile networks cause costs by making and continuing to receive the calls made in either direction. So the current FMIC arrangements do not allocate costs in a way which follows cost causation.

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<sup>38</sup> See for example Page 5 of OFTA's Second Review of Statement 7, published on 10/3/02

When the current FMIC arrangements were established mobile networks generated relatively little traffic and this traffic was additional to the traffic originating on the fixed network. Today they:

- compete with fixed networks to originate traffic
- originate around 33% of all outbound voice traffic - a proportion which is rising steadily
- account for over 40% of telecommunications investment and revenues in Hong Kong.

In these circumstances it is not appropriate to continue to treat them as valued added service providers.

**Secondly** the current model provides no incentive for fixed operators to deal with voice spam on fixed to mobile calls. Indeed it invites fixed operators to cooperate with spammers. This is now a serious problem in Hong Kong. We were unable to find any statistics on this problem despite our inquiries of stakeholders. But anecdotal evidence<sup>39</sup> suggests that in excess of one in twenty calls received by mobile users fall into this category. Under the current FMIC arrangements the fixed operator generates revenues and profits out of such calls, whilst flat rate retail pricing means that the spammer incurs no call-related costs. If FMIC arrangements were changed so that the fixed operator paid the mobile operator a call termination charge, or at least bore the cost of originating such calls, then it would have stronger incentives to deal with this problem.

**Thirdly** the current model generates two types of transaction costs which, in combination, are significant. These are of two kinds:

- the cost of negotiating and/or determining the interconnect prices of Figure 5.1. These are substantial given the number of operators in Hong Kong<sup>40</sup>
- the cost of billing, reconciling and collecting the interconnect charges generated.

**Finally** the current arrangements do not provide a graceful migration path to convergence on two specific counts:

- the precise form of future interconnect arrangements is, as yet, unclear. But it seems likely that many next generation networks will use BAK arrangements, just as equivalent IP networks in today's Internet do. Current FMIC arrangements in Hong Kong are very different from BAK
- with FMC devices the terminal acts as a fixed phone in the home or office<sup>41</sup> and as a mobile phone at other times. Wholesale charging for calls which switch from fixed to mobile modes, perhaps in mid call, is complex, if not impossible, under current FMIC arrangements.

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<sup>39</sup> Through talking to mobile users in Hong Kong about the incidence of SPAM

<sup>40</sup> For example in a market with 12 operators there is a requirement to negotiate 66 (12x11/2) interconnect agreements

<sup>41</sup> For example using a WiFi connection

### 5.3 CHANGING FMIC ARRANGEMENTS BY WITHDRAWING REGULATION

Given the problems listed above, and the significance of the economic benefits that are involved, there is a strong case for changing FMIC arrangements. In so doing the first question we need to consider is whether OFTA should simply remove interconnect regulations and let the operators negotiate agreements. There are two main pieces of regulation to consider here:

- the requirement for any-to-any interconnect between operators so as to provide voice telephony
- the interconnect charging principles set in the TA Statement 7 which specify the interconnect charging arrangements of Figure 5.1

#### 5.3.1 Any-to-any interconnect

The requirement for any-to-any interconnect between networks is, as far as we know, a universal requirement for voice services. It has not in the past been a requirement for interconnection between the IP networks of the Internet. As a result similar sized IP network operators interconnect with each on a BAK basis (peering) while small operators interconnect with large ones using transit arrangements i.e. they pay the large network with which they interconnect for global Internet connectivity. These arrangements have worked well. But even here there are concerns and in late 2005 the FCC published a statement<sup>42</sup> which adopts a principle which states that:

*“consumers are entitled to access the lawful Internet content of their choice”*

Given that consumers are often on different IP networks from the sites which they access this is essentially a requirement for any-to-any interconnect between networks<sup>43</sup>.

The effect of withdrawing the any-to-any interconnect requirement for voice services is impossible to predict with certainty. But there is evidence that it could substantially damage Hong Kong telecommunications:

- there are theoretical grounds for believing that removal could lead to market failure. When one operator has more than 50% of a market then it has strong incentives to refuse to interconnect with rivals. Customers are then attracted to the larger network which grows in size, making it even more attractive. This leads, in the absence of regulatory intervention, to a monopoly
- there are also precedents from early in the 20<sup>th</sup> century. At that time in the US the Bell Operating Companies refused to interconnect with their rivals. This led to monopolisation of the America telephone system

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<sup>42</sup> FCC 05-151

<sup>43</sup> In Hong Kong we understand that IP networks can interconnect free of charge at the HK Internet exchange, either on a peering or transit basis, and that consumers have the right to access lawful Internet content of their choice

Withdrawal of the any to any interconnect requirement may not lead to a breakdown in full interconnection between consumers. But if it were to do so the social and economic consequences would be both highly undesirable and inconsistent with the Governments policy to make Hong Kong the pre-eminent telecommunications hub in the region. Withdrawal of the any-to-any requirement would also generate substantial market uncertainty. Given these arguments we recommend that ***OFTA preserves the requirement for any-to-any interconnect between networks for voice telephony.***

### 5.3.2 Guidance on FMIC charging arrangements

Should OFTA withdraw the guidance it offers on FMIC charging arrangements while preserving the any-to-any interconnect requirement? Under such regulatory conditions it is likely that FMIC charging would be based on BAK arrangements – in the form of each party refusing to pay the other for interconnect. The argument is as follows:

- the fixed operators would argue for the status quo
- the mobile operators would argue for some kind of calling parties network pays arrangement
- the parties would not agree
- the any-to-any requirement would keep the networks interconnected *and*
- the parties would refuse to pay each other for interconnect – a non cooperative form of BAK arrangement.

There are two things wrong with this outcome:

- *First*, the effort which might be put in to attempting to reach negotiated settlement could substantially raise the cost of operating a network in Hong Kong. Notwithstanding that, absent regulatory intervention, such negotiations would likely be unsuccessful
- *Secondly*, the absence of regulatory guidance on FMIC creates market uncertainty and so reduces investment incentives.

For these reasons we recommend that OFTA continues to offer guidance on what default arrangements<sup>44</sup> it would prefer if it were required to determine an FMIC agreement. We consider what form that guidance should take in the remainder of this chapter.

## 5.4 ALTERNATIVE FMIC MODELS FOR HONG KONG

Other countries use the same FMIC arrangements as Hong Kong for mobile to fixed calls but different arrangements for fixed to mobile calls. Figure 5.2 illustrates.

For fixed to mobile calls:

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<sup>44</sup> The arrangements which would apply if one of the negotiating parties sought a determination, OFTA accepted there were grounds for making a determination, and neither of the parties supplied justification for some other form of interconnect charging arrangements

- In Hong Kong the mobile operator pays a call origination charge to cover the fixed operator's call origination costs. The mobile operator then recovers this fee plus its network termination costs through airtime charges to its customers
- In Singapore there is no payment by either the originating fixed or terminating mobile operator. Again the mobile operator recovers its termination costs through airtime charges to its customers
- In the US and Canada the fixed operator pays the mobile operator a call termination charge. This is set under the "reciprocal compensation" principle, set out in the US Telecommunications Act of 1996, and is equal to the fixed operator's own call termination charge. A similar model applies in Hong Kong for fixed to fixed interconnection
- In the EU, Australia and Africa the fixed operator pays the mobile operator a termination charge which is designed to cover the mobile operator's terminating costs. Given the traffic-sensitive cost structure of the mobile operator's radio access network, this charge is normally three to six times higher than a cost-based fixed termination charge.<sup>45</sup> Unlike the other three models, the receiving mobile user makes no payment under these charging arrangements for fixed to mobile calls.

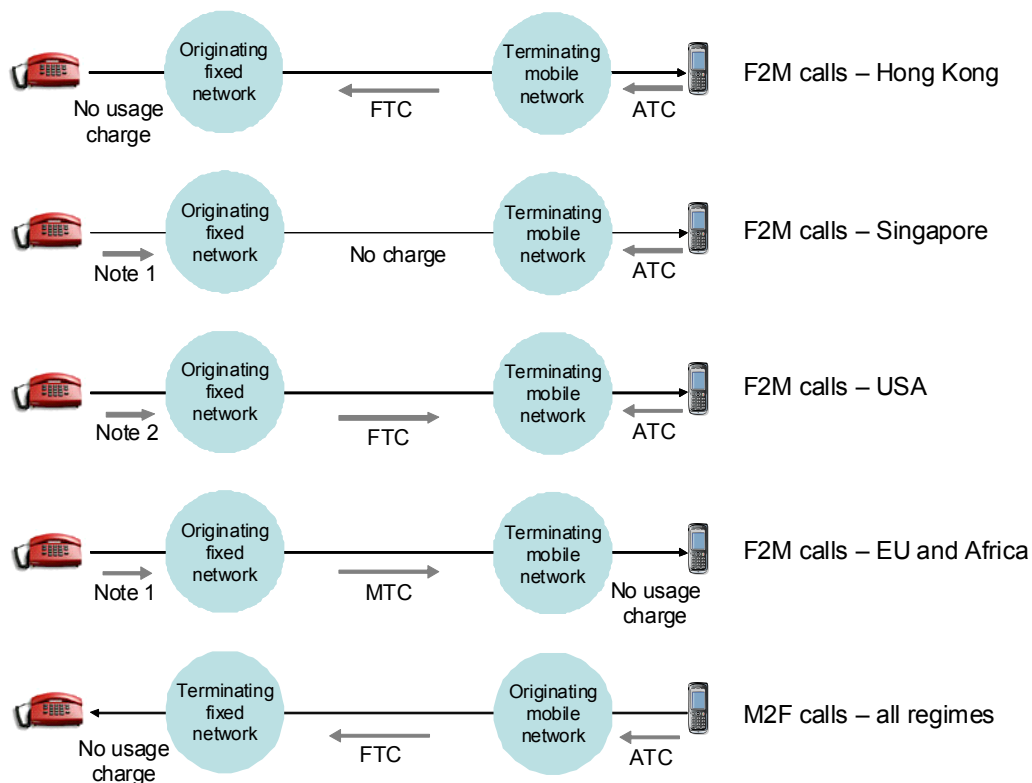
Which of these models should OFTA consider as the default for FMIC arrangements if negotiations between parties fail? In the following sections of this chapter we evaluate the models of Figure 5.2 against seven criteria:

- Whether each model removes the current regulatory asymmetries in FMIC arrangements
- The extent to which each model meets the cost causation principle, assuming that fixed and mobile networks are treated as equivalent when they exchange traffic
- The extent to which each model maximises calling volumes, and, as a result, economic welfare
- The extent to which each model enables a graceful migration to interconnect arrangements when next generation networks are introduced
- The transaction costs generated by each model
- The incentive each model provides for dealing with voice spam on fixed to mobile calls
- The ease of interconnect charging for fixed-mobile convergence services involving dual mode, fixed mobile terminals.

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<sup>45</sup> In the case of Australia it is over 10 times higher.

Figure 5.2: Alternative regimes for FMIC



Key: ATC = airtime charge; FTC = cost based call termination charge; MTC = cost based mobile termination charge  
 Note 1: Retail charge per minute  
 Note 2: Retail charge bundled with monthly fee for most consumers but a per minute charge for most businesses

In so doing we also consider one additional form of FMIC arrangements – BAK. Under BAK each interconnecting network recovers the cost of both outbound and terminating calls from its customers and there are no interconnect charges in either direction. This model is used extensively for voice calls exchanged between mobile operators and by the interconnected IP networks of the Internet.

We might also add for completeness a pure *receiving party's network pays* model in which the receiving network always pays to receive calls. But we omit this model because it is not used anywhere in the world as far as we know.

### 5.5 REMOVING THE REGULATORY ASYMMETRIES IN FMIC ARRANGEMENTS

We argue in Chapter 4 that it is important to remove regulatory asymmetries in the treatment of fixed and mobile operators in Hong Kong. So in assessing different models for FMIC we should start by considering which of them use symmetric charging arrangements. We find that:

- neither the Hong Kong nor Singapore models are symmetric. For mobile to fixed calls the mobile operator pays the fixed operator a terminating charge. But the reverse is not true. In the case of Singapore there is no payment by the fixed operator for fixed to mobile calls. In the case of the current Hong Kong model, the mobile operator also pays a charge to the fixed operator to cover its call origination costs
- the EU and US models are symmetric. In both cases the fixed operator pays a terminating charge to the mobile operator for fixed to mobile calls and the mobile operator pays a terminating charge to the fixed operator for calls in the other direction
- the BAK model is also symmetric. Here no money changes hands in either direction when traffic is exchanged between the fixed and mobile operators. Instead the operators each charge their own subscribers to recover the costs of both origination and termination.

## 5.6 THE COST CAUSATION PRINCIPLE

In its general form we can express the cost causation principle as:

*“The party which causes the cost should bear the cost”*

In applying this principle it is important to note that there are four parties involved in a call from Network 1 to Network 2:

- the calling party A
- the calling party's operator, Network 1
- the called party B
- the called party's operator, Network 2.

The interconnect charging arrangements which are appropriate are those which lead to the A and B parties both knowing and bearing the cost of their actions. It is up to the network operator to signal to its customers the cost of their actions through the retail prices it charges them, and it is for the interconnect charging arrangements to signal to the operators the cost of their customers' actions.

Traditionally analysts have started from the principle that the calling party causes the costs. But it takes only a moment's reflection to realise that this is not the case.

- The calling party A generates an initial cost by initiating the call but
- The called party B can minimise the cost by refusing the call e.g. by looking at the CLI and deciding he does not wish to speak to A
- both A and B can terminate the call at any point in the conversation

Laffont and Tirole<sup>46</sup> refer to this as the “receiver sovereignty” property of calls. In their paper they conclude that:

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<sup>46</sup> On the Receiver Party Pays Principle, D S Jeon, J J Laffont and J Tirole, March 2001

- There is an efficient equilibrium for sharing the end-to-end cost of calls between the calling and receiving parties
- This equilibrium is a function of the utility which the calling and receiving parties extract from the call. It is not a function of the costs incurred by the two networks.

So the costs of the call are caused by both A and B, and the interconnection charging arrangements which best meet the cost causation principles are those where the end to end costs of the call are shared. If they are not shared, the network operator who does not pay does not have the incentive to signal to his subscribers through retail prices the costs that they cause.

Sharing can be done in two main ways:

- the cost might be shared for individual calls. This is how the BAK model works
- the costs may be shared for calls in aggregate. Generally there are flows of traffic in each direction between the interconnected networks. So any calling party pays model shares costs at this level.

All of the FMIC models under evaluation meet the cost causation principle to some extent with one exception. The Hong Kong model requires the mobile network to meet the full cost of both fixed to mobile and mobile to fixed calls and there is no cost sharing.

## 5.7 CALLING RATES

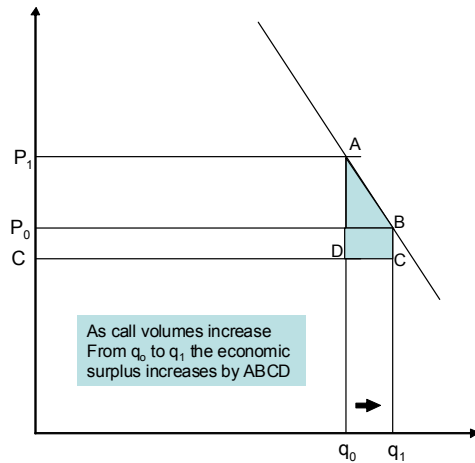
In a market for calls where there is a normal downward-sloping demand curve with prices above or equal to cost, economic surplus increases with the volume of traffic<sup>47</sup>. So we can use calling rates per subscriber as a measure of economic surplus. Figure 5.4 illustrates

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<sup>47</sup> With a straight line demand curve the consumer surplus is proportionate to the square of the traffic volume.

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**Figure 5.4: Economic welfare and calling volumes**




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Figure 5.5 provides estimates of the minutes of use per mobile subscriber, inbound and outbound, in eight countries:

- In four of them - France, Germany, Italy and the UK - the calling user pays the full cost of the call for both fixed to mobile and mobile to fixed calls
- In the other four countries - Canada, Hong Kong, Singapore and the US - the calling user pays the full cost of the call for mobile to fixed calls, but the receiving user pays a proportion (which varies across the four countries) of the costs of a fixed to mobile call through airtime charges.

We can see that:

- mobile calling rates are significantly higher when the receiving user pays some proportion of the costs - 412 minutes of use per month in the second set of countries compared with 138 in the first
- this difference, a factor of three, is too high to be explained by income effects or geographic differences.

We do not have equivalent data on fixed calling rates. But it is reasonable to assume that fixed rates are also higher in the second set of countries, given that fixed operators in these countries face lower costs for fixed to mobile calls and so, on average, set lower prices.

**Figure 5.5: Comparison of mobile calling rates**

| Country        | Interconnect charging model |     | Minutes of use per month (in and out) |
|----------------|-----------------------------|-----|---------------------------------------|
|                | F2M                         | M2F |                                       |
| France         | EU                          | All | 210                                   |
| Germany        | EU                          | All | 76                                    |
| Italy          | EU                          | All | 120                                   |
| UK             | EU                          | All | 145                                   |
| Simple average |                             |     | <b>138</b>                            |
| Canada         | US                          | All | 360                                   |
| Hong Kong      | HK                          | All | 380                                   |
| Singapore      | Sing                        | All | 290                                   |
| USA            | US                          | All | 620                                   |
| Simple average |                             |     | <b>412</b>                            |

Source: *Global Wireless Matrix 1Q05, Merrill Lynch, 21/5/05*

Taking these two arguments together we conclude that calling rates are likely to be lower for both fixed and mobile users under EU FMIC arrangements than under the US, BAK<sup>48</sup>, Hong Kong or Singapore regimes, where the receiving user contributes significantly to the cost of fixed to mobile calls. In other words, empirical evidence on mobile calling rates suggests that the EU FMIC model does not generate economic welfare to the same extent as the other regimes under consideration.

## 5.8 TRANSACTION COSTS

There are transaction costs involved in operating any FMIC arrangement:

- in monitoring traffic, billing, reconciling charges and collecting the money owed
- in negotiating interconnect rates. This is a substantial overhead in a market the size of Hong Kong. In a market with 12 operators there is a requirement to negotiate 66 (12x11/2) interconnect agreements
- in determining interconnect rates. In the past OFTA has concentrated on determining a rate for PCCW, leaving other fixed operators to negotiate FMIC rates with mobile operators and determining rates relatively infrequently

The BAK model scores highest on this criterion by some way with the US model second best. In addition the EU regime scores especially badly on this criterion:

<sup>48</sup> In practice the BAK model produces similar outcomes to the US model. Under BAK no money passes between the fixed and mobile operators. Under the US model we observe the same outcome when the traffic flows between the fixed and mobile networks are balanced. This is normally the case.

- the BAK model involves low transaction costs. There are no operating costs and no requirement for negotiations/determination on termination prices
- the US model scores reasonably well because it provide opportunities to move to BAK when traffic flows are balanced. (Operators monitor traffic flows for capacity planning purpose so this cost is incurred in any case)
- The EU model scores badly because, unlike the other models, there are significant transaction costs in setting the mobile call termination rate. In the past European mobile operators have charged mobile termination rates (MTRs) well above their costs. This generated supra normal profits from call termination which were then used to reduce the price of competitive retail products. Now mobile termination rates in the EU are regulated and NRAs have spent substantial efforts in setting these MTRs. In the UK, for example, the regulatory authorities and the operators have between them spent at least HK\$1000 million on this process over the past eight years<sup>49</sup>. The other regimes, in which some proportion of the costs of mobile termination are recovered from the mobile subscriber through an air time charge, avoid this problem.

## 5.9 INCENTIVES TO DEAL WITH VOICE SPAM

Of the five regimes:

- The Hong Kong model provides no incentives for the fixed operators to deal with organisations which use the network to send spam to mobile users. Indeed there are incentives for the fixed operator to invite such activities. On each minute of traffic generated in this way the fixed operator earns a call origination fee from the receiving mobile network
- The Singapore model provides only weak incentives for the fixed operator to deal with the problem. The fixed operator must bear the cost of providing network capacity to carry the call in the long run. But in the short run there are no out payments on the traffic generated by the spammer
- the BAK model has similar incentive properties to the Singapore model
- The US model provides reasonable incentives for the fixed operator to deal with the problem. On each minute generated by the spammer the fixed operator pays a fixed termination charge to the terminating mobile operator. Our research indicates that these incentives are effective and that voice spam is not a problem in the US
- The EU provides even stronger incentives against voice spam. There the spammer must pay a substantial charge per call minute to make fixed to mobile calls.

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<sup>49</sup> Based on discussions with two senior managers of mobile operators involved in the UK's Competition Commission inquires into mobile termination rates of 1997 and 2001

## 5.10 FUTURE INTERCONNECT ARRANGEMENTS

A useful property for FMIC arrangements is that they allow a graceful migration to the most likely form of interconnect for next generation networks. This is BAK<sup>50</sup>. Clearly the BAK model meets this requirement. The US model, where the fixed and mobile operators charge each other identical fees for termination, also scores well here.

## 5.11 INTERCONNECTION CHARGING FOR FMC SERVICES

Many operators throughout the world are now introducing FMC services involving dual mode fixed and mobile terminals. The terminal acts as a fixed telephone in the home or office where it uses a Bluetooth or Wi-Fi connection, and as a mobile phone at other times. How do interconnecting operators charge for a call to such a terminal when it moves from fixed to mobile mode in mid-call? In the case of the US and BAK regimes the mode of the terminal makes no difference to the charging arrangements. The originating network continues to pay the terminating network the same fee. In the case of the other regimes the interconnect charging arrangements change as the receiving terminal changes mode and the charging is more complex.

## 5.12 REDISTRIBUTION EFFECTS

Currently fixed network operators earn HK\$600 million each year through current FMIC charging arrangements. What will happen if we move to each of the models under evaluation?

- maintaining current arrangements means no redistribution
- moving to the Singapore model means that the net FMIC revenue flowing to the fixed operators is reduced by half
- moving to the US or BAK models eliminates these revenues
- moving to the EU model will produce a net flow of revenues from the fixed to the mobile operators. The scale of this flow depends upon the size of the mobile termination rate which is negotiated or determined. This is uncertain. But it is likely that moving to the EU model would roughly reverse the flow of FMIC revenues.

## 5.13 AN OVERALL ASSESSMENT OF THE FIVE MODELS

Figure 5.6 provides an overall comparison of the five regimes. The figure indicates that:

- the current Hong Kong model is not now in the best interests of Hong Kong. The regime does not follow cost causation principles; it generates substantial transaction costs; it positively encourages voice SPAM on fixed to mobile calls; and it does not provide a graceful evolution path towards future developments like next generation networks and FMC. Its main merit is that it involves no change

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<sup>50</sup> IP networks of roughly equal size normally interconnect by peering. Under this arrangement neither operator pays the other as the two networks exchange traffic

- we can also reject the EU model on three main grounds. It generates very high transactions costs; there is strong empirical evidence that it results in lower calling rates and reduced economic welfare when compared with other models; and again it does not provide a graceful evolution towards future developments
- of the other three models the BAK model scores best. In many ways it scores in a similar way to the US model. But it has one major advantage – it generates no transaction costs. Its only disadvantage is that it provides weaker incentives than the US model for the fixed operators to deal with voice spam on fixed to mobile calls.

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**Figure 5.6: Overall assessment of the four regimes**

| Assessment criterion   | Regime   |           |        |           |          |
|--|----------|-----------|--------|-----------|----------|
|  | HK now   | Singapore | US     | EU        | BAK      |
| Removes asymmetry in FMIC charging?                          | No       | No        | Yes    | Yes       | Yes      |
| Compliance with cost causality                               | No       | Partly    | Yes    | Yes       | Yes      |
| High calling rates?  | Yes      | Yes       | Yes    | No        | Yes      |
| Transaction costs  | Medium   | Medium    | Medium | Very high | Very low |
| Incentives to police voice spam                              | Negative | Weak      | Yes    | Yes       | Weak     |
| Graceful migration to likely NGN interconnect                | No       | No        | Partly | No        | Yes      |
| Simple interconnect charging for dual mode terminal services | No       | No        | Yes    | No        | Simplest |
| Redistribution effects                                       | Nil      | Medium    | High   | Very high | High     |

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## 5.14 MOVING TO A BAK MODEL

Should Hong Kong move to a BAK model? Before we can make any recommendation of this kind we need to consider:

- the cost of change
- the likely impact of the change on operators and end-users
- how well a BAK model works when traffic flows between networks is out of balance
- the problem of establishing efficient points of interconnect
- other objections to the BAK model raised in the literature.

### 5.14.1 The cost of change

The cost of changing to a BAK model is minimal. The operators simply suspend interconnect charging arrangements when they exchange traffic. This does not mean they can abandon

interconnect charging completely. Our proposals for BAK arrangements are designed to apply only to carrier to carrier interconnection and not to one way access by service providers. It is outside our terms of reference to consider to what extent BAK might also apply to access by service providers.

#### **5.14.2 The likely impact of the change on operators**

Moving to the BAK model will lead to a reduction in interconnect revenues for the fixed operators of approximately \$600 million per annum. The fixed operators currently receive \$600 million per annum<sup>51</sup> from the mobile operators in interconnect revenues. This is split roughly equally between payments for call origination on fixed to mobile calls and termination payments for mobile to fixed calls

With the loss of such revenue, fixed operators will have pressure to raise prices or reduce discounts. However, they will be substantially constrained from doing so by competitive pressures in the form of fixed mobile substitution and the emergence of triple / quadruple play packages. A transition period before the introduction of BAK will also assist them to plan for changed cash-flow circumstances.

In the long run changing the FMIC arrangements will, almost certainly, accelerate fixed mobile substitution of voice calls. This in turn will focus the efforts and investments of fixed operators on the provision of broadband services, where the fixed operators have a substantial advantage over the mobile operators in the delivery of cost-effective high bandwidth services.

Moving to the BAK model will enable a saving of HK\$600 million for mobile operators. But we do not expect the operators to retain this revenue as profits. Given the high level of competition in the mobile market we expect that the revenue will be passed to customers in the form of lower prices.

#### **5.14.3 The likely impact of the change on end-users**

As a result of moving to BAK for FMIC the average citizen should be better off in the long term.

In the short term end users will experience a change in FMIC arrangements through lower prices for local mobile services and higher prices for local fixed services. But this should not create any significant number of winners or losers amongst the end user population. Given the high penetration of both mobile and fixed services in Hong Kong, there is general agreement that virtually all adults in the population use both fixed and mobile services. So what the average citizen or business loses through higher fixed service prices should be offset by lower mobile prices and the average citizen is neither better nor worse off than before<sup>52</sup>.

But in the long term our proposals should enable the telecommunications industry to complete more effectively and should create more appropriate incentives for investment in new technologies by both the fixed and mobile operators as discussed in Chapter 4. Provided a competitive telecommunications industry is maintained in Hong Kong, these changes should

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<sup>51</sup> Statistic supplied by OFTA

<sup>52</sup> There may be some small transfer of benefits from businesses to consumers given that businesses make a proportionately greater use of fixed lines than consumers

lead to the average citizen enjoying a wider range of better functionality services at lower prices<sup>53</sup>.

#### **5.14.4 Does BAK work when interconnect traffic is unbalanced?**

A common objection to BAK is that it is not economically efficient when the traffic between networks is out of balance. Objectors argue that the network with the net inflow of traffic should be paid to terminate the excess calls on the grounds that the originating network is causing it a cost which it would otherwise not incur.

We take a different view. As described in Section 5.6 both the calling and receiving parties cause the cost of end to end calls. So, for economic efficiency, the cost of calls should be shared between the interconnecting networks. This signals the costs caused to the two operators which can then signal these costs to their subscribers through appropriate retail pricing.

Under BAK an operator could charge subscribers who simply receive calls in a way which reflects the costs of terminating calls on its network. The subscriber will, in turn, then take action (e.g. refusing calls or curtailing calls) to control the charges in a way which reflects the value of the calls to him. So his behaviour is economically efficient. Indeed, as we move to FMC services, the economic efficiency of BAK will increase. Subscribers using converged devices will receive calls via both higher cost cellular mobile services and lower cost fixed services. So the called party will know a lot more about the cost of receiving the call than the caller and will have more information on which to act in an economically efficient manner.

It is important to note that these arguments, and our recommendation to move to BAK, apply only to carrier to carrier interconnection for any-to-any calls and not, for example, to access by service providers.

#### **5.14.5 Efficient location of points of interconnect**

If operators implement BAK then they have incentives for near end handover of calls. This would minimise the origination costs of the call which they bear and maximise the termination costs of the call borne by the other party. The FCC recognised this issue in its notice of proposed rule making of April 2001<sup>54</sup>. This is certainly an important issue in the US and it is one which OFTA will need to consider in deciding if it is to establish BAK as the default option for interconnect. But there are good reasons to believe that it is not a serious issue in Hong Kong where:

- Interconnect between operators at the transit switch level is well established
- The scope for near end handover is limited given the small size of Hong Kong
- The traffic flows between pairs of interconnecting operators is broadly balanced and the incentives for operators to cooperate to agree efficient POIs are substantial

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<sup>53</sup> For example quadruple play packages which provide subscribers with “best connected” service in terms of bandwidth, price, and quality wherever they are in Hong Kong

<sup>54</sup> FCC 01-132

- The market for transmission across Hong Kong is already highly competitive.

#### 5.14.6 Other objections to BAK

We set out in Annex 11 a review of other criticisms of BAK interconnect charging arrangements found in the literature. We conclude that these objections are either not applicable in Hong Kong or out of date.

#### 5.14.6 Conclusion

On the basis of the comparison of Figure 5.6 and the analysis set out above, we recommend that **OFTA should revise its guidelines on FMIC so as to change from current arrangements to BAK**. We consider in Chapter 10 whether, and in what form, it is within OFTA's powers to implement such a recommendation.

### 5.15 PAYING FOR INTERCONNECTION LINKS

Currently the mobile operator bears 100% of the ongoing cost of interconnection links between fixed and mobile networks. We believe that it is in the public interest for OFTA to require each originating network to pay for the link capacity required to deliver traffic to the terminating network. This proposal has two main advantages over current arrangements:

- It removes further asymmetries in the treatment of fixed and mobile operators, allowing for more rational decision making on investment in fixed-mobile convergence services and strengthening cross platform infrastructure based competition in Hong Kong. This should in turn generate dynamic and productive efficiency gains as discussed in Chapter 4
- It is consistent with the practices used for fixed to fixed interconnect in Hong Kong and with international best practice for FMIC arrangements

We believe that such a proposal represents a further withdrawal of regulation. It is highly unlikely that fixed and mobile operators would negotiate current arrangements if all regulation, except the any-to-any interconnect requirement were withdrawn. It is much more likely that they would negotiate an agreement similar to our proposal – for example one in which each operator provided its own link capacity to deliver traffic to the terminating network. Our proposal is closely linked to the suggestion to move to BAK for FMIC. We discuss the precise form in which we suggest that OFTA implements our proposals in Chapter 10.

We estimate that, if implemented, such a proposal would lead to a reduction in interconnection link payments from the mobile to the fixed operators of around \$41 million per annum. Our estimates assume that:

- fixed and mobile networks exchanged 17 billion minutes of traffic per annum<sup>55</sup>
- each 2Mbit/s link carries 4.1 million minutes of traffic per annum<sup>56</sup>

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<sup>55</sup> The sum of F2M and M2F call minutes for 2004 (as supplied by OFTA).

<sup>56</sup> 30 channels x 60 minutes x 0.7 (trunk efficiency ratio) x 9 (day to busy hour ratio) x 365 days = 4.1 million minutes

- each link costs \$20,000 per annum to rent<sup>57</sup>
- interconnection links currently generate around \$82 million in revenues for the fixed operators (17 billion minutes x \$20,000/4.1 million)
- 50% of these revenues disappear under our proposals.

These changes in revenue flows amplify slightly the effects set out in Section 5.14 by increasing the revenue transfer from fixed to mobile operators from \$600m to \$641m per year.

## 5.16 FIXED TERMINATION CHARGES

### 5.16.1 Current arrangements

Fixed operators charge different call termination rates when they terminate calls originating on fixed and mobile networks as shown in Figure 5.1. Again it is important to remove this asymmetry for the reasons set out in Chapter 4. But in developing proposals here we need to look more widely at the current arrangements for setting fixed interconnect charges if we are to make proposals in the public interest. To date:

- OFTA has determined PCCW's interconnection rates with one fixed operator and approved its tariffs for calls to and from mobile networks
- OFTA has issued a preliminary analysis for the determination of HKBN's FMIC charges with one mobile operator

Other operators have negotiated their call termination rates, knowing that if the negotiations failed and they sought a determination, OFTA would set a rate in accordance with Section 36A of the Telecommunications Ordinance and associated guiding principles.

### 5.16.2 Proposed changes

Current arrangements suffer from two main weaknesses:

- The use of discriminatory fixed termination prices (with prices to mobile operators at 60% more than the level of prices to fixed operators) generates a major asymmetry in the treatment of fixed and mobile operators
- The arrangements generate high transaction costs in negotiating, and possibly determining, termination charges. Many of the stakeholders we interviewed in the course of the study made this point. In particular, the entry costs for a new player are raised substantially by the need to negotiate call termination rates with all other players.

If OFTA were to further withdraw regulation and regulate termination prices on an ex post basis then this would tend to increase rather than reduce these transaction costs.

To deal with these problems we recommend that ***all Type I interconnect, and not just that required for FMIC, moves to the BAK***. We set out the impact of this proposal for FMIC in

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<sup>57</sup> Current price for a PCCW E1 link

Section 5.14. The impact on fixed to fixed (FFIC) and mobile to mobile (MMIC) interconnect is likely to be limited. In the case of FFIC the current charging arrangements are symmetrical and traffic is close to balanced between most pairs of networks. In the case of MMIC BAK is already in common use.

As far as we can tell BAK suffers from only one weakness when compared with other interconnect regimes. When an operator terminates calls free of charge then it creates opportunities for illegal activities. For example:

- BAK creates only weak incentives for originating operators to deal with spam on fixed to mobile calls<sup>58</sup>
- BAK increases the incentives for illegal bypass on inbound international calls.<sup>59</sup>

But this is a minor weakness when set against the advantages of BAK, especially given that the current interconnect arrangements in Hong Kong suffer from similar weaknesses. We summarise the main advantages of BAK<sup>60</sup> as follows. BAK:

- eliminates the current problems associated with fixed termination charges
- substantially reduces the transaction costs of negotiating/determining interconnect charges for all operators, both fixed and mobile
- substantially reduces transaction costs of billing, reconciling and collecting interconnect charges for all operators
- focuses the efforts of the operators on competing in the supply of retail services to Hong Kong citizens rather than competing through regulatory arbitrage and gaming
- gives operators a greater pricing freedom at the retail level. At the moment an operator offering services for a flat monthly fee at the retail level pays interconnect charges on a per minute basis and risks a margin squeeze. Moving to BAK removes this problem
- is future proof. Operators using IP and circuit switch technologies can interconnect with each other without needing to negotiate complex interconnect charging arrangements
- gives an operator stronger incentives for cost efficiency than other interconnect charging arrangements. Under BAK the operator must recover all its costs from its customers. In a competitive market this gives it strong incentives to minimise its unit costs. Under a traditional calling parties network pays model the operator receives a substantial portion of its revenues from call termination prices which are set by negotiation or determination and where incentives for regulatory gaming rather than cost efficiency dominate. The same argument applies to current FMIC arrangements in Hong Kong

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<sup>58</sup> Compared to the incentive to cooperate with spammers that exists in HK at present

<sup>59</sup> Note that the opportunity for illegal bypass exists at present, in any case.

<sup>60</sup> As recognised by the Deputy Chief Economist of the FCC, Patrick DeGraba in *Bill and keep at the central office as the efficient interconnect regime*, , December 2000, FCC OPP 33

- eliminates any need to consider the “terminating access monopoly” problem, which gives even the smallest operators’ substantial calls over calls that terminates with its customers
- reduces the role which OFTA plays in competitive interconnect in Hong Kong and so represents a substantial withdrawal of regulation and of regulatory costs
- costs virtually nothing to implement.

## 6 Local Access Charges

### 6.1 THE LAC PREMIUM

Currently fixed telecommunications operators in Hong Kong receive a local access charge (LAC) when:

- they originate **outbound** international calls from their directly connected subscribers. PCCW's LAC is currently set at 12.1 cents per minute<sup>61</sup>
- they terminate international **inbound** calls to their directly connected subscribers. PCCW's LAC is set at 12.6 cents per minute<sup>62</sup>

The difference in the prices reflects the cost of the number portability dip which is required on inbound calls to route the call to the correct terminating network.

OFTA has determined the LAC only for PCCW, but the other fixed operators use PCCW's LAC as a benchmark and levy similar charges for international calls themselves. Figure 6.1 illustrates these arrangements for payments between fixed carriers and external telecommunications service (ETS) providers for typical inbound and outbound calls.

Fixed operators typically charge 12.6 cents per minute to terminate international calls. But they charge only 2.7 cents per minute<sup>63</sup> to terminate calls originating on other local fixed networks. We refer to the difference, 9.9 cents per minute in the case of inbound international calls, as the **LAC premium**. Some of this premium may be justified by the additional cost incurred in terminating an international rather than a local call. But a large part of it represents:

*“a commercial incentive for investment in the local infrastructure”<sup>64</sup>.*

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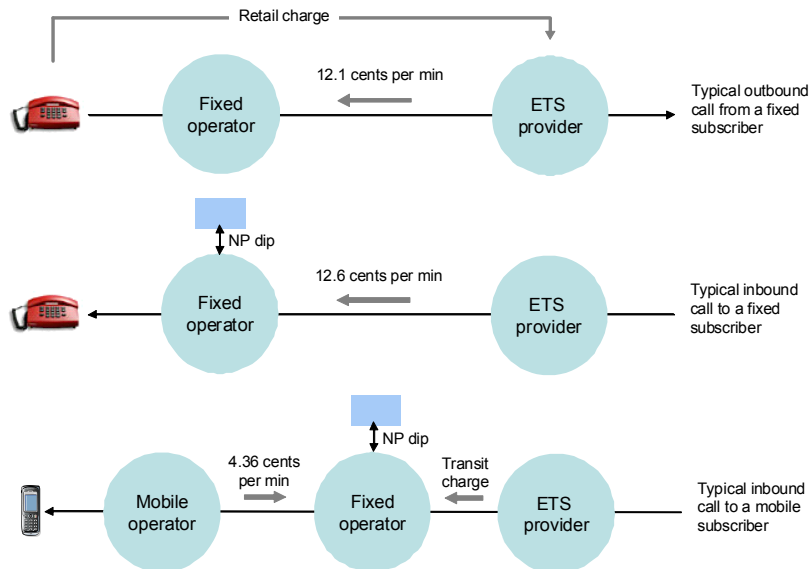
<sup>61</sup> 10.6 cents for calls via a local transit operator

<sup>62</sup> 10.6 cents for calls via a local transit operator

<sup>63</sup> Assuming a two-minute call

<sup>64</sup> See OFTA statement on the LAC of 25/11/98

**Figure 6.1 - The LAC and international calls**



## 6.2 FIXED VERSUS MOBILE OPERATORS

All fixed operators charge a LAC premium for originating and terminating international calls at a level similar to that of PCCW. But mobile operators are not able to do so. OFTA has made it clear that mobile operators are free to negotiate a LAC if they can. Some have tried. But, through our discussions with stakeholders, we have found none of the mobile operators are able to charge for origination and termination of international calls at the level of the LAC. There are two main reasons:

- There are market pressures on the mobile operators to hold down the price for outbound international calls. These pressures do not exist to the same extent for the fixed operators. PCCW is required to charge the LAC on outbound calls and its fixed rivals, as price takers, are happy to charge at a similar level
- Almost all inbound international calls are routed over facilities which are in common ownership with those of a local fixed operator. It is natural for these calls to be routed via this operator, especially since the fixed operator is then entitled to charge the terminating mobile operator a call origination charge of 4.36 cents per minute. Under these circumstances ETS providers have no commercial incentive to negotiate a LAC equivalent with mobile operators. Figure 6.1 illustrates.

