

Case studies of mobile termination regimes in Canada, Hong Kong, Singapore and the USA

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Annex A: Key reference documents

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1 Mobile termination in non-CPP countries

1.1 Introduction

Ofcom asked Analysys Mason to prepare this report on the regulatory regimes governing the termination of calls on mobile networks in four countries – the US, Hong Kong, Singapore and Canada. These are often grouped together as having a Bill & Keep regime for call termination. As this report shows there are, however, significant complexities and variations on how these regimes work in practice.

There are two broad categorisations of termination regime:

- Regimes operating so-called ‘calling-party-network-pays’ (CPNP) termination regimes commonly combined with *ex ante* rate regulation; these are broadly similar to (or indeed, are often based on) European practice;
- Regimes that have unique inter-carrier compensation frameworks, employing hybrid mechanisms that usually combine some form of ‘bill-and-keep’ (BAK), ‘mobile party network pays’ (MPNP)¹, or other charging arrangements.

In the former category, there are notable distinctions in the way that mobile termination rates (MTRs) are calculated and the latitude given to operators in setting rates; however, the more interesting discussions involve the latter category, which includes the USA, Singapore, Hong Kong and Canada. In this report, we present an overview of the situation in each of these countries. Topics covered include:

- how the termination regime functions and the reasons for its implementation;
- issues observed in the termination regime presently in place; and
- an update on any outstanding plans to reform the termination regime, the rationale behind such plans and the status of those changes.

This report also includes an assessment in each market of four categories of relevant issues; ‘spam’, arbitrage, level of investment and availability and affordability of mobile services. These are discussed in more detail in Section 1.4.

¹ This terminology describes the system in Hong Kong, where the mobile network operator pays a per minute rate to the fixed operator for all minutes exchanged between the networks (whether originated or terminated on the mobile network), and the fixed network does not make any payments to the mobile operators at all

1.2 The distinction between the interconnection and retail charging regimes

Discussions about the appropriate choice of mobile charging regime are often framed in the context of two alternatives:

- receiving party pays (RPP); and
- calling party pays (CPP).

While this has been a convenient framework for distilling the relevant issues primarily as they affect consumers, it may obfuscate other issues of interest which affect operators as well as consumers because these terms more accurately refer to the retail arrangements between consumers and their service providers.

To correctly identify the wide range of options available to regulators, it is useful to describe and distinguish between the two distinct components of any mobile charging regime:

- **Interconnection charging** concerns payments *between operators* to compensate each other for traffic exchanged between their networks. These interconnection payments are typically made in order to enable an operator to recover the cost (either partially or fully) of carrying and terminating traffic that originates on another operator's network.

The following paragraphs clarify the distinction between three broad types of charging regime that have arisen at this level;

- under CPNP, the originating operator is responsible for paying a per minute charge to the terminating operator for traffic exchanged between the networks;
 - under BAK, there are no per minute charges levied between interconnected operators for the exchange of traffic, and no payments are exchanged. Operators can recover the cost of carrying and terminating any traffic originated on other networks from their own consumers in whatever way they choose; and
 - under MPNP, the mobile operator is responsible for paying a per minute charge for all traffic (whether originated or terminated) exchanged with fixed operators. Traffic exchange payments with other mobile operators generally default to BAK as the charges for this type of traffic are exactly balanced for every call.
- **Retail charging** concerns payments *from consumers to operators* for services provided. From an operator's perspective, the way it sets its retail prices represents a choice about how it chooses to recover its costs from its own customers, and can potentially cover both originating and terminating calls, as well as any fixed costs and other value-added services.

There are generally two categories of retail charging regimes:

- Under a CPP regime, consumers are charged a per minute outgoing rate and are not charged for receiving incoming calls. The cost of terminating outgoing calls on another network is paid by the calling party's network, which covers the cost in the outgoing rate it charges its subscribers;
- Under an RPP regime, consumers are charged a per minute airtime rate for all outgoing and incoming calls that they make. This regime is also commonly referred to as a mobile party pays (MPP) regime.

In principle, the interconnection charging regime and the retail charging regime are independent. A good illustration of this from our case study countries is seen in Singapore, which has a mobile interconnection charging regime in which the mobile termination rate is set to zero, and yet there exists both RPP and CPP pricing (free incoming call plans) in the retail arena. Likewise, while in the USA there is a small mobile termination rate, mobile operators have historically chosen RPP pricing. These arrangements are possible because while the interconnection charging regime is regulated, the mobile retail charging regime is not.