We also note that ETS providers tend to route calls to fixed network operators who operate both fixed number portability and mobile number portability (MNP) services and can therefore route all their calls to the correct destination directly. Mobile operators, who only run MNP services, cannot do this. So while the supply of NP services remains asymmetric, mobile operators cannot compete on equal terms with fixed operators to offer termination transit services to ETS providers.

### 6.3 THE CURRENT STATUS OF THE LAC

In February 2004, OFTA announced its intention to review the LAC and in May 2004 it issued a determination setting out substantially reduced rates for the LAC. PCCW then challenged the determination in the High Court, and in March 2005 the court ruled that PCCW's application for judicial review should be allowed. So OFTA's determination of May 2004 was not implemented and, for the time being, the LAC remains at the levels specified in Section 6.1. In the meantime the LAC regime is under increasing pressure from two sources:

- illegal bypass on international inbound calls. The bypass service provider strips out the CLI of the inbound international call, replaces it with a local CLI, and passes it to a local fixed operator for termination. As a result it avoids the LAC of 12.6 cents per minute and pays the local termination charge of 2.7 cents per minute<sup>65</sup> instead. According to one stakeholder we interviewed such illegal bypass accounts for 30 to 40% of inbound international traffic. According to the traffic statistics published by OFTA, currently only 26% of international traffic is inbound and this proportion is falling steadily as shown in Figure 6.2<sup>66</sup>
- legal voice over IP services are popular with broadband customers in Hong Kong, where household penetration is over 65%. Hong Kong users, according to our stakeholder interviews, make a growing number of international calls using such services at prices which are well below market rates for traditional IDD calls<sup>67</sup>. OFTA has attempted to minimise this problem by requiring VoIP operators based in Hong Kong to pay a LAC for traffic which is routed via a hosting fixed carrier for local delivery in Hong Kong. This requirement reduces LAC bypass by Hong Kong based VoIP operators. But it does not prevent LAC bypass if traffic is not routed through a conventional circuit switched network in Hong Kong. So, as end users switch from circuit switched to IP technologies to make voice calls, the LAC regime becomes less effective as a way of meeting its original objective of providing a commercial incentive for investment in local infrastructure.

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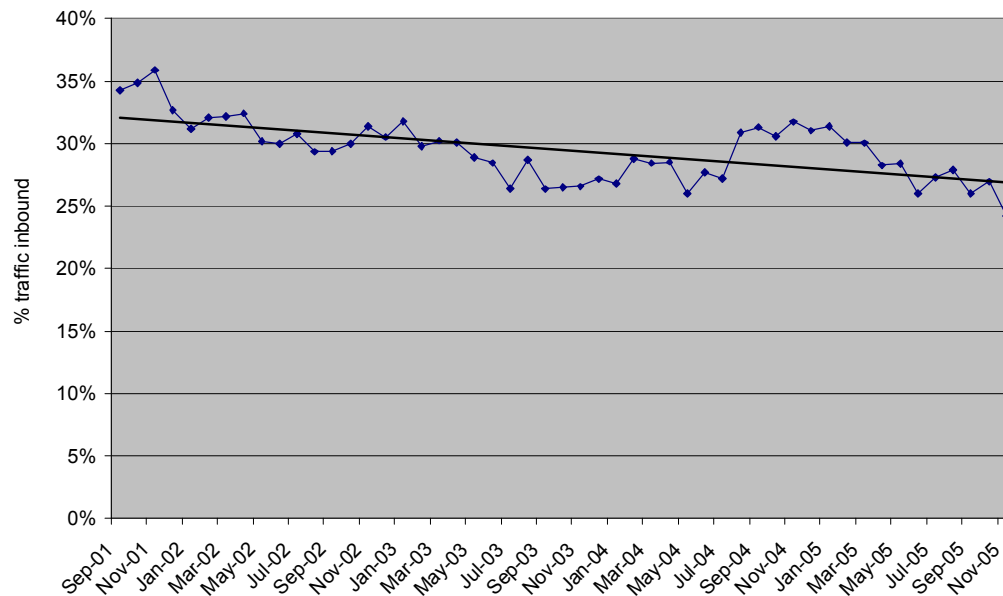
<sup>65</sup> Assuming a two-minute call

<sup>66</sup> If illegal bypass were eliminated we would not necessarily expect a 50:50 balance of outbound to inbound traffic. But we would not expect a difference of the magnitude observed in Hong Kong ie 74:26. In Western Europe for example the ratio was around 52:48 outbound to inbound. On the other hand, in the US, where a massive refile industry tilts the ratio strongly in favour of outbound traffic, the ratio has increased from 70:30 in 2000 to 74:26 in 2002. Source: ITU

<sup>67</sup> At the end of 2004 the weighted average price for international calls outbound from Hong Kong was \$0.53 per minute. In contrast Skype charges \$0.16 per minute for calls to most international destinations.

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**Figure 6.2 - The % of international traffic recorded as inbound**




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#### 6.4 PROBLEMS WITH THE LAC PREMIUM

Based upon the analysis set out above, and through our discussions with stakeholders, we have identified five main problems with the LAC premium.

**Firstly** it constitutes a further asymmetry in the treatment of fixed and mobile operators. Fixed operators charge a LAC. Mobile operators do not and, in practice, are unable to do so.

**Secondly** it leads to substantial illegal arbitrage. This arbitrage leads to few economic benefits for Hong Kong, since it applies to inbound international calls and the benefits are mainly felt as lower prices by foreigners calling to Hong Kong. But it certainly leads to costs. In particular it leads ETS providers to charge higher prices for outbound international calls, since a substantial proportion of the revenue stream from terminating inbound international calls is currently lost by these operators to the arbitragers.

**Thirdly** it leads to allocative inefficiency. It raises the costs and prices of providing international service while encouraging fixed operators to set local fixed service prices at levels below cost<sup>68</sup>. We estimate the scale of this loss of allocative efficiency in Annex 10. It is very

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<sup>68</sup> This argument does not depend on whether fixed local services are currently priced below cost. In the long run in a competitive market prices will tend to cost in the absence of additional revenue streams

modest. Abolition of the LAC premium would lead to a reduction in revenues for the fixed network operators of \$191 million per annum. But abolition leads to allocative efficiency gains of only \$3.5 million per annum according to Annex 10.

**Fourthly** it is inconsistent with the Hong Kong Government's stated policy objective of making Hong Kong the leading international telecommunications hub in South East Asia. The LAC raises both inbound international termination rates and international retail outbound prices.

**Finally** the LAC is increasingly inefficient as a way of raising revenue to fund investment in local infrastructure as use of voice over IP services grows.

We consider only the first of these five problems in this report. It is beyond our terms of reference to consider whether the LAC premium should be abolished.

## 6.5 OPTIONS FOR ABOLISHING THE LAC ASYMMETRY

The asymmetry between fixed and mobile operators generated by the LAC is substantial. As a result of regulation, fixed operators generate HK\$103 million per year<sup>69</sup> from the LAC premium while a corresponding revenue stream is not available to mobile operators. This asymmetry may distort future investment decisions on fixed-mobile convergence, undermines cross platform infrastructure based competition, and so reduces the dynamic and productive efficiency gains which are possible through such activities. See Chapter 4 for a fuller discussion.

***We recommend the abolition of this asymmetry, preferably in a manner that reduces the level of regulatory intervention.***

There are a number of ways in which OFTA might remove this asymmetry. In analysing what to do, it will need to consider the impacts of any changes on three markets:

- the market for originating outbound international calls. In setting either retail or wholesale prices in this market, fixed and mobile operators are subject to substantial competitive pressures. So we can see no case for regulation here
- the transit market for the conveyance of international calls between the ETS providers and the originating network (for outbound international calls) or the terminating network (for inbound international calls). Again this market appears to be competitive and we can see no case for regulation here. We do however suggest removing asymmetries in the operation of number portability services in Hong Kong which currently prevent mobile operators from competing in this market. See Chapter 8 for details
- the market for termination of international calls. Here we encounter the normal "terminating access monopoly" problem. There is only one way to terminate the call and there is a regulatory requirement to complete the call. In such circumstances, and in the

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such as that provided by the LAC. We need to evaluate the effect of regulatory decisions, such as that requiring fixed operators to charge a LAC, on this long run equilibrium position

<sup>69</sup> See Annex 10 for the derivation of this estimate

absence of further regulatory intervention, the market pressures on the terminating network operator to hold down the terminating charge which it levies are weak.

We provide analysis for three options that OFTA might wish to consider in abolishing the LAC asymmetry.

**Option 1:** *legalise the currently illegal international inbound bypass service providers.* If we assume that our recommendation from Chapter 5 to move to BAK for local call termination is implemented, then Option 1 will lead to a complete loss of revenues to Hong Kong from termination of international inbound calls. Service providers will pass the traffic to the terminating networks, both fixed and mobile, as if it comprised local calls and the terminating operator terminates it without charge. Compared with the current position this represents an economic loss of \$114 million per annum<sup>70</sup> to Hong Kong since the LAC payments come ultimately from overseas residents making calls to Hong Kong. This loss will be felt in terms of higher end-user prices for Hong Kong residents.

**Option 2:** *allow network operators, whether fixed or mobile, to charge what they like for terminating inbound international calls, while they continue to make all reasonable efforts to minimise illegal bypass.* This option leads us to the terminating access monopoly problem described above. But we believe that terminating charges for inbound international calls would be constrained by market mechanisms in two ways:

- Hong Kong operators negotiate deals with foreign operators. If they levy excessive termination charges for inbound calls then they will face similar charges on outbound.
- Raising these termination charges strengthens incentives for illegal bypass and potentially increases the loss of traffic to such organisations.

Hong Kong residents would be better off under Option 2 than Option 1, assuming illegal bypass does not get out of control. Indeed they may be better off than they are now given that mobile as well as fixed operators would generate significant termination revenues<sup>71</sup>. If it were to implement Option 2 OFTA would need to consider revising the relevant TA Statement issued in 1998 along the lines shown in Figure 6.3.

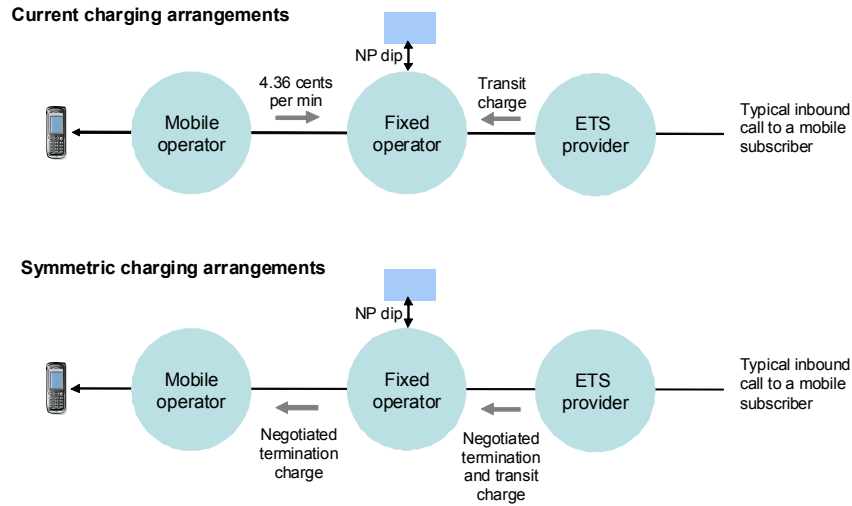
**Option 3:** *maintain a determined LAC for PCCW and allow all other operators, fixed and mobile, to charge what they like for inbound international call termination.* This option is likely to generate similar outcomes to Option 2. It involves fewer changes from current arrangements than Option 2. But it also constrains what the price leader, PCCW, can charge for international call termination. So it does not remove regulation to the same extent as Option 2.

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<sup>70</sup> OFTA's estimate of the current revenue from inbound LAC

<sup>71</sup> Current charging arrangements mean that it is cheaper for most foreigners to call a mobile terminal than a fixed terminal in Hong Kong. Under Option 2 this price difference would disappear. The mobile operator would enjoy a new source of revenues for terminating inbound international calls from foreign callers. But this revenue would not remain as profit. It would be competed away in lower retail prices for mobile services. So ultimately Hong Kong citizens would be the beneficiaries

**Figure 6.3 - Inbound international charging arrangements for calls to mobiles**



These options raise important issues that are strictly beyond the scope of this study. However we recommend that the options be considered further by OFTA.

## 7. Access and Licensing Issues

### 7.1 INTRODUCTION

Consideration of access to property and licensing raised a number of issues in the course of stakeholder interviews. These issues were often cited as examples of asymmetries in the treatment of fixed and mobile operations, which they are, and as potential barriers to FMC development, which they may be. Many of these issues are beyond the scope of this study or their overall effect on the study is slight.

### 7.2 ACCESS TO CIVIC INFRASTRUCTURE AND ROAD OPENING

#### 7.2.1 Background

Under the FTNS and fixed carrier licences, the licensee is obliged to coordinate and cooperate with any other fixed carrier or FTNS licensee under the Ordinance and any other authorised person in respect of road openings and to comply with any guidelines issued by OFTA after consultation. Local wireline-based fixed carriers who entered the market after 2003 are required to seek OFTA's approval on a case-by-case basis on the road opening works. The approval relates of the duct routes in the master plan of the block licence granted by the Lands Department.<sup>72</sup>

Further, all fixed carriers and FTNS licensees are required to follow the coordination mechanism as set out in the Guidelines for Road Opening for Telecommunications/Broadcasting Operators ("the Road Opening Guidelines").

Coordination is considered necessary because of the limited space availability underneath public streets or unleased Government land in Hong Kong.

In its Consultation Document of 21 September 2005 relating to FMC, OFTA proposed that the same licence condition would be transplanted to the new unified carrier licence. For coordination purposes, all unified carriers should be subject to OFTA's approval on the road opening works on a case-by-case basis and the coordination mechanism set out in the Road Opening Guidelines.

Mobile operators are not permitted access to road openings and to the coordinated access to ducts. Instead mobile operators are required to make arrangements with fixed carriers for the provision of backhaul and cable-based transmission services.

#### 7.2.2 Impact of asymmetrical treatment

Mobile operators are treated asymmetrically in relation to self-provisioning and, consequently, in relation to road openings and access to civic infrastructure. This asymmetry is a result of past approaches to licensing mobile operations as if they were value added service providers.

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<sup>72</sup> Pursuant to the TA Statement entitled "Implementation of the Full Liberalization of the Local Fixed Telecommunications Network Services Market from 1 January 2003"

The result of this differential treatment is to reduce the potential cross-platform competition in Hong Kong, and to redistribute costs and revenues between fixed and mobile operations.

There is no continuing justification for the different treatment. We therefore recommend that it should be removed in order for economic benefits, denied to date, to be realised. Giving the mobile operators an opportunity to provide their own transmission links improves their bargaining position when negotiating to lease transmission components from the fixed operators.

We assess this economic impact as relatively minor, because:

- The market for backhaul and other transmission services, is competitive in Hong Kong, with a number of fixed operators in the market
- The downward pressure on backhaul prices that might result from self-provisioning is likely to be small, given the competitive market that already exists.

Our proposals could lead to increased road opening activity. But we believe that any additional activity would be modest:

- In many cases mobile operators would use their newly acquired right to get better deals from the fixed operators and would not open the roads
- Some road openings by mobile operators would substitute for existing road openings by the fixed operators who provide transmission services to them
- Even now it is open to mobile operators to obtain a fixed network operator licence, and thereby add to the number of operators who can seek to open roads.

Importantly, whoever may seek road opening must be subject to coordination arrangements in the Road Opening Guidelines.

This issue is closely related to the arrangements for self-provisioning of backhaul services by mobile operators, which is discussed further later in this chapter.

## **7.3 ACCESS TO LAND AND BUILDINGS**

### **7.3.1 Current situation**

Section 14 (1) of the Ordinance empowers OFTA and any authorised licensee to place and maintain a 'telecommunications line'<sup>73</sup>, and to enter upon any land for the purpose. This treatment has been claimed by some of the stakeholders interviewed for this project to be asymmetrical, because 'telecommunications line' may be interpreted to refer to fixed access service infrastructure, and not mobile. On this argument, Section 14 (1) therefore gives fixed operators power to require building owners to permit access for installation and maintenance, but does not extend to mobile operators in similar circumstances.

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<sup>73</sup> "telecommunications line" is defined in Section 2 to mean "any wire, cable, duct, optical fibre, filament, line, pipe, pole, post, tube, conduit, support structure, ancillary equipment or apparatus or other physical medium used or intended for use as a continuous artificial guide for or in connection with telecommunications".

Our understanding is that the purpose of Section 14(1) is to ensure that operators have access to buildings and land in order to provide and maintain services to end users located there. This means reasonable access for the provision and maintenance of services to business and residential tenants.

It has been argued that mobile facilities, such as base stations, on or within buildings may not be provided only for benefit of tenants and that they will often have a coverage that extends beyond the building in question.

By contrast, Section 14(1A) of the Ordinance sets out the basis for the authorisation of licensees to enter upon land to provide radiocommunications services. The authorisation in Section 14(1A) requires OFTA to ensure that the public interest is being served and to consider whether an alternative location can be reasonably utilised, whether there are technical alternatives, and so on.

The Ordinance therefore makes the distinction in terms of whether the services are to be provided by radiocommunications means or via a 'telecommunications line'. This appears at first sight to create asymmetries in terms of rights of access for fixed and mobile operators. But there is an important distinction to be made here between:

- Access to buildings in order to install a system, whether wireless or wireline, which is for the purpose of serving the building only. Without rights under Section 14(1), operators seeking to install such systems would find themselves paying monopoly rents to the building owner, thereby raising the costs of providing telecommunications in Hong Kong
- Access to buildings in order to install a system which services the local area beyond the building. Here the operator can negotiate with a number of neighbouring landlords and does not require the protection of Section 14(1) to prevent monopoly rents.

We believe that this is an important distinction to make in removing any asymmetry in the treatment of fixed and mobile operators operating in similar circumstances.

### **7.3.2 Approaches in other countries**

The primary purpose of the country case studies was to document the context for and extent of FMC development in those countries, rather than to undertake a full policy comparison of matters such as access to land and buildings. Nevertheless we have examined the approaches to property and building access, as follows:

- In all of the case study countries, except the United States, the rights of operators to access land and buildings for the provision of service are established on a technology neutral basis
- The approach in Australia has been designed to overcome the planning powers and discretions of local government and to provide some certainty for operators providing service on a multi-municipal and multi-region basis. The approach in Australia is based on the concept of low impact installations. Operators installing such facilities are subject to reduced regulation. However all operators must negotiate with building owners to agree detailed terms for access.

### 7.3.3 Potential for clarification

We understand that, based on requests for authorisation, there is scope for OFTA to interpret the term 'telecommunications line' in Section 14(1) widely, and in a technological neutral manner. This understanding is based on advice from OFTA staff that OFTA has already authorised a fixed operator of an LMDS system under Section 14(1).

We recommend that, for the avoidance of doubt, OFTA makes clear, to the extent that it is able, absent legislative amendment, that it will:

- consider the term "telecommunications line" in Section 14(1) of the Ordinance to be technologically neutral, and
- permit requests for authorisation from both mobile and fixed operators that involve the provision of service to tenants and inhabitants of buildings to be considered under Section 14(1) of the Ordinance when the purpose of the installation is to serve the tenants.

## 7.4 SELF-PROVISIONING

Mobile operators are precluded from self-providing fixed transmission capacity:

- for backbone transmission operations
- for interconnection links to the points of interconnection (POI) with fixed networks
- for Base Station to Base Station Controller links

### Backbone operations

The market in Hong Kong for backhaul services is competitive with most locations being covered by a number of fixed operators. The negotiation leverage of mobile operators would be improved, albeit in small measure, if they had an equal right to provide their own fixed backbone transmission systems and accompanying road opening rights. The removal of this disadvantage would, in a small way, help enable FMC and strengthen cross platform competition

### Interconnection links

At present MNOs must interconnect using interconnection links provided by fixed operators. They may do this in a number of ways, including the use of transit FNOs. Self-provisioning will enable costs to be reduced through:

- leveraging the possibility of self-provision and the option of sourcing jointly with other MNOs in price negotiations
- providing links using different techniques and network configurations than available at present from FNOs

Mobile operators are responsible for 100% of the costs of the links and ports required for the carriage of traffic to and from POIs. (See Chapter 5.14 for further details.) Under the proposals in Chapter 5, with equal contribution to the cost of links, mobile operators would be able to reduce their annual link payments by up to 50% or to around \$HK 41 million. However,

with the right to self-provision the remainder, some proportion of the residual \$HK 41 million per annum could also be saved through the lower costs of self (including third party) provision or through using this right to get a better deal from the fixed network operator in question. We have examined the wholesale rates that apply in similar network environments to Hong Kong, and we believe that there is ready potential for negotiating at least 20% off that cost - or up to \$HK 8 million per annum.<sup>74</sup>

### **BTS-BSC transmission links**

A more important area in which self-provisioning will provide both allocative and productive efficiencies is in the provision of backhaul transmission facilities for mobile operators, particularly for facilities connecting base stations with base station controllers. As at the end of January 2006, the total number of 2G base stations and 3G base stations are 11,241 and 5,152 respectively. A significant number of 3G and 2G base stations are co-located and the possibility of sharing transmission links exists. Allowing for these possibilities we estimate that the annual cost of backhaul transmission services in Hong Kong is approximately \$HK 240 million.<sup>75</sup> Self-provision will enable this figure to be reduced through alternative supply arrangements or through more effective price negotiation. However, we cannot with any certainty say what that benefit will be. Nevertheless, in principle, if 20% of the cost can be saved for interconnection links, a similar percentage may be saved off the cost of these transmission links. This saving would then be up to around \$HK 48 million annually.

## **7.5 LICENCE STRUCTURES**

### **7.5.1 Current licence structures**

The current licence structure in Hong Kong differs for fixed and mobile operators. The licence fee structure provides an example:

- Mobile operators pay spectrum fees<sup>76</sup> and an annual licence fee based on \$HK 18 per mobile subscriber. It is assumed that OFTA's costs of licensing and numbering administration are built into the prescribed fees.
- Fixed operators who provide local voice service pay an annual licence fee of \$HK 1 million, plus \$HK 7 for each physical connection at customers' premises. Again, these payments at least notionally include any costs associated with OFTA's licensing and numbering administration.

An approximate comparison shows that mobile operators in total pay annual licensing fees of \$HK 140 to 150 million,<sup>77</sup> compared to licensing fees of about \$ 30 million per annum from fixed operators<sup>78</sup>

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<sup>74</sup> Based on cost modelling exercises undertaken for other clients relating to leased circuits in CBD and metropolitan environments.

<sup>75</sup> Based on 12,000 links at \$HK 20,000 per annum.

<sup>76</sup> There is a \$50 fee for every 1kHz spectrum assigned. In addition, 3G operators pay spectrum utilisation fees under S.32I of the Ordinance.

### 7.5.2 Recommended approach to licensing

We propose that OFTA adopt the following approach to licensing in future:

- The UCL should provide a general authorisation for the licensee to build networks and offer services subject to some general constraints
- This general authorisation should replace the current system of special licence conditions for each operator
- The same authorisation should be issues to all operators – fixed and mobile
- Spectrum licences should be issued to operators separately from the general authorisation
- Licence fees should be structured to relate the fee to the relevant costs caused by the licensee.

The rationale for these proposals is that:

- They remove regulatory asymmetries between fixed and mobile operators
- They encourage innovation by the industry. The operator is free, within the wide scope of the general authorisation, to experiment with combinations of fixed and mobile services without the need to refer back to OFTA

## 7.6 CONCLUSIONS AND RECOMMENDATIONS

### 7.6.1 Access to land and buildings

We recommend that, for the avoidance of doubt, OFTA makes clear that, to the extent that it is able, absent legislative amendment, it will:

- consider the term "telecommunications line" in Section 14(1) of the Ordinance to be technologically neutral, and
- permit requests for authorisation from both mobile and fixed operators that involve the provision of service to tenants and inhabitants of buildings to be considered under Section 14(1) of the Ordinance.

### 7.6.2 Self-provision by mobile operators

We recommend that licence and other conditions that restrict the ability of mobile operators from self-providing transmission services, including backhaul services between network elements and sites in mobile networks and the provision of interconnection links, be removed.

We recommend that road and civic infrastructure access be made available to mobile operators on the same basis and subject to the same road opening conditions that apply to fixed operators.

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<sup>77</sup> 8 million \* \$ 18

<sup>78</sup> (5 \* \$ 1 million) + (3.6 million \* \$7)

### **Licence structures**

We recommend that:

- Licence structures be developed that are symmetrical in their treatment of licensees whether they have fixed or mobile operations, and that licence conditions be established on a technologically neutral basis. We note that the OFTA UCL arrangements seek to meet this objective.
- Future licensing and the UCL should provide a general authorisation for the licensee to build networks and offer services subject to some general constraints, with the same authorisation issued to all operators - fixed and mobile

## 8 Number Portability and the Number Plan

### 8.1 INTRODUCTION

As part of our study OFTA has asked us to consider:

- the appropriateness of current arrangements for providing fixed and mobile number portability (FNP and MNP) in the light of current market conditions and the prospects of FMC
- the case for introducing fixed mobile number portability (FMNP) where mobile operators can port fixed numbers for use with mobile services and vice versa
- the impact which the introduction of FMNP would have on the Hong Kong numbering plan.

We set out our analysis in this chapter. We first consider current NP arrangements, the market problems that they create, and possible solutions to these problems (Sections 8.2 to 8.5). We then consider FMNP and its interaction with the Hong Kong numbering plan in Section 8.7.

### 8.2 CURRENT NP ARRANGEMENTS

The current arrangements for NP in Hong Kong arise from an accumulation of regulatory decisions:

- In 1995 the authorities required the then fixed network operators or FNOs<sup>79</sup> to implement FNP<sup>80</sup>. With this requirement came obligations to direct mobile to fixed calls to the intended fixed network without charge and to provide information on ported numbers to fixed rivals free of charge
- In 1999 the authorities required the introduction of MNP. MNOs were required to implement the service, to route fixed to mobile calls to the correct terminating mobile network and to supply information on ported numbers to each other free of charge. The four original FNOs were also directed by the TA to provide MNP services in return for payment by the MNOs every time the FNO updates its database with a ported mobile number and each time it does a data dip for a call that originates from a customer of the fixed network and terminates on a mobile network. PCCW's charges for these services have subsequently been determined by OFTA. Figure 8.1 shows how, as porting volumes have grown, these cost based charges have fallen. We are told by stakeholders that PCCW's three original rivals charged similar prices to PCCW
- the authorities required new FNOs, licensed since 2000, to implement both FNP and MNP. These new fixed licensees were not entitled to charge MNOs for MNP as the four older FNOs do.

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<sup>79</sup> PCCW, Hutchison Global, Wharf and New World Telecom

<sup>80</sup> Also known as Operator Number Portability (ONP)

**Figure 8.1 - The falling cost of NP services**

| Service   | Charge in |      |      |
|---|-----------|------|------|
|   | 2001      | 2003 | 2005 |
| Database amendment or porting charge<br>(HK \$ per port per fixed operator) | 10        | 2.5  | 1.26 |
| Dipping charge (HK cents per dip)   | 1.19      | 0.50 | 0.29 |

Currently Hong Kong operates FNP and MNP in parallel. In both systems the originating operator dips into an on-line Gateway Number database (GD), which translates the directory number (DN) of the called party into a gateway number<sup>81</sup>. Used to provide full information for the purpose of call routing to the destination network, the gateway number is set by the recipient operator (RO).<sup>82</sup> So there is only ever a need for one dip.

An off-line Administration Database (AD) is also needed to keep track of the ported numbers and their respective ROs<sup>83</sup>. Through a public data network<sup>84</sup>, the required porting information is exchanged among the ADs run by different operators. To effect the porting of a number, all GN database are updated during an agreed cut-over window.

The fixed operators support the porting of both **fixed and mobile numbers** while the mobile operators are required only to support the porting of **mobile numbers**. So the routing of calls differs for fixed and mobile operators as shown in Figure 8.2:

- the fixed operator can route directly to the correct terminating network as long as it has the necessary interconnection links in place
- the mobile operator can route directly to the correct terminating network for mobile to mobile calls but not for mobile to fixed calls. In the latter case, it normally delivers the calls to a fixed operator that does the NP dip and routes the calls to the correct fixed network.

Most mobile operators are unhappy with this arrangement and several have tried to buy AD information on fixed network ported numbers from FNOs so that they can run their own FNP database and avoid transit charges. So far only one has succeeded.

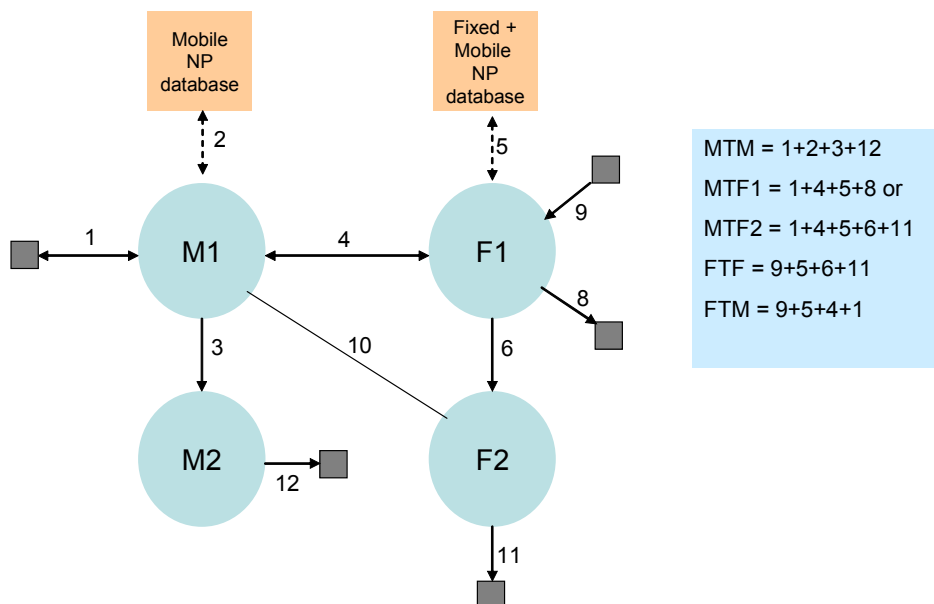
<sup>81</sup> An E164 number starting with the prefix 4 or 14

<sup>82</sup> i.e. Recipient Operator, the operator that receives the DN as a result of porting

<sup>83</sup> The GD is a copy of this AD

<sup>84</sup> X.25 is used for fixed number porting platform while Frame Relay is used for mobile number porting platform

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**Figure 8.2 - NP in Hong Kong**



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The porting process is similar for FNP and MNP. For FNP:

- the subscriber requests NP from the RO
- the RO sends a message over the public data network connecting the ADs, requesting a port from the donor operator (DO). The information in the message includes the directory number, the customer's name and Hong Kong identity number and the selected cut-over time
- the DO has 1.5 working days to validate the request and send back an acknowledgment to the RO
- the RO then sends an "advice of porting number" message to all relevant operators e.g. for FNP to all fixed operators at least 4 calendar days in advance of the agreed cut-over date
- all operators acknowledge receipt of the RO's message
- the RO sends out a "successful porting" message after the porting is successfully implemented.

The process takes three working days plus four calendar days for fixed numbers but is quicker (2 to 3 calendar days) for mobile numbers where there is no physical cut-over of a line required. For fixed number port out, the fixed DO needs to check the customer information and related exchange records of porting request. In the next four calendar days, DO and RO carry out the physical changeover works and all operators update their records and gateway network (GN) databases. The process for mobile number porting is quicker because it involves no physical cut-over work.

The volume of number portings is running at a rate of around 300,000 successful ports per year for FNP<sup>85</sup> and 1,300,000 successful ports per year for MNP<sup>86</sup>.

Each operator bears its own system setup costs. For FNP, the RO is required to pay the DO for the one-off per number rearrangement cost. Some receiving operators may charge users up to \$40 per port for MNP, but in most cases, this charge is waived. In addition the four original FNOs levy the charges of Figure 8.1 on the MNOs.

### 8.3 PROBLEMS WITH THE CURRENT NP ARRANGEMENTS

There are a number of problems with the current NP arrangements.

**First** the current system leads to inefficient routing. Mobile operators route calls to FNOs which then do the data dip. In a significant proportion of cases the FNOs then route the calls to another network and transit costs are generated. We estimate, in Figure 8.3, that this inefficient routing generates costs of up to \$36 million per annum<sup>87</sup>

**Figure 8.3 - Productivity gains from symmetrical operation of NP**

Mobile operators generate 9.3 billion minutes pa of M2F calls

If they send them all via PCCW, then there is a 30% chance this traffic will terminate on another network.

We assume that the cost of transit is 1.3 cpm

Then the cost reduction through accurate routing is **\$36 million pa** =  $9.3bn \times 0.3 \times 1.3cpm$

This efficient routing costs money in terms of NP data dips.

But, if the MNOs carry out the data dips instead of the FNOs then, in the long term, this is simply a cost transfer and not a cost increase

**Secondly** the current system requires repeated determination of charges by OFTA. These cost based charges are falling rapidly as Figure 8.1 illustrates. To date OFTA has determined charges for PCCW and left the other fixed operators to negotiate charges with the mobile operators. The recent High Court ruling on OFTA's attempted new LAC determination has implications for the basis on which OFTA intervenes to set PCCW's charges in future. As a result it could be difficult for OFTA to ensure that NP charges remain cost based in future.

**Thirdly** the asymmetries in the arrangements for NP services (together with current FMIC arrangements) mean that MNOs cannot compete in the market to provide transit service for inbound international calls. The fixed operator has the information needed to route the call efficiently while the mobile operator does not. This objection to the current system should not

<sup>85</sup> With 60% of applications turning into successful ports

<sup>86</sup> With 95% of applications turning into successful ports

<sup>87</sup> Assuming that volume of traffic between the originating mobile network and the terminating fixed network justifies the provision of an interconnect link between the two networks

be exaggerated however. Given the common ownership of the biggest ETS providers and fixed operators in Hong Kong, we would expect the bulk of traffic to be routed as it is now, even if the mobile operators had the information required for accurate routing.

**Finally** the current system, with multiple ADs, creates problems for new entrants when they implement number portability service and raises significantly the cost of keeping NP databases up-to-date. We discuss this problem in Section 8.6.

## 8.4 POSSIBLE SOLUTIONS

The current licences of the four oldest FNOs will expire in 2010. So we support the idea that, from that date, all fixed and mobile operators should be obliged to offer both FNP and MNP with corresponding rights to receive information on all ported numbers free of charge. Then all operators will be free to choose whether they build their own FNP and/or MNP services or rent these services from another operator. With this freedom to rent or build will come market mechanisms to determine rental prices. As a result, OFTA should no longer need to determine NP prices to ensure that they remain cost based.

In the meantime there are two possible market based solutions to the problems identified in Section 8.3:

- mobile operators could continue to try to buy AD information, and regular updates to it, from the FNOs. There is little incentive for the four original FNOs to supply this information since they receive an income from the MNOs by withholding it. But one of the new FNOs may be willing to make such a deal at a commercially viable price
- mobile operators, either singly or in a group, might buy access to the GD of one of the new FNOs so that they can do their own data dips before routing calls to fixed network numbers

Mobile operators might also charge FNOs to supply information on ported mobile numbers to offset the charges the FNOs make for entering this information on their databases. The problem here is that this charge represents a cost to the FNOs, who would then simply raise their charge for amending the NP database by the same amount. This would render such a move by mobile operators futile.

## 8.5 RECOMMENDATIONS ON NP SERVICES

We recommend that:

- in the long term OFTA:
  - requires all operators, fixed and mobile, to provide both FNP and MNP services and
  - gives all operators the rights to receive information on ported numbers free of charge.

The unified carrier licence, discussed in Chapter 7, is the obvious vehicle for implementing this recommendation

- in the short term OFTA leaves operators to devise their own market based solutions to deal with current difficulties

In reaching this second recommendation to deal with the immediate future we have taken into account our proposal to move FMIC arrangements to BAK, as set out in Chapter 5. This could change the rationale for the complex deals which mobile operators now enter into to purchase bundles of NP services, interconnection links, and transit services from FNOs so that one or both of the market based solutions described in Section 8.4 could then work effectively.

## 8.6 MOVING TO A CENTRALISED DATABASE

There are good reasons to believe that a centralised AD, which is synchronised on a periodic basis with the GDs run by each operator, would be a lower cost solution for Hong Kong than the current decentralised arrangements. Using a centralised solution:

- the cost of interworking tests which are required before a new operator can enter the market is reduced to  $1/N^{\text{th}}$ <sup>88</sup> of the cost of a distributed solution
- the daily cost of updating the GDs used for NP dips is reduced. Rather than sending messages for individual ported numbers to all distributed ADs, the centralised AD could update the GDs of each operator on a periodic basis in batch mode.

Such a change is a matter for the industry to consider and agree, since it will require close cooperation between operators to reach an effective solution. So we recommend that OFTA should:

- make clear to operators that all will have full NP obligations in future so as to enable efficient routing, and that FMNP might be introduced at some point (See Section 8.7 for a discussion of this issue)
- convene an industry working group to see whether a centralised solution is cheaper and whether there is willingness to cooperate on developing and operating such a solution. This solution might involve all, or most, operators
- ensure that any centralised database operator treats all operators in a non discriminatory way. One way to do this is to make sure that the centralised database is run by a third party, independent from any of the operators
- rule that, if a centralised database solution is more expensive or there is only limited interest in cooperation, then the current decentralised arrangements will continue for FNP and MNP.

Implementation of such recommendations would lead to productive efficiency gains if the centralised database solution is cheaper and cooperation is possible. If not then the default solution should still lead to productive efficiency gains through more efficient routing of mobile to fixed calls.

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<sup>88</sup> Where N is the current number of ADs

## 8.7 FMNP AND THE HONG KONG NUMBERING PLAN

One of the six case study countries has introduced FMNP<sup>89</sup>. Should Hong Kong do the same? We believe the following considerations are important in answering this question.

- a there appears to be limited value in Hong Kong maintaining fixed and mobile numbers in separate ranges once FMIC arrangements are moved to BAK. In many countries the dialled number gives callers valuable information on the location of the called (fixed) subscriber and on the price of calls. This does not apply in Hong Kong.
- b the move to BAK could lead some operators to replace flat rate tariffs with two part tariffs. We think this is unlikely because of the transaction costs involved. But it is possible. And such moves might then alter the analysis in (a).
- c some stakeholders have argued that:
  - FMNP would accelerate fixed mobile substitution in terms of access, rather than just calls, and
  - lack of FMNP is a major barrier to subscribers abandoning the fixed line.

Others argued that:

- fixed and mobile services fulfilled different purposes
- fixed numbers are increasingly associated with broadband connections<sup>90</sup> and
- FMNP would do little to change the rate of fixed mobile substitution.

We believe that it is important to carry out market research here to illuminate this issue further.

- d Hong Kong subscribers may value the segregation of fixed and mobile numbers for other reasons. For example they may value the knowledge that they are calling a mobile terminal where the called party is not necessarily in a position to talk immediately. Again market research would be useful here.
- e allowing FMNP is an irreversible decision. Once numbers from the two ranges are mixed it is, for all practical purposes, impossible to separate them again. This suggests that OFTA should err on the side of caution in taking its decision on the introduction of FMNP.
- f we are not aware of any evidence which suggests that lack of FMNP is a significant barrier to development of FMC
- g once all operators have the opportunity to run their own FNP and MNP services the cost of implementing FMNP should be minor. The current systems used to provide FNP and MNP could be used to provide FMNP or a centralised database could provide

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<sup>89</sup> USA

<sup>90</sup> As subscribers move to use of voice over broadband

a cost effective alternative. Some new procedures would be required for fixed to mobile and mobile to fixed porting. But, based on discussions with stakeholders, we understand that these changes should require only a handful of person years to implement.

- h the case study country which has introduced FMNP has done so primarily to deal with the problem of number exhaustion rather than to enable fixed mobile substitution.
- i We are told that there is a possibility that the current 8-digit Hong Kong numbering plan will reach exhaustion within the next ten years. There is considerable capacity in the current plan for further growth in the number of both fixed and mobile numbers in use<sup>91</sup>. At the same time the number of fixed and mobile subscribers will probably not increase substantially over the next 10 years. But still there is a chance that the number of numbers required per subscriber will grow substantially and that this could lead to exhaustion problems, especially in the mobile and SBO ranges. In such circumstances it would almost certainly make economic sense to introduce FMNP. Postponing the need for a new number plan, even by as little as ten years, would avoid costs of change to users and operators which could run into billions of HK\$.

We can see that these factors pull in different directions. Some suggest immediate implementation of FMNP; but most suggest waiting for a few years before taking a decision. So we recommend that:

- OFTA postpones a decision on FMNP for two years before reviewing again. This should provide sufficient time for the industry group to consider the issue; for relevant market research to be conducted; and for other shorter term changes recommended in the report to be implemented so that they can be better factored into the review
- in the meantime OFTA carries out market research on factors (c) and (d)
- the industry working group which examines the case for a centralised NP administrative database takes account of the likely long term need for FMNP
- OFTA continues to monitor the utilisation of the numbering plan so as to identify any numbering exhaustion problems at an early date.

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<sup>91</sup> In the current numbering plan arrangement, prefixes '2' & '3' are reserved for **fixed numbers**, prefix '8' for fixed personal numbers, prefixes '6' & '9' for mobile numbers, prefix '7' for paging numbers, prefixes '57' and '58' for Class 2 service under the FTNS/FC or SBO (eg VoIP) and prefixes '0', '1', '4' for other special purposes. There are currently 2.5 million numbers (plus 1.6 million special numbers) in prefixes '6' & '9' available for the future growth of **mobile subscribers**. OFTA suggested in its consultation paper of May 2004 to deploy prefixes '5' and then '7' after exhaustion of current prefixes '6' and '9', before undertaking any migration to a 9 digit plan.

## 9 Synthesis of Costs, Benefits and Distributional Effects

### 9.1 THE OVERALL IMPACT OF OUR PROPOSALS

As described in Chapter 4 the current regulatory asymmetries in the treatment of fixed and mobile operators constitute a major barrier to FMC in Hong Kong. To deal with these asymmetries we propose, in Chapters 5 to 8, that OFTA should:

- move from the current interconnect arrangements to a BAK model for both fixed to mobile and fixed to fixed interconnect
- require each operator, whether fixed or mobile, to bear the costs of the interconnection link capacity it uses to deliver traffic to the terminating network
- abolish the asymmetric treatment of fixed and mobile operators in terms of the LAC
- clarify that it will consider the term 'telecommunications line' in Section 14(1) of the Ordinance to be technologically neutral, and permit requests for authorisation from both fixed and mobile operators, that involve provision of service primarily to tenants and inhabitants of buildings, to be considered
- remove licence and other conditions that restrict the ability of mobile operators from self-providing transmission services for their network operations and interconnection links
- develop licence structures that are symmetrical in their treatment of licensees whether they have fixed or mobile operations and establish licence conditions on a technologically neutral basis
- provide in future licences and the UCL a general authorisation for the licensee to build networks and offer services subject to some general constraints, with the same authorisation issued to all operators - fixed and mobile
- in the long term, requires all operators, fixed and mobile, to provide both FNP and MNP services and gives all operators the right to receive information on all ported numbers free of charge
- in the short term leaves operators free to devise their own market based solutions on NP
- commission market research before deciding whether to introduce FMNP and the related changes to the Numbering Plan
- commission an industry working group to consider a move to a centralised database for number portability services.

In all cases, the asymmetries and other issues that are being addressed are the result of regulatory intervention. In almost all cases, the proposals can be implemented by the withdrawal of regulation, together with guidelines or explanatory statements, rather than by the introduction of changed or fresh regulation. This is an important consideration. It means that the approach to implementation is simple, and the regulatory costs are kept low.

These proposals are all made to remove regulatory barriers to the development of FMC in Hong Kong. They are made based on the following considerations:

- The industry requires regulatory certainty to maximise the level of investment that it will make in next generation platforms in general and Stage 4 FMC in particular
- The development of FMC in Hong Kong and elsewhere is still at an early stage, and the development path is uncertain.
- Investment in Hong Kong is influenced by the low rate of return on current operations, relative to fixed and mobile operations in other countries.
- The quantum of economic welfare gains that might result from implementation of these proposals is not certain, both as a result of the factors already mentioned, and because the quantum depends on how the operators behave and negotiate in response to them.

Figure 9.1 summarises the benefits and costs that we have identified in examining each of the issues and assessing the proposals. We can see that:

- There are significant benefits which are specific to the individual measures as shown in Column 3 of Figure 9.1
- The costs of implementing our proposals are, with the exception of any decisions on FMNP, minimal. This reflects the fact that they involve withdrawal rather than imposition of regulation
- Ongoing regulatory costs are reduced as a result of our proposals, especially the proposal to move interconnect charging to BAK
- In combination the measures generate the two overall major benefits shown in the right hand column of Figure 9.1:
  - They improve FMC investment by removing regulatory uncertainty, reducing inefficient investment and removing potential distortions to industry restructuring which takes place over the next few years. More effective investment should, in turn, enable the potential dynamic and productive efficiency gains from FMC identified in Chapter 2 to be realised more quickly in Hong Kong. We estimate a possible NPV of such benefits of \$HK 4.5 billion
  - They strengthen OFTA's policy of infrastructure based competition by removing barriers to cross platform competition between fixed and mobile operators. This should enable Hong Kong to enjoy substantial dynamic efficiency gains as infrastructure based operators strive to compete more effectively through innovation

**Figure 9.1 - Summary of Costs and Benefits of Proposal**

| <b>Proposal</b>   | <b>Costs</b>   | <b>Proposal specific benefits</b>  | <b>Overall benefits</b>  |
|---|--|--|--|
| 1. BAK model for FMIC arrangements  | <p>Low regulatory costs associated with withdrawal of regulation</p> <p>Some, but limited, transition costs as operators negotiate new agreements - but in knowledge of default (BAK) outcome</p> <p>Very low ongoing transaction costs - absent billing, bill query, reconciliation, etc.</p> <p>Low ongoing regulatory costs - in the absence of arbitration and determination of cost based or other interconnect charges</p> | <p>Dynamic efficiencies from increased calling rates</p> <p>Productive efficiencies from reduced operating and transaction costs</p> | <p>Convergence-related economic efficiency gains are assessed at \$HK 3 billion per annum by 2011. The NPV if these benefits are delayed two years would be \$HK 4.5 billion.</p> <p>The combined effect of these measures is to minimise the risk of this delay.</p> <p>Removing regulatory asymmetries between fixed and mobile operators also removes barriers to infrastructure based cross platform competition</p> |
| 2. Operators to bear cost of interconnection links to terminating network | Renegotiating agreements - limited transition costs  | Potential productive efficiencies for mobile operators - within the estimated \$HK 41million paid by mobile operators each year      |  |
| 3. Symmetrical LAC  | Effectively no costs.  |  |  |
| 4. Access and licensing issues  | Effectively no costs   |  |  |
| 5. Remove NP asymmetries  | Minimal  | More efficient routing leading to productive efficiency gains of up to \$HK36m   |  |
| 6. Permit mobile operators to self-provision transmission facilities      | Effectively no costs   | Potential productive efficiencies for mobile operators - up to around \$HK 67 million each year                                      |  |
| 7. FMNP   | Costs of implementation could be substantial and the process of FMNP would be irreversible - hence the need to undertake further industry and market research.   | Improved cross-platform competition and facilitation of convergence.   |  |

The proposed changes are substantial. So, while we are confident that they benefit Hong Kong overall, we need to examine the impact on individual stakeholders to see if they produce consequences which are unacceptable.

## 9.2 INDUSTRY IMPACTS

In the *short term* we expect our proposals will lead:

- Loss of revenue currently received by fixed operators
- Saving of payment by mobile operators because of removal of the regulatory asymmetries between fixed and mobile operators

We have evaluated these effects in Chapters 5 and 6.

In the *longer term* we expect, partly as a result of our proposals and partly as a result of FMC developments, to see:

- an acceleration in fixed mobile substitution of calls, with the proportion of voice calls originating on the mobile network continuing to grow
- some fixed mobile substitution of access lines. Some subscribers will discontinue their fixed line service and rely entirely on mobile services for access to telecommunications. But we expect this effect to be limited. Most consumers and virtually all business will continue to use fixed line services for broadband access
- pure fixed operators concentrating their marketing effort and investment on the provision of broadband based fixed services e.g. the triple play offering of TV, voice telephony and Internet access for the consumer segment
- integrated operators, with both fixed and mobile networks, to roll out next generation networks which offer FMC services.

These are substantial changes that may well act as a catalyst for a general restructuring and consolidation of the industry in Hong Kong. The telecommunications' industry in Hong Kong is clearly not in a state of equilibrium. As Figure 2.7 shows, the EBITDA margins for some operators in Hong Kong are lower than those for other developed countries. For the time being investment continues<sup>92</sup>. But incentives for future investment in FMC, or other investment in major infrastructure projects, are relatively weak. In these circumstances we might expect the industry to restructure itself, with operators combining to improve economies of scale and rate of returns. We now see some signs of this happening with CSL's purchase of New World Mobility.

It is impossible to predict with any certainty what will happen in these circumstances. But, given the competitive advantage conferred on integrated fixed and mobile networks<sup>93</sup>, we might reasonably expect to see mergers between fixed and mobile operators rather than

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<sup>92</sup> With the fixed and mobile industry each investing 17% of revenues in 2004

<sup>93</sup> In terms of lower unit costs, lower churn and higher functionality services

between operators of the same type<sup>94</sup>. Already PCCW and Sunday are in common ownership and Hutchison operates both a fixed and mobile network. We might expect consolidation to create one or two more integrated operators to compete with them and to improve returns to the industry.

### 9.3 THE IMPACT OF OUR PROPOSALS ON END-USERS

Overall our proposals should make the average citizens of Hong Kong better off.

Given the high penetration of both mobile and fixed services in Hong Kong, there is general agreement that virtually all adults in the population use both fixed and mobile services. So any price changes generated by our proposals should mean that the overall telecommunications bill of the average resident or business will remain unchanged in the short term. But in the long term our proposals should enable the telecommunications industry to complete more effectively and should create more appropriate incentives for investment in new technologies by both the fixed and mobile operators as discussed in Chapter 4. Provided a competitive telecommunications industry is maintained in Hong Kong, these changes should lead to the average citizen enjoying a wider range of better functionality services at lower prices<sup>95</sup>.

### 9.4 CONCLUSIONS

Our proposals will:

- remove significant distortions to investment and infrastructure based competition in Hong Kong and so generate substantial dynamic and productive efficiency gains by the industry
- generate substantial economic gains for end users overall. In a competitive market like Hong Kong it is inevitable that end users rather than operators will enjoy the bulk of the benefits generated by our proposals
- lead to few, if any, segments of the end user population suffering economic loss<sup>96</sup>

In anticipation of these changes we suggest that OFTA should implement our proposals in the manner and timetable suggested in the roadmap at Chapter 10.

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<sup>94</sup> For example, between CSL and New World Mobility, and between Peoples and China Mobile

<sup>95</sup> For example quadruple play packages which provide subscribers with “best connected” service in terms of bandwidth, price, and quality wherever they are in Hong Kong

<sup>96</sup> Businesses which make heavy use of fixed lines and modest use of mobile services might face higher bills. But they would still pay telecommunications charges which are amongst the lowest in the world

## 10 Principles, Proposals and Roadmap

### 10.1 PRINCIPLES FOR FUTURE REGULATION

The issues that we have dealt with in this report suggest a number of key regulatory principles that should drive regulation in Hong Kong so as to ensure that it is compatible with the optimal development of FMC. As our report makes clear, the advantages for Hong Kong, and indeed for any country, lie not in FMC alone, but in the implementation of next generation networks that will enable the benefits of convergence to be achieved quickly. FMC is only a part of this larger picture. But it is a substantial part that may provide commercial justification for the large investments involved.

We believe that any regulatory principles that we propose for FMC must also apply to telecommunications across the board. The regulatory principles cannot apply to FMC alone.

On this basis we propose five principles covering:

- Regulatory forbearance, intervention and proportionality
- Separation of social and economic regulation
- Maximising use of competition law
- Technology neutrality
- Forward looking regulation

#### **Principle 1: Regulatory forbearance and intervention with proportionality**

*OFTA should intervene when markets fail or the prospect of market failure without prior regulation is substantial, and, when it intervenes, it should use the minimum regulation that is required to deal with the problem*

This principle is based on the fact that regulatory intervention can do harm and often has unintended consequences. It has several facets:

- the scale of regulatory intervention should be proportionate to the gravity of the market failure and the intervention should be the minimum required to deal with the problem. In the EU this is known as the principle of proportionality
- regulators should consider regulatory forbearance. This usually refers to the desirability of a regulator taking no action at all if there is a chance of an acceptable market outcome. Forbearance operates at all levels, and includes the notion of minimal regulation as well as none
- OFTA should intervene as little as possible. It should justify intervention on grounds of public interest. We can divide these into:
  - Grounds of consumer protection and empowerment
  - Grounds of economic efficiency

OFTA should only intervene on grounds of economic efficiency only when markets fail or the prospects for market failure are substantial.

## **Principle 2: Separation of economic and social regulation<sup>97</sup>**

*Regulators should maximise economic welfare subject to generally agreed social constraints*

It is important for regulators:

- to establish an overall goal so as to provide regulatory certainty
- to maintain a clear distinction between economic regulation (with one objective) and social regulation (with another set of objectives) and
- to find a systematic way to combine these sometimes conflicting objectives.

The principle set out above provides one way to do this. Under this principle regulators and governments would make a clear and explicit trade off between economic welfare and social objectives when introducing social measures. Regulators would attempt to maximise economic welfare when they regulate. In parallel they and their governments would:

- identify desirable social objectives
- assess the economic cost of implementing these objectives by imposing obligations on the industry
- impose them on the industry in an efficient and appropriate way so that the social benefits are maximised at minimum economic cost.

Such a process should lead to more rational analysis of options and better regulatory decision making.

## **Principle 3: Maximising use of competition law**

*OFTA should maximise use of competition law to regulate markets. It should use ex ante regulation, which tends to crowd out competition law, only where there is substantial evidence that forbearance would lead to market outcomes which are clearly not in the public interest.*

The disciplines of the market place need to be given full sway, thereby enabling operators to deal with each other and with their customers commercially as far as possible. This approach is encapsulated in Principle (1) above. It is part of this approach that commercial arrangements should be guided by and compliant with the requirements of the general competition law. The general competition law has sanctions for the exercise of market power under certain circumstances, and, typically where there has been a market failure.

The opportunity to deploy general competition law effectively is reduced to the extent that ex ante regulation is operating. Ex ante regulation makes it difficult to attribute outcomes

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<sup>97</sup> Economic regulation and social regulation are not mutually exclusive - they need to be aligned in their impacts. However, they do involve the application of different analytical processes and different objectives, and as a result ought to be undertaken separately to the greatest extent.

between market circumstances and regulatory requirements. It also makes it difficult to argue whether or not market failure may have occurred.

There will often be a choice between relying on ex ante regulation or on compliance with the general competition law so as to produce suitable outcomes that might not otherwise be achieved through competition. In these circumstances we believe that Hong Kong should, wherever possible, prefer to rely on competition law, and should leave its full scope to be deployed by private parties who claim cause, or by public officials charged with its administration. This approach aligns well with the approach in Principle (1) above.

In general we would expect the use of ex ante regulation to be restricted to cases where there is substantial evidence that forbearance would lead to market outcomes which are clearly not in the public interest.

#### **Principle 4: Technology neutral regulation**

*When regulation is required to enable markets to function properly it should be applied without regard for the technology used to deliver the services into the market.*

This principle applies more broadly than to the regulation of fixed and mobile services. It applies across the board and, in its absence, many other convergence developments may be compromised or prevented.

The main application of the technology neutrality principle for FMC is to remove the asymmetries that are a feature of current fixed and mobile regulation in Hong Kong, and which operate as barriers to both FMC and cross platform competition.

#### **Principle 5: Forward looking regulation**

*Regulation needs to anticipate to the extent reasonably possible the circumstances in which markets might operate in future.*

In applying regulation in a forward looking way authorities need to consider that

- regulation is often more effective when applied on an ex post rather than ex ante basis. Regulation needs to allow market forces to have full effect. It should not seek to pre-empt the market and how commercial arrangements might emerge. Pre-emption is a different matter to reasonable anticipation of the consequences that must be taken into account when regulatory intervention is being considered.
- Market developments are uncertain. Indeed, consideration of longer term consequences and future uncertainties may well be a reason to limit the extent and scope of current regulatory intervention.
- Regulatory certainty is important if the telecommunications industry is to maximise investment in the latest technologies.

Forward looking regulation also includes the recognition that telecommunications is an industry subject to high rates of technology change that impact the cost structures and cost relativities.

## 10.2 IMPACT OF THESE PRINCIPLES ON OUR PROPOSALS

We have applied the principles set out above in the way we have formulated our proposals arising from this study, especially in relation to the choice of means that OFTA should adopt in removing regulatory barriers to FMC.

In particular:

- A key set of proposals are aimed at removing asymmetries in the regulatory treatment of fixed and mobile operators and services;
- Where OFTA's aims can be achieved as well by withdrawing regulation rather than imposing fresh regulation, as in the approach to FMIC, we propose the former approach;
- It is proper and appropriate for OFTA to have regard to the likely development patterns of FMC both overseas and in Hong Kong, and to seek outcomes that are consistent with achieving the economic benefits of FMC (particularly Stage 4 FMC) at an early stage;
- We have focussed on the economic welfare issues associated with FMC in this study, leaving social issues as matters for separate consideration; and
- The approach to regulatory withdrawal takes account of the need not to permit residual regulation to be expressed as *ex ante* rules that prevent appropriate OFTA *ex post* intervention or deployment of the sanctions of the general competition.

## 10.3 IMPLEMENTING OUR PROPOSALS

In order to remove regulatory barriers to FMC development, and achieve the economic benefits outlined earlier in this report, we make the following proposals. These proposals constitute the substance of what needs to be done. The roadmap, which follows each proposal, adds detail on how and when we suggest that each proposal should be implemented.

### 10.3.1 Bill and Keep (BAK)

In Chapter 5 we recommend that OFTA should revise its guidelines on fixed mobile interconnect (FMIC) and fixed to fixed interconnection charging (FFIC) so as to change from current arrangements to BAK. FMIC is our prime concern because of its direct consequences for the FMC development. However the same arguments support the current arrangements for FFIC being changed to BAK. These proposals relate only to interconnection for the conveyance of local traffic within Hong Kong and between infrastructure based operators.

#### Roadmap - How?

There are two ways potentially available to OFTA to implement this recommendation:

- amendment of existing regulation to specifically substitute a BAK regime for the present arrangements in TA statement No. 7, or
- withdrawing TA Statement No. 7 and leaving negotiations on interconnection and interconnection charging to commercial negotiation, with some guidance on the approach that OFTA will take if required to arbitrate in the absence of commercial agreement.

A further choice arises about the way in which the any to any connectivity principle is to be rendered in future. We consider that any to any connectivity is a fundamental principle of interconnection that provides a high level of certainty for both operators and users. For users it ensures that they have and will continue to have the benefit of the network externalities that interconnection provides. For operators it acts to prevent re-monopolisation of markets. It also provides a major source of certainty on regulatory matters, at a time when new investment requiring such certainty is important. Although we have recommended that regulation should be minimised and withdrawn where possible, this does not extend, for the foreseeable future, to the any to any connectivity rule.

Our understanding is that it is a condition of all licences that operators will interconnect their networks, failing which a direction may be issued by OFTA under Section 36B to require interconnection. The requirement to interconnect is therefore effectively established in current licence conditions and the charging arrangements that OFTA requires are set out as guidelines in the form of TA Statement No. 7. Therefore, TA Statement No. 7 may be withdrawn or amended without affecting the arrangements for the any to any connectivity rule.

We recommend the withdrawal of TA Statement No. 7 and its replacement by a new guideline statement of the way in which OFTA would approach the failure of operators to agree on interconnection terms. The new statement should contain the following or substantially equivalent guidance:

*The operators that are potential parties should negotiate a Type I interconnection agreement in good faith when agreements have expired or are otherwise required to be put in place.*

*There is no regulatory obligation on operators to pay interconnect charges to each other after an interconnection agreement has expired.*

*OFTA will make determinations on interconnection matters only if it is established that interconnection on the offered terms represents a failure of the market to achieve the public interest within the meaning of Section 36A(10) of the Ordinance.*

*OFTA will determine interconnection issues based on the merits and will have regard to the following three rules:*

*(1) That neither network operator shall charge the other network operator for call origination or for call termination (a rule sometimes known as BAK)*

*(2) That the originating network operator shall bear the costs of transmission of calls to the agreed POI with the terminating operator's network*

*(3) That the terminating network operator shall bear the costs of transmission of calls from the agreed POI to the network termination point.*

This approach maximises the extent to which the operators may develop commercial agreements that best suit their circumstances. They also have some guidance on what will likely result from determination, subject to the merits of the case, and therefore a degree of certainty that BAK will be the likely default outcome.

**Roadmap - When?**

This recommendation should be implemented by OFTA as soon as possible, subject to process requirements, in order to enable a symmetrical charging environment for the future.

By implementation in this context we refer to a clear guiding statement by OFTA. The actual process of implementation for operators will extend over a much longer period as current interconnection agreements expire. This could take a number of years.

We have considered the possibility of standardising new practices from a certain date (in the future) forward. There is a real possibility that such a date will be deferred until all or most of the existing interconnection agreements have expired. In the absence of a clear and early statement from OFTA, deferral of implementation until a distant date has the following disadvantages:

- It leaves the market with an avoidable degree of uncertainty in the meantime, with potential adverse impacts on investment
- Parties to interconnection agreements expiring at an early date would be obliged to establish arrangements for the interim (until the future date) and these would almost certainly continue current practice
- The benefits of BAK for FMC and the efficiencies involved would be delayed

An early guiding statement and withdrawal of relevant regulation therefore recommends itself as the best implementation timing option.

**10.3.2 Interconnection links**

We recommend that OFTA should require each originating network to pay for the link capacity required for the delivery of traffic to the terminating network.

**Roadmap - How?**

We recommend that the same means be adopted for the implementation of this recommendation as for the introduction of BAK. Therefore we have already incorporated this requirement into the suggested replacement statement for TA Statement No. 7, in Section 10.3.1 above.

By implementing in this way as part of the proposed statement, primacy will be given to the parties reaching their own commercial agreements on related matters. The parties might agree on bi-directional links with 50:50 payment. If the parties do not agree, the proposed solution becomes the default. It becomes a very effective default when taken in conjunction with the principles of technology neutrality and self-provisioning.

**Roadmap - When?**

This proposal should be implemented within the same timeframe as the BAK proposal:

- in order to enable a symmetrical charging environment arrangement for the future
- because the recommended means of implementation is to use the same vehicle as for the BAK

### 10.3.3 Symmetrical entitlement to charge for inbound international calls

We recommend the introduction of symmetrical treatment of fixed and mobile operators in terms of their entitlement to charge for inbound international calls.<sup>98</sup>

#### Roadmap - How?

This proposal is one aspect of the general requirement to remove asymmetrical regulatory treatment of fixed and mobile operators. If the LAC policy is changed, the changes should apply equally to all operators. However, this proposal is not about the LAC policy as such. It is about the symmetrical treatment of all infrastructure based operators.

The preferred approach to implementing the proposal is to incorporate appropriate provisions in the replacement guideline for TA Statement No. 7. It is preferable that the Statement only deal with carrier-to-carrier interconnection, and that the TA Statements issued in 1998 should be amended to deal with LAC for both fixed and mobile carriers.

#### Roadmap - When?

This recommendation should be implemented by OFTA as soon as possible, subject to process requirements, in order to enable an a symmetrical charging environment for the future.

### 10.3.4 Number Portability

We note that:

- there is a lack of symmetry in relation to the obligations that apply to mobile operators and fixed operators to support fixed number portability (FNP).<sup>99</sup>
- there is a legacy situation in that the original four fixed network operators are compensated for supporting MNP and more recently licensed fixed network operators are not.

We recommend that, in the long term, OFTA:

- requires all operators, fixed and mobile, to provide both FNP and MNP services and
- gives all operators the rights to receive information on ported numbers free of charge.

We recommend that in the short term OFTA leave operators to devise their own market based solutions to deal with current difficulties.

In relation to the possibility of a centralised AD (Administrative Database) for NP, we recommend that OFTA should:

- make clear to operators that all will have full NP obligations in future so as to enable efficient routing, and that FMNP might be introduced at some point

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<sup>98</sup> This charge is called the local access charge when applied by PCCW

<sup>99</sup> Also known as ONP in Hong Kong

- convene an industry working group to see whether a centralised solution is cheaper and whether there is willingness to cooperate on developing and operating such a solution
- determine that, if a centralised database solution is more expensive or there is only limited interest in cooperation, then the current decentralised arrangements will become the default options.

#### **Roadmap - How?**

The immediate task is to make clear that in future licences will contain symmetrical conditions involving full support for all forms of number portability. This might be included in a TA guideline in the short term, but will eventually need to be included in a determination and be subject to the procedure associated with such determinations.

Actions associated with convening an industry working group on centralised Administrative Database and management should be undertaken as administrative actions.

#### **Roadmap - When?**

Making a clarification statement in a guideline in relation to the symmetrical conditions that will apply to full support obligations for number portability should be undertaken as soon as possible.

The processes associated with incorporating this change into licence conditions should commence as soon as possible, so that the changed condition will be applied to new licences as they are issued. The implementation will be progressive. The introduction of the Unified Carrier Licence and the expiry of existing licences are the longer term events referred to in the proposal.

OFTA should convene an industry working group on the matter of a centralised solution to the Administrative Database as soon as possible. This is necessary to ensure that industry views have been fully tested to guide mid-term considerations about the approach to FMNP.

### **10.3.5 FMNP**

We note that there are many factors that will influence the outcome of FMNP in Hong Kong. This includes:

- a current lack of research on consumer preferences
- the fact that the process is effectively irreversible.

We recommend that OFTA carries out market research on issues associated with FMNP including whether:

- fixed and mobile services fulfil different purposes as far as users are concerned
- fixed numbers are increasingly associated with broadband connections
- Hong Kong subscribers value the segregation of fixed and mobile numbers and, if so, for what reasons.

The timing of the market research is a matter for judgement. One approach would be to defer the research to allow potential respondents to gain a better understanding of the FMC as it emerges in Hong Kong over the next few years. Another approach, would be to undertake longitudinal research at regular intervals, starting soon, to capture any changes in consumer sentiment and preference. We prefer the second approach, but we recognise that this needs to be considered in the light of available budgetary resources.

We further recommend that:

- the industry group which examines the case for a centralised NP administrative database takes account of the likely long term need for FMNP
- OFTA continues to monitor the utilisation of the numbering plan so as to identify any numbering exhaustion problems at an early date

#### **Roadmap - How?**

The immediate task is to obtain information that OFTA requires to determine how best to proceed on FMNP through:

- Market research
- Industry working group activity
- Monitoring of utilisation of numbers in the numbering plan

#### **Roadmap - When?**

The tasks referred to above should be put in train as soon as possible so that the situation can be further reviewed, with the benefit of better information, in two years time.

We further recommend that the Numbering Plan be amended consequent upon the arrangements determined for FMNP.

### **10.3.6 Section 14(1) and technology neutrality**

We recommend that, for the avoidance of doubt, OFTA makes clear, to the extent that it is able, absent legislative amendment, that it will:

- consider the term "telecommunications line" in Section 14(1) of the Ordinance to be technologically neutral, and
- permit requests for authorisation from both mobile and fixed operators that involve the provision of service to tenants and inhabitants of buildings to be considered under Section 14(1) of the Ordinance when the purpose of the installation is to serve the tenants.

#### **Roadmap - How?**

Our discussions with OFTA and with stakeholders in relation to the operation of Section 14(1) suggest that there may be a need for OFTA to issue a clarification in the form of a suitable guideline statement.

**Roadmap - When?**

The clarification should be made as soon as possible to establish early certainty on the matter.

**10.3.7 Self-provisioning for mobile operators**

We recommend the removal of constraints on mobile operators that prevent them from self-provisioning transmission links - specifically interconnection links connecting their networks to those of other operators, and transmission links connecting elements within their networks (such as between base stations and base station controllers).

**Roadmap - How?**

These constraints are contained in licences and their removal would need to be achieved through:

- Modification of the special licence conditions and/or schedules of each mobile operator's licence on an individual basis with the agreement of the operator concerned (which agreement might reasonably be anticipated since it would be in their interest)
- Modification of the General Licence Conditions
- Incorporation of the self-provisioning principle, if necessary, in the UCL when it is issued

We favour the first approach in the short term and the third approach for the long term. In both cases our preference is on the balance of convenience. Special conditions and schedules to licences may be modified by OFTA, but General Conditions require action by the Secretary. A licence by licence approach in the short term would have the advantage of self-selection amongst mobile operators. Those that have any interest in self-provision will take the initiative to request a suitable licence modification.

**Roadmap - When?**

This proposal should be implemented as soon as reasonably possible, subject to appropriate consultation and other processes. There is no benefit in delaying the matter.

**10.3.8 Licensing constraints and permissions**

We recommend that, in the interests of FMC and other convergence developments, future licences should take the form of general permissions to provide services of any kind, subject to specific constraints that are required for specific policy purposes. This may be contrasted to a licence that requires further permissions for each additional service type or category being contemplated by the licensee.

**Roadmap - How?**

This is a matter relating to general licensing formats for the future. There are two possible ways of introducing it:

- As a modification of existing licences at an early stage
- As a uniform change in the course of introducing the new UCL arrangements

We strongly prefer the latter approach because:

- this would avoid the replacement of licence conditions on an interim basis (that is, two major changes rather than one)
- the new approach proposed would be of benefit to all operators and increase their flexibility in deploying services in an FMC and generally convergent environment. Consequently the inclusion of the arrangements in the UCL would encourage operators to transfer to the UCL arrangements at an earlier stage than otherwise.

#### **Roadmap - When?**

OFTA should include this approach to licence conditions in the UCL and the timing for implementation would be the timing that applies to UCL.

### **10.3.9 Carriage and spectrum elements in licensing**

We recommend that carriage and spectrum elements be separated in licence conditions and in the development of licence fee structures.

#### **Roadmap - How?**

This proposal relates to all aspects of licensing, including licensee obligations, licensee entitlements and charges.

We believe that the opportunities to address the proposal and commence implementation will occur:

- in the course of OFTA's Spectrum Policy Review, now underway
- in the course of establishing and articulating the conditions for the UCL

#### **Roadmap - When?**

We see a progressive implementation of the concept behind this proposal as the opportunities arise. The opportunities above will occur this year and with the introduction of the UCL, respectively.

## **10.4 OVERALL ROADMAP**

With the exception of the recommendations relating Number Portability and changes to the Numbering Plan consequent on a decision to introduce FMNP, we recommend that all of the recommendations in this study be implemented at the earliest possible time, having regard to a range of factors:

- the desirability of removing regulatory uncertainty and barriers to increased cross platform competition at the earliest time, so that investment plans might be made with greater certainty and the benefits identified in this study can start to flow as soon as possible
- the need to undertake proper consultative and other processes associated with decisions of the sort now being recommended
- the desirability of permitting a reasonable transitional period for the industry. This would enable operators to make plans which take account of the changed cash flow and other

industry settings that will result from implementation of the proposals. A transition period between announcement and implementation will also allow operators to consider their commercial responses to these changes carefully and make plans that are less likely to be disruptive of their operations and be more acceptable to end users.

We have not recommended a specific transition period. That is a matter that OFTA will be better placed to determine once it has the benefit of industry comment in response to the study.

## Annex 1 - Study Terms of Reference

According to the Agreement, the Consultant has to complete 3 major tasks as follows:

- Task 1: The Consultant shall conduct an overview of the overseas economies the regulatory frameworks of which have been revised, or in process of being reviewed, in relation to FMC.
- Task 2: The Consultant shall assess the market situations and phenomena in Hong Kong's telecommunications industry, and conduct a detailed economic analysis if the existing regulatory framework in Hong Kong is to be changed to a converged framework for the following regulatory aspects:
- (i) Possible change from the existing asymmetrical to symmetrical interconnection charging arrangement between fixed and mobile networks;
  - (ii) Possible expansion of the existing fixed (operator) number portability and mobile number portability to intermodal number portability; and
  - (iii) Other aspects of the regulatory frameworks considered to be relevant, including but not limited to the numbering plan and the local access charge arrangement.
- Task 3: The Consultant shall make recommendations with detailed reasoning and explanation, on the areas, if any, of Hong Kong's existing regulatory framework that should be revised in relation to FMC. The recommendations shall also include the approach of conducting the revisions identified and a roadmap covering the transitional arrangements for implementing such revisions.

## Annex 2: Case Study - Australia

### 1. CURRENT INDUSTRY STRUCTURE

#### 1.1 Fixed operators

As at June 2005 there were 38 carrier networks in Australia. Of these, 19 carriers (including Telstra) offer, or propose to offer services to regional Australia. The majority of carriers serving regional areas are small and operate within a specifically defined regional location. The incumbent, Telstra, has national coverage and is the major regional provider.

#### 1.2 Mobile Operators

There are four main mobile operators using seven networks to provide services to residential and business customers: Telstra, Optus, Vodafone and Hutchison (incorporating Orange and 3 Australia). Telstra and Hutchison share a WCDMA network, as do Vodafone and Optus. Figure 1.2 shows market coverage by operator. Hutchison has concentrated on the metropolitan centres for its coverage.

**Figure 1.2 - Market coverage by operator (June 2005)**

|           | Network       | Coverage of the population (%) |
|-----------|---------------|--------------------------------|
| Telstra   | GSM           | 96%                            |
|           | CDMA          | 98%                            |
| Optus     | GSM           | 96%                            |
| Vodafone  | GSM           | 95%                            |
| Hutchison | CDMA (Orange) | 54%                            |
|           | WCDMA ('3')   | 44%                            |

Source: ACMA (Note: Vodafone/Optus 3G network was only available in Canberra at June 2005)

In addition to the four mobile service providers operating on their own network, there are almost 90 resellers in the Australian market, including the fixed operator Primus. There are also two MVNOs: Virgin, and AAPT, utilising the Optus and Vodafone networks respectively.

#### 1.3 Levels of integration

Only two operators in Australia own and operate fixed and mobile networks: Telstra and Optus. Both operators have nationwide coverage for their fixed and mobile networks. However there are many operators that sell both fixed and mobile services. For example AAPT has a limited fixed network, wholesales fixed services from Telstra, and wholesales mobile services from Vodafone. Primus wholesales fixed and mobile services from Telstra and Optus.

Telstra integrates its fixed and mobile divisions, differentiating instead along customer lines with separate departments for business and residential customers. Optus has a separate

mobile division. The fixed division is split between the Consumer and Multimedia and Business and Wholesale divisions in Optus.

## 1.4 Market shares

### Fixed

Telstra dominates the fixed market in Australia with an 82% share of the basic access lines. Optus holds 11% of the basic access market share. There is more competition in the IDD sector with Telstra's market share now at around 60%.

### Mobile

The Australian mobile market is more competitive than the fixed market as shown in Figure 1.3. Telstra has the largest market share.

**Figure 1.3 Mobile market share**

| Operator         | Network | Sep-04             |              | Sep-05             |              |
|------------------|---------|--------------------|--------------|--------------------|--------------|
|                  |         | Subscribers (000s) | Market share | Subscribers (000s) | Market share |
| Telstra          | GSM     | 6,747              | 40.4%        | 6,954              | 37.6%        |
| Telstra          | CDMA    | 1,048              | 6.1%         | 1,387              | 7.6%         |
| Telstra*         | WCDMA   | 0                  | 0.0%         | 13                 |              |
| Optus            | GSM     | 5,919              | 34.5%        | 6,085              | 32.5%        |
| Vodafone         | GSM     | 2,649              | 15.2%        | 3,010              | 17.2%        |
| Vodafone**       | WCDMA   | 0                  | 0.0%         | 6                  |              |
| Hutchison Orange | CDMA    | 436                | 2.3%         | 457                | 2.3%         |
| Hutchison 3      | WCDMA   | 326                | 1.4%         | 526                | 2.9%         |
| <b>Total</b>     |         | <b>17,125</b>      | <b>100%</b>  | <b>18,438</b>      | <b>100%</b>  |

\*WCDMA network shared with Hutchison

\*\*WCDMA network shared with Optus. Optus 3G had not launched at September 2005.