Indeed, the retail charging regime in most jurisdictions is unregulated and hence shaped by two main factors as shown in the figure below.

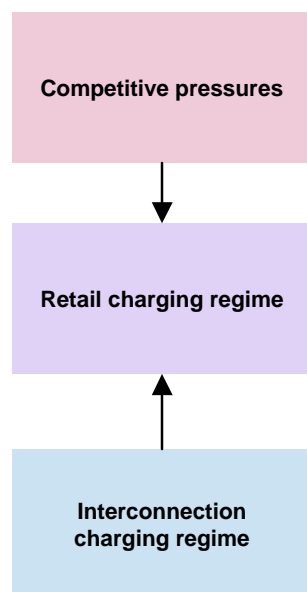


Figure 1.1: The retail charging regime is separate from, but closely linked to, the interconnection charging regime, and influenced by competitive pressures
[Source: Analysys Mason]

On the one hand, the (regulated) interconnection charging regime (represented by the lower box) determines the interconnection revenues operators receive and interconnection payments they make. Operators will generally seek to recover their net costs less net termination revenues through retail charges. Thus, in countries where termination rates are fully cost-based, there is no pressure to recover termination costs through retail pricing, and where termination rates are less than cost, nominal or zero, there is a need to recover those costs through retail pricing.

On the other hand, competitive pressures (represented by the upper box) from other operators and substitute services tend to push retail prices down. In the absence of competitive pressures, operators could charge what they like on top of the cost of termination. Competition not only pushes prices down, but may also encourage operators to allocate costs to the services that cause them.

However, even in competitive markets, operators try to differentiate their services, and an operator may make a commercial decision to cross-subsidise one service with another, for example in order to attract subscribers.

International examples of this include StarHub's introduction of 'free incoming' retail call plans when it entered the market in Singapore (which started with contract plans but now extends to prepaid subscribers); similarly free incoming plans are now offered by many operators in Canada. Since the operators are not fully compensated (or in some cases not compensated at all) for terminating incoming traffic, they recover terminating costs from elsewhere – for example through increased charges for outgoing calls, increased monthly subscription prices, increased future earnings from a larger customer base, or a daily flat rate for receiving unlimited incoming calls.

Our primary focus in the case studies will be on the interconnection charging regime. Where the various regulatory authorities use particular terminology, we will be explicit about its definition and scope in relation to mobile termination.

1.3 The need for harmonisation

The migration to all-IP networks is now well underway across the telecoms sector. In recent years carriers have increasingly understood the benefits of moving voice and data services onto a single IP platform.

International carriers have led the way, and fixed operators have been steadily migrating their national core networks to IP. Some of the world's largest incumbents (such as BT, Telstra and France Telecom) have announced plans and are in the process of replacing the PSTN entirely with end-to-end carrier-grade VoIP network technology (next-generation-networks – NGNs).

Mobile operators have actually been ahead of the curve relative to fixed NGNs. The launch of 3G and the introduction of IP multimedia subsystems (IMS) has them well on the way to all IP networks, and indeed fixed operators are adopting the IMS platform.

That the interconnection charging regimes for different types of services (for example, mobile voice, fixed voice, IP data) are different is largely a consequence of past regulation that was developed for a world where mobile and fixed networks were felt to provide distinct services because the technologies for the provision of fixed and mobile voice calls were separate; the markets for voice calls were in turn quite separate from markets for data services such as email and SMS. In addition, Internet interconnection was typically unregulated, and developed a form of

BAK known as peering, which has an impact as calls begin to migrate towards voice over IP technologies.

This growing and universal trend towards the adoption of IP-based technology in fixed and mobile networks, the development of fixed-mobile convergent services and the growth of non-voice multi-media services on all networks means that the traditional distinction between fixed and mobile voice services, and between voice and data services, are likely to become less relevant in the future.

Therefore, Ofcom is rightly investigating the question of what interconnection charging regime is most appropriate for telecommunications services going forward.

1.4 Comparative analysis of the four case study countries

As part of the process of answering the question posed in the previous section, Sections 2-5 present case studies of countries where mobile interconnection arrangements are different to that present in the UK which adopted a CPNP system (via a LRIC-based mobile termination rate) that led to operators adopting a CPP retail charging system.

In particular, Ofcom is interested in understanding the impact of these alternative arrangements in four areas:

- spam or unwanted calls, and how they are treated;
- the arbitrage opportunities afforded in such arrangements;
- the possibility of affecting investment; and
- the impact on the affordability and availability of mobile services.