Source: *Wireless Intelligence*

### Retail and wholesale

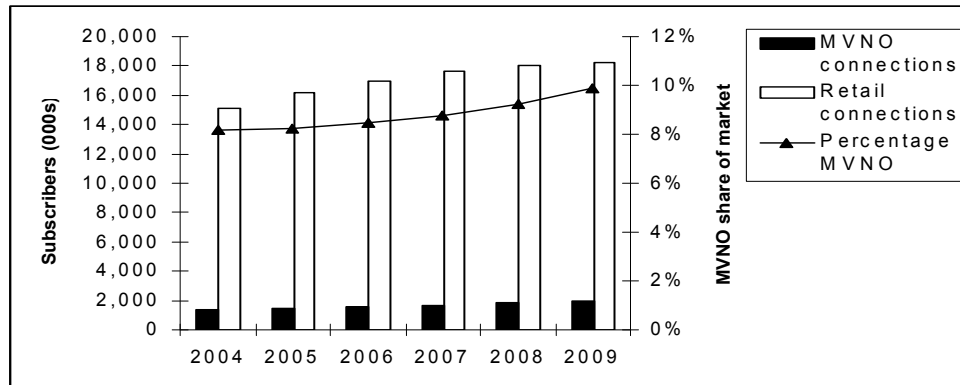
The share of wholesale fixed lines in the overall fixed line market has increased over the past year as shown in Figure 1.4.

**Figure 1.4 Retail and wholesale fixed lines**

|                             | Jun-04             |             | Jun-05             |             |
|-----------------------------|--------------------|-------------|--------------------|-------------|
|                             | Fixed lines (000s) | % share     | Fixed lines (000s) | % share     |
| <b>Retail (own network)</b> | 9,820              | 84%         | 9,379              | 82%         |
| <b>Wholesale</b>            | 1,840              | 16%         | 2,081              | 18%         |
| <b>Total</b>                | <b>11,660</b>      | <b>100%</b> | <b>11,460</b>      | <b>100%</b> |

Source: ACMA

Exact figures are not available for the split between wholesales and retail mobile subscribers. However, Ovum estimates that MVNO subscribers made up 8% of total mobile subscribers at 2004. This is forecast to increase to 10% by 2009 as shown in Figure 1.5.

**Figure 1.5** *MVNO connections in Australia: 2004 – 2009*

Source: [Mobile@Ovum](#)

## 2. CURRENT REGULATORY FRAMEWORK

### 2.1 Regulator and policy maker

There are four organisations involved in the regulation of the Australian telecommunications market: the Australian Consumer and Competition Commission (ACCC), the Australian Communications and Media Authority (ACMA), the Australian Communications Industry Forum (ACIF) and the Department of Communications, Information Technology and the Arts (DCITA).

DCITA provides advice to the Minister for the purpose of making policy. Once set, the responsibility for the administration of policy rests with ACMA and the ACCC.

#### **Australian Consumer and Competition Commission (ACCC)**

The ACCC is responsible for prohibiting anti-competitive conduct across all sectors in Australia, including the telecommunications industry. It derives its authority from Part XIB (anti-competitive conduct) and Part XIC (access) of the Trade Practices Act. The ACCC's role includes determining which telecommunications services should be declared or brought within the regulatory framework and arbitrating access disputes if negotiations fail between parties.

#### **Australian Communication and Media Authority (ACMA)**

ACMA is the result of a merger between the Australian Broadcasting Authority and the Australian Communications Authority. It regulates telecommunications, radio communications as well as online content and broadcasting. Responsibilities for ACMA include promoting industry self-regulation, consumer protection and managing access to the radio frequency spectrum including the broadcasting service bands.

#### **Australian Communications Industry Forum (ACIF)**

ACIF is a member-funded organisation established in 1997 to facilitate communications self-regulation in the interests of both industry and consumers. Its membership comprises

carriers/carriage service providers, business and residential consumer groups, industry associations and individual companies.

### **Department of Communications, Information Technology and the Arts (DCITA)**

DCITA covers a broad range of areas including telecommunications. The Minister for Communications, Information Technology and the Arts, sets policy direction for the telecommunications industry.

## **2.2 Regulatory philosophy and powers**

ACMA, ACCC and DCITA are all able to take the initiative rather than respond to events. For example, the ACCC can declare an eligible service for mandated access, either in consultation with an appointed industry self-regulatory body made up of carriers and carriage service providers or via a public inquiry initiated on its own motion, rather than responding to failure of market competition. However, due to market factors and workload issues, the regulatory authorities tend to respond to events as they occur rather than use anticipatory (ex ante) regulation. In this respect, the philosophy differs from that in Europe.

## **2.3 Carrier licensing**

Carriers are individually licensed. It is an open regime. Carriage licenses cover mobile, fixed voice and Internet services. Licensed carriers determine the services that they will provide. Consequently there is no barrier for fixed-mobile services in the carrier licensing arrangements.

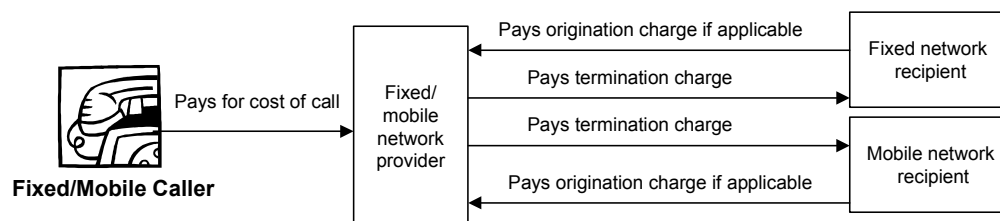
## **2.4 Interconnection**

Australia is a Calling Party's Network Pays (CPNP) market. Operators have an obligation to enter into interconnect arrangements with other operators who request access.

For both fixed and mobile interconnection, operators negotiate their own interconnect arrangements. ACCC arbitrates if the operators fail to negotiate terms.

The ACCC currently uses a bottom-up LRIC model to set the upper bounds of what it considers reasonable fixed interconnect charges. The ACCC has based its approach for setting reasonable mobile termination rates on a benchmark of LRIC cost models developed in other countries rather than a custom-produced model as was used for determining reasonable fixed termination rates.

Figure 2.1 shows the charge flow for Originating and Terminating calls. The process is effectively the same for both fixed and mobile calls.

**Figure 2.1** *Origination and Termination charge flow*

Source: Ovum

Note: Origination charges are only applicable where there is call selection and pre-selection and where the call is to a premium service number associated with a service directly connected to another network.

## 2.5 Number Plan

The numbering plan allocates premium rate numbers and local numbers, both of which are for businesses. There is also a provision for special service number ranges. The Minister for Communication, Information Technology and the Arts, recently announced that the government will support the development of a new number range to support the provision of VoIP services.

A follow-me range of numbers with the prefix 0500 was introduced many years ago. However pricing was very expensive. As the operator would not know if the caller was reaching the person's home phone or mobile, rates were charged at a premium rate in order to cover the risk. This was the main cause of poor consumer take-up, and the service is no longer available although the number range is still allocated in the numbering plan.

A year-long trial of Electronic Telephone Numbers Mapping (ENUM) call routing technology began in May 2005. ACMA is managing the trial. This service connects conventional phone numbers with Web pages, Internet fax services and other online resources. Subscribers register their other contact details, then set up rules that control how and when calls to their phone are routed. Incoming callers can use the number to access web sites, VoIP applications, faxes and other services. The participants in this trial have been given a new number with a 059 prefix. It has not been decided whether the trial will continue after the first year.

## 2.6 Number Portability

Geographic and National (fixed) number portability and mobile number portability operate in Australia. Inter-model number portability has not been introduced in Australia and has not been discussed formally by relevant regulatory bodies.

### Requirements

Operators are required to provide mobile number portability. While there is a requirement for operators to offer local number portability, there are geographical limits on the portability of local numbers. The difference in requirements may result in restrictions on the mobile number portability arrangements for FMC devices.

As a matter of practice, customers are not charged for either local or mobile number porting.

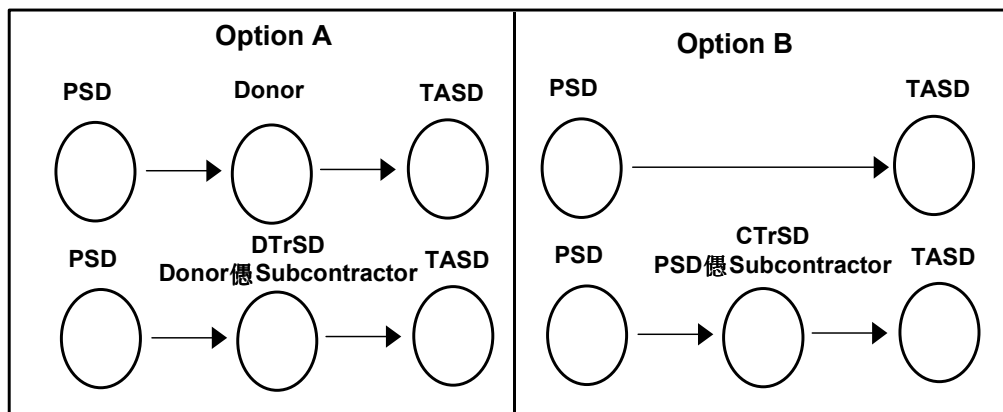
### Number portability models

Mobile number portability uses a hybrid model for call routing. Under this model, the Prime Service Deliverer (PSD or operator from whose network the call is made) can:

- A. Route the call to the donor or its subcontractor which will route the call to the correct Terminating Access Service Deliverer (TASD), or
- B. Route the call directly to the TASD or via the PSD's subcontractor (Contracted Transit Service Deliverer –CTrSD

Figure 2.3 shows options A and B.

**Figure 2.3 Hybrid model for call routing**



Source: Australian Communications Industry Forum, *Mobile Number Portability – Network Plan for Voice, Data and Fax Services*.

There is only one system for local number portability. Intelligent Network (IN) based routing is used so that calls are routed directly to the recipient. A look-up table is used by the originating operator to determine which fixed operator is holding the number and the call is routed accordingly. Each operator is required to keep a record of numbers allocated to them that have been ported and to make this information available to other carriage service providers and ACMA. The fact that two different systems used for local and mobile number portability presents a barrier for FMC.

### Responsibility for costs

ACMA has outlined the following approaches should it be called upon to arbitrate a dispute over the terms and conditions of the provision of number portability.

For local number portability, each carrier is responsible for its own costs relating to local number portability.

For mobile number portability, there is a division of cost responsibility:

- Each service provider is responsible for all system set-up and maintenance costs and all customer transfer costs, incurred on its own network.
- Prime Service Deliverers (PSDs) are responsible for the efficient call conveyance costs incurred that result from their choice of MNP solution.

This difference in cost responsibility will be a barrier for FMC because of confusion about which operator will be responsible for which costs for an integrated FMC offering.

## 2.7 Universal Service

The USO in Australia covers standard telephony services (STS), payphones, and prescribed carriage services (none have been prescribed to date).

The USO is the obligation to ensure that STS, payphones, and prescribed carriage services are reasonably accessible to all people in Australia on an equitable basis. Fixed line services come under the definition of standard telephony services. Operators are not obligated to provide a mobile service.

Mobile and fixed revenues are included in the eligible revenues that calculate the contribution for each operator to the Universal Subsidy Fund.

There has been no indication that other services or converged services will be included in the future.

## 2.8 Retail price controls -

Telstra is subject to price controls for the following services:

- Basket 1 – Local calls, trunk calls, and international calls
- Basket 2 – line rentals
- Basket 3 - connections

Additionally, Telstra can not charge more than 22 cents for an untimed local call or 40 cents for a call from a payphone. Other operators are not subject to price controls.

Calls made from and to mobiles are not subject to price controls.

## 2.9 Access to property

The *Telecommunications Act 1997* and the *Telecommunications (Low Impact Facilities) Determination 1997* sets out the rights and obligations for carriers seeking access to property to install or maintain telecommunications equipment.

Carriers have the right to install 'low-impact' facilities in land or buildings. The definition of low-impact facilities includes mobile and fixed equipment, for example: omnidirectional antenna, radiocommunications dish, in-building coverage installation and underground cable equipment.

Should an operator wish to install equipment that does not come under the definition, such as an overhead line, it can apply for a Facility Installation permit. These permits are usually

granted for networks that are of national significance, are, or have approval to be, significantly complete and fulfil other requirements.<sup>100</sup>

Under this legislation, carriers are allowed to access any land irrespective of its status or ownership to undertake authorised activities, which include inspecting and surveying land and installing and maintaining low impact facilities. Carriers are required to notify landowners and occupiers before installing a communications facility to give them the opportunity to object. If the objection is not resolved, it can be referred to the Telecommunications Industry Ombudsman which then has the power to give directions to the carrier about what the carrier should do before installing the low-impact facility.

As the access regulation covers both mobile and fixed equipment, this will not be an impediment to fixed-mobile convergence.

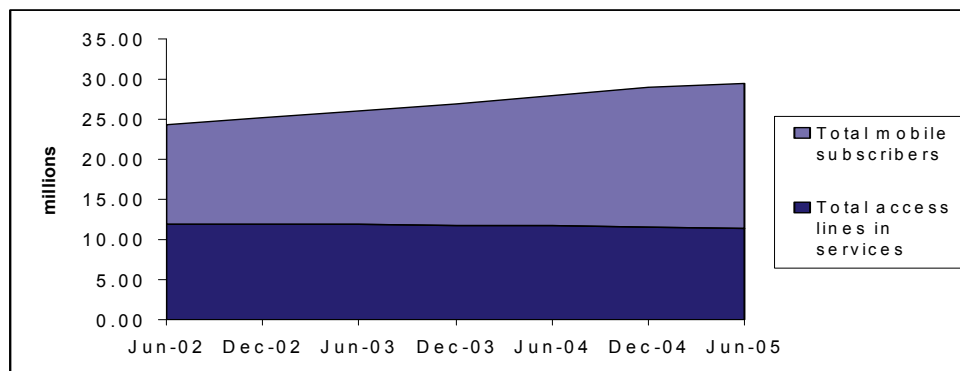
### 3. EXTENT OF CONVERGENCE

#### 3.1 Fixed Mobile Substitution

##### Service substitution

Service substitution is occurring in Australia, albeit at a fairly steady rate. Figure 3.1 shows the rate of fixed decline and growth in mobile.

**Figure 3.1** Fixed-mobile service substitution



Source: Telstra reports, ACCC, ACMA, Ovum estimates

Fixed lines have declined by 4.3% between June 2002 and June 2005. The percentage decrease per annum increased from 0.7% in June 2003 to 1.7% in June 2005.

The decline in fixed lines has been the result of two trends:

<sup>100</sup> Other requirements include: the carrier has attempted in good faith to come to a mutually beneficial agreement with the landowner, the facility is an important part of the network to which the facility relates, and the advantages to be obtained through the network outweigh any likely damages to the environment resulting from the installation of the facility.

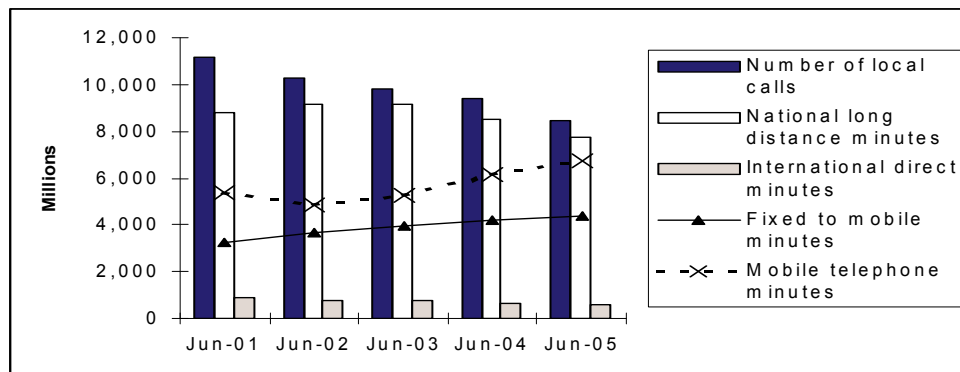
- Growth in broadband connections because households are cancelling their second lines.
- Higher volume dial-up customers being early movers to broadband. This means dial-up and fax traffic is now being superseded by broadband.

While the latest Telstra results suggest that line loss is accelerating, there are limits on the extent to which service fixed to mobile substitution will occur. Internet use is a key barrier to Fixed-Mobile Substitution, as a subscriber line is required in order to be able to connect to the Internet, regardless of whether the connection is dial-up or broadband via DSL. Alternative broadband access, in the form of wireless broadband, is starting to make an appearance. This may permit further fixed-mobile substitution.

The two major operators in the Australian telecommunications market, Telstra and Optus, bundle their fixed, mobile, Internet access, and Pay TV products. Optus now has 67% of its cable subscribers and 46% of its resale subscribers on a bundled package. This creates a high level of consumer inertia. Customers will be unwilling to give up their PSTN line totally if it means they miss out on other reward benefits, such as annual 'free' months of broadband access.

#### **Call substitution (elsewhere called 'call FMS')**

There is a definite trend of call substitution occurring in Australia - that is, mobile minutes of usage are increasing while fixed minutes of usage are decreasing. More and more people are using their mobiles to make calls rather than their home phone. The introduction by 3 Australia initially, to be followed by other mobile operators, greatly reduced the mobile premium in comparison to fixed calls. Ovum estimates that the mobile premium has reduced from a range of 8.5 - 11 times the price of fixed calls, to 1.9 - 2.5 times. While figures for the whole of Australia are not available, the incumbent Telstra's results strongly indicate a decline in fixed calls, with the exception of fixed-to-mobile calls and an increase in mobile minutes.

**Figure 3.2 Telstra's billable traffic**

Source: Telstra

### 3.2 Take-up of Personal Numbers

Personal numbers, with the prefix 0500, were introduced but only had minimal take-up due to the high cost of ringing these numbers. There are no plans to re-introduce personal numbers, although a government-sponsored trial of a similar service is currently underway as discussed in Section 2.5.

### 3.3 Barriers to convergence

Figure 3.3 outlines the regulatory environment and its relationship with convergence barriers.

**Figure 3.3 Australian regulatory environment and convergence**

| <b>Aspect of regulation</b>  | <b>Barrier to FMC</b>   |
|--|---|
| <b>Regulatory structure:</b> Separation of responsibilities between ACCC, ACMA and the Minister  | No  |
| <b>Carrier licensing:</b>  | No - the licence arrangements are technology neutral, and a single licence covers both fixed and mobile carrier licensing requirements.   |
| <b>Interconnection:</b> Calling Party Pays applies to both fixed and mobile, and, in both cases, termination rates are set on the basis of TSLRIC cost standard. | Yes - The mobile:fixed termination rates are in the order 15:1 and will reduce to around 12:1 in the next two years. The differential will be a significant barrier to FMC service development. |
| <b>Number Plan:</b> Separate ranges for geographic (fixed) and national (mobile) numbers.  | Yes - numbering for converged services will need to be addressed in the Plan.   |
| <b>Number Portability:</b> All operators treated similarly for NP purposes.  | No - although porting procedures will need to be better harmonised.   |
| <b>Universal service:</b> Applies only to standard (fixed)   | No - obligation to contribute to funding the net cost   |

|  |  |
|--|--|
| telephone service and to public payphones                        | of universal service is on all carriers.   |
| <b>Retail price controls:</b> Apply on to local fixed services   | Yes - the asymmetrical approach could favour the development of converged services based on mobile services. |
| <b>Access to buildings:</b> Legislation covers mobile and fixed. | No   |

Source: Ovum

## 4. PROVISION OF CONVERGED SERVICES

### 4.1 Provision of FMC services

Bundling, in the form of bundles of services incorporating fixed and mobile services, is well established in the Australian market place. These bundles generally offer rewards or a basic discount, such as free broadband months, rather than offering converged pricing of fixed and mobile products.

Recently both Telstra and Optus offered integrated pricing for their fixed and mobile services. Both operators offered a bundle of minutes for both home and the mobile phone services with a value well in excess of the monthly charge. Converged devices, such as a single handset for both mobile and fixed use, have not appeared in the market place. There is no indication that a converged device will be introduced commercially in the near future, although Telstra has recently completed a trial of an FMC device as discussed in Section 4.4

#### Restructuring of the operator

None of the full-service providers have restructured their organisations to enable FMC although, as mentioned previously, Telstra's current organisation is consistent with the provision of such a service. The organisational structure of Optus does not support the provision of FMC.

### 4.2 Broadband services with mobile potential

#### Wireless broadband

Many operators are starting to offer wireless broadband in Australia. Mobile operators, such as 3 Australia and Telstra, are offering broadband over the wireless network. Austar, the regional Pay TV provider, has also announced plans to rollout a WiMAX network in its coverage area. Wireless broadband only providers, such as Unwired, have also entered the market.

#### WiFi hotspots

Many different organisations provide WiFi hotspots in Australia, ranging from Nintendo to Boingo. While the total number of WiFi hot spots is not available, Telstra and Optus have provided approximate figures. Telstra has 939 hotspots and Optus has approximately 100.

### **4.3 'Home zone' and other mobile services**

The top three mobile operators, Telstra, Optus and Vodafone, have not launched any mobile services that offer convergent solutions, such as the Homezone product offered by Vodafone Germany.

Orange, the smallest mobile operator, has launched a new converged solution called Mobile+Home.

Under the new service, customers get a local phone number on which they can be contacted via their cellphone when at designated places (home or office). Calls from that location are also charged at lower rates than normal cellphone calls. Orange provides two numbers, the regular mobile number and a local number (e.g. 03 1234 5678) that the subscriber can be contacted on. Individuals can contact the subscriber on the local number whenever the person is in the designated zone. When subscribers are not in the home zone calls to the local number will automatically divert to voicemail. This gives callers the certainty that they will always be charged for a call to a fixed service.

### **4.4 Plans by operators for converged services in future**

Telstra recently completed a trial in conjunction with Alcatel of the Wireless Office solution. The technology allows mobile calls made in the office to be charged at fixed line rates. It uses a Bluetooth technology called BlueMod that allows mobile handsets to roam across its fixed-line and mobile networks. However plans for further use of this technology have been discontinued due to lack of handset portfolio and support, as most are moving towards a WiFi solution. Teething problems with technology means that a Telstra FMC product is many years away.

## **5. REVIEWS BY REGULATOR INTO CONVERGENCE AND RELATED ISSUES**

DCITA published a convergence review paper in 2000. This paper was an analysis of issues related to the convergence of technologies and markets in the telecommunications, information technology, broadcasting and media industries and its implications on government policy. The review concluded that convergence had barely begun, that the current structure were likely to persist for many years and that the related legislation would remain sound for the foreseeable future.

## Annex 3: Case Study - Denmark

### 1. CURRENT INDUSTRY STRUCTURE

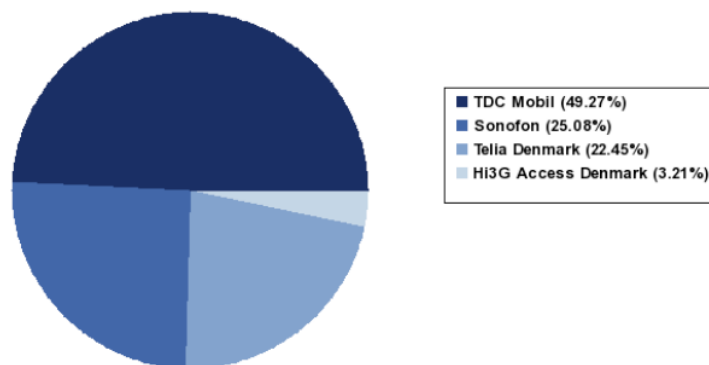
#### 1.1 Fixed operators

The incumbent fixed operator, TDC, had a market share of 82% at the end of 2004. Tele2 was TDC's key competitor with a 13% market share of domestic traffic, followed by Telia with 7% and Sonofon with 4%. In the past year both Telia and Sonofon have slightly increased their market shares by 1%. Competition also comes from Orange and Tiscali, who have taken advantage of carrier pre-selection (CPS) and wholesale line rental (WLR) to enter the fixed voice markets. Equant, MCI and Colt are significant players in the business market.

#### 1.2 Mobile Operators

There are four mobile network operators and 13 mobile virtual network operators (MVNOs). The top four MVNOs in the market, Telmore, Debitel, CCB Mobile and Tele2 accounted for 21% of the mobile market at the end of 2004.

**Figure 1 Wireless network operators market share, June 2005**



Source: Global Comms

#### 1.3 Levels of integration

TDC is an integrated company and operates through six main businesses - Solutions (telephony and Internet), Mobile, Services, Cable TV, Innovation and Directories. The establishment of the new units in 2002 came as part of TDC's plan to phase out the old Tele Denmark branding and shift its wireline operations to focus on ADSL, setting itself ambitious broadband rollout targets.

## 2. CURRENT REGULATORY FRAMEWORK

### 2.1 Regulator

In April 2002 the Danish regulator was merged to deal with a wider range of issues. The merged regulator, the National IT and Telecom Agency (NITA), is independent of both telecommunications operators and the Ministry.

The NITA's responsibilities relating to interconnection and promotion of competition include supervision of standard offers for interconnection, guidance regarding negotiated interconnection agreements, complaints processing, mediation, accounting supervision, and cases started on the regulator's own initiative.

In July 2003, the *Consolidation Act on Competitive Conditions and Consumer Interests in the Telecommunications Market* was passed. The Act transposed the EU directives into Danish Law.

#### Role of the national competition authority

The *Danish Competition Act* came into effect in January 1998 with amendments to the Act taking place in June 1997, May 2000, June 2002 and December 2004. The Act is based on two prohibitions:

- prohibition against anti-competitive behaviour
- prohibition against abuse of a dominant position.

The division of responsibilities for regulation of the telecommunications sector is relatively well defined in Denmark. Danish legislation formalises co-operation between the Ministry, the NITA and the Competition Authority in a number of areas.

The Competition Authority is to give binding opinions on:

- the interconnection agreements submitted by the NITA, as to whether the terms included constitute a violation of the Competition Act
- the universal service obligation (USO), including the proposed maximum prices as submitted by the USO provider – namely, TDC
- accounting supervision (for example, in relation to cross subsidisation).

In addition, there is co-operation on pending cases between the NITA and the Competition Authority, where complaints related to competitive conditions in the telecoms sector are often addressed to both regulators in parallel.

### 2.2 Regulatory philosophy and powers

The Danish regulatory framework is one of the most pro-competitive in the EU, with some of the lowest interconnect prices and the availability of measures such as wholesale line rental. However, the telecommunications regulators in Denmark, Italy and the UK all operate within the framework established by the European Commission. This framework came into force in July 2003. It is explicitly designed so that the ex ante regulation which it provides complements the ex post regulation of competition law. In particular it requires NRAs to

minimise ex ante intervention and rely on use of competition law to regulate telecommunications markets wherever possible.

There is a four stage process for deciding if ex ante regulation is justified:

- Step 1: the Commission has identified (using economic techniques of competition law analysis) a list of markets, which are susceptible to ex ante regulation. This list contains markets, which are not contestable. There are 7 retail and 11 wholesale markets in the current list
- Step 2: each NRA can add or remove markets from this list if national circumstances require. But it must justify its deviation to the European Commission
- Step 3: the NRA assesses each market to determine whether one or more operators has significant market power
- Step 4: for markets where an operator has SMP, the NRA imposes an ex ante remedy to deal with the market problem which SMP causes. The NRA should intervene as little as possible. So it should pick a remedy (transparency, non discrimination, etc) which is the minimum required to deal with the identified problem.

In practice this process has led to a relatively high level of regulatory intervention by Hong Kong standards. In particular in a typical member state:

- all suppliers of voice call termination services (fixed and mobile) are considered to have SMP and their call termination charges are regulated. Often the NRAs sets a cost based price for these services
- all incumbent fixed operators are required to provide carrier selection and call origination services at cost based prices
- fixed incumbents are required to offer bit stream broadband access as well as unbundled local loops (Type II interconnect)
- mobile operators escape most economic regulation. NRAs focus mainly on regulating mobile termination rates (with charges typically at HK\$0.8 per minute).

In all member states the focus is on regulating at the wholesale level in preference to the retail level.

The EU framework advises against ex ante regulation of emerging markets such as those for services running on next generation networks. This advice recognises the fact that the four step process outlined above works when applied to *established* markets but cannot be applied with any confidence to *emerging* markets, where the information required to define markets and make SMP assessments is simply not available.

EU NRAs are concerned however that, in the absence of regulation, incumbent operators will use their investment in emerging markets infrastructure, like NGNs, to re-monopolise telecommunications markets. Resolving this problem is one of the main challenges that faces the European Commission as it reviews its regulatory framework in the first half of 2006.

## 2.3 Licensing

### GSM licensing

Four companies have established GSM mobile networks in Denmark. In addition there are a number of companies that resell mobile services by leasing capacity in these networks.

### 3G licensing

The 3G licensing process was completed in September 2001 with the grant of four licences following a sealed bid auction. The resulting licence charges were (at about \$150 million) almost twice the level of the reserve price. The successful bidders included one new entrant Hutchison 3G. Rollout conditions require 30% of the population to be covered by the end of 2004 and 80% by the end of 2008. The legal scope for network infrastructure sharing by licensed network operators, which was clearly defined before the auction, is considered by some operators to be limited.

In March 2005, the NITA decided to invite tenders for the fourth 3G licence that was returned by TeliaSonera after its acquisition of Orange Denmark. The auction for this licence is due to take place in December 2005.

Hutchison 3G is the only operator in Denmark to have launched 3G services.

## 2.4 Interconnection

As in the rest of Europe, Denmark uses a Calling Party's Network Pays (CPNP) scheme.

Since July 1998, the interconnection obligation has covered switched interconnection, leased infrastructure (including leased lines and unbundled access to the local loop, and other infrastructure elements) and access by telecommunications service providers.

CPS became available on 1 January 1999. Only TDC is obliged to offer the service.

### Basis for setting charges

According to Section 55 of the *Act on Competitive Conditions and Consumer Interests in the Telecommunications Market*, the following pricing methods can be applied in respect of interconnection products:

- the modified historic cost method
- the 'best-practice' method
- the end-user price adjusted for saved costs
- the LRAIC method

### Cost model for TDC's RIO

On 1 January 2003, the Danish regulator, the NITA, introduced its long-run average incremental cost (LRAIC) model for setting TDC's interconnection charges. The LRAIC model used by the NITA is a hybrid model, combining a top-down analysis prepared by TDC and a bottom-up analysis provided by other operators.

Based on the model, NITA issued a decision on 20 December 2002 setting TDC interconnection charges to apply from 1 January 2003. Previously, TDC's interconnection charges had been based on historical costs, with the NITA entitled to reduce charges on the basis of a 'best practice' assessment with European peers.

This practice did have the positive result of driving down TDC's interconnection charges to the lowest in Europe.

### **Procedure for setting and reviewing charges**

A revised *Executive Order on Standard Offers in the Interconnection Field* came into force on 6 October 2001. The offers cover exchange of traffic, raw copper, dark fibre, co-location, transmission services, resale in the fixed network area and, as new elements, CPS and bitstream access. Since 1 February 2002, the incumbent has included these new products in its reference offers.

Each year TDC presents its standard interconnect offer to the NITA for auditing. The NITA may amend the charges, which TDC then has to implement. Other licensed operators may request the regulator to require TDC to reduce its charges if they can prove that best practice in other countries would result in lower charges.

### **Flat-rate Internet access call origination (FRIACO)**

Danish legislation on interconnection allows for the provision of flat-rate Internet access. However, there seems to be no demand for FRIACO-type services. The takeup of ADSL products is probably the main reason for the lack of interest in FRIACO services.

### **Local loop unbundling**

Full local loop unbundling has been available in Denmark by law since 1 July 1998. Following the EU's local loop unbundling (LLU) regulation, TDC submitted revised reference offers to the NITA on fully unbundled local loops and shared access loops. The NITA reviewed the reference offers to ensure that the offers complied with the LLU regulation. In the review process, the NITA raised several concerns with the incumbent, such as terms of termination, initial charge/discount system and the provision of sub-loops, which are now reflected in the reference offers and practices of the incumbent.

### **Cost model for reference unbundling offer (RUO)**

Since January 2003, TDC's prices for fully unbundled and shared access loop rental have been approved by the regulator using an LRAIC model. Previously, the NITA used international benchmarking to ensure that TDC's loop prices were cost-oriented.

### **Wholesale line rental**

Wholesale line rental (WLR) has been available from TDC since mid-2000. It is regulated using the retail minus factor of -21%.

### **Bitstream access**

The incumbent provides ADSL products via the use of bitstream access and has an obligation to offer bitstream to other operators under the same terms as those used for sale to the incumbent's retail division. Bitstream access is available from the parent ATM switch. Its price must be cost-oriented based on historic cost, but there is no formal price regulation.

### **VoIP**

There is no specific regulation on VoIP. VoIP numbering is treated in the same way as other numbers, which form the Danish numbering plan.

### **Mobile termination rates**

TDC Mobile and Sonofon, the two largest mobile operators in the market, have been found by the regulator to have significant market power (SMP) in the market for mobile services – but not in the market for national interconnection. Under the *Danish Telecoms Act*, this SMP status requires the two mobile operators to offer interconnection on their networks on a non-discriminatory basis.

Since no mobile network operator has been designated as having SMP in the national market for interconnection, there is no requirement for cost-orientation for mobile termination.

Mobile termination charges are negotiated by the mobile network operators with the fixed and mobile operators. Although the charge levels are monitored by the regulator, they are not subject to regulatory intervention.

## **2.5 Number Plan**

The national numbering plan for telephony, ISDN and mobile communications is a common and unique plan. The plan is based on international standards and regulations for numbering in electronic communications networks, particularly ITU Recommendation E.164.

The plan is common to the networks, which implies that the numbers may in principle be reached from all subscribers in networks for telephony, ISDN and mobile communications services that use the numbering plan. However, the exchange of traffic between networks will only occur to the extent that the providers enter into interconnection agreements, and the content of such agreements might imply that certain services and numbers cannot be reached. Numbers within the European telephone numbering area, including numbers with special charging, may also in principle be reached from all networks for telephony, ISDN and mobile communications services. However, there is only an obligation to ensure routing if the provider can obtain recovery of the costs of delivering calls to the European numbering area via its network. The obligation to route calls to numbers with special charging applies only if this is economically and technically feasible, and if the receiver of the call has not chosen to limit access to calling such numbers.

The plan is unique, which implies that a given number has only one application/one purpose, no matter where the call is originated in the public electronic communications networks.

## **2.6 Number Portability**

Number portability between service providers has been available since October 1999. Plans have been developed since 2002 to enable subscribers have been able to port their subscriber

numbers when changing providers within telephony, ISDN, and public mobile communication. The implementation of these plans has been postponed on a number of occasions, until, most recently, December 2005. The plan has now been cancelled altogether because of concerns about:

- the ability of operators to differentiate charges for international inbound calls terminating on fixed and mobile networks
- removal of indications in numbers that provides call pricing information to callers.

## 2.7 Universal Service

TDC has been designated as Universal Service Provider until 31 December 2007. Services covered by the USO include basic telephony, ISDN services, leased lines (except for broadband lines) and directory enquiry services.

The NITA sets maximum prices for universal services on a 'best practice' basis, in consultation with the Danish competition authority. In addition, Danish telecoms legislation gives the NITA the power to ensure that falls in real end-user prices do not exceed the fall in real prices for interconnection during the same period. This is to ensure that reductions in end-user prices by the incumbent do not have a price squeeze effect.

The NITA calculated the required fall in real prices for the USO provider every other year. The last decision was taken in April 2002, and with that decision, a required fall in the real price of the average private consumer's total telephone bill was set at 4%, both in 2004 and 2005. With this decision, the agency has ensured that the average private telephone bill during the period 1998–2005 will fall by at least 27% in real terms.

So far, there has been no USO contribution. TDC bears the full cost of providing the universal service.

## 2.8 Retail price controls

The EU regulatory framework requires NRAs to focus regulation at the wholesale rather than the retail level. However the Universal Service Directive allows NRAs to impose retail price controls on operators with SMP in the retail voice telephony markets.

Historically most EU NRAs, including those in the study countries of Italy, the UK and Denmark, have regulated the retail price of a basket of fixed line voice telephony services using a price cap regime. There is now a general trend to remove such regulation given the growing level of competition in fixed retail voice telephony markets. But retail price caps remain in all three EU study countries. In Denmark there is an RPI-0 price cap on line rentals and connections.

There is no evidence that retail price controls have affected interconnect charging arrangements. Indeed the reverse is true. The interconnection charging arrangements affect the level of retail prices. This is especially true of the retail prices of fixed to mobile and mobile to mobile off net calls. Both are raised substantially by the fact that the originating operator has to pay a substantial mobile termination rate to the terminating mobile operator. In Italy the

NRA regulates both the MTR and the fixed retention on FTM calls<sup>101</sup>. So, in effect the retail price of FTM calls is regulated.

There are concerns amongst EU NRAs about price bundling of fixed and mobile products by fixed incumbents and/or their mobile subsidiaries. This reflects the fact that in almost all EU member states, except the UK and Ireland, the incumbent operator has a market share of over 80% in the fixed line market and over 40% in the mobile market. However we are not aware of any explicit ex ante regulations to constrain price bundling. Instead the operators are constrained by ex post competition law.

### **3. EXTENT OF CONVERGENCE**

#### **3.1 Fixed Mobile Substitution**

There is mixed evidence of access substitution in the Denmark. While mobile subscribers grew by 17% in the period from June 2001 to June 2004, the number of fixed lines declined by 7% in the same period. Indeed, an EU-commissioned user survey revealed that household fixed line penetration declined slightly to 91%, while the percentage of mobile-only households grew from 8% to 9% in the same period. The large decline in fixed lines compared with the relatively low decline in fixed penetration among households may be due to cancellation of second fixed lines as households adopted broadband.

There is strong evidence of call substitution, aside from the changes in mobile and fixed penetration, as users increasingly used their mobile phones instead of their fixed line services. Mobile monthly MoU grew by 22% to 82 minutes in the three years to June 2004, while at the same time fixed monthly MoU declined by 5% to 418 minutes per month. Despite the decline, fixed line usage remains over five times greater than mobile, reflecting the shared nature of the fixed phone versus the personal mobile phone, but also the price premium of mobile phones.

In the medium term, it is expected that the current trends will continue in Denmark. The mobile premium will continue to decline, as a result of the country's intense mobile competition, which will lead to a continuation in the trend of call substitution. At the same time, there will be a marginal increase in mobile-only households.

#### **3.2 Take-up of Personal Numbers (if any)**

Not applicable

#### **3.3 Barriers to convergence**

To date the majority of bundling by European incumbents has been limited to mixed bundles, and therefore these. Users may continue to purchase the services that make up such bundles separately. types of bundles have limited anti-competitive risk. However, such bundles are also not innovative and mark very limited progress towards service convergence.

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<sup>101</sup> The UK regulated in a similar way from 1999 to 2003

Bundling *per se* is welfare enhancing because it generates more benefits for the consumer than the cost associated with doing it. One of the key economic costs of bundling is the potential reduction in competition that may result.

In Denmark, operators that have SMP status in either fixed or mobile markets are not free to plan and offer convergent services as they please. SMP operators are not permitted to pass information between fixed and mobile divisions. SMP operators can bundle fixed and mobile services but must offer the customer the chance to take each service independently.

Figure 3.1 outlines the barriers to convergence in the current regulatory environment.

**Figure 3.1 - Barriers to convergence in Denmark**

| <b>Aspect of regulation</b>  | <b>Barrier to FMC</b>   |
|--|---|
| <b>Regulatory structure:</b> Separation of responsibilities between NITA and Competition Authority   | No  |
| <b>Carrier licensing:</b> licenses not required  | No  |
| <b>Interconnection:</b> Calling Party Pays applies to both fixed and mobile and different regulation for fixed and mobile termination rates. | Yes, the different approach to termination rates will be a barrier to FMC.                                  |
| <b>Number Plan:</b> Common numbering plan; each number is unique with one purpose  | Yes, numbering for converged services will need to be addressed in the plan.                                |
| <b>Number Portability:</b> All operators treated similarly for NP purposes.  | No  |
| <b>Universal service:</b> applies to standard fixed services and payphones   | No – both mobile and fixed operators have to contribute. Not applicable as there has been no fund to date.  |
| <b>Retail price controls:</b> Applies to fixed only  | Yes, the asymmetrical approach could favour the development of converged services based on mobile services. |

## 4. PROVISION OF CONVERGED SERVICES

### 4.1 Provision of FMC services

#### TDC Duet

TDC's Duet service is a network-based solution. TDC claims that it is the first operator to launch a fixed-mobile convergence solution with the launch of its Duet service in September

1997. Duet customers have one phone number, and calls are routed to the user's mobile or fixed line depending on whether the mobile is switched off or not.

TDC offers its Duet service to both consumers and businesses. Both work in the same way, except with the business service, users have a PBX and a direct dial, whereas residential customers use an ISDN line. Additional features available through Duet Business include the following:

- employees have eight-digit direct inward dialling (DID) numbers and employees each have their own mobile phone with a TDC subscription. Calls are diverted to the employee's mobile phone when it is switched on, even if an employee is abroad
- there are two answer machine facilities - DuetAnswer and MobileAnswer. DuetAnswer is cheaper than MobileAnswer, although MobileAnswer is better when an employee is using data or fax facilities. Calls can be transferred to a pre-programmed number, and employees can also choose to transfer calls to any other number. The call transfer number can be changed at any time, and it can be the same number for everyone who is covered by the company's Duet solution, or the employee can select a different number that is of importance to them, such as the number for an assistant
- employees can call a number (DuetControl) in order to change their personal greeting and listen to their messages. If calls are made to DuetControl from a non-registered phone, then they must enter a PIN number to obtain access.

While the service has grown strongly in the first couple of years since launch, in the past two years it has attracted very few new subscribers. TDC's financial results in the third quarter of 2003 showed that the operator had 276,000 Duet customers, or approximately 12% of the operator's cellular customer base at the time. Clearly TDC exhausted the core of enthusiasts for this service and it finds it difficult to market the service to the general population.

Network-based solutions such as TDC's Duet are cheaper to deploy, but as TDC's experience shows, they have a less market potential. This is partly due to the fact that users are still left with two handsets, despite having one number and a single bill. There is uncertainty as to whether such services will appeal to the mass consumer market, in terms of offering sufficient benefits for the costs involved.

## **4.2 Broadband services with mobile potential**

Internet service providers in Denmark (ISP's) are establishing an increasing number of public hotspots based on WLAN-technology. Public hotspots are primarily established in cafes, restaurants, public libraries, petrol stations and out-door spaces in urban areas.

ADSL is available nationwide. The overall availability of ADSL services in Denmark was 98 per cent of all households and enterprises October 2005.

Cable modem services are available to 60 per cent of all households and FWA is available to approximately 90 percent of all households and enterprises. FWA is primarily offered to business users and building associations (FWA/LAN solutions).

### **4.3 'Home zone' and other mobile services**

#### **Sonofon**

Sonofon's UnoFon home zone package was introduced in May 1997, but was forced to stop recruiting new subscribers in August 1997 due to technical problems. The service re-launched in December 1997.

UnoFon offers cheap call rates for calls made from inside the subscriber's home zone using 1800MHz frequencies. This is usually a diameter of several hundred meters of the users designated "home", greater than the coverage offered by a cordless phone.

#### **Orange Denmark's Mono**

In October 2002 Orange Denmark introduced a new tariff designed to encourage substitution. Mono offers mobile to fixed calls at rates comparable to TDC's fixed to fixed charges.

### **4.4 Plans by operators for converged services in future**

TDC joined the Fixed Mobile Convergence Association in August 2005.

#### **TeliaSonera**

On 24 November 2005, TeliaSonera completed a six-month trial in Denmark of technology that combines fixed and mobile network services. The technology allows people to use a wireless handset with Bluetooth to make voice over IP (VoIP) calls via DSL while at home, and to use the same handset to make calls on a regular mobile network. The trial involved 50 families, who were generally positive about the technology. TeliaSonera will now begin its next phase of testing.

TeliaSonera is testing technology that is almost identical to that used by BT Group's Fusion product. Users benefit from a single number and handset, one invoice, phonebook and voice mail service, and cheaper VoIP calls at home. But the attractiveness of this kind of product when compared with a simple mobile phone will diminish as charges for mobile-to-fixed calls drop. This trial may have had an especially favourable reaction because Danes are used to the concept. About 10 percent of them subscribe to a product from the incumbent, TDC, that combines aspects of fixed and mobile access.

## **5. REVIEWS BY THE REGULATOR**

There have been no reviews by regulator, NITA, of the regulatory requirements for and regulatory barriers to FMC.

## Annex 4: Case Study - Italy

### 1. CURRENT INDUSTRY STRUCTURE

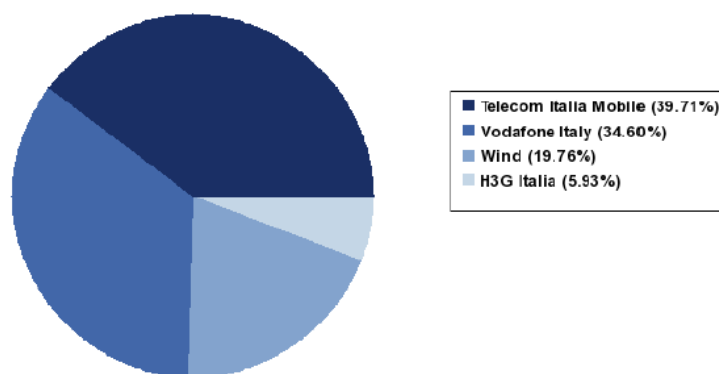
#### 1.1 Fixed operators

In September 2004, Telecom Italia held a 70% share of the fixed voice market, with 26,156,000 fixed line connections. Telecom Italia's main competitor in Italy is Wind, a subsidiary of the electricity company, Enel. As of September 2004, Wind had 2.6 million active customers, a reduction of 13% from its 3.1 million active customers in December 2003. Wind also had 3 million active Internet access customers and 223,000 ADSL customers. Pan-European operator Tele2 has 2 million customers in Italy and offers fixed voice and Internet access services. Broadband player FastWeb offers a triple-play of voice, Internet and video services and had 456,600 customers as of September 2004 – an increase of 28% on 2003. The fixed market is growing in Italy because of broadband, which is helping to offset the effects of mobile substitution.

#### 1.2 Mobile Operators

In September 2004, mobile penetration in Italy reached 103% – one of the highest mobile penetrations in both Europe and the rest of the world. There are four mobile operators in Italy providing commercial services: Telecom Italia Mobile (TIM), Vodafone, Wind and new entrant 3 Italy. 3 Italy has the highest 3G penetration in Europe at 5%.

**Figure 1 Wireless network operator market share, June 2005**



Source: Global Comms

#### 1.3 Levels of integration

The Telecom Italia Group, the incumbent in the market, is an integrated operator, which spans the entire advanced communications services chain – fixed and mobile telephony, the Internet, media and innovative business solutions and systems.

Telecom Italia Mobile (TIM) and Telecom Italia (TI) merged earlier this year to generate three main benefits:

- financial benefits. The parent company, Olivetti, holds the debt and the two main subsidiaries (TI and TIM) generate the cash. Merger simplifies and reduces the cost of servicing the debt
- efficiency savings. TI has saved around €1.5 billion per annum from the merger.
- potential increase in revenues and strengthening of TI's competitive position. FMC services should offer customers more.

The merger was partly a response to recent market share losses by TIM to Vodafone and 3 in Italy.

TI has seen cost savings through the merger in five main areas:

- €170 million per annum in better procurement
- €1000 million per annum in more efficient use of network infrastructure e.g. TI now uses its metronet fibre to provide BTS to BSC links rather than leased lines
- reductions in its universal service costs through use of GSM technology to supply rural customers (erecting a BTS and supplying GSM fixed phones)
- development of a single platform for mobile and fixed value added and content based services
- use of a common IT services platform.

TI will see further benefits in 2006 by cross selling through its fixed and mobile channels. The mobile arm sells to customers primarily through shops. The fixed subsidiary sells primarily through outbound call centres to consumers or face to face to corporates. Where appropriate the two sales organisations will cross sell each others products (although it is hard to win back a fixed customer when he is visiting a mobile shop).

## 2. CURRENT REGULATORY FRAMEWORK

### 2.1 Regulator

The national regulatory authority (NRA) for the telecoms sector, *Autorità per le Garanzie nelle Comunicazioni* (Agcom), was created in July 1997. Agcom has overall responsibility for regulatory matters relating to communications, while the Ministry of Communications (MoC) is responsible for the issue of licences, the national number and spectrum plans, and the nomination of the Agcom council members. Agcom is responsible for regulation of interconnection and tariffs, registration and supervision of licences and authorisations, verification of accounting systems of operators with significant market power (SMP), competition in the mobile communications market, supervision of quality of service to customers, and dissemination of information on communications. It acts as an independent agency.

## 2.2 Regulatory philosophy and powers

The telecommunications regulators in Denmark, Italy and the UK all operate within the framework established by the European Commission. This framework came into force in July 2003. It is explicitly designed so that the ex ante regulation which it provides complements the ex post regulation of competition law. In particular it requires NRAs to minimise ex ante intervention and rely on use of competition law to regulate telecommunications markets wherever possible.

There is a four stage process for deciding if ex ante regulation is justified:

- Step 1: the Commission has identified (using economic techniques of competition law analysis) a list of markets that are susceptible to ex ante regulation. This list contains markets that are not contestable. There are 7 retail and 11 wholesale markets in the current list
- Step 2: each NRA can add or remove markets from this list if national circumstances require. But it must justify its deviation to the European Commission
- Step 3: the NRA assesses each market to determine whether one or more operators has significant market power
- Step 4: for markets where an operator has SMP, the NRA imposes an ex ante remedy to deal with the market problem that SMP causes. The NRA should intervene as little as possible. So it should pick a remedy (transparency, non discrimination, etc) which is the minimum required to deal with the identified problem.

In practice this process has led to a relatively high level of regulatory intervention by Hong Kong standards. In particular in a typical member state:

- all suppliers of voice call termination services (fixed and mobile) are considered to have SMP and their call termination charges are regulated. Often the NRAs sets a cost based price for these services
- all incumbent fixed operators are required to provide carrier selection and call origination services at cost based prices
- fixed incumbents are required to offer bit stream broadband access as well as unbundled local loops (Type II interconnect)
- mobile operators escape most economic regulation. NRAs focus mainly on regulating mobile termination rates (with charges typically at HK\$0.8 per minute).

In all member states the focus is on regulating at the wholesale level in preference to the retail level.

The EU framework advises against ex ante regulation of emerging markets such as those for services running on next generation networks. This advice recognises the fact that the four step process outlined above works when applied to *established* markets but cannot be applied

with any confidence to *emerging* markets, where the information required to define markets and make SMP assessments is simply not available.

EU NRAs are concerned however that, in the absence of regulation, incumbent operators will use their investment in emerging markets infrastructure, like NGNs, to re-monopolise telecommunications markets. Resolving this problem is one of the main challenges that faces the European Commission as it reviews its regulatory framework in the first half of 2006.

## 2.3 Carrier licensing

Italy established a general licensing regime when the telecommunications market was liberalised.

**Figure 2.1 - Italian licensing regime**

| Type of business or operators  | Entry condition   |
|--|---|
| Fixed and mobile voice telephony services including the installation and provision of networks | Individual Licence                                      |
| Telecommunications services other than the above mentioned activities                          | Authorisation   |
| TIM, Omnitel,  | Concession (subject to the individual licensing regime) |

Source: Agcom

## 3G licences

The Italian government awarded five 15-year 3G licences in October 2000 . The method used in Italy to grant the UMTS licences is a combination of beauty contest and auction. In August 2003, the Italian government approved plans to permit the buying and selling of frequencies assigned

Under the licence agreements, operators have to cover regional capitals within 30 months and provincial cities within 60 months of the licence award. In August 2002 the Italian government extended the duration of the UMTS licences from 15 to 20 years.

## 2.4 Interconnection

Like the rest of Europe, Italy uses a Calling Party's Network Pays (CPNP) scheme.

### Fixed termination charges

Publicly available telecoms networks and services have rights and obligations to negotiate interconnection with each other on a non-discriminatory basis.

Organisations determined to have 'significant market power' (SMP) are assigned certain obligations, including requirements for meeting reasonable requests for access to their network, for non-discrimination, for publication of a reference interconnection offer (RIO), for cost-oriented interconnection charges supported by transparent cost-accounting systems, and for accounting separation in certain cases.

Agcom has designated Telecom Italia as having SMP in the fixed public telecoms market, the national market for interconnection and the market for leased lines.

### **Basis for setting charges**

Since 2001, interconnection charges have been set using a LRIC model. An operator (fixed or mobile) that terminates traffic on Telecom Italia's network currently pays 0.76 Euro cents per minute on average.

Telecom Italia is required to submit a draft Reference Interconnect Offer (RIO) each November for the calendar years to follow. Agcom then conducts a public consultation before issuing a final decision on whether to approve the RIO or not. If the RIO is disapproved in any way, Telecom Italia has to review it.

In February 2003, Agcom adopted a four-year 'network cap' scheme to apply to Telecom Italia's fixed interconnection charges, covering the years from 2002 to 2006.

### **Mobile termination charges**

Under current EU regulation, voice call termination on individual mobile networks is a wholesale market susceptible to ex ante regulatory intervention, including price controls.

Currently TIM and Vodafone Omnitel, are both designated as having significant market power (SMP) in the market for national termination and are required to offer cost-based termination charges using LRIC models. Wind, the third operator, has not been yet designated as having SMP in mobile termination, but given the EU framework, this is likely to change soon.

In February 2003, Agcom imposed a three-year price regime on fixed-to-mobile call termination and retail pricing effective from 1 June 2003.

By setting a maximum average termination rate for fixed-to-mobile calls of 14.95 Euro cents per minute for 2003, Agcom imposed an approximate 12% reduction in the mobile termination charges of TIM and Vodafone Omnitel. The regulator also saw scope for another reduction of 20% for the period 2004-2005, with annual reductions of 10% during each year thereafter.

This Agcom decision is part of an ongoing policy effort to bring mobile termination charges more closely in line with costs. The full implementation of LRIC is expected to be achieved at the end of the network cap period in 2006.

## **2.5 Number Plan**

Under the National Numbering Plan there are four different sets of numbers (special national services, mobile services, geographic services and non-geographic services) which have specific rules for their management and allocation. In principle, numbers are allocated by a 'first come first served' basis. Operators are required to pay annual numbering fees for the use of numbers per number basis and the use of carrier selection codes.

## **2.6 Number Portability**

Fixed number portability has been available since 1 January 2000 in Italy. All licensed operators are obliged to offer it on a cost basis.

Mobile number portability (MNP) was introduced on 30 April 2002. Agcom has established a framework agreement for operators to define service costs and the duration of porting procedures. Agcom has intervened in cases where off-net tariffs were still applied after the change of network and where procedures were not effective.

There is no number portability between the fixed and mobile networks.

## 2.7 Universal Service

All companies operating public networks and all providers of public telephony services contribute to the funding of universal service. Each company contributes in proportion to its share of revenues for the public telephony services market.

## 2.8 Retail price controls

The EU regulatory framework requires NRAs to focus regulation at the wholesale rather than the retail level. However the Universal Service Directive allows NRAs to impose retail price controls on operators with SMP in the retail voice telephony markets.

Historically most EU NRAs, including those in the study countries of Italy, the UK and Denmark, have regulated the retail price of a basket of fixed line voice telephony services using a price cap regime. There is now a general trend to remove such regulation given the growing level of competition in fixed retail voice telephony markets. But retail price caps remain in all three EU study countries. In Italy there is an RPI-0 price cap on line rentals, an RPI-RPI cap on fixed call prices and an RPI-6 price cap on the fixed to mobile retention<sup>102</sup>

There is no evidence that retail price controls have affected interconnect charging arrangements. Indeed the reverse is true. The interconnection charging arrangements affect the level of retail prices. This is especially true of the retail prices of fixed to mobile and mobile to mobile off net calls. Both are raised substantially by the fact that the originating operator has to pay a substantial mobile termination rate to the terminating mobile operator. In Italy the NRA, Agcom, regulates both the MTR and the fixed retention on FTM calls<sup>103</sup>. So, in effect the retail price of FTM calls is regulated.

There are concerns amongst EU NRAs about price bundling of fixed and mobile products by fixed incumbents and/or their mobile subsidiaries. This reflects the fact that in almost all EU member states, except the UK and Ireland, the incumbent operator has a market share of over 80% in the fixed line market and over 40% in the mobile market. However we are not aware of any explicit ex ante regulations to constrain price bundling. Instead the operators are constrained by ex post competition law.

So far TI has only offered limited fixed and mobile price bundles. The regulator is deeply concerned by such developments. So TI is going slowly here. TI's offer is very similar to that of France Telecom. Users get a discount on FTM and MTF calls for 3 nominated numbers. The produce is called *Family Net*. The discount is fully justified by cost saving.

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<sup>102</sup> I.e. the retail price less the mobile termination rate

<sup>103</sup> The UK regulated in a similar way from 1999 to 2003

Vodafone and FastWeb (TI's main rivals in Italy) have both complained about Family Net to the NRA. So far Agcom has not banned Family Net. But it has expressed concern.

TI is not constrained from cross selling. But it is not allowed to share customer profile information between its fixed and mobile arms. The two databases are therefore kept separate.

### 3. EXTENT OF CONVERGENCE

#### 3.1 Fixed Mobile Substitution

In Europe, there is less evidence of line substitution and more evidence of traffic substitution. Consumers are changing from fixed to mobile and mobile to fixed connections on a call by call basis, according to convenience and cost. In Italy, consumers take out multiple mobile subscriptions, and are extremely knowledgeable about tariff plans. They use a number of different subscriptions according to which is cheaper at any given time.

#### 3.2 Take-up of Personal Numbers

Not applicable

#### 3.3 Barriers to convergence

So far, the majority of bundles from European incumbents, including TI, have been limited to mixed bundles. This allows end users to continue purchasing the services in the bundle separately if they wish to. Given the widespread availability of sufficiently unbundled wholesale services in Europe, these types of bundles pose limited problems with respect to possible anti-competitive effects. However, they do not provide great innovation.

Figure 3.1 summarises the barriers to convergence in the current regulatory environment.

**Figure 3.1** *Barriers to convergence in Italy*

| <b>Aspect of regulation</b>   | <b>Barrier to FMC</b>   |
|---|---|
| <b>Regulatory structure:</b> Split of responsibility between Agcom and MoC  | No  |
| <b>Carrier licensing:</b> Individual licenses   | No  |
| <b>Interconnection:</b> Calling Party Pays applies to both fixed and mobile and both use LRIC to determine termination charges. | Yes, the price differential between fixed and mobile termination rates, and the fact that Wind's mobile termination rates are not regulated, are both barriers to fixed-mobile convergence. |
| <b>Number Plan:</b> Four categories – special national, mobile, geographic, non-geographic                                      | Yes, numbering for converged services will need to be addressed in the plan.  |
| <b>Number Portability:</b> All operators treated similarly for NP purposes.   | No  |

|  |   |
|--|---|
| <b>Universal service:</b> applied to standard fixed services and payphones | No – both fixed and mobile operators contribute.  |
| <b>Retail price controls:</b> Applies to fixed only                        | Yes, the asymmetrical approach could favour the development of converged services based on mobile services. |

## 4. PROVISION OF CONVERGED SERVICES

### 4.1 Provision of FMC services

Agcom completed its retail market analysis in 2005, and has published its draft proposal for remedies. The authority analysed the issue of bundled offers. It proposed an obligation not to unreasonably bundle services to be imposed on Telecom Italia.

Agcom plans to introduce a compulsory margin squeeze test for bundles to ensure that Telecom Italia does not leverage its dominance on the fixed voice and access markets to gain market power in other, more competitive, markets, and to guarantee that competitors can replicate the offer economically. It is also allowing only mixed bundles; that is, bundles of services where the services can also be bought separately by consumers.

Telecom Italia is a relative laggard in terms of bundling services compared with its peers, especially in bundling that includes line rental. However, its recent Alice Mia proposition combines DSL access with WiFi CPE, value-added services such as personal numbers (up to five) and a flat-rate voice package for fixed on-net calls.

### 4.2 Broadband services with mobile potential

Italy is one of the most innovative and competitive broadband markets in Europe, and has a current household penetration of 20.5%. Major operators have demonstrated strong growth over the last two years.

Broadband access services in 2005 have been characterised by more à la carte pricing including pay-as-you-go offers, flexible contracts and a strong push on WiFi from Telecom Italia in particular. Reasonable prices in the areas of local loop unbundling (LLU) and wholesale DSL mean uptake has been relatively successful, with aggressive deployment from Fastweb and Wind. Uptake of LLU will continue, driven primarily by Fastweb. Operators will also continue to push VoIP in order to compete on voice tariffs and benefit from internal cost savings.

In Italy, there are relatively few hotspots and WiMAX trials have just been authorised by the Ministry of Defence who owns the 3.5GHz spectrum. WiMAX trials have begun mostly in rural areas. Telecom Italia is also going to trial WiBro in Turin during the Winter Olympic games in 2006.

### 4.3 Plans by operators for converged services in future

Telecom Italia has long seen a strategy of convergence as the means of developing long term competitive advantage and underpinning growth and profitability. The group intends to develop

integrated offers and deliver efficiency gains. The group joined the Fixed Mobile Convergence Association in August 2005.

The resulting “one company” organisational model supersedes the separate wireline and mobile business units with the responsibilities for the development of the fixed telephony, mobile telephony, and Internet service businesses converging into a single organisational unit.

Telecom Italia has focused on innovative value-added services and customised next generation CPE to successfully defend its market share and grow its revenues. Its main competitors are Wind and FastWeb. It was one of the first Western European operators to introduce discounted call packages with flat-rate or free calls, having launched its Teleconomy packages in June 2000. However, this is not bundled with line rental. Its recent Alice Mia proposition combines DSL access with WiFi CPE, VoIP and value-added services such as personal numbers (up to five).

In 2006, it plans to launch a “superphone”, which is a UMA (unlicensed mobile access) WiFi / cellular phone. The phone will work seamlessly in both fixed (ADSL line via a WiFi link) and mobile environment. Customers will be charged fixed or mobile tariffs for outgoing calls depending on the environment they are in.

Although alternative operator Wind is positioning itself as an integrated operator, it does not currently offer any fixed-mobile bundles. Its main focus has been to increase its LLU customer base with offers including line rental, free calls and value-added services for euro14.57 per month (which is equivalent to the incumbent’s basic line rental charges), with the option of adding either pay as you go or flat-rate DSL.

As a result of these offers, Wind has managed to nearly double the number of active LLU customers in the year to September 2004, from 231,000 to 400,000. However, this has not had much impact on incumbent Telecom Italia, as most of the new LLU customers were existing Wind customers.

FastWeb offers bundled triple-play offerings, combining broadband access with voice and TV-over-DSL/ video on demand (VoD) in major urban areas.

Telecom Italia now offers a common Internet platform to supply content to a range of devices at [www.vigilio.it](http://www.vigilio.it) (narrowband + broadband + mobile + TV). The platform is device sensitive and tailors presentation to the limitations of the access device used. Having quadruple play services is important to Telecom Italia. It allows it to generate more revenue from the same content and makes it more competitive when bidding for premium content (films and sports rights).

Telecom Italia believes operators will have to offer FMC services to the business segment in the next year or so. 3G connections alone offer very poor quality compared with fixed broadband so FMC is considered to be the answer. Telecom Italia expects to get to 10% of revenue from this source in 3 to 5 years.

## **5. REVIEWS BY THE REGULATOR**

Agcom has conducted no reviews directly relating to FMC services and barriers to their development.

## Annex 5: Case Study - Singapore

### 1. CURRENT INDUSTRY STRUCTURE

#### 1.1 Fixed operators

Singapore is a small island city state with highly competitive fixed and mobile telecoms markets. SingTel is the incumbent operator and is dominant in the fixed market. SingTel's main fixed network rival is cable operator StarHub, whose cable TV network has been upgraded to be two-way capable.

There are many other smaller licensed fixed operators with interests in specific service or business segments.

#### 1.2 Mobile Operators

Singapore's mobile market is small, with three network operators. Market penetration is high, with competitive mobile coverage across the island. The three main players are SingTel Mobile, MobileOne Asia (M1) and Starhub. Rather than competing on price, mobile operators are focused on increasing the value of subscribers and maintaining low churn levels.

Successful market entry by new mobile players in Singapore is difficult. Virgin Mobile briefly entered the market in October 2001 as an MVNO but ceased trading a year later. Philippine Long Distance Telephone Co. (PLDT) announced a partnership recently with M1, targeting Filipinos in Singapore through a mobile virtual network operator venture. The agreement is similar to that made between PLDT and Hong Kong's CSL last year, which captured a share of the market from Filipinos working in Hong Kong. The MI/PLDT partnership has proved successful and PLDT hopes to capture 25% of the Filipino market in Singapore within the first year.

#### 1.3 Levels of integration

Only SingTel and StarHub own and operate fixed and mobile networks. No other operators offer both fixed and mobile services, and there are no MVNOs in Singapore at this stage.

SingTel is not integrated for mobile and fixed services. It organises its business by mobile, fixed, broadband and IT, rather than by customer groups.

#### 1.4 Market shares

SingTel has a virtual monopoly of fixed access lines. The fixed access and calls markets are decreasing. In the past year fixed network calls have declined by more than 12% due mainly to FM substitution.

Competition is higher in the calls market. The IDD market is particularly competitive, SingTel's international calling revenues have declined rapidly (59% in four years to March 2005). Prices are falling more slowly in the local calls market, by a total of 5% in the same period.

In the broadband market, SingTel's market share is declining, falling from 57% to 53% in the last year.

In the mobile market there is no dominant operator, but SingTel holds the largest market share, although it is decreasing. Mobile market shares are shown in Figure 2.1.

**Figure 2.1 - Mobile Market Share in Q3**

|                          |       | 2003        | 2004        | 2005        |
|--------------------------|-------|-------------|-------------|-------------|
| <b>M1</b>                | GSM   | 30.72%      | 30.52%      | 29.76%      |
| <b>M1</b>                | WCDMA |             |             | 0.30%       |
| <b>Singtel Singapore</b> | GSM   | 44.12%      | 40.51%      | 37.47%      |
| <b>Singtel Singapore</b> | WCDMA |             |             | 0.73%       |
| <b>Starhub</b>           | GSM   | 25.17%      | 28.97%      | 31.18%      |
| <b>Starhub</b>           | WCDMA |             |             | 0.55%       |
| <b>Total</b>             |       | <b>100%</b> | <b>100%</b> | <b>100%</b> |

Source: Wireless Intelligence, Ovum

## 2. CURRENT REGULATORY FRAMEWORK

### 2.1 Regulator

The regulator is the Info-communications Development Authority (IDA). IDA's main responsibilities include the promotion of competition, ensuring service continuity, encouraging investment in the telecoms sector, building and operating the Government's IT infrastructure, and administering regulation under the Act.

### 2.2 Regulatory philosophy and powers

The Singapore telecoms market is governed by the Telecommunications Act 1999, which provides for the licensing and regulatory powers of the IDA. The IDA is an active regulator – it is keen to both encourage competition and keep Singapore at the leading edge of technology.

On 7 October 2003 the IDA published a proposed draft revised code, “the 2004 Code”, which restated its preference for industry self-regulation over regulation by the IDA, and the promotion of effective and sustainable facilities-based competition. The 2004 Code distinguishes between Dominant Licensees (DLs) and Non-Dominant Licensees (NDLs); DLs are deemed to be able to exercise operational control over facilities used to provide telecommunications services that are sufficiently costly or difficult to replicate in a market.

IDA aims to be technology neutral in regulating.

### 2.3 Carrier licensing

In Singapore the licenses are finely graded to specific services and to implied technologies.

#### Licence structure

There are two main types of licenses available:

- Facilities-Based Operator (FBO) Licence: FBOs are operators intending to deploy any form of telecommunication networks, systems and facilities to offer telecommunication switching and/or telecommunication services to other licensed telecommunication operators,

business, and/or consumers. To be able to provide FBO services in Singapore, interested parties must submit a proposal to the IDA and comply with the Code of Practice for Competition in the Provision of Telecommunication Services (Telecom Competition Code) 2000.

- **Service Based Operator (SBO) Licence:** SBOs are operators intending to lease telecommunication network elements such as transmission capacity, switching services, ducts and fibre from any FBO licensed by IDA to provide telecommunication services to third parties or resell the telecommunication services of FBOs. SBO licences may be individual or class licences, depending on the services stipulated.

### **Open versus managed number of licensees**

The IDA adopts a free market entry and exit approach and no longer pre-determine the number of licences to be awarded. The IDA evaluates the licence applications based on, but not limited to, the applicant's commitment in developing and investing in Singapore's InfoComm infrastructure, ability to deliver its proposed service and/or infrastructure commitments, and commitment to quality of service standards. All applications are treated on the basis of objective, non-discriminatory and transparent selection criteria and procedures. There may however be spectrum and other physical constraints (e.g. frequency spectrum, land for satellite and cable landing stations) which would inevitably limit the number of licences that could be issued. Where such constraints arise, the IDA awards the licences following a comparative and/or auction-based selection exercise.

## **2.4 Interconnection**

All licensees are required to interconnect with each other, whether directly or indirectly. IDA encourages licensees to enter into Interconnection Agreements through commercial negotiations where possible. For interconnection between dominant and non-dominant licensees, IDA takes a much more active role. Dominant operators are required to submit Reference Interconnection Offers (RIOs) for approval by the IDA. The IDA has developed its own models and other means for assessing RIOs, and for amending proposals as it considers appropriate. In all other cases the interconnection charges are reached by commercial agreement. IDA arbitrates on matters if the operators fail to negotiate terms.

Interconnection settlement arrangements in Singapore are governed by the cost causality principle. In the case of FM interconnection a mobile party pays regime operates. Figure 2.2 shows the charge flows for mobile originating and terminating calls resulting from the MPP regime in Singapore.

**Figure 2.2 - Originating and terminating charge flows for mobile calls**

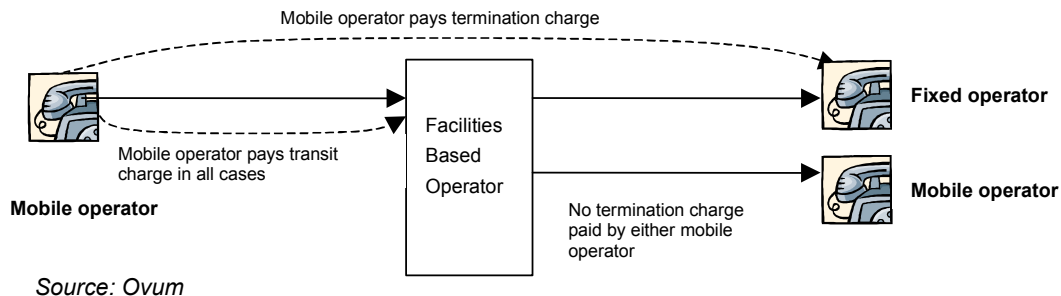
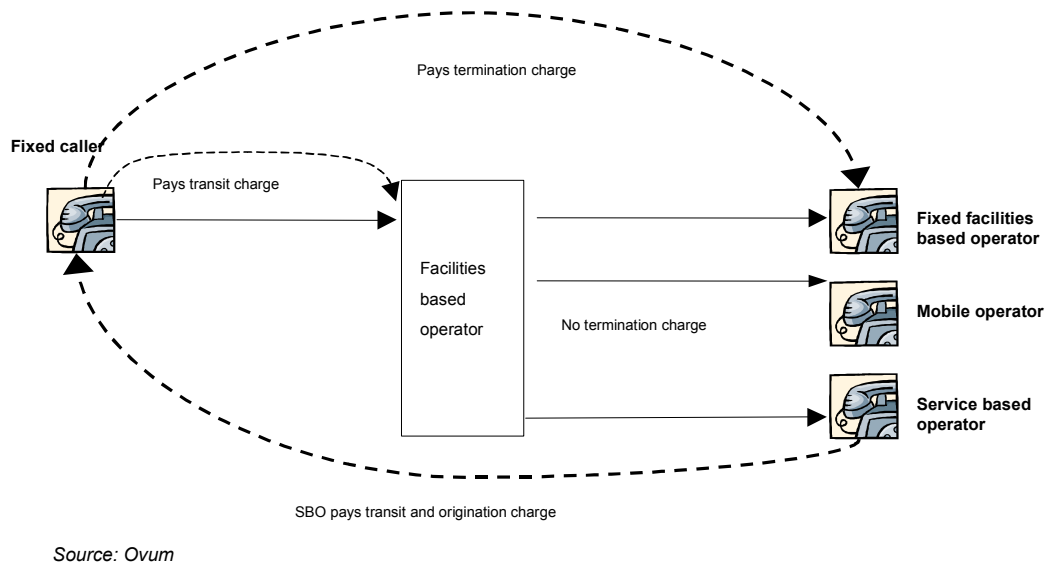


Figure 2.3 shows the charge flows for fixed originating calls in Singapore.

**Figure 2.3 - Charge flows for fixed originating calls**



## 2.5 Number Plan

The PSTN, Radio Network and IP Telephony (IPT) share the same numbering plan, which is a uniform 8-digit numbering plan implemented from 2002.

Numbers are allocated to various services under the plan according to the first digit (i.e. Numbers beginning with the digit '6' are reserved for use for PSTN service and IP Telephony (IPT) service). The structure of national numbers complies with the relevant International Telecommunication Union Standard Sector (ITU-T) Recommendations.

## 2.6 Number Portability

Fixed number portability and more limited mobile number portability are in place in Singapore. Intermodal number portability is not.

### Fixed Number Portability

Intelligent Network (IN) based routing is used for fixed number portability in Singapore, employing the Query on Release method. This method requires the Donor Network to provide an indication to the originating network that the number called is a ported number. The originating network will then query its database to determine where the call should be routed. Relevant information on ported numbers is exchanged between operators for the purpose of updating their individual databases.

### Mobile Number Portability

Mobile operators have been required to provide limited number portability since 1997.

IDA has reviewed the technical approach to mobile number portability a number of times following changes in the demand for mobile services. A call forwarding solution has been maintained to provide portability of mobile numbers.

The current forwarding systems require customers who switch operators to get new numbers. It also involves an added expense for consumers because they must pay to have calls forward from their old number to their new number. The process is cumbersome and has therefore resulted in very few customers using the service.

The IDA is currently considering implementing full, genuine number portability among the three telcos with a move to a centralised database. The IDA is reviewing industry submissions and aims to make its decision in Q2 2006.

### Porting charges

In August 2003 the monthly fees for mobile number portability (MNP) were lifted. Unsurprisingly, the response to the introduction of free MNP was muted. Churn rates for all operators remained low.

The cost recovery principles that apply are:

- The costs of setting up the number portability system or capability within each operator's network shall be borne by each operator. This includes costs of any switch software modification and operational support system upgrades to cater for number portability. The operator may not pass on these costs to the other operators requesting number portability. However, if an operator incurs costs in support of number portability implementation from which it does not benefit then it should be able to recover these costs in full from the operators who do benefit.
- The administrative costs of porting a number are recovered from the importing operator. Administrative cost refers to the costs incurred by the exporting operator or any third party operator to process the application for number portability by a customer and bring it into effect. The importing operator may choose to pass these charges to the customer or absorb the charges.

- The costs of any additional network capacity to support calls to ported numbers are borne in part by the operator that incurs them and recovered in part from the importing operator

If the operators fail to come to an agreement on the charges, IDA will determine the charges based on benchmarks computed based on LRAIC principles.

## 2.7 Universal Service

As a general rule, USO will only be imposed on Public Telecommunications Licensees designated under section 6 of the Telecommunications Act 1999. SingTel is so designated. Facilities-based operators using wireless technologies will however be required to ensure nationwide coverage and availability.

## 2.8 Retail price controls

Dominant Licensees (only SingTel to date) are required to submit tariffs to the IDA for review to determine whether they are just and reasonable. The IDA submits the tariffs to various benchmark and other tests for this purpose.<sup>104</sup>

## 2.9 Access to buildings

The Singapore *Telecommunications Act 1999* sets out the carriers rights and responsibilities in terms of property access. Part III Erection, maintenance and repair of telecommunication installations (14) of the Act states that a public telecommunication licensee has the power to enter land to make the necessary provisions for the installation of services. Additionally, the licensee has the right to install equipment on or under land or in a building in order to provide a service. A building owner requiring services from an operator must make space in the building for the operator's equipment that allows it to provide the service. Public telecommunication licensees include mobile operators. This means that fixed and mobile operators have the same rights in this regard.

# 3. EXTENT OF CONVERGENCE

## 3.1 Fixed Mobile Substitution

Despite Singapore's developed competitive mobile market, it has not experienced much access FMS compared to other mobile markets. In Singapore fixed line rental and calls are inexpensive. Consumer line rental is S\$26.25 per quarter and calls are about S\$0.014 per minute.

However, in recent years there has been substantial call substitution. In the most recent year Ovum estimates the substitution to have exceeded 12%. This is facilitated by the low cost of mobile calls which average about S\$0.12 per minute.

There are signs, however, that FMS driven by non-price drivers is beginning. Access lines have dropped 2% year-on-year. SingTel attributes some loss to second lines migrating to broadband but also to FMS.

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<sup>104</sup> Telecommunications Competition Code (September, 2005), Sections 4.4.2 and 4.4.3

### 3.2 Take-up of Personal Numbers (if any)

There are no personal numbers in Singapore.

### 3.3 Barriers to convergence

Figure 3.1 outlines the regulatory environment and its relationship with convergence barriers.