In this section, we summarise the case study outcomes from four countries that have low or no mobile termination rates, corresponding with an RPP retail charging regime: Canada, Hong Kong, Singapore, and the USA, and briefly discuss the implications of our findings from consumer, operator and regulatory perspectives.

1.4.1 Observations on specific issues of relevance to Ofcom in the case study countries

- **Spam** – In general, the consumers' objections to spam in these countries is based more on nuisance and annoyance than on having to pay for unwanted calls. It is more common to have complaints about receiving spam SMS messages that are counted towards a subscriber's monthly allocation, as has been observed recently in Canada, and also in Hong Kong.

Regulators have generally addressed this issue by using instruments such as do-not-call registers and promulgating codes of conduct for contacting users. Note that in all countries, certain types of call continue to be permitted (such as person-to-person calls in Hong Kong, or political calls in Canada).

- **Arbitrage** – The presence of arbitrage opportunities varies widely by country, and if present tend to be very specific to the particular country. They can also vary from being seen as a significant problem (such as with above-cost pricing for some traffic types in the USA) to not being seen as much of a problem (such as in Canada where regulatory staff did not consider there to be any arbitrage opportunities currently being exploited). What is clear is that at this point in time, the potential for arbitrage is highly dependent on legacy arrangements that may predate the deployment of modern mobile networks.
- **Investment levels** – Given that all four countries have different interconnection charging regimes (despite all operating under the RPP retail system), it is difficult to draw any general conclusions on the impact of the choice of interconnection charging framework on future investment into the network.

Industry sources with knowledge of proposed termination regime changes in these countries did not consider that the termination regime adopted has had an adverse impact on the ability of mobile operators to invest in their networks.

- **Affordability and availability of mobile services** – Minutes of use (MoU) by mobile subscribers in all four case study countries is high and continues to grow, while take-up varies from relatively low (Canada) to very high (Hong Kong).

The significantly lower penetration levels seen in Canada and the USA (relative to Europe) are due to the lower incidence of prepaid subscriptions; in Europe, ownership of multiple (typically prepaid) subscriptions is more common.

There appears to be no specific regulatory process aimed at improving the affordability of mobile services especially for cost-conscious users in any of these countries. In Canada and the USA, universal service and affordability efforts have been focused on fixed telecommunications services, and mobile operators continue to be largely unregulated.

1.4.2 General discussion and observations

For comparative purposes we present a number of metrics that assess the development of the mobile market in the four case study countries and the UK. Figure 1.2 below illustrates how the take-up of mobile services has changed since 1995. Figure 1.3 below presents data on the minutes-of-use (MoU), population, SIM penetration, monthly ARPU, average revenue per minute (ARPM) and the mobile charging systems (retail and interconnection) across all five countries.

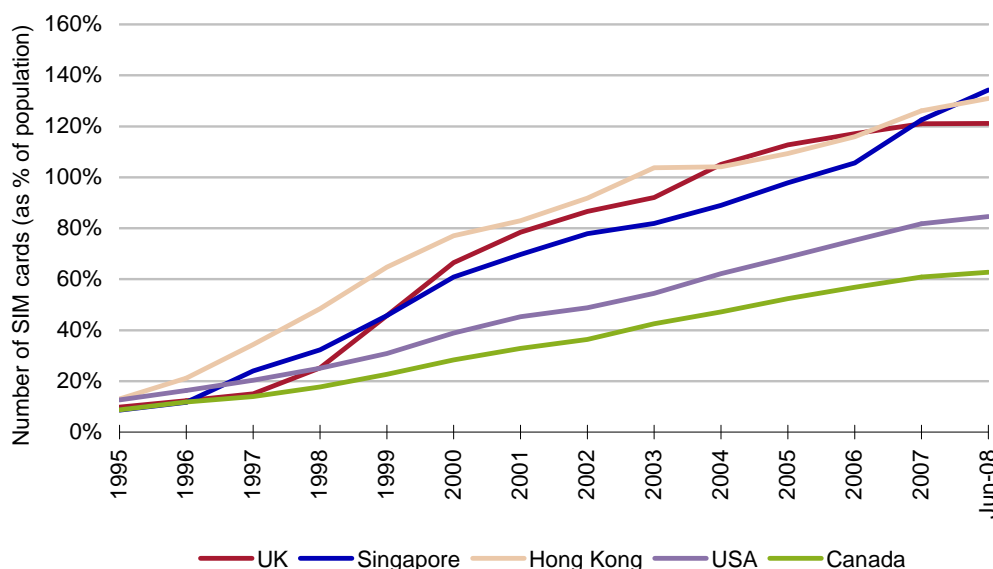


Figure 1.2: SIM penetration (as % of population) [Source: GlobalComms, ITU]