**Figure 3.1 Singaporean regulatory environment and convergence**

|  | Impediment to convergence?  |
|--|---|
| <b>Regulatory responsibilities</b><br>IDA administers communications for Singapore.  | This could result in some impediment, given detailed powers involved. |
| <b>Carrier licensing</b><br>Same arrangement for both fixed and mobile   | No  |
| <b>Interconnection</b><br>Based on regulatory approval to reference Interconnection Offers of Dominant Licensees, and individual agreements between other Licensees. | Yes - Dominant Licensee RIOs are assessed on the basis of LRAIC.      |
| <b>Number plan</b><br>Does not currently allow for special number ranges   | This could result in some impediment                                  |
| <b>Number portability</b><br>Fixed and limited mobile number portability is available for any customers. Intermodal number portability is not available.             | Arrangements for FMC number portability will need to be developed     |
| <b>Universal service</b><br>Universal service requirements are limited in Singapore. There is no indication that converged services will be included.                | No  |
| <b>Retail price controls</b><br>All Dominant Licensee tariffs must be assessed for fairness and reasonableness and filed by the regulator                            | Yes   |

Source: Ovum

## 4. PROVISION OF CONVERGED SERVICES

### 4.1 Provision of FMC services

#### Fixed mobile price bundling of service

StarHub permits customer can bundle two or more services with StarHub and this has proven extremely popular. StarHub is a full service operator, offering fixed, mobile, broadband and IT to consumers and businesses.

### **Services with converged devices**

None have been launched to date - possibly because the opportunities for price arbitrage between fixed and mobile services in some countries (e.g. In most of Europe) do not exist, to the same extent, in Singapore.

## **4.2 Broadband services with mobile potential**

### **WiFi hot spots**

Singapore is a wireless city. SingTel and StarHub boast an extensive network of hotspots around the city. There is strong competition between StarHub and SingTel for key wireless locations. Starhub has got Singapore Changi Airport and the Suntec City Convention Centre, and an agreement with The Coffee Bean and Tea Leaf chain of coffee shops in about 40 outlets around the metropolis. SingTel has a much wider network, with over 300 hotspots altogether. Additionally, SingTel works with a variety of chains such as Starbucks, Spinelli, Delifrance and Burger King to offer WiFi services. Based on these chains alone, there are about 130 hotspots.

In addition Singapore Airlines are offering in-flight wireless Internet access to passengers through the Connexion by Boeing service. By August 2005 Connexion had available in-flight wireless Internet access on 70 planes and more than 100 daily routes worldwide.

### **4.3 'Home zone' and other mobile services**

There are currently no announced 'Home Zone' services in Singapore.

### **4.4 Plans by operators for converged services in future**

There are currently no announced converged services in the future.

## **5. REVIEWS BY THE REGULATOR**

The IDA has been working with industry leaders, like Cisco, to explore possibilities and build Singapore's capabilities in next-generation network technologies to provide a ubiquitous computing environment in Singapore. The IDA and Cisco have signed an S\$18 million three-year Memorandum of Intent (MoI) to advance Internet Protocol (IP) networking in Singapore. The IDA has not initiated any reviews that specifically address FMC.

## Annex 6: Case Study - United Kingdom

### 1. CURRENT INDUSTRY STRUCTURE

#### 1.1 Fixed operators

The UK was the first country in Europe to liberalise its telecommunications market and has long been seen as a model for telecoms liberalisation. BT remains a significant player in the access market. The main competition in network access comes from the cable operators such as NTL and Telewest in the residential market. The main players are BT, Cable & Wireless, Colt, NTL and Telewest, which are national in terms of both scope and coverage. However, there are many other small players operate in this market.

#### 1.2 Mobile Operators

There are four GSM operators in the UK; O2, Orange, T-Mobile, and Vodafone. The UK has allocated five 3G mobile licenses, with licenses being granted to the four incumbents and a new entrant, Hutchison 3G. In November 2004, "3", the commercial brand of Hutchison's 3G operations, had over 2.9 million subscribers, the equivalent to 4% market share increase from 0.4% in December 2003.

#### 1.3 Level of integration

BT, the incumbent in the UK market, is an integrated operator. With alternative players coming into its traditional voice telephony market and stealing the share from its core market, BT has turned its strategic focus to broadband market and has announced an ambitious plan to migrate its entire network to a single IP platform over the next five years. The company's 21<sup>st</sup> century network (21CN) programme aims to deliver a suite of services including high speed Internet access, TV-style broadcasting, VoIP, and handsets that work on fixed and mobile networks, anywhere, on any devices, and all at broadband speed.

#### 1.4 Market shares

##### Fixed lines market share

BT remains a significant player. It accounted for 81.8% of total exchange lines as at end of Q2 2005. It also has significant share in both call and access market with 79.6% of residential and 88.9% of business fixed lines at the end of Q2 2005.

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*Figure 1 Summary of exchange lines at end of quarter by operator (000s)*

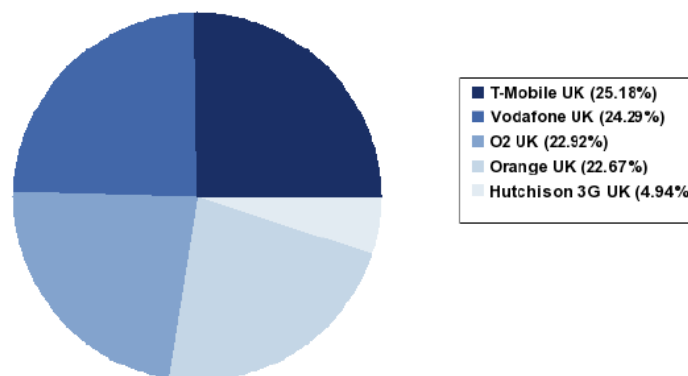
|         | All Operators | BT <sup>1</sup> | NTL & Telewest Broadband | Other Direct Access | Other Indirect Access | BT Share |
|---------|---------------|-----------------|--------------------------|---------------------|-----------------------|----------|
| 2004 Q2 | 34,384        | 28,192          | 4,884                    | 1,309               | ..                    | 82.0%    |
| 2004 Q3 | 34,013        | 27,962          | 4,751                    | 1,300               | ..                    | 82.2%    |
| 2004 Q4 | 33,748        | 27,721          | 4,728                    | 1,300               | ..                    | 82.1%    |
| 2005 Q1 | 33,550        | 27,502          | 4,746                    | 1,302               | ..                    | 82.0%    |
| 2005 Q2 | 32,943        | 26,959          | 4,682                    | 1,302               | ..                    | 81.8%    |

Source: Ofcom

### Mobile market share

By the end of June 2005, T-Mobile UK had emerged as the new market leader with 25.18% market share, largely by the fact that former MVNO joint venture partner Virgin Mobile, which leases capacity on its UK network, continued to grow throughout the year. Previous market leader, Vodafone, was pushed into second spot with 24.29% market share.

**Figure 2 Wireless network operators market share as of June 2005**



Source: Global Comms

## 1.5 Service penetration levels

There is a shift in balance from fixed to mobile traffic. Most of the growth in mobile revenues came as a result of increase mobile voice traffic. Voice calls either originating or terminating on mobile networks now account for 36% of all calls in the UK, with mobile originating voice calls accounting for over 28%. This has also been affected by the continuing reduction in dial-up Internet traffic and the growth of broadband take-up.

### Fixed line penetration

The total number of fixed exchange lines in the UK continues its slow decline. This decline reflects continuous growth in mobile-only homes, a reduction in the number of second lines for dial-up Internet access, and a significant growth in the number of DSL connections.

### **Mobile penetration**

There has been a continuing increase in the number of mobile subscriptions, giving the UK the third largest mobile market in Europe. At the end of March 2005, there were an estimated 61.1 million active mobile subscriptions in the UK, of which almost 90% were held directly by the 5 mobile network operators, giving the UK the penetration rate of 101.7%. MVNOs, while still relatively small in customer terms, are growing rapidly. Customers of MVNOs and other independent service providers grew by almost 30% over the past year to 6.7 million.

## **2. CURRENT REGULATORY FRAMEWORK**

### **2.1 Regulator**

The Office of Communications (Ofcom) became the national regulatory authority at the end of 2003 when it took over from Oftel (the Office of Telecommunications). Ofcom's role does not only include administration of telecommunications regulation, but it also administers regulation in the broadcasting and radio communications sector. Ofcom is responsible for infrastructure and content regulation, as well as enforcement of UK competition rules concurrently with the Office of Fair Trading (OFT).

### **2.2 Regulatory philosophy and powers**

The telecommunications regulators in the UK operate within the framework established by the European Commission. This framework came into force in July 2003. It is explicitly designed so that the ex ante regulation complements the ex post regulation of competition law. In particular it requires NRAs to minimise ex ante intervention and rely on use of competition law to regulate telecommunications markets wherever possible.

There is a four-stage process for deciding if ex ante regulation is justified:

- Step 1: the Commission has identified (using economic techniques of competition law analysis) a list of markets which are susceptible to ex ante regulation. This list contains markets which are not contestable. There are 7 retail and 11 wholesale markets in the current list
- Step 2: each NRA can add or remove markets from this list if national circumstances require. But it must justify its deviation to the European Commission
- Step 3: the NRA assesses each market to determine whether one or more operators has significant market power
- Step 4: for markets where an operator has SMP, the NRA imposes an ex ante remedy to deal with the market problem which SMP causes. The NRA should intervene as little as possible. So it should pick a remedy (transparency, non discrimination, etc) which is the minimum required to deal with the identified problem.

In practice this process has led to a relatively high level of regulatory intervention by Hong Kong standards. In particular in a typical member state:

- all suppliers of voice call termination services (fixed and mobile) are considered to have SMP and their call termination charges are regulated. Often the NRAs sets a cost based price for these services
- all incumbent fixed operators are required to provide carrier selection and call origination services at cost based prices
- fixed incumbents are required to offer bit stream broadband access as well as unbundled local loops (Type II interconnect)
- mobile operators escape most economic regulation. NRAs focus mainly on regulating mobile termination rates (with charges typically at HK\$0.8 per minute).

In all member states the focus is on regulating at the wholesale level in preference to the retail level.

The EU framework advises against ex ante regulation of emerging markets such as those for services running on next generation networks. This advice recognises the fact that the four step process outlined above works when applied to **established** markets but cannot be applied with any confidence to **emerging** markets, where the information required to define markets and make SMP assessments is simply not available.

EU NRAs are concerned however that, in the absence of regulation, incumbent operators will use their investment in emerging markets infrastructure, like NGNs, to re-monopolise telecommunications markets. Resolving this problem is one of the main challenges that faces the European Commission as it reviews its regulatory framework in the first half of 2006.

### 2.3 Carrier licensing

The most significant operational change for communications networks and service providers has been the ending of the licensing regime and the withdrawal and revocation of Telecommunication Act licences. Prior to the 25 July 2003, any company operating in the UK had to do so under the appropriate telecommunications licence. The process required most companies to apply to the Department of Trade and Industry (DTI) for a licence before being able to operate and supply services to consumers.

When the new EU communications regime was implemented in the UK on 25 July 2003, individual licences granted under the Telecommunications Act 1984 were replaced by the General Authorisation regime. The effect was that licences are no longer required for providing communications networks or services in the UK. Everyone is generally authorised to do so. However, the General Authorisation is subject to the General Conditions of Entitlement. These conditions apply to all persons providing electronic communications networks and services.

Individual providers may be subject to additional conditions, such as SMP conditions, which imposed as a result of a finding of Significant Market Power, access related conditions or conditions imposed as a consequence of a provider being designated as a universal service provider. Any provider that is subject to these additional conditions will have been notified individually when the conditions were imposed. For most providers, the only relevant conditions are the General Conditions of Entitlement.

#### Mobile Licensing

### *MVNOs*

Currently there is neither regulation imposed on the mobile virtual network operators nor there is obligation on MNOs to MVNOs in the UK.

### *3G licenses*

In April 2000, the British government awarded five UMTS licenses to the four existing operators and a new entrant, Hutchison 3G. The licenses were awarded via an auction, which was won by Vodafone who bid the largest offer. They were therefore awarded the largest amount of spectrum, 2x10MHz paired and 5MHz unpaired. The new entrant Hutchison 3G came in with the second largest bid and was awarded 15MHz paired and 5MHz unpaired. T-Mobile, O2 and Orange received the same amount of spectrum, 2x10MHz paired and 5MHz unpaired.

The licenses were awarded for a 20-year period of commercial service, on the condition that they reach 80% population coverage by the end of 2007. In May 2000, the Department of Trade and Industry announced that UMTS infrastructure sharing was to be permitted.

## **2.4 Interconnection**

Termination charges in the UK are rendered on the Calling Party's Network Pays (CPNP) principle.

### **Narrowband voice interconnection**

UK legislation, underpinned by EU directives, provides for designated organisations, offering publicly available telecoms networks and services to have rights and obligations to negotiate interconnection with each other on a non-discriminatory basis. Organisations notified as having significant market power (SMP) is assigned certain obligations, in particular to compensate for an imbalance in negotiating power with new entrants. The principles of SMP designation are aligned with the EU competition law concept of dominance.

Obligations on organisations with SMP include requirements for meeting reasonable requests for access to their network, for non-discrimination, for publication of a reference interconnection offer (RIO), for cost-oriented interconnection charges supported by transparent cost-accounting system, and for accounting separation in certain cases. Ofcom has designated BT as having SMP in the fixed public telecoms market, the national market for interconnection and the market for leased line.

Until 1997, Ofcom determined BT's charges for interconnection services each year using a cost model based on historical costs. In February 2001, Ofcom published the network charge controls to apply from October 2001 until September 2005. Ofcom has since made provision for these controls to continue until 30 September 2006.

The baskets of non-competitive standard services and their network charge controls are:

- tandem-layer services (local tandem conveyance and single transit) – RPI -13%
- origination and termination – RPI -15%

- interconnection specific basket (including interconnect extension circuits, in-span and customer-sited interconnection, data management amendments and PPP charges) – RPI - 8.25%
- FRIACO charges – RPI -7.5%

There is no access deficit contribution or universal service obligation (USO) charges in the interconnection services. These were explicitly excluded by Ofcom, which stipulated that access deficit charges should be recovered through tariff re-balancing. The USO charges were excluded after a study that examined the cost of USO versus the benefits that BT gained from its dominance in the UK. The study found that the indirect benefits gained by BT outweighed the cost of USO provision so the USO should be borne by BT alone.

#### **Procedure for setting and reviewing charges**

BT set its interconnection charges subject to the network charge controls established by Ofcom. BT generally reviews its charges at the beginning of the UK financial year, in April, having previously submitted a proposal to Ofcom and received approval for the new charges.

#### **Wholesale mobile**

In the case of mobile operators, the EU interconnection directive requires that cost-oriented interconnection pricing should only apply where the operator has SMP on the national market for interconnection that is combined fixed and mobile. In addition, Ofcom has introduced cost-based price caps on the mobile termination services of all national mobile operators based on competition law and consumer protection concerns.

#### **Mobile-to-Fixed termination charge**

For terminating mobile calls on BT's network, mobile operators pay the same interconnection charge as fixed network operators.

#### **Mobile termination charges**

On 1 September 2004, UK mobile termination charges were reduced further from around 8 pence per minute to 5.63 per minute for operators using 900 MHz bands, Vodafone and O2. For those using only the 1,800 MHz bands, Orange and T-Mobile, the reduction was from 9.5 pence to 6.31 pence per minute.

The new target prices will be imposed over 2 periods; September 2004 – March 2005 and April 2005 – March 2006. The same rates for mobile termination will be applied for fixed-to-mobile and off-net, mobile –to-mobile calls. Ofcom decided not to impose any ex ante price regulation on 3G mobile networks.

On 7 June 2005, Ofcom launched a consultation paper aimed at receiving opinion from the industry over a set of issues, including the current treatment of 3G termination as opposed to 2G. The UK regulator was concerned about the current asymmetric treatment of the two different technologies, which may in turn introduce a distortion in the behaviour of the market players.

At the current stage, mobile operators can charge a higher than regulated termination rate for terminating traffic over their 3G networks, whereas they are bound to respect a charge control over 2G termination. As 3G traffic grows, a similar asymmetry may favour the tendency to shift traffic over the 3G network in order to get higher revenues.

Ofcom sought the industry's opinion over the possible solutions to this problem by presenting a set of regulatory options, ranging from the complete removal of charge controls to the introduction of a blended, regulated termination charge over 2G/3G networks, no matter what technology is used to terminate the traffic.

Ofcom acknowledges a lack of information over 3G technology and market behaviour, and to this purpose is commissioning an analysis of 3G costs, with a goal to inform the debate. It expects to receive output from that study during 2006. This event, coupled with the objective to postpone the next future market review to 2006, so that new decisions will be enforced from March 2007, will probably mean that an extension of regulation to 3G networks will not take place before then.

## 2.5 Number Plan

There are 2 main regulations related to numbering plan in the UK;

- The National Telephone Numbering Plan, which sets out numbers available for allocation and any restrictions on their adoption (the Plan)
- The UK's National Numbering Scheme, which provides the day-to-day record of the status of telephone numbers in the UK (the Scheme)

### Numbering arrangement for Voice Over Broadband and VoIP services

VoB services raise a range of regulatory issues, one of which is telephone numbering. Ofcom needs to consider what the appropriate numbering resource for VoB services should be as the services can differ from traditional voice telephony by offering mobility, personal rather than household access and additional feature such as video and messaging services. They may also present different standard of quality guarantees. Ofcom proposes that numbers in the 056 range be determined as available for VoB services. Moreover, there exists a demand for a new and distinguished number range for VoIP services. Ofcom believes it would be appropriate to use numbers from the 05x range, which would also provide sufficient spare capacity for future expansion.

## 2.6 Number Portability

Fixed number portability has been available in the UK since December 1997 while the mobile number portability has been available since January 1999.

The issue of fixed-to-mobile portability was raised recently in a number portability dispute between BT and Vodafone in which Vodafone sought portability of geographic numbers for use with its Wireless Office service. Ofcom determined that BT was under no obligation to provide number portability for geographic numbers to Vodafone as the Number Portability Condition did not require fixed to mobile number portability of geographic numbers. However, Ofcom said that it would consider the policy issue raised by this dispute to modify the Number

Portability General Condition and the National Telephone Numbering Plan to encourage switching between providers and to facilitate inter-platform voice competition.

Although there is no inter-platform competition available in the UK market at the moment, Ofcom has made it clear that it regards inter-platform voice competition as desirable. In the Strategic Review of Telecommunications 2005, Ofcom noted the potential for inter-platform competition to deliver a competitive market in voice services, and proposed that it would facilitate such competition whenever possible. Ofcom emphasised the importance of fixed-mobile convergence and the importance of ensuring that VoIP services are not artificially impeded as they enter the market. It said that without the ability for consumers to switch easily, there could be no effective competition.

Ofcom's approach to inter-platform competition has been reflected in a number of tactical measures in relation to number allocation policy. For example, Ofcom has agreed to allocation mobile numbers to certain mobile services, which are delivered via hybrid fixed-mobile networks, such as BT Fusion.

Ofcom believes that number portability should be mandated in a manner that promotes inter-platform competition. A well-functioning market should therefore make switching supplier as straightforward as possible.

#### **Fixed Number Portability (FNP)**

Communications providers are required to provide number portability in relation to geographic numbers as set out in the General Conditions of Entitlement. The UK standard for handling calls to a number that has been ported is for the originating communications provider to deliver the calls to the range holder. The range holder will add the recipient network's number portability code as a prefix to dialled number and onward route it to the recipient network. Portability may be established in one direction only, but a communications provider must be able to export a number if requested by its customer.

#### **Mobile Number Portability (MNP)**

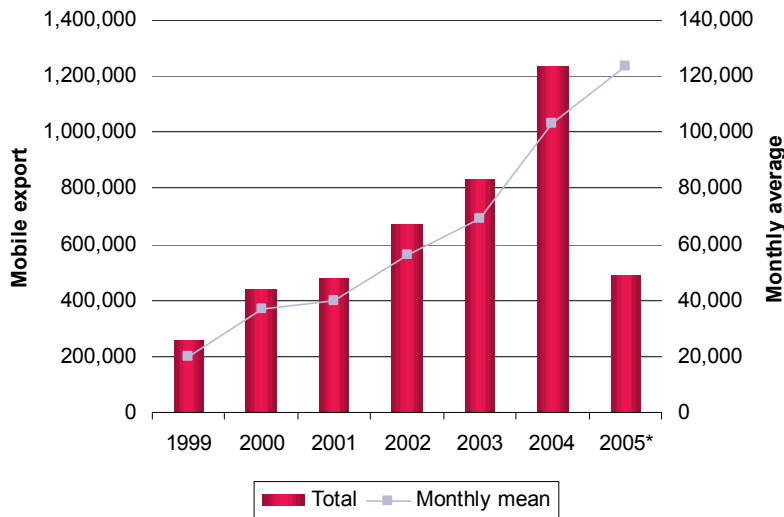
UK is one of the pioneer countries in introducing MNP. Oftel took a decision to introduce MNP in the UK at the end of 1996 following a consultation document on numbering which showed widespread support from end users for MNP. MNP was seen as a logical extension of the introduction of number portability in the fixed networks, without much distinction being drawn between the two forms of number portability.

The charging principles for MNP in the UK are as follows:

- All MNOs bear their own set up costs
- Receiving MNOs or service providers can charge end users for the cost of porting, although few do
- A donor MNO can, but does not, recover the cost of a port from the receiving MNO
- Donor MNOs can and do charge the receiving MNO 50% of the additional conveyance cost for onward routing

- Donor MNOs transfer the call termination charge received from the originating network operator to the receiving MNO.

**Figure 3 - Number of mobile number ported in the UK**



\*AS OF APRIL 2005

Source: Ofcom

## 2.7 Universal Service

The EU regulatory framework specifies the scope of universal service, the rules for choosing the universal service provider, for establishing costs and for determining how these costs are met. This specification is set out in the Universal Service Directive. So in the three EU study countries:

- universal service is defined as making basic telecommunications services available to all citizens at affordable prices
- basic service included basic narrowband telephone (which allows reasonable dial up Internet access), payphone provision, free access to emergency services, directory enquires and access for the disabled
- the universal service cost is calculated as the cost avoided less the revenue forgone by the universal service provider as a result of not meeting the universal service obligation. The cost is net of any benefits of being the universal service provider
- a universal service fund is set up only if the universal service cost is judged to be an unfair burden on the universal service provider. Of the study countries only Italy operates a universal service fund

- contributions to the universal fund are made by all operators above a certain size, normally in proportion to their net revenues. This includes all mobile operators
- there is a provision within the framework for appointing a universal service provider other than the fixed incumbent, but so far only the fixed incumbent has taken this role.

In 2005 the European Commission reviewed the universal service provisions of its framework. It concluded that arrangements should remain unchanged for the next four years but that consideration should be given at the next review to:

- changing the scope of universal service to allow mobile provision as well as fixed
- dropping payphones and directory enquiries from the scope of universal service
- meeting universal service costs out of general taxation rather through a levy on the industry

## 2.8 Retail price controls

The EU regulatory framework requires NRAs to focus regulation at the wholesale rather than the retail level. However the Universal Service Directive allows NRAs to impose retail price controls on operators with SMP in the retail voice telephony markets.

Historically most EU NRAs, including those in the study countries of Italy, the UK and Denmark, have regulated the retail price of a basket of fixed line voice telephony services using a price cap regime. There is now a general trend to remove such regulation given the growing level of competition in fixed retail voice telephony markets. But retail price caps remain in all three EU study countries. In the UK there is an RPI-X cap on a basket of services consumed by the bottom 80% of residential customers. Ofcom now plans to remove this cap, given that BT recently provided rivals with a suitable wholesale line rental product

There is no evidence that retail price controls have affected interconnect charging arrangements. Indeed the reverse is true. The interconnection charging arrangements affect the level of retail prices. This is especially true of the retail prices of fixed to mobile and mobile to mobile off net calls. Both are raised substantially by the fact that the originating operator has to pay a substantial mobile termination rate to the terminating mobile operator. In Italy the NRA regulates both the MTR and the fixed retention on FTM calls<sup>105</sup>. So, in effect the retail price of FTM calls is regulated.

There are concerns amongst EU NRAs about price bundling of fixed and mobile products by fixed incumbents and/or their mobile subsidiaries. This reflects the fact that in almost all EU member states, except the UK and Ireland, the incumbent operator has a market share of over 80% in the fixed line market and over 40% in the mobile market. However we are not aware of any explicit ex ante regulations to constrain price bundling. Instead the operators are constrained by ex post competition law.

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<sup>105</sup> The UK regulated in a similar way from 1999 to 2003

## 2.9 Access to property

The Electronic Communications Code, set out in *Schedule 2 of the Telecommunications Act 1984 as amended by Schedule 3 of the Communications Act 2003*, enables electronic communications operators to construct infrastructure on public land and to take rights over private land by either an agreement with the landowner or applying to the County Court. Land includes buildings. The rights to access property are usually subject to the approval of the Town and Country Planning Authority although the Electronic Communications Code exempts operators from certain restrictions. The Local Planning Authority needs to give permission in the case of mobile phone masts. The Electronic Communications Code covers both mobile and fixed operators.

## 3. EXTENT OF CONVERGENCE

### 3.1 Fixed Mobile Substitution (FMS)

In the UK, there is an evidence of marginal access FMS. According to Ofcom, the number of fixed lines declined by 4% from the first half of 2004 to the first half of 2005 while mobile subscribers grew by 9% during the same period. The EU residential survey found that approximately 9% of households in the UK are “mobile-only” households, and fixed line users are already making fewer calls on their fixed lines and more on their mobiles.

Moderate but steady call FMS is also evident in the UK. Fixed MoU declined by 6% to 327 minutes per month in the 2 years to December 2004, while mobile MoU grew by 7% to 95 minutes per month in the same period. According to Ovum study, the gradual call FMS in the UK will continue with the decline in the mobile premium, due to pressure from 3, as well as aggressive pricing from MVNOs. A minimal access substitution is also expected as a result of the defences put in place by BT and other access providers, as well as the growth in broadband Internet access.

### 3.2 Take-up of Personal Numbers

The National Telephone Numbering Plan designates numbers in the 070 range for personal numbering services, which allow someone to be contacted via a single telephone number, regardless of location, and to receive those calls at almost any telephone number, including mobile numbers. The personal numbering service offers a service to the person being called.

However personal numbers have not been a great success in the UK market. The take-up rate has been less than operators anticipated. One reason is the call forward charges involved.

### 3.3 Barriers to convergence

Operators that have significant market power in either fixed or mobile markets are not entirely free to offer convergent services as they please. In the UK, US and Italy, SMP operators are not allowed to pass information between their fixed and mobile divisions. Regulations in these countries are in place to prevent operators, for example, from targeting suitable customers for mobile services, based on in-house information on fixed line usage.

Currently the regulation of bundled services is partially covered via the existing retail regulations spurring from the universal service directive (USD) and partially via the use of *ex-post* competition law analysis. There is little or no trace of sector-specific *ex-ante* regulation.

Sector-specific regulation prefigures the introduction of policies to correct market behaviour in the face of actual or potential market failure. To be effective, it needs clear goals and instruments. At present, there is little policy available on bundling in Europe. However, some policy guidelines can be deduced from regulatory statement, for approving new bundles and from the market analysis conducted so far on the market for fixed services by European regulators.

So far, the majority of bundles from European incumbents have been limited to mixed bundles. This allows end users to continue purchasing the services in the bundle separately if they wish to. Given the widespread availability of sufficiently unbundled wholesale services in Europe, these types of bundles pose limited problems with respect to possible anti-competitive effects. However, they do not provide great innovation. Operators in North America and Asia have proven much more innovative than their European counterparts in adopting bundled services.

#### **Current approach by regulator to convergence**

Ofcom conducted the 2005 strategic review of telecommunications to assess the situation of the market. In fixed telecoms, it looked at the prospects for effective and sustainable end-to-end competition, which made possible by the evolution of technology. In particular, it looked at the prospects for deployment of alternative access technologies, the evolution to next generation networks, and the prospects for substitution between fixed and mobile networks.

It concluded that there is enduring economic bottlenecks in fixed telecoms networks. The location of these bottlenecks in the network varies for different customers, different services, and different geographies. For example, broadband competition based on LLU may be sustainable in large suburban exchanges, but not in small rural exchanges. The approach of Ofcom to resolve this is based on the equality of access.

As for mobile telecoms, the networks lack the enduring economic bottlenecks that found to exist in fixed networks. Competition has been sustainable between a sufficient number of networks, each providing end-to-end service to customers, to constitute effective competition. In the UK, this has also resulted in competition in wholesale markets as well as retail markets, as network operators have entered into commercial arrangements to provide wholesale access to the variety of MVNOs that have emerged in the market.

Ofcom's principal strategy to promote further competition in mobile has been through approach to liberalising spectrum policy. However, a number of mobile operators challenged Ofcom to put in place a comprehensive deregulatory agenda for mobile. The principal remaining area of economic regulation in mobile is in relation to call termination. Approaches to remove the underlying causes of SMP in call termination markets were discussed. It was noted that major change to tariff structures such as RPNP could be disruptive and confusing to consumers. The consultation conducted by Ofcom in May 2005 concluded that RPNP was an unreliable remedy as it is difficult to predict how called parties would react and, if the called parties resisted it and made limited use of these facilities, no competitive pressure would be placed on mobile termination charges. The study also concluded that it seems economically more

efficient that the cost of a consumption decision (i.e. the decision to make a call) is borne by the person who takes that decision (i.e. the calling party).

Moreover, there is some scepticism about the potential for the evolution to IP-based technologies to remove the causes of SMP. A number of mobile operators have also called for the removal of the market for access and call origination of mobile networks.

### **Fixed and mobile convergence in voice telephony**

The market reviews conducted by Oftel in 2003 identified separate markets for fixed and mobile voice and data services. Oftel concluded that fixed and mobile services are insufficiently close substitutes to fall within the same market definition. Moreover, there is some switching from voice to non-voice communications, for example with people using text messaging in circumstances where in the past they might have made a voice call.

To some extent, this may represent a shift in behaviour driven by convenience rather than price. The important issue in assessing competition is whether switching between products will increasingly take place in response to changes in relative prices, such that mobile and fixed operations become economic substitutes for voice and/or data services. If two products are sufficiently close substitutes for each to constrain the other's pricing then these are likely to form part of the same economic market.

Seventy-six per cent of households now have access to both a fixed line and a mobile. In principle, an increase in the price of fixed calling might lead a number of these consumers to substitute a mobile service (voice call or text message) for some of their fixed calls. If such call substitution were substantial it could constrain the price of fixed, with a small price rise from the competitive level being rendered unprofitable, and the two would be regarded as part of the same economic market. Currently the costs of mobile calls are significantly higher than those of fixed calls. In conducting its mobile market review, Oftel noted that mobile operators' traffic related costs are expected to remain above those of fixed networks.

Unit costs are declining both in fixed and mobile technologies. It may be that in the long term, the costs of the two platforms will converge and consumers will readily substitute between them. An important factor could be the release into the market of additional mobile network capacity as 3G networks come on line, reducing unit costs. Even if the unit cost of mobile remains higher than fixed, the difference may be sufficiently modest that consumers are willing to pay the very small premium implied for the greater convenience of mobile. However, it is still unclear whether this will happen in the UK in the next 5 years. The fixed interconnection is still stable and will be for a period of time. There is also an issue of 3G growth rate in the country.

The shift in usage patterns could go further than the scenario of consumers who have both fixed and mobile erring on the side of mobile to make individual calls. 'Platform substitution' would occur if consumers stopped subscribing to one technology altogether because they preferred another; for example, if they did not have a fixed line because they had a mobile.

An operator on one platform may extend its brand into the other platform; offering combined fixed and mobile services with a single bill and attractive bundles including both fixed and mobile minutes. Service providers without their own network infrastructure might also offer combined fixed and mobile services. Such a strategy could further increase substitution

between fixed and mobile calling, although it might perhaps hold back full platform substitution. It should be noted that service providers without their own network infrastructure are dependent on wholesale agreements with existing networks, and hence may not have complete freedom of action in terms of their pricing strategies.

Finally, there may in future be a substantial blurring of the definition of 'fixed' and 'mobile' services, with the emergence of new technologies offering limited mobility and enhanced functionality. Wireless LAN 'hotspot' solutions using 802.11 technology are currently being deployed by both fixed and mobile network operators, giving high-speed connectivity within a small area. Other limited mobility wireless technologies, such as 802.16 ('WiMax') may be deployed in future, giving different combinations of connection speed and coverage.

As these technologies are deployed both by fixed and mobile operators, and as devices become capable of connecting to different access networks in fixed, limited mobility and fully mobile environments, the services of the two types of operator could converge, and distinctions between them blur. One implication of this is that substitution of traffic between fixed and mobile could potentially take place in the opposite direction from that described above, away from mobile operators and towards fixed operators.

Figure 3.1 shows a summary of the barriers to convergence in the UK.

**Figure 3.1** *Barriers to convergence in the UK*

| <b>Aspect of regulation</b>  | <b>Barrier to FMC</b>  |
|--|--|
| <b>Regulatory structure:</b> responsibility with Ofcom   | No   |
| <b>Carrier licensing:</b> Licenses replaced with General Authorisation regime  | No   |
| <b>Interconnection:</b> Calling Party Pays applies to both fixed and mobile. Fixed termination costs and mobile termination costs are regulated. | Yes, the price differential between fixed and mobile termination rates, and the different methods of regulating termination costs between mobile and fixed will be a barrier to FMC service development. |
| <b>Number Plan:</b> Includes geographic numbers, mobile phone numbers and non-geographic numbers   | Yes, numbering for converged services will need to be addressed in the plan, although currently Ofcom does allocate mobile numbers to FMC products like BT Fusion.                                       |
| <b>Number Portability:</b> All operators appear to be treated similarly for NP purposes.   | No   |
| <b>Universal service:</b> applied to standard fixed services and payphones   | No – both fixed and mobile operators contribute. Not applicable as there has been no fund to date.   |
| <b>Retail price controls:</b> Applies to fixed only  | Yes, the asymmetrical approach could favour the development of converged services based on mobile services. However fixed controls are soon to be removed which removes this barrier.                    |

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## 4. PROVISION OF CONVERGED SERVICES

### 4.1 Provision of bundled services

Following the failures of FMC services in the 1990s, a new wave of FMC services has emerged rapidly over the past few years. From bundled fixed and mobile tariffs, dualband GSM/ Bluetooth phones to FMC enterprise solutions, the market is evolving at a fast pace. It is becoming increasingly clear that well functioning convergent solutions add real value for both business and residential customers and so offer a revenue opportunity for service providers.

So far, the majority of bundles from European incumbents have been limited to mixed bundles. This allows end users to continue purchasing the services in the bundle separately if they wish to. Given the widespread availability of sufficiently unbundled wholesale services in Europe, these types of bundles pose limited problems with respect to possible anti-competitive effects. However, they do not provide great innovation. Operators in North America and Asia have proven much more innovative than their European counterparts in adopting bundled services.

FMC services are mostly associated with an integrated device for the different services (mobile and fixed voice), and provide a seamless experience so that the end user perceives it as one service experience. These types of FMC services are the most innovative, and when offered by a fixed incumbent with a dominant market share like BT, it can expect the highest level of regulatory scrutiny.

#### BT Fusion

BT Fusion is a seamless fixed-mobile convergence product for the consumer market, and the technology works. The key to BT's overall convergence strategy is to get the hub into the home. The delay to this product has affected its impact. For example, had Fusion launched 2 years ago when this was first aired then it would have had much more success in the market. However, players like 3 have driven down mobile voice tariffs in the UK and fixed-to-mobile traffic substitution has moved on significantly. This means that UK mobile users are used to relatively cheap mobile voice minutes which can be used to make calls at any time to any network.

BT had its first attempt at an FMC product, a DECT/ GSM phone service called Onephone in 1999 but this failed. BT then began its Bluephone project in 2003 but experienced a number of delays. As of December 2005, there were over 20,000 customers registering interest in BT Fusion.

The BT Mobile and Fusion number range is currently a sub set of Vodafone's numbers, although Ofcom will allocate mobile number specifically for this service in the near future.

#### The Fusion concept

Fusion is designed for the handset to work as a standard GSM phone when out of the home environment but as the user enters the home zone the phone connects to a BT hub through

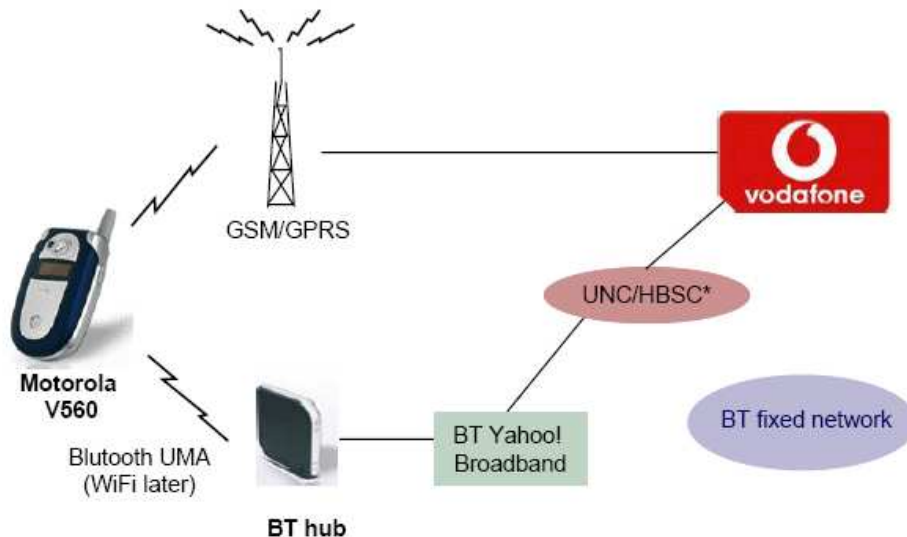
Bluetooth UMA. Calls are then routed via the broadband line and calls to UK fixed lines are offered at comparable rates to standard BT landline call charges.

From the user perspective, the aims of Fusion are to provide cheaper calls when in the home zone and better in building voice coverage. It also gives a seamless customer experience, regardless of whether the user is using the cellular network or in the home using the hub and broadband line. Moreover, it provides users with the convenience of a single device, which holds their personal address book.

Users know when they are in the home zone area and able to make cheaper calls as a blue symbol appears on the menu screen. If a caller is on the phone as they enter or leave the home zone, a short beep will sound to alert the user that the call has been handed over. However, it should be noted that at launch, callers are to be billed at the rate of where the call was started.

Fusion has a seamless handover from the cellular network to the BT hub in the home. This means that calls are not dropped when leaving or entering the home zone. Another interesting feature is that Fusion has a signalling timer. This means that if users are using UMA in the home zone and move out of range onto GSM coverage and then back to UMA, there is a 2 minute timer which has to expire before you are handed back to the UMA base station. This was imposed by Vodafone to conserve signalling. A situation where this could arise is when the phone is being used whilst moving but in the vicinity of the home.

**Figure 4.1 - BT Fusion**



Source: Ovum

\* sits in either the mobile or fixed network

## BT Fusion Tariffs

As BT Fusion is considered a mobile service, all numbering, interconnection and call charges are structured like UK mobile services. It offers bundles of inclusive minutes; £10 per month for 100 minutes or £15 per month for 200 minutes. Fusion customers can use their inclusive minutes for any calls made to a mobile number in the UK and to any fixed number when the call is made outside the home using the Vodafone network.

Calls made when in the home to an UK fixed line are not included in the bundled minutes. They are charged additionally at BT Option One fixed standard rates at either £0.03 per minute peak (weekdays during the day) or £0.055 per hour for the first hour, then £0.01 per minute off peak (evenings and weekends).

The Fusion tariffs also include the BT Mobile option of free quick calls home. This means any calls made when out of the home back to the nominated BT fixed number in the home are free of charge if they are under 2 minutes long. BT is subsidising the handset and hub, providing both free of charge. In the early launch phase, customers will also be able to have a second handset free of charge but with an additional monthly subscription attached to it. Fusion comes with a 12-month contract.

Regarding interconnect charges, they are currently collected by Vodafone and are set at the same rate as Vodafone's interconnection charges. A proportion of these revenues is then passed back to BT but it is not publicly known how much.

## **4.2 Broadband services**

Most of the incumbents consider WiFi as key wireless bearer to provide high-speed wireless data connections to business users in particular. Fixed operators without mobile activities are facing fixed to mobile substitution and provides WiFi services in order to enhance the attractiveness of their fixed services through the supply of packages for residential users and SOHO (DSL at home + WiFi in public hotspots). But the main targets remain business users and travellers.

### **BT WiFi**

BT considers WiFi as a key technology for future. As BT does not own a mobile business since its de-merger of BT Wireless, the UK fixed incumbent considers WiFi as key technology to enhance the attractiveness of its fixed services and a way to fight against "Fixed to Mobile substitution". Compared to 3G, BT considers its WiFi offering is ten times less expensive per downloaded MB and five to ten times faster than 3G.

An illustration of BT's involvement in FMC was the launch of BT Fusion, a service for residential users based on UMA technology and using Bluetooth in its initial stage. Later it will be based on WiFi. BT also plans to launch a voice-over-IP version of its Fusion fixed and mobile convergence service for enterprises next year when it expects to have sorted out existing technical and billing challenges.

### **BT Openzone's WiFi Network**

BT is providing WiFi services in the UK through BT Openzone since August 2002. BT Openzone owns a WiFi network composed by 1,500 public hotspots and has wholesale

agreements with The Cloud for around 5,500 additional hotspots in the UK. BT Openzone considers that 90% of UK hotspots are accessible from its services.

BT has set up partnerships with site owners such as British Airways, BMI, McDonald's, and rail stations. BT also partners with local authorities to deploy "WiFi lakes". BT also provides "hotspot in a box" solutions for SOHO and consumers.

BT Openzone uses Cisco's WiFi equipment for the main hotspots (hotels, airports) and NETGEAR for "hotspot in a box" products. BT has also installed WiFi access points on the top of BT's public Payphones.

### **The Cloud**

The Cloud first deployed its WiFi infrastructure in the UK where it now operates around 5,400 hotspots nationwide out of which 300 are located in London. The Cloud has wholesale agreements with BT Openzone and O2 UK. In April 2004, The Cloud mentioned a WiFi usage growth of 7% per week in the UK. Business users generate most of the traffic.

## **4.3 Broadband services in general**

Broadband continues to be the lead story in the telecoms sector. By June 2005, there were a record 8.1 million broadband connections in the UK. The growth in broadband connections has driven the uptake of products and services that are either unique to broadband or that provide a far more satisfying user experience at faster broadband speeds.

BT's competitor DSL ISPs have been rapidly gaining market share over the past 2 years, to a point where they now comprise 47% of all broadband connections, and the cable companies have a combined 28% market share of broadband. BT's Fusion fixed-mobile product is expected to be only the first step in the convergence of fixed and mobile platform. A number of key enabling factors will facilitate development of fixed-mobile convergence, notably;

- The emergence of handsets with multiple transmission protocols (GSM/ WCDMA/ WiFi/ WiMax)
- The growth of VoIP offerings over fixed broadband and WiFi platforms
- A move towards all IP-transmission of voice and data over mobile networks

There are 2 major cable operators in the UK which have been merged recently which are NTL and Telewest. Together they have 2,028,566 users as of December 2004.

Other operators include Easynet, Demon, Virgin.Net and ClaraNet. As of December 2004, there are 4,193,000 and 1,491,000 DSL lines in the incumbent DSL and incumbent retail lines, respectively. Number of LLU lines is 10,900 and 16,900 for shared access lines. As for broadband FWA, there are approximately 10,000 users.

### **Other Technologies**

#### ***BWA technologies***

- **IP Wireless UMTS TDD technology:** used by UK Broadband in London (Thames valley) using the 3.4GHz band

- **WiMAX (or Pre-WiMAX):** used by Libera (Bristol, 5.8GHz band, 2 base stations), Telabria (Kent, 5.8GHz)
- WiMAX trials: Pipex is testing Navini's equipment, BT is testing Navini's equipment
- WiBro: BT is testing Samsung's equipment

#### **4.4 Plans by operators for converged services in future**

##### **BT**

BT plans to launch the consumer services first with the Enterprise solution to follow once the dual-mode WiFi handsets are available in 2006. BT has announced that it is working with Nokia, Samsung and Motorola to launch 6 WiFi UMA handsets by mid 2006.

##### **Cable & Wireless**

Cable & Wireless has been focusing on encouraging the migration to a converged communications and computing IP-based infrastructure, using a range of solutions developed through its C&W Integrate model, which was launched in July 2004. C&W acquired ISP Bulldog Communications in May 2004 and 4 months later it had launched a 4 MBIT/s DSL service (which has been upgraded to 8Mbit/s in June 2005) packaged with fixed line rental and calls in unbundled areas.

Initially confined to Greater London, coverage has been expanding rapidly, with 400 unbundled exchanges by the end of May 2005. Bulldog plans to unbundle 800 exchanges by the first half of the 2006/2007 financial year, giving coverage of 52% of the population.

##### **Orange & Wanadoo**

In August, Orange announced that its UK mobile customers could benefit from a discounted broadband service from Wanadoo. New subscribers can get up to 2Mb per month for £9.99. The offer is also open to existing subscribers provided they sign a new mobile contract with Orange. The Wanadoo service is called Wireless & Talk, and it is the first product announcement since France Telecom unveiled its NexT convergence strategy in June 2005.

This is a form of bundling, but customers are still purchasing two separate services with separate charges. However, Orange is offering a discount to customers that sign up for both services. The broadband deal is good value at 2Mb per month, and customers also receive a VoIP service as a second line, although they are still required to pay the BT line rental.

This product is the first small step in Orange's convergence strategy. Next, Wanadoo will be branded Orange and expect to see the first Orange FMC product, along the lines of BT Fusion, in France by early next year.

## **5. REVIEWS BY THE REGULATOR**

### **5.1 Reviews by regulator into convergence and related issues**

Ofcom believes that the fixed-mobile convergence is a crucial issue in the market. The current regulation is justified by significant market power within the market and the existing

approached is based on separate fixed and mobile markets for call origination. There is already a clear evidence of replacement activity. If and when this occurs, it could lead to significant regulatory withdrawal.

Fixed market requires more attention in terms of FMC-related regulation since it has little prospect for further cable roll out. The proposed principles for telecoms regulation suggest to Ofcom that it should

- Promote competition at the deepest levels of infrastructure where it will be effective and sustainable
- Focus regulation to deliver equality of access beyond those levels
- As soon as competitive conditions allow, withdraw from regulation at other levels
- Promote favourable climate for efficient and timely investment and stimulate innovation, in particular by ensuring a consistent and transparent regulatory approach
- Accommodate varying regulatory solutions for different products and, where appropriate, different geographies
- Create scope for market entry that could, over time, remove economic bottlenecks
- In the wider communication value chain, unless there are enduring economic bottlenecks, adopt light touch economic regulation based on competition law and the promotion of interoperability.

Ofcom has identified a number of key FMC-related issues that have to be resolved in the near future, including Significant Market Power, spectrum, and universal services.

### **Significant Market Power**

Before a market power determination may be considered, Ofcom must identify the markets which are the ones which in the circumstances of the UK, are the markets in relation to which it is appropriate to consider such a determination and to analyse that market. In identifying relevant markets, Ofcom is required to take the utmost account of all applicable guidelines and recommendations issued by the Commission.

SMP has been defined so that it is equivalent to the competition law concept of dominance. Specifically, the Framework Directive states that *"an undertaking shall be deemed to have significant market power if, either individually or jointly with others, it enjoys a position equivalent to dominance, that is to say a position of economic strength affording it the power to behave to an appreciable extent independently of competitors, customers, and ultimately consumers."*

In general, Ofcom does not believe that the fixed mobile market has already converged. Rate of substitution is still uneven between demographic groups. A convergence of costs is plausible as all platforms move to IP. However, actual pricing depends on allocation of fixed costs and operator strategies. Moreover, the non-price factors such as handset functionality make it difficult to model. The SMP issue, therefore, needs to be monitored carefully to ensure that market boundaries remain appropriate.

## **Spectrum**

The UK is going down the road of market mechanisms for spectrum trading (spectrum may be bought and sold at market value), and spectrum liberalisation (reduces conditions associated with specific frequencies). This liberalisation should help remove the artificial regulatory barriers to fixed-mobile convergence. As concepts, these are perhaps more popular with innovators and new entrants than they are with the incumbents.

## **Universal Service**

In the past, the universal service issue has been relatively straightforward. This may well still be the position today but tomorrow's market offers a wider perspective. The current approach to universal service requirements is becoming obsolete and may need new arrangements for funding and provision. Currently, USO specifies fixed connection, which may no longer be appropriate. However, there is no plan for Ofcom to ask mobile companies to deliver USO.

## **Other Issues**

There are a number of other issues that will influence the development and provision for FMC. The key priorities are data protection (enforced by the Information Commission not Ofcom) focussing specifically on the use of traffic and location information, subscriber directories, numbering, digital rights, VoIP, standards, and next generation networks.

## **5.2 Stakeholder responses**

There were around 100 responses from operators, vendors, consumer and industry groups to the 2005 Strategic Review conducted by Ofcom regarding the FMC provision. There is a broad agreement that markets have not converged and the respondents mostly agreed on the principles proposed by Ofcom with a few exceptions. Many respondents thought that Ofcom should encourage convergence.

The respondents' proposals included

- Obligation on mobile operators to provide wholesale network access
- Complete withdrawal from mobile call termination regulation
- Many of the mobile operators argue that it is no longer appropriate for Ofcom to regulate mobile call termination at all. T-Mobile and 3 argued that new technologies such as VoIP handsets, WLAN termination and push-to-talk services are generating competitive pressures on termination rates.
- Measures to prevent BT leveraging dominance in fixed markets into the mobile market
- Mobile USO and mobile contribution to USO fund

## **5.3 Outcomes**

After conducting the 2005 Strategic Review and integrating the responses from the market, Ofcom believes that regulation should not push convergence. Fixed and mobile substitution is not an inherently virtuous outcome. Ofcom stated that regulators should be concerned if current pricing remains above cost in a way which is not justifiable. Ofcom also pointed out

that the right way to address this is to create the scope for competition to erode such pricing. With sufficient competition, consumers will decide the right pricing mix.

#### **5.4 Plans to address convergence issues**

Ofcom has identified the formal and informal activities as next steps to approach convergence issues.

##### **Formal activities**

- Conduct Strategic Review of Telecoms Phase 3 Regulatory Proposals
- Voice call termination on mobile networks market review
- USO consultation and review
- European USO Directives review
- Risk and cost of capital consultation and review

##### **Informal activities**

- Listen to and consult with industry
- Monitor changes in services, markets and citizen consumer attitudes
- Identify potential areas for regulatory withdrawal
- Identify potential threats to competition

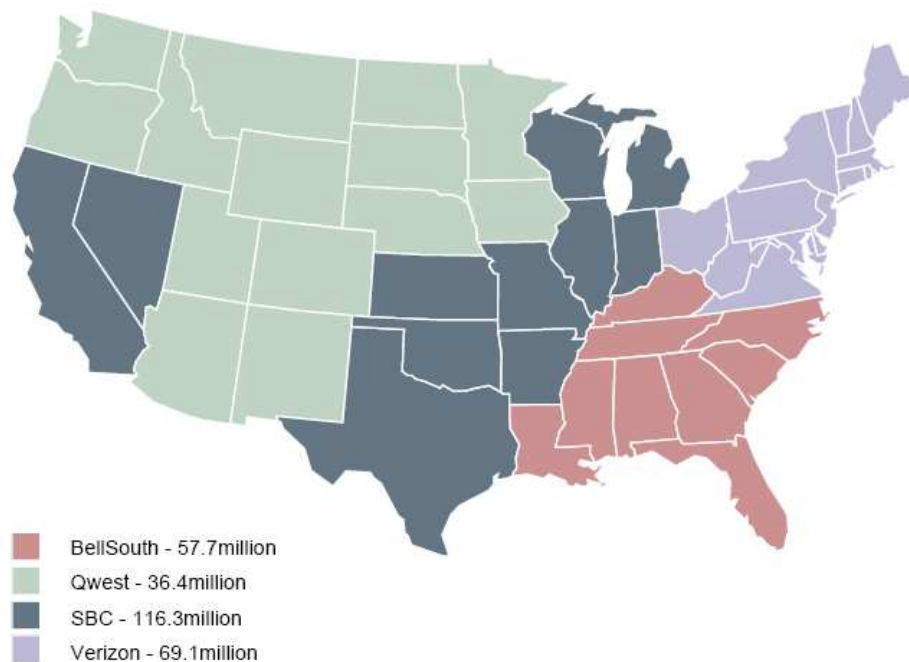
## Annex 7: Case Study - United States

### 1. CURRENT INDUSTRY STRUCTURE

#### 1.1 Fixed operators

The US telecoms market is one of the most deregulated in the world. The long distance and international markets have been liberalised since AT&T's divestiture in 1984. AT&T was broken up into a long-distance operator, which retained the AT&T name, and seven incumbent local exchange carriers (ILECs), also referred to as the 'Baby Bells' or the 'regional Bell operating companies' (RBOCs). The structure of the industry has changed considerably since the passage of the *1996 Telecommunications Act*, which permitted long-distance carriers to move into local markets, and local carriers to move into long-distance markets.

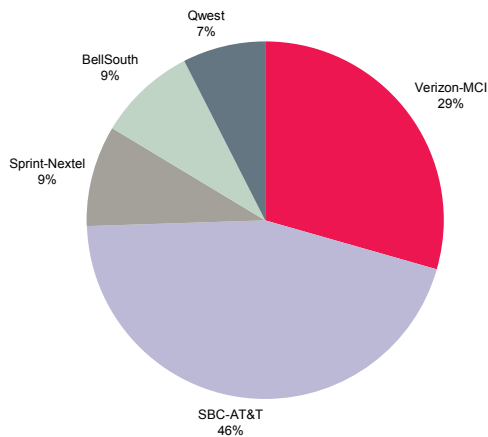
**Figure 1 Regional franchise areas of the four RBOCs**



Source: Ovum

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**Figure 2 US wireline market share, 2005**



Source: Ovum

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## 1.2 Mobile Operators

The US was one of the first countries to introduce mobile communications, and as of June 2005, it boasted more than 190 million subscribers. The mobile industry in the US has one key characteristic: the 'called party pays', or 'receiving party pays', principle, which is still dominant. PCS licences were awarded in 1997.

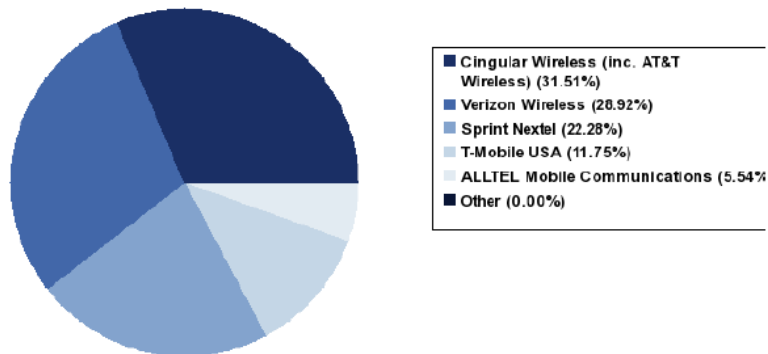
Mobile competition takes place on a regional, rather than a national basis. Mobile operators are only awarded local concessions, which mean that roaming agreements are required to provide national coverage.

In 2004, the US market was dominated by the 'big six' national wireless operators: Verizon Wireless, Cingular Wireless, AT&T Wireless, Sprint PCS, Nextel and T-Mobile. With a combined market share of over 80% of US wireless subscribers, these operators share the advantages of national coverage, long-term operating experience, a large embedded network and customer support infrastructure. Some also benefit from ties to fixed-line parent companies.

The acquisition and merger activity in the market has changed market dynamics. With the acquisition of AT&T Wireless by Cingular, and the merger of Sprint and Nextel, due to be complete at the end of the year, the market will have four main operators instead of six. Now the market has three big players: Cingular, Verizon and Sprint, who are roughly the same size, with over 40 million subscribers each. T-Mobile, the smallest of the operators, had 18.2 million customers at the end of 2004.

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**Figure 3 Wireless network operators market share (June 2005)**



Source: Global Comms

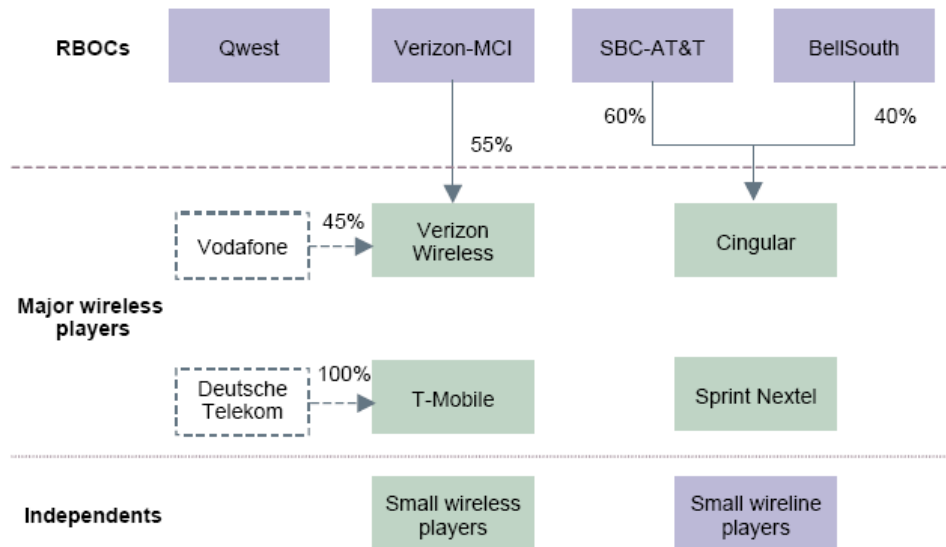
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### 1.3 Levels of integration

The mergers of early 2005 add a new twist, as the two largest long-distance companies are folded back into the RBOC mix, including 'Ma Bell' herself – AT&T. Sprint, the third-largest long-distance carrier, is merging with Nextel, sealing the fate of the stand alone long-distance company. These moves also eradicate the easy distinction between incumbent local exchange carriers (ILECs) and inter-exchange carriers (IXCs) that existed until recently, since two companies will now contain large elements of both.

All of this consolidation leaves:

- four integrated wireline/wireless players:
  - Verizon-MCI, including a stake in Verizon Wireless
  - SBC-AT&T, including a stake in Cingular
  - BellSouth, including a stake in Cingular
  - Sprint-Nextel
- one almost entirely wireline business – Qwest
- one stand alone wireless business – T-Mobile
- a number of smaller wireline and wireless players, such as Alltel, CenturyTel, Citizens Communications and others.

**Figure 4 Market structure post-consolidation**

Source: Ovum

## 2. CURRENT REGULATORY FRAMEWORK

### 2.1 Regulator

#### National regulatory authority

The Federal Communications Commission (FCC) was established in 1934 to supervise communications policy within the US. The FCC's responsibilities include all domestic and international telecommunications services; television and radio broadcasting; cable television broadcasting; amateur radio; type approval of telecommunications and radio equipment; and spectrum management for communications systems.

Telecommunications services within individual states are formally the responsibility of the state regulatory commissions, often known as public utilities commissions (PUCs). Through its supervision of common carriers' tariffs and access to numbering and frequencies, the FCC retains significant influence over the provision of local services.

#### National competition authorities

The investigation of anti-competitive behaviour can be carried out by either federal or state authorities: if the activity in question is limited to a single state, then the state regulator will take responsibility; if the activity affects more than one state, federal bodies will investigate.

The Department of Justice (DoJ) Anti-trust Division is responsible for enforcing the rules of the free market and preventing damage to consumers resulting from 'anti-competitive' activity at the federal level.

A second federal agency with responsibility for investigating anti-competitive behaviour is the Federal Trade Commission (FTC), which was established by the *Federal Trade Commission Act* of 1914. It is required to investigate and prosecute all unfair methods of competition in interstate commerce.

## 2.2 Regulatory philosophy and powers

US regulation is very different to Europe. The 1996 Telecommunications Act continues to make a distinction, embedded in the original act of 1934, between;

- common carrier services of Title II of the Act (which includes all fixed line services) and radio communications services of Title III of the Act (which includes all mobile services)
- basic fixed telecommunications services and enhanced services which includes Internet services.

This distinction is coming under increasing pressure as technologies develop and IP based services displace circuit switched common carrier services. So there is now considerable debate on when and how to revise the 1996 Act to get rid of these increasingly artificial distinctions.

In contrast the regulatory framework in the EU is already technology neutral in the rules it applies to fixed and mobile markets.

The US regulation is also different in that the courts play a much more prominent part in the development of telecommunications regulation than in the EU. In many cases the FCC makes rules and operators challenge them in the courts, often with considerable success. So for example:

- in the late 1990s the FCC required the incumbent local carriers (ILECs) to sell access and local conveyance of voice calls to rivals at a 50% to 60% discount to the retail price. This is known as the UNE-P product
- the ILECs appealed the ruling in the courts
- in 2004 the courts finally overturned the FCC ruling
- the FCC has now swung in the opposite direction - away from the service based competition supported by UNE-P and towards pure infrastructure based competition. In particular it has ruled that the ILECs will not have to provide access to their fibre-to-the-curb or fibre-to-the-home investments on regulated terms. Nor do they have to provide alternatives to unbundled local loops when these local loops are replaced by fibre.

## 2.3 Carrier licensing

### Mobile licensing

In June 2006, the FCC will hold an auction for Advanced Wireless Services (AWS). The spectrum to be auctioned will include spectrum allocated for 3G services. The licences for this spectrum will be issued on a 15-year term. The winning bidders in the auction will not be obliged to use 3G technologies but will be able to decide whether they want to use the

spectrum for this service or other digital services. Currently in the US, some operators have launched 3G services using EV-DO and CDMA2000 1xRTT technology.

### **PCS licensing**

The introduction of PCS licences in 1997 increased the potential number of mobile operators within each area to five. Licences for PCS services were offered through an auctioning process. For the purpose of licensing, the US was divided into a number of major trading areas (Mats) and a number of basic trading areas (Bats). Each licence permitted a mobile carrier to establish a home service area within the MTA or the BTA that the licence covered. A home service area defined the boundary of the local services with respect to mobile carriers. Mobile operators, like ILECs, can only offer services within local areas defined by their licences. They are perceived as 'co-carriers', co-existing with ILECs to provide local services.

The regulations imposed upon ILECs for long-distance calls also apply to mobile operators, so mobile operators are unable to carry long-distance traffic. Instead, nearly all mobile carriers have introduced equal access pre-selection, and mobile subscribers can select their own long-distance providers.

## **2.4 Interconnection**

### **Narrowband voice interconnection**

#### **Basis for setting charges – local communications**

State-wide regulators (PUCs) have always focused on the 'equivalent facility', hence allowing mobile providers to recover the 'equivalent' of the ILEC cost of local switching.

#### **Basis for setting charges – long-distance communications**

The focus is on the interconnect arrangements for inter-LATA interstate calls, since they form the bulk of interconnect payments. One part of the Access Reform Order was implemented, marginally changing the charges that long-distance companies pay to LECs.

The two forms of interconnect service that an IXC may require are:

- inter-LATA interstate calls. These account for the majority of calls that an IXC carries
- inter-LATA intra-state calls. These account for around 20% of an IXC's traffic.
- Under the May 2000 access charge reform, the interconnect charges are made up of:
  - a carrier common line (CCL) charge per minute for originating and terminating calls. This is intended to contribute to the cost of providing the local loop (that is, access deficit contribution). Some states have removed this charge. All the operators we study have now removed this element from their interstate charges
  - a dedicated port charge
  - a tandem switched interconnection charge to cover the costs of carrying the terminated call from the point of interconnection to the local switch. The charge has four components:
    - a per-minute charge for terminating the call

- a per-minute per-mile charge for carrying the call
  - a per-minute charge for tandem switching
  - a per-minute residual transport interconnection charge (TIC). This component, unlike the other three, has no cost justification. It was originally included to insulate LECs against loss of interconnect revenues following the restructuring of the transport charge in 1992, and is regarded as an interim measure. Some states have removed the charge. Many operators have now removed this element from their interstate charges
- a common trunk port charge
  - a common multiplexing charge
  - a per-minute end-office switching charge. This is designed to cover the LEC's cost of operating the terminating local switch for the call.

#### **Procedure for setting and reviewing charges – long-distance communications**

Traffic-sensitive components for switched-access services are subject to a price cap of retail price index (RPI) minus  $x$ . Following the May 2000 reform, the  $x$  factor will gradually reduce to zero as the average traffic-sensitive charges reach specific 'floor' rates fixed by the FCC. Once average traffic-sensitive rates reach the target levels, the  $x$  factor would equal inflation and switched-access rate caps would be frozen.

The *1996 Telecommunications Act* introduced a monthly charge to apply to all originating traffic, and was meant to replace the CCL charge (which applied to both originating and terminating traffic). IXCs had to pay this charge (the pre-subscribed inter-exchange carrier charge, or PICC) to the ILECs to help them recover the costs of providing the local loop to the customer. The May 2000 order removed the PICC charge and allowed the ILECs to recover these costs directly from the customers through a charge on their monthly bill.

These modifications to the interconnection and common line charges have not been implemented in every state due to resistance to change.

#### **Cost model for RIO**

A form of LRIC methodology is used to set interconnection charges. This methodology – defined as total element long-run incremental costs (TELRIC) – uses a regulated return on capital expenditure of 11.25% to set the charges. Initially, most LECs have not had time to make their TELRIC estimates for their network charges; instead, many have either used the proxy charges suggested by the *1996 Telecommunications Act* or the charges suggested by the Hatfield model (which calculates the network charges on a state-by-state basis).

#### **Mobile termination charges**

Because of the 'receiving party pays' system, there are no mobile termination charges in the US.

However, because of the reciprocal compensation rule for local traffic, mobile operators do receive some traffic-related tariffs from the fixed operators every time they terminate a call on their networks.

In the US, most of the traffic terminating on a mobile network is local, which means traffic generated in a major trading area (MTA – the licensed home area of a mobile provider) and terminating within a LATA (local traffic) and within a state (intra-LATA intra-state). To this type of traffic, the principle of 'reciprocal compensation' applies. This principle applies to both fixed-to-fixed and fixed-to-mobile interconnection.

Reciprocal agreements between mobile operators and ILECs are not disclosed. We can assume that the cost of local (end-office) switching as provided by ILECs in their state tariffs for intra-state inter-LATA traffic represents a good approximation of the charges paid by fixed operators as a reciprocal compensation to mobile operators in the US.

### **National Roaming**

Roaming can be done manually - in which a subscriber establishes a relationship with the host carrier, usually by providing a credit card number - or automatically, in which the subscriber does nothing more than turn on their telephone. Automatic roaming requires a contractual agreement between the respective operators.

Any 'covered CMRS' carrier must provide mobile radio services upon request to any subscriber in good standing, including roamers, while the subscriber is within any portion of the licensee's licensed service area, and assuming that the subscriber is using technically compatible mobile equipment. The rule only mandates that carriers offer manual roaming, and does not require provision of automatic roaming. However, most mobile operators have reached automatic roaming agreements among themselves.

Operators such as AT&T, Nextel and Verizon have also developed nationwide 'footprints' and wide-area calling plans that give their customers the ability to receive services outside their local area without paying roaming charges. However, some local and regional operators have alleged that they have been unable to enter into roaming agreements with competing carriers. Consumers' ability to roam may also be limited because they can only roam on networks that use the same technical standard (CDMA, TDMA, GSM or Iden) as the home carrier.

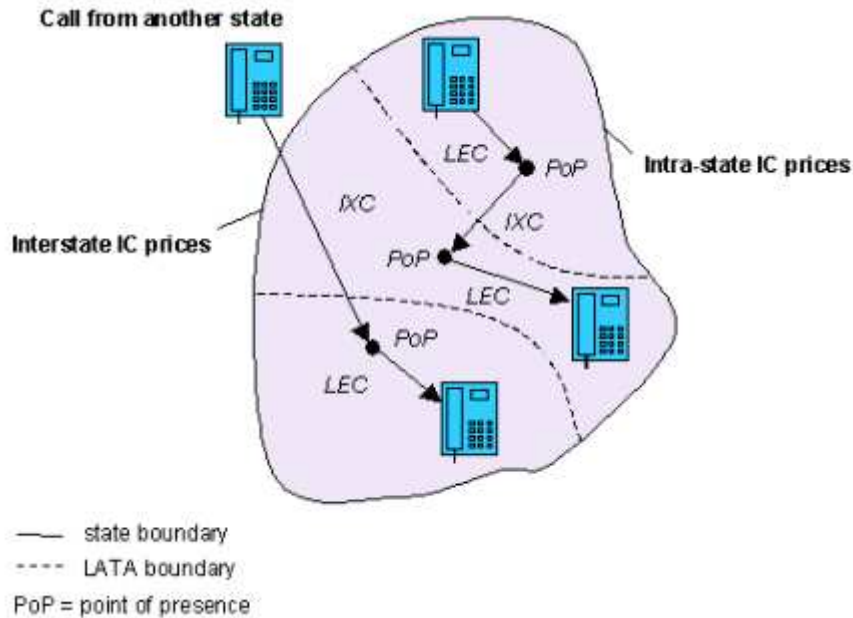
The charge for mobile roaming is set at a representative retail tariff by the mobile operator that donates the network. There is also a surcharge of \$0.50-0.80 per day and a mark-up for the roaming service; these are added to the subscriber's bill.

### **Interconnection links between operators**

An IXC has to establish a point of interconnect in each LATA that it wishes to serve. AT&T has around 30 points of presence per LATA; other IXCs have significantly fewer. The point of presence is then interconnected to a serving wire centre of an LEC, using entrance facilities. The LEC's serving wire centre is often a local switch, and so some calls are terminated directly from this switch over the relevant local loops. Most calls, however, require transport to the terminating local exchange (or end office). This is done either through direct end-office trunks or through tandem switching.

Figure 5 shows the traditional way that an IXC interconnects with an LEC for call origination and termination services.

**Figure 5 US inter-state and intra-state interconnect architecture**



Source: Ovum

For setting up points of interconnect with the LECs, mobile operators have the same options as IXCs. Under the terms of the interconnect agreement, the mobile operators have to pay the full charge for the entrance facilities.

In February 2000, Sprint PCS filed an analysis of traffic-sensitive costs for CMRS providers of terminating local calls originating on LECs' networks, and requested the FCC to consider rules that would mandate the recovery of such costs. The issue is still pending review.

### VoIP

In May 2005, the FCC enforced an emergency call obligation on VoIP providers. All VoIP services capable of receiving and terminating calls on a public switched network should provide end users with access to the enhanced 911 (E911) emergency service. This means that VoIP providers must deliver 911 calls to local emergency operators as a standard feature. VoIP operators will have to find a way to identify the location of the caller, since most VoIP users are nomadic and access the services from different locations. This represents one of the first attempts to regulate VoIP services.

## 2.5 Number Plan

Mobile numbers in the US belong to the same geographic numbering plan as fixed numbers. This means that the prefix of a mobile phone number is associated with a particular geographic location and the network operator delivering the call can route it to the mobile switching centre on the mobile terminating network closest to the called party.

## 2.6 Number Portability

Since November 2003, Wireless Local Number Portability (WLNP) has been available in the top 100 MTAs. That is within the largest 100 MTAs, customers have been able to port their numbers between wireless carriers, and to and from wireline carriers as well. From 24 May 2004, customers in areas outside the 100 largest MTAs have also been able to port their numbers.

There is an issue relates to the disconnection of central office codes assigned to carriers that no longer provide service or plan to discontinue service. Local number portability has made the process significantly more complex. In areas where local number portability has been implemented, central office codes assigned to carriers discontinuing service often contain numbers that have been ported to other service providers. If numbers have been ported, disconnecting the code disables the default routing path, causing some calls to the ported numbers to fail. The North American Numbering Plan Administration, therefore, resolved the problem by finding a new home for ported telephone numbers associated with the returned codes. This resulted in a 99% success rate in 2004. Mobile number portability (MNP) has been the only area that the FCC has intervened to regulate.

The FCC originally mandated the implementation of MNP by 30 June 1999. MNP will require mobile operators to be able to sustain:

- mobile-to-mobile porting
- mobile-to-fixed porting
- full national roaming
- porting of all services (such as emergency calls and SMS).

The implementation is currently blocked by appeals by mobile operators in the federal courts.

## 2.7 Universal Service

The scope of universal service is rather different in the US. When compared with the EU:

- there is no requirement to provide payphones but
- there is a requirement to fund telecommunication provision to schools, libraries and health care centres

This second provision has come under considerable criticism from many economists who believe it constitutes a highly distorting tax.

In June 2005, the FCC launched an enquiry into the universal service fund (USF) to determine whether it needs to change the management of the USF, so that it can be used more effectively and not be subjected to waste, fraud or abuse. The investigation has arisen after the E-Rate programme was suspended due to its failure to follow government accounting regulations. The E-Rate programme provides schools with subsidies for Internet services. The service was resumed after Congress passed legislation temporarily exempting the Universal Service Administrative Company, who administers the fund, from the rules.

The *1996 Telecommunications Act* clearly states that there can be more than one provider of universal service in a given area and that carriers can compete to provide universal service. This approach is meant to ensure that competition develops in the provision of universal service, rewarding the most efficient operator. It is also designed to encourage new entrants to develop business plans to serve rural areas.

All carriers, including mobile operators certified by the state as being an 'eligible telecommunications carrier (ETC)', are entitled to receive support from the fund. Prior to 1996, only common carriers could receive funding. The *1996 Telecommunications Act* expanded the universe of payers and receivers to include discounts to schools, libraries and rural healthcare providers, and make all telephone subsidies explicit.

### **Universal service funding**

The *1996 Telecommunications Act* requires that support for universal service be 'explicit' and 'sufficient', and that contributions come from all telecoms services on an 'equitable and non-discriminatory basis.' Today, all telecommunications carriers must contribute based on their interstate revenues. This includes long distance operators including mobile providers and private operators that lease lines. Contributions are based on a percentage of carriers' gross interstate telecoms revenues net of payments to other carriers such as interconnection.

## **2.8 Retail price controls**

In the US:

- There is no retail price regulation of mobile or long distance calls
- The price of basic local services is regulated at the individual state level in a variety of ways. Normally some kind of rate of return regulation is used.

Retail price bundling of fixed and mobile services is common. For example Verizon has bundled services from its mobile arm with standard fixed offerings and sold them through its fixed retail business. This offer has not proved popular – at least in part because the bundle is sold over the phone where regulations prevent the operator from offering services with a contract period of more than one year. In contrast the mobile operators can offer better deals, but with two year contracts, through their shops where regulatory restrictions on length of contract are less stringent.

Again there is no evidence in the US that the nature of retail pricing has had any impact on fixed-mobile interconnect arrangements. Nor is there evidence of the reverse effect as there is in the EU. The RPNP model in the US means that an originating operator pays the same fixed termination charge for terminating a call on a fixed or mobile network.

## **2.9 Access to buildings**

The regulation on operator access to property is decided on a state level. Currently, there are 46 states that do not mandate access to properties for telecommunications operators. Connecticut, Texas, Ohio and Nebraska have introduced statutes requiring landlords to grant non-discriminatory access to telecommunications carriers from whom their tenants choose to take service. These state regulations do not include mobile equipment.

### 3. EXTENT OF CONVERGENCE

#### 3.1 Fixed Mobile Substitution

In the US, the substitution effect thus far has been one way. Many consumers are substituting a wireless phone for wired phone and making their wireless service their only telephone service. For local and long distance companies this trend has been disastrous, which results in a steady decline in the customer base and revenue.

The number of fixed lines has been dropping at nearly a 3% rate for the past several years, even as adoption of mobile phones increases. Nearly 65% of Americans, or 195 million people, are expected to be mobile phone subscribers by the end of 2005.

As users become more used to the convenience of cellular, long distance and local usage is shifting from wireline to cellular. The average wireline residential toll minutes of use (MOUs) have been dropping at a compounded rate of 15% since 2000, while wireless interstate MOUs per user grew at a compounded rate of nearly 40 percent during the same period. According to one FCC study, on the wireless side, the percentage of interstate residential minutes has increased from 16% to 26% of all wireless minutes. These changes in calling patterns are being reflected in ILEC line losses—a trend likely to continue.

#### 3.2 Barriers to convergence

For all players, regardless of their outlook on convergence, there remain significant barriers to real-world adoption. Many of these barriers are common to all geographies, and include the technical challenges of seamless roaming, effective billing, and the availability of mass-market, dual-mode handsets. However, there are also some concerns that appear to be stronger in the US market than elsewhere.

- *Regulation and taxation*, especially around dual-mode handsets: Providers are concerned about how services involving dual-mode handsets will be regulated and taxed, since the regimes for fixed and mobile services are very different. Which regime would apply to a call which roamed from a home network to the cellular network mid-call? Such concerns will be difficult to resolve without either a change in the law (which could be part of the impending Telecom Act rewrite) or an extraordinary intervention by the FCC, which would also take time
- *Security*, in particular in the enterprise market: Where WiFi and other technologies are used to transmit voice calls from dual-mode handsets, how should providers ensure adequate security
- *International roaming*: While many of the technical challenges may be solved domestically, what happens when subscribers with dual-mode handsets roam abroad? Will their services still work there? Will European, Asian and other operators have adopted compatible solutions to common problems?

Although none of these issues are necessarily insurmountable, each poses a considerable additional challenge on top of the global issues. Together, they combine to ensure that it will

be some time before mass-market adoption of converged services, devices and networks become a reality in the US market.

Moreover, there are several barriers to development of convergence in the enterprise. Firstly, enterprises, and those who serve them, face other problems, most notably the way mobile services used in the enterprise are bought and paid for. As in other parts of the world, the majority of mobile services in the enterprise are actually purchased by individual employees, who receive an allowance or are reimbursed for the cost according to a corporate policy, or through the standard expenses process.

Therefore, the biggest issue for many enterprises is actually getting a handle on mobile spending and bringing it under control. Similarly, the biggest issue for enterprise service providers is trying to sell a corporate solution in this context. Although converged solutions might provide a solution to this problem for both customer and service provider, they are not yet thinking in these terms.

Secondly, service providers agree that the main attraction for convergent solutions to enterprises will be reducing their costs, regardless of how much service providers would like to sell based on added value. In such an environment, attempting to sell a solution which offers few cost benefits but merely promises productivity improvements will be viewed with scepticism by corporate buyers.

However, the current solutions do not, on the whole, offer substantial cost savings, and customers are typically able to bring down spending by similar amounts through other, less disruptive means. Service providers have yet to build convincing total cost of ownership (TCO) models that demonstrate the benefits to the business of convergence.

Thirdly, the solutions which are available are untried, and most providers to the enterprise space are reluctant to move forward on them before there is solid evidence that they are robust and scalable. This is especially true with large deployments. However, there is an increased willingness to trial these solutions on a limited basis to determine their viability, and this should lead to greater uptake in future.

Figure 3.1 shows a summary of the barriers to convergence in the United States.

**Figure 3.1** *Barriers to convergence in the United States*

| <b>Aspect of regulation</b>  | <b>Barrier to FMC</b>   |
|--|---|
| <b>Regulatory structure:</b> Split between the FCC and the DoJ                                 | No  |
| <b>Carrier licensing:</b> Separate for mobile and fixed.                                       | Yes   |
| <b>Interconnection:</b> Receiving Party Pays. No mobile termination charges.                   | No. FTR is applied in both directions, in a reciprocal basis. |
| <b>Number Plan:</b> Mobile numbering has same geographic codes as fixed numbers.               | No.   |
| <b>Number Portability:</b> There is local number portability. Mobile number portability is not | Yes.  |

|   |   |
|---|---|
| implemented yet.  |   |
| <b>Universal service:</b> applied to standard fixed services and subsidies for health-care and schools. | No – both fixed and mobile operators contribute.  |
| <b>Retail price controls:</b> Local calls are regulated.  | Yes, the asymmetrical approach could favour the development of converged services based on mobile services. |

## 4. PROVISION OF CONVERGED SERVICES

### 4.1 Provision of FMC services

Despite all the talk around fixed–mobile convergence, the most prevalent manifestation today is still bundling – an early, fairly superficial form of convergence. All four US Regional Bell Operating Companies (RBOCs) and Sprint offer bundles of services which pull together wireline and wireless elements. Typically, these bundles of services offer discounts over services purchased individually.

These bundled packages, though providing some of the benefits of convergence, are just a first stage on the road to full convergence. The main benefits offered by bundling include single billing and discounts for taking multiple services, but bundling typically does not offer some of the more advanced benefits of convergence, such as a single phone number, single voicemail, single customer service, integration of devices and others.

It may be for this reason that wireless–wireline bundles constitute a small minority of total bundles – although bundles as a whole, including bundles of local service with long-distance, DSL and/or TV services, have been very popular.

Although bundling is by far the most prominent, and most adopted, form of convergence so far, there are some fairly low-profile examples of more advanced forms of convergence. The co-owners of Cingular, SBC and BellSouth, have been most advanced in offering two types of solutions – automated call forwarding and integrated voicemail.

#### Call-forwarding solutions

SBC and BellSouth have combined with Cingular Wireless to offer an automated call forwarding solution branded by the companies as FastForward. This service is available to customers who buy local wireline services from either SBC or BellSouth, plus wireless services from Cingular.

This service has several advantages. For customers, it means they do not use up call minutes for receiving incoming calls when they are at home, and could just as easily receive the calls for free on their home phone. For Cingular, it means calls are diverted off the Cingular network and onto wireline networks, leading to lower traffic and better voice quality to the end user. For SBC and BellSouth, this improves customer stickiness and provides modest additional revenues from call forwarding. FastForward has been offered by both SBC and BellSouth since October 2003.

### **Integrated voicemail solutions**

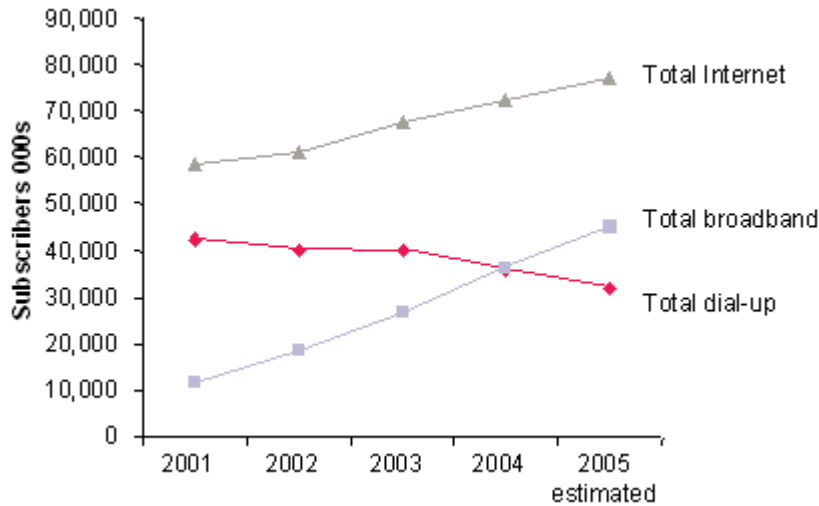
One of the frustrations of separate wireline and wireless services that can be overcome through convergence is the existence of separate voicemail boxes for the home phone service and cellular service. SBC and BellSouth have both adopted different approaches to this problem, although both companies are again working in conjunction with Cingular. BellSouth offers its customers a Wireline Wireless Mailbox Service, which combines both voicemail boxes into a single mailbox, so that customers can retrieve all messages from either source, regardless of where they were left. This service can be added to BellSouth's standard home voice mail service for no extra charge. Notifications of new messages are automatically sent to home and mobile phones.

SBC, on the other hand, offers a Unified Communications service which allows customers to access all their messages from a single source – whether home phone, mobile phone or a PC. Faxes, e-mails, mobile and fixed voicemails can all be retrieved through the unified mailbox, which offers standard unified messaging features such as text-to-speech and accessing voicemails online.

Despite the early steps towards convergence, which are being taken in the consumer market, there has been very little movement in this direction in the enterprise. The small business market is largely sold and largely buys consumer products, and so benefits from such trends as bundling, automated call forwarding and unified messaging, where offered. However, larger businesses are so far virtually untouched by convergence, although some solutions are becoming available through specialist vendors.

## **4.2 Broadband services with mobile potential**

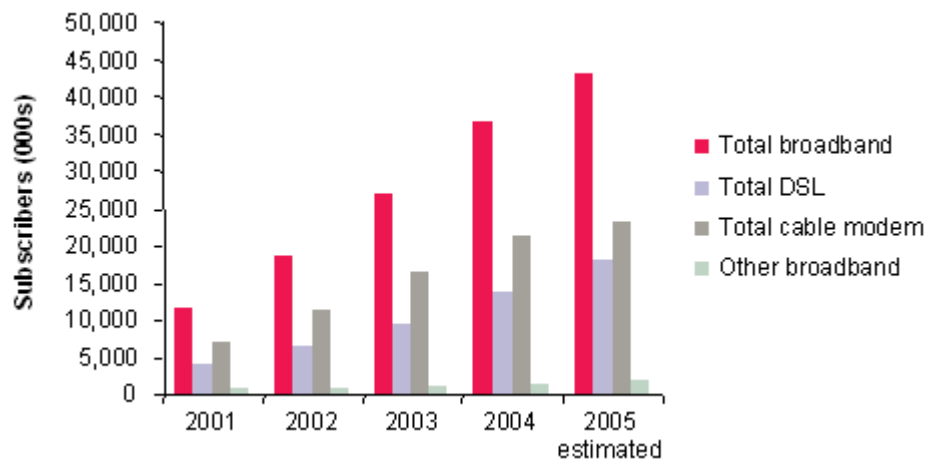
Broadband growth in the US has continued to grow but at a slower pace with an estimated increase of 20% from 2004 to 2005 compared with a 26% increase from 2003 to 2004. Dial-up Internet subscriptions continue to fall. Total Internet connections continue to rise, which indicates that new subscribers are likely to go for broadband services rather than dial-up Internet services.

**Figure 7 Internet connections**

Source: Ovum

Cable broadband is the dominant broadband technology in the US. DSL has been fighting back to gain market share. In 2004, cable broadband held a 58% share of the total broadband market. It is estimated to decrease to 54% by the end of 2005 and that DSL broadband will pick up most of the remaining share.

Other broadband technologies such as FTTP, FWA and PLC are also growing and they are estimated to gain a market share of 4% at the end of 2005.

**Figure 8 Broadband subscribers by technology**

Source: Ovum

## Wireless Broadband

### WiFi market

Targeting the consumer market, T-Mobile USA announced an agreement with Eastman Kodak Company to simplify online picture sharing using WiFi outside of the home or office. All EASYSHARE-ONE digital camera purchasers will initially receive a free camera-specific T-Mobile HotSpot trial for sharing and viewing their pictures online after subscribing to the T-Mobile HotSpot service.

### BWA technologies

Flash-OFDM services: Citizens Wireless, Cellular One Arizona

Towerstream (VoIP over WiMAX), Speakeasy, Sequelle Communications and US Wireless provide pre-WiMAX services for business while Clearwire and NTELOS provide pre-WiMAX services for both business and residential users. There are more than a dozen of pre-WiMAX deployments in rural areas such as Plateau Telecommunications, Evertek, Info Link, Rioplex Wireless, SpeedNet.

Many operators are coming up with trials. For example, BellSouth (WiMAX), Verizon (WiMAX), Sprint-Nextel (WiBro, WiMAX, Flash-OFDM, UMTS TDD), Qwest (WiMAX), AT&T (WiMAX), Covad (WiMAX), Aloha Partners (Flash-OFDM).

### New unbundling rules in the US

In February 2005, the FCC issued a new set of unbundling rules, which have been enforced since 11 March 2005. These rules lift some of the requirements on the RBOCs to unbundle their local loops, especially in competitive markets. As a result, competitors relying on the unbundled network element platform (UNE-P) to provide services will now have to transition to commercially-based arrangements with the RBOCs in order to continue to provide service.

The new framework will also require competitors to step up their investments in infrastructure for broadband access. In addition, the new rules exclude fibre in the last mile from unbundling, which gives an incentive to ILECs to upgrade their local networks.

Bitstream access is currently available only on a commercial basis for alternative operators.

## 4.3 Plans by operators for converged services in future

### Device convergence

Device convergence is the area that has arguably been receiving most attention globally, and this is also the case in the US. Although there are no announced plans to offer commercially available dual-mode handsets yet, all the major providers are planning trials during 2005 and are likely to launch commercially available services in 2006.

The details of these services are far from ironed out yet, and providers remain coy about their plans. However, it is likely that the RBOCs and Sprint will all launch some form of combo phone in the consumer market. In addition, Sprint will offer its cable operator partners some form of wholesale mobile service to enable them to offer combo phones combining cellular and VoIP service (which is already provided in part by Sprint).

In the enterprise market, there seems to be far less interest in moving to a single converged device. The functionality of desk phones – especially IP phones – is still far greater than anything that could be enabled in the near future on a mobile phone, so it is likely that device convergence will be limited in the enterprise market.

However, some employees who currently do not have a desk phone are likely to be mobile-only employees. This is the case with approximately 8,000 employees at Ford which have recently been issued a mobile device as their only phone through a contract with Sprint. These employees, who all work in product development, rarely work in the same place for extended periods of time, so do not require a desk or a desk phone. Sprint had to build considerable additional in-building coverage and capacity to support this move in late 2004 before the switch was made early in 2005.

This model is likely to be adopted by many other businesses with a mobile workforce. There may also be an opportunity at the lower end of the market, where companies are currently using more basic desk phones, or even DECT cordless phones, and where there will therefore be less resistance to losing a wireline device. The move from a key system to one of the cleverer converged solutions may actually be a step up in terms of functionality for some of these small businesses.

The challenge with the small business market is that this market is typically underserved by major providers, which tend to focus on either the consumer or enterprise markets. Those with the scale to invest in the best convergent solutions may therefore bypass this market. This raises the question of who will provide convergent solutions to small businesses. If major providers such as the RBOCs and inter-exchange carriers (IXCs) do not offer those services, the next candidates would be the resellers which currently serve this market. However, they are unlikely to have the clout to be able to pull such solutions together alone.

It is therefore likely that at this lower end of the market, PBX vendors and other equipment vendors may end up providing solutions incorporating elements from specialist convergent solutions vendors. Rather than simply selling a new IP PBX, these vendors would offer a solution which incorporates mobile extensions and inbuilding coverage within the PBX solution, bringing together the appropriate providers for connectivity.

### **Service convergence**

Even in the absence of device convergence, several providers are making early moves towards enabling service convergence. Two in particular – SBC and Verizon – are working hard to lay the groundwork for providing a unified experience over multiple devices. In both cases, these devices will include not just the home phone and the mobile phone, but also the TV, PC and other devices such as digital video recorders (DVRs). SBC announced in January 2005 that it had signed a partnership with 2Wire, a vendor of set-top boxes. SBC and its existing partner Yahoo! will work together with 2Wire to develop an integrated communications solution which will rely on connectivity from SBC and Cingular, user interfaces and portals from Yahoo!, and set-top boxes from 2Wire.

This solution will enable customers to access a similar set of services from multiple devices, and will also allow customers to remotely program their DVRs from their mobile phones, manage incoming calls on their television sets, and otherwise integrate the operation of their

various devices. Although the early version of this product, to be launched in mid-2005, will be based on SBC's partnership with satellite provider DirecTV, in the longer term it will incorporate SBC's fibre-based IPTV service.

Although the SBC solution is currently the best articulated, others are planning similar services. Verizon is planning to use its lobi platform and user interface software to offer an integrated experience across multiple devices in much the same way as SBC. It is working with Motorola set-top boxes and Microsoft TV software to bring this package together, with the solution to be delivered over Verizon's fibre local access networks.

Although the consumer experience is all about accessing the same content on multiple devices, and controlling one from another, service convergence in the enterprise market will be quite different. Business solutions will be built around accessing corporate voice and data networks, and associated services and functionality from a range of devices, including the desk PC and phone, the mobile phone, laptops and PDAs. Creating such solutions will require several steps, some of which have already been taken. Many enterprises are employing VPN clients to allow remote employees to access corporate networks from their laptops over broadband, WiFi or cellular connections for checking email and file transfer. However, little has so far been done by way of voice service convergence.

Voice service convergence will come as enterprises enable PBX features and functionality (as appropriate) on mobile phones and softphones on laptops and PDAs. There appears to be some agreement among enterprise service providers that the best way to do this will be through hosted IP voice services such as IP centrex and hosted IP PBX solutions. These solutions allow network-based management of services, and allow mobile employees to access network features from essentially any location.

There are already some solutions in the market which offer such functionality, effectively turning mobile phones into mobile PBX extensions. However, there has been little uptake as yet among enterprise customers in the US. In part, these solutions may have to be implemented at the same time as the customer implements a major migration from TDM to IP services, or from a CPE-based solution to a hosted one. For many enterprises, the upheaval of implementing a converged service on a stand alone basis is not currently justifiable.

### **Network convergence**

Network convergence appears to be the most remote of the major forms of convergence today in the US market. Only Sprint has made moves in this direction, signing contracts with Lucent and Ericsson to implement IP Multimedia Sub-System (IMS) components in its network. However, even Sprint is not ripping out its existing networks entirely, but merely replacing some elements with convergence-friendly components.

A major barrier to network convergence in the US is the relationship between major wireline providers and wireless providers. Only Sprint owns its wireless provider outright (and even this situation will be complicated as Sprint merges with Nextel). Verizon shares control of Verizon Wireless with Vodafone, while Cingular is split between SBC and BellSouth. Meanwhile, Qwest is using Sprint's mobile network to provide mobile services.

These companies will find it difficult to create truly converged networks when the networks they want to converge are under shared ownership. In the absence of truly shared networks,

progress in this area is likely to be slow. Some IMS components are likely to be installed in both wireline and wireless networks in order to enable some of the service convergence features discussed earlier, but large-scale network convergence remains quite a way off.

### **Player attitudes**

The attitudes of the various players in the US market vary greatly with regard to fixed–mobile convergence. Among the likely future participants in fixed–mobile convergence are:

- the RBOCs – Verizon, SBC, BellSouth and Qwest
- the cable companies, or MSOs – including Comcast, Cox, Time Warner, Charter, Adelphia and Cablevision
- mobile operators – principally Verizon Wireless, Cingular Wireless and T-Mobile
- the IXC's – Sprint, AT&T and MCI.

Of all the players that will be involved in fixed–mobile convergence, the RBOCs are the keenest. They see the greatest opportunities in fixed–mobile convergence because they own assets on both sides of the fence. Although these relationships are complex (as described above), three of the four RBOCs own substantial stakes in the wireless market.

The main opportunities for the RBOCs are increasing share in the wireless market, and increasing customer stickiness in the wireline market. They also hope to slow fixed–mobile substitution and bring some traffic back onto fixed line networks. They are behind the offers in the market today, and look the most likely to introduce further offers in the consumer market in future.

The cable companies are presently poorly positioned to offer fixed–mobile convergent services. Their fixed voice bases, though rapidly growing thanks to the recent launch of VoIP services, are very small, and none has a stake in the wireless market. However, several of these companies are already working with Sprint and have agreed to launch dual-mode devices in future in combination with Sprint. In order to do this, the cable companies are likely to launch MVNOs to provide the mobile side of the fixed–mobile convergence equation, with Sprint as the underlying network provider. The first moves in this direction are likely to occur in the second half of 2005, with Time Warner Cable, which is one of the most advanced in its thinking at present.

The incentive for these companies is to break into new markets in which they have historically not participated. Fixed voice itself is new to them, but wireless would be not only another major revenue opportunity, but also an effective competitive weapon against the RBOCs, which can offer a more complete bundle at present.

The IXC's, primarily Sprint and AT&T, will push hard for convergence in the enterprise (although Sprint will also play in the consumer space). So far, there have been few indications that MCI will be actively engaged in fixed–mobile convergence in the enterprise space.

Sprint owns the assets it needs to offer fixed–mobile convergence services itself, and will probably move the fastest of the three major IXC's. AT&T had announced plans to launch an MVNO over Sprint's network prior to its acquisition by SBC. However, since SBC owns a stake

in Cingular, it is likely that AT&T will now switch to Cingular as its wholesale provider of choice, and convergent services may in fact be provided by a combination of AT&T and Cingular.

Both companies are likely to pursue a range of options in working with the enterprise to provide convergence. Some employees will go mobile only, while others will be provided with dual-mode devices. Others will still maintain separate devices for fixed and mobile, while being better enabled to access corporate resources and PBX functionality remotely.

For the IXCs, this strategy is all about capturing a greater share of the enterprise wallet in the face of declining legacy revenues. They recognise that enterprise spend on mobile is currently poorly managed, and see fixed–mobile convergence as a way of helping customers bring that spend under control and under the same contract as wireline voice and data spend.

T-Mobile, as a stand alone operator, and Verizon Wireless, though majority-owned by Verizon, are two of the most sluggish players in fixed–mobile convergence in the US so far. Despite advances from Verizon, the wireless business still sees little incentive to work on fixed–mobile convergence offerings. As these operators see the world, fixed–mobile substitution brings clear benefits in terms of higher usage and revenues, and they do not want to risk slowing it down through convergence.

Similarly, T-Mobile sees little incentive to pursue convergence aggressively, especially since to do so would require co-operation with a wireline provider. Cingular appears (at least according to its co-owners) to be more co-operative, mostly because the board consists of representatives from both wireline parents, and it can be more easily controlled.

## 5. REVIEWS BY THE REGULATOR

Convergence across communications industries is already taking place, and is likely to accelerate as competition develops further. Thus, in addition to refocusing FCC resources on core functions for a world of fully competitive communications markets, the FCC must also assess how to streamline and consolidate policymaking functions for a future where convergence has blurred traditional regulatory definitions and jurisdictional boundaries.

The issues involved in thinking about convergence and consolidation are complex. Prior to the Telecom Act, the core of the Communications Act was actually three separate statutes: it incorporated portions of the 1887 Interstate Commerce Act (governing telephony), the 1927 Federal Radio Act (governing broadcasting), and the 1984 Cable Communications Policy Act (governing cable television). Telephony is regulated one way, cable a second, terrestrial broadcast a third, satellite broadcast a fourth. As the historical, technological, and market boundaries distinguishing these industries blur, the statutory differences make less and less sense. Maintaining them will likely result in inefficient rules that stifle promising innovation and increase opportunities for regulatory arbitrage.

Some argue for developing regulatory principles that cut across traditional industry boundaries. For example, the policies of interconnection, equal access, and open architecture have served consumers well in the wireline context, a traditionally regulated industry. Similarly, concepts of connectivity, interoperability, and openness are the lifeblood of the Internet, an unregulated industry. While these similar principles appear to cut across these different media, it is unclear

whether and how the government should be involved, if at all, in applying these principles in a world where competition will largely replace regulation.

Some argue that, at the very least, as competition develops across what had been distinct industries, FCC should level the regulatory playing field by levelling regulation down to the least burdensome level necessary to protect the public interest. The guiding principle should be to presume that new entrants and competitors should not be subjected to legacy regulation. This is not to say that different media, with different technologies, must be regulated identically. Rather, FCC need to make sure that the rules for different forms of media delivery, while respecting differences in technology, reflect a coherent and sensible overall approach. To the extent FCC cannot do that within the confines of the existing statute, FCC may need to work with Congress and others to reform the statute.

## Annex 8: Hong Kong Stakeholders interviewed

- Office of the Telecommunications Authority
- Asia Satellite Communications Co Ltd.
- Hong Kong Cable Television Ltd.
- China Resources PEOPLES Telephone Company Ltd.
- China Motion Telecom International Ltd
- HK Broadband Network Ltd.
- HKC Network Ltd.
- Hong Kong CSL Ltd.
- Hutchison Global Communications Ltd.
- Hutchison Telecommunications (Hong Kong) Ltd.
- New World Telecommunications Ltd.
- New World PCS Ltd.
- PCCW Ltd.
- Reach Ltd.
- SmarTone-Vodafone
- Sunday
- Television Broadcasts Ltd
- Towngas Telecommunications Fixed Network Ltd.
- TraxComm Ltd.
- Wharf T&T Ltd.

## Annex 9: The Price Elasticity of Telecommunications Services

1. This annex provides a brief discussion of price elasticities of demand for telecoms services. Information is scarce. Back in the 1980s operators published information on price elasticities. Today such information is confidential and unpublished.

2. It is important to distinguish between price elasticities faced by individual operators and market elasticities. When there is a monopoly the two are the same. But in a competitive market each operator faces price elasticities which are substantially higher than the market elasticity. This reflects the fact that, when an operator increases its prices, the main impact is usually one of customers switching to rivals rather than customers exiting the market.

3. There is a significant body of evidence which indicates that price elasticity for telecoms services falls as the price of the service falls. This is common sense. End users are more likely to increase use of a service they see as expensive when the price falls than when the price of a service which they regard as cheap falls by the same proportion.

4. Ofcom incorporated such effects into some recent work it did on number translation services in the UK to estimate changes in consumer welfare under different policy options<sup>106</sup>. It used the demand curve:

$$Q = Ae^{-\lambda p} \text{ where } Q = \text{demand, } p = \text{price and } A \text{ and } \lambda \text{ are constants}$$

This curve has the property that price elasticity is proportionate to price i.e.

$$E = (\Delta q/q)/(\Delta p/p) = \alpha p$$

5. Studies in the US<sup>107</sup> suggest that long distance fixed line calls in the mid 1990s exhibited market elasticities of -0.7 for inter LATA calls and -0.3 to -0.4 for intra LATA calls

6. A UK study from the late 1980s<sup>108</sup> uses price elasticities for fixed services of -0.1 for fixed access, -0.2 for local fixed calls and -0.7 for long distance calls

7. dotecon, in work for BT in the UK, estimated the price elasticity of fixed to mobile calls<sup>109</sup> at:

- -0.22 in the short run and -0.37 in the long run for daytime and weekend calls

<sup>106</sup> Number Translation Services: the Way Forward, Ofcom, September 2005

<sup>107</sup> Toll Price Elasticities from a Sample of US Residential Telephone Bills, Rappoport and Taylor, 1997, Information Economics and Policy, Vol 9, No 1

<sup>108</sup> A method for determining the optimal balance of prices for telephony services, P G Cullen, 1987, Oftel Working Paper 1

<sup>109</sup> Estimation of Fixed to Mobile Price Elasticities, dotecon, 2001, For BT

- -0.5 in the short run and -0.8 in the long run for evening calls.

8. In estimating subscriber price elasticity of demand for post paid mobile services in its submissions to the UK's Competition Commission, Ofcom assumed a price elasticity of -0.3

9. Figure A9.1 tabulates these results and provides crude estimates, based on the author's knowledge, of the price charged at the time the elasticity was estimated or assumed. It then goes on to make consistent assumptions for the price elasticities used in this study i.e.:

- The price elasticity of F2M and M2F calls
- The price elasticity of international calls
- The price elasticity of local fixed access

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**Figure A9.1 - A comparison of price elasticities**

| <i>Status</i>   | <i>Service</i>            | <i>Price elasticity</i> | <i>Approximate price of the service (\$HK)</i> |
|-----------------|---------------------------|-------------------------|--|
| Observation     | Long distance fixed calls | -0.7                    | \$1.9 per min                                  |
| Observation     | Local fixed calls         | -0.2                    | \$0.26 per min                                 |
| Observation     | Local access              | -0.1                    | \$90 per month                                 |
| Observation     | Fixed to mobile calls     | -0.4                    | \$1.3 per min                                  |
| Assumed         | Mobile subscription       | -0.3                    | \$130 per month                                |
| Estimate for HK | F2M and M2F calls         | -0.2                    | \$0.4 per min (1)                              |
| Estimate for HK | International calls       | -0.6                    | \$1.0 per min                                  |
| Estimate for HK | Local fixed access        | -0.1                    | \$70 per month (2)                             |

(1) Revenue per minute for mobile calls in HK

(2) Including local calls

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## Annex 10: Quantifying the Impact of Abolishing the LAC

This annex estimates the changes in prices and economic welfare which would result if OFTA abolished the LAC. In making our estimates we assume that the markets for both local fixed services and international outbound calls are in the long run equilibrium position for competitive markets and that both set of suppliers start with prices which reflect the costs they face. For local fixed operators this means the cost of supply less the LAC contribution. For ETS providers it means costs plus the LAC contribution. We then make the following assumptions and calculations:

- In theory the LAC generates very substantial revenues for the FNOs. We estimate this theoretical revenue at \$664 million pa<sup>110</sup>. This assumes that there are 6 billion outbound international minutes of calls, of which 63% originate on fixed networks and attract a LAC of 12.3 cpm<sup>111</sup>, and that outbound calls represent 70% of total international minutes,
- In practice the FNOs deliver a substantial % of their own outbound international calls and also pay LAC to other FNOs for delivery of international calls. Alternatively, some international calls are also originated by MNOs directly. When we exclude these the net LAC revenue flow to the FNOs reduces to \$191m pa of which around \$80m pa comes from outbound calls
- If the LAC is abolished origination and termination charges for international calls fall to cost base levels. We estimate the cost of terminating and originating international calls at 5.7cents per minute
- When this happens the local fixed operators see a net reduction in revenues of \$103 million per annum ( $\$191 \text{ million} \times (12.3 - 5.7)/12.3$ )
- ETS providers see a reduction in their costs for international calls of \$43 million pa<sup>112</sup>.
- These changes produce modest economic efficiency gains overall. Assuming that the fixed operators currently price below cost because of LAC revenues, whilst ETS providers price above costs (the long run equilibrium position assuming both markets are effectively competitive), then we estimate the overall gain in allocative efficiency at \$3.5 million<sup>113</sup> per annum. Again see Figures A10.1 and A10.2.

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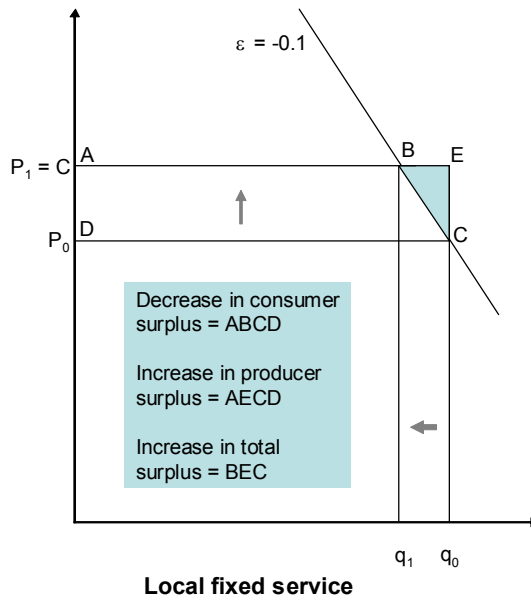
<sup>110</sup>  $\$6\text{bn} \times 10/7 \times 0.123 \times 63\%$

<sup>111</sup>  $70\% \times 12.1 \text{ cpm} + 30\% \times 12.6 \text{ cpm}$

<sup>112</sup>  $\$80\text{m} \times (12.3 - 5.7)/12.3$

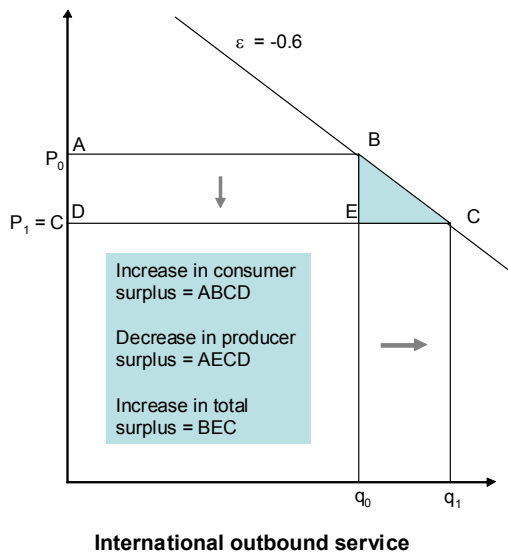
<sup>113</sup>  $\$0.2 \text{ million} + \$3.3 \text{ million pa}$

**Figure A10.1 - Abolishing the LAC – impact on local fixed service market**



Change in revenues =  $\Delta R = p_1q_1 - p_0q_0$   
 $= (p_0 + \Delta p)(q_0 + \Delta q) - p_0q_0$   
 But  $\Delta q = \Delta p q_0 \epsilon / p_0$   
 So  $\Delta R = \Delta p q_0 + \Delta p \epsilon q_0 = \Delta p q_0 (1 + \epsilon)$  and  
 $\Delta p = \Delta R / (q_0 (1 + \epsilon))$   
 Increase in economic welfare =  $\Delta EW = \Delta p \Delta q / 2 = \Delta p^2 q_0 \epsilon / 2 p_0$   
 Then for local fixed services:  
 $\Delta R = \$103m$  pa  
 $q_0 = 3.8$  million lines  
 $\epsilon = -0.1$  (local service prices are normally very inelastic. See Annex 9 for discussion)  
 $p_0 = \$70$  per month =  $\$840$  pa  
 $\Delta EW = (\$103m / (3.8m * (1 - 0.1)))^2 * 3.8m * 0.1 / (2 * 840) =$   
 **$\$0.2m$**  pa

**Figure A10.2 - Abolishing the LAC – impact on international outbound market**



Change in revenues =  $\Delta R = p_1q_1 - p_0q_0$   
 $= (p_0 + \Delta p)(q_0 + \Delta q) - p_0q_0$   
 But  $\Delta q = \Delta p q_0 \epsilon / p_0$   
 So  $\Delta R = \Delta p q_0 + \Delta p \epsilon q_0 = \Delta p q_0 (1 + \epsilon)$  and  
 $\Delta p = \Delta R / (q_0 (1 + \epsilon))$   
 Increase in economic welfare =  $\Delta EW = \Delta p \Delta q / 2 = \Delta p^2 q_0 \epsilon / 2 p_0$   
 And for international outbound services:  
 $\Delta R = \$43m$  (we assume LAC revenues on inbound go to foreigners calling to HK)  
 $q_0 = 1032m$  mins pa  
 $\epsilon = -0.6$  (International call prices are normally elastic. See Annex 9 for discussion)  
 $p_0 = \$1.00$  per minute ( $\$1.30$  per minute at end 2003)  
 $\Delta EW = (43m / (1032 * (1 - 0.6)))^2 * 1032m * 0.6 / (2 * 1.0) =$   
 **$\$3.3$  million** pa

## Annex 11: A Critique of Bill and Keep (BAK)

### 1 INTRODUCTION

This Annex analyses various criticisms made in the literature of BAK as the basis for carrier interconnection.

### 2 PCCW'S SUBMISSION

In response to OFTA's request for feedback on whether BAK should be considered for interconnect in 2001, PCCW argued that BAK was successful and equitable only when the costs of the two interconnecting operators were equal. In support of this assertion it quoted from testimony from Professor Hausman of MIT in 1996:

*"BAK destroys the correct economic incentives because it makes interconnection "free", i.e., zero cost to the CLEC [Competitive Local Exchange Carrier] provider. Thus the CLEC has no economic incentive to use the least cost most economically efficient alternative for transport and termination and the CLEC has no incentive to make efficient production or investment decisions. The CLEC provider will choose the least cost alternative to itself but this alternative may create large costs for the LEC and for society. Only if cost based prices are used for interconnection instead of free interconnection does LEC provider have any economic incentive to consider the LEC's costs through the price signal it receives. Even if traffic is in balance, costs structures of networks vary and different marketing and investment decisions would cause traffic to fall out of balance over time. BAK will waste social resources, which is among the worst possible outcomes of government policy."<sup>114</sup>*

More recent work indicates that this conclusion needs to be modified in cases where network subscription has reached saturation – the situation in Hong Kong for both fixed and mobile networks. Modelling by Cambini and Valletti<sup>115</sup> in 2003, and by Berger in 2004<sup>116</sup>, indicates that, with two part retail tariffs:

- in order to induce firms to invest in an efficient manner, access [call termination] charges should be set below costs (Cambini and Valletti) and that
- *"welfare maximising access charges are below marginal cost" and BAK arrangements are welfare improving compared with cost based access prices [for call termination]"* (Berger)

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<sup>114</sup> Affidavit of Jerry A. Hausman para. 19 appended to Comments of Bell Atlantic Corporation, in the matter of Implementation of the Local Competition Provisions in the Telecommunications Act 1996, CC Dkt. No. 96-98 (filed 16, 1996).

<sup>115</sup> Network competition with price discrimination: "bill and keep" is not so bad after all, C Cambini and T Valletti, Economic Letters 81, May 2003

<sup>116</sup> Bill and keep versus cost based accessed pricing revisited, U Berger, Economic Letters 86, July 2004

Another paper by Laffont and Tirole<sup>117</sup> concludes that:

- There is an efficient equilibrium in sharing the end-to-end cost of calls between the calling and receiving parties
- This equilibrium is a function of the utility which the calling and receiving parties extract from the call. It is not a function of the split of costs between the two networks.

### 3 WRIGHT ON DE GRABA

Wright<sup>118</sup> criticises the case made by DeGraba<sup>119</sup> and summarised in Chapter 5 of the report. He argues against BAK on two main grounds:

- BAK is not efficient when there are substantial network externalities. For example when mobile subscription is below saturation and fixed subscription is at saturation it makes sense to subsidise the mobile network from the fixed network using above cost termination charges in order to get more mobile subscribers to join the network of networks. BAK stops such subsidies occurring. We agree with this analysis but argue that it does apply in Hong Kong where mobile penetration has reached 120%
- BAK does not allow for optimal Ramsey pricing. Ramsey pricing is excellent in theory. But it is very difficult to apply in practice. For example the UK regulator Ofcom rejected the use of Ramsay pricing for setting mobile termination rates on the practical grounds that it was not possible to estimate the price elasticities required with any certainty. The UK's Competition Commission, which considered the appeal of this decision for nearly 12 months, upheld this decision.

### 4 SUBMISSIONS TO THE FCC ON BAK

Gabel<sup>120</sup> argues against BAK on two main grounds:

- customers prefer a calling party's network pays (CPNP) regime to a receiving party's network pays (RPNP)<sup>121</sup> regime for fixed and mobile calls. It is clear that CPNP regimes for fixed to mobile calls produce faster mobile subscription growth for developing countries. But there is strong evidence that overall call rates in developed countries are substantially higher when some kind of RPNP regime is in place, as shown in Figure 5.5 of our report. So CPNP is effective where there are big network externalities but some form of RPNP, of

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<sup>117</sup> On the Receiver Party Pays Principle, D S Jeon, J J Laffont and J Tirole, March 2001

<sup>118</sup> Bill and keep as the efficient interconnect regime, Review of Network Economics, March 2002

<sup>119</sup> Bill and keep at the central office as the efficient interconnect regime, Patrick DeGraba, December 2000, FCC OPP 33

<sup>120</sup> Affidavit on behalf of NASUCA in submission to FCC on developing a unified intercarrier compensation regime, CC docket 01 -92, D Gabel, March 2005

<sup>121</sup> Gabel classifies bill and keep as an RPNP rather than CPNP regime

which BAK is one variant, is more effective when these externalities are exhausted. This is the case in Hong Kong

- BAK “*could lead to a rate structure that deviates from the underlying cost structures of the industry*”. We respond to this criticism of BAK in Section 2 of this annex.

## **5 CONCLUSION**

In summary the general criticisms levelled at BAK in the literature are either not relevant to the circumstances in Hong Kong or are out of date.

## **6 HONG KONG SPECIFIC ARGUMENT AGAINST BAK**

An argument against BAK which is specific to Hong Kong is that it puts pressure on fixed operators to move from a flat rate monthly charge to two part retail pricing e.g. a monthly charge plus a per minute charge. This is expensive to implement and the cost outweighs any benefits.

Our analysis here is as follows:

- Overall a move to BAK gives fixed and mobile operators greater pricing freedom at the retail level. At the moment an operator offering services for a flat monthly fee at the retail level pays or receives interconnect charges on a per minute basis. This makes margins more difficult to predict and puts pressure on operators to charge at the retail level in a way which reflects interconnect charges so as to generate more predictable margins. Moving to BAK removes this problem
- In practice both the fixed and mobile operators in Hong Kong have chosen to use flat rate tariffs despite per minute interconnect charges. A move to BAK should make that same choice more attractive in future
- In particular, the fixed operators preserved a flat rate monthly charge when they rebalanced international and local service prices in 1999. The increase in the monthly charge as a result of this rebalancing was substantially greater than the increase in the monthly charge required now to compensate for loss of FMIC revenues. So it is reasonable to assume that fixed operators will again preserve the flat rate monthly charge.