In evaluating the metrics in the table below the following should be borne in mind:

- MoU, ARPU and revenue per minute data are obtained from a variety of sources;
 - Hong Kong, Singapore, and UK MoU and ARPU data are obtained from the Merrill Lynch Global Wireless Matrix (ML);
 - Canadian MoU and ARPU data are obtained from the official regulatory annual report;
 - USA MoU data are obtained from the official wireless trade industry association CTIA, while ARPU and revenue per minute data are obtained from ML; and
 - All ARPM data is obtained from the ML.
- There has historically been some concern that ML data tends to overestimate usage and underestimate revenue in BAK countries. The data provided in this Matrix is understood to suffer from two possible sources of biases which have to be considered when using these data for international comparisons:
 - ML states that Minute of Usage (MoU) are overstated by about 20 per cent in the so called BAK countries due to double counting of minutes billed to both caller and receiver for on-net calls;
 - The factors that go into determining the revenue per minute data are somewhat uncertain and could include handset subsidies; if they do, it is not clear what the relative weighing of handset subsidies would be among the comparison countries, and thus the comparability of the numbers below may be ambiguous. ARPU is also biased upwards in CPNP countries because revenue from wholesale termination payments are "generally" included in the

revenue figures. Therefore, ARPM per user, which is defined as ARPU divided by MOU, tends to be overstated in CPNP countries.

	<i>UK</i> (YE 2007)	<i>Canada</i> (YE 2007)	<i>Hong Kong</i> (YE 2007)	<i>Singapore</i> (YE 2007)	<i>USA</i> (YE 2007)
Population (million)	61	33	6.9	4.6	302
SIM penetration (%)	121	61	126	123	82
Monthly MoU (minutes)	190	380	462	348	766
Monthly ARPU (GBP)	30	40	14	24	35
Revenue per minute (GBP)	0.108	0.074	0.027	0.054	0.034
Retail charging regime	CPP	RPP ²	RPP ²	RPP ²	RPP ²
Interconnection charging regime	CPNP/ LRIC MTR	BAK with mutual compensation ¹	MPNP	BAK with zero MTR	CPNP/ reciprocal compensation ³

¹ Mutual compensation rated based on incremental costing approach known as Phase II

² Note that free incoming call plans are available which simulate CPP like experience. However the predominant calling system is still RPP

³ Reciprocal compensation based on TELRIC methodology

Figure 1.3: Demographic and mobile market metrics [Sources: GlobalComms, Global Wireless Matrix, CTIA, CRTC, WCIS]

In the paragraphs below, we summarise some of our observations having assembled these case studies:

- Of the four case study countries, Singapore and Hong Kong have the strongest similarities in that they have higher SIM penetration figures (123% and 126% at YE 2007 respectively) and lower ARPUs (GBP14 and GBP24 respectively) than the UK. Conversely, the USA and Canada have lower penetration figures (82% and 61%) but higher ARPUs (GBP40 and GBP35 respectively);
- While looking at the comparative statistics, it is important to note that the standard penetration data shown in Figure 1.2 measures the number of *subscriptions* in circulation, and not the number of *users who hold mobile subscriptions*, which in the case of Hong Kong, Singapore and the UK is much lower than the figures shown.

This difference between these metrics arises due to a combination of various factors, the most significant being the number of prepaid subscriptions² and the incidence of users who maintain

² Many inactive SIMs are categorised as active subscriptions. This is due to the lag between a user discarding a SIM and an operator designating and reporting a SIM as inactive (often 3 months, but not uncommon to see 6 months or 1 year). As a result, the number of active subscriptions at a given point in time is likely to be overstated

multiple subscriptions. Incentives for maintaining multiple subscriptions vary by the retail regime as discussed below:

- In CPP countries in general, an incentive for a customer to maintain multiple subscriptions is to take advantage of lower rates for on-net calls given that mobile termination charges are passed on to customers in the form of considerably higher prices for off-net calls. While this was the case historically in Europe, as mobile termination rates have fallen, the price discrepancy has reduced and, increasingly the primary reasons for maintaining multiple SIMs are tied to other factors such as a separation between work and personal handsets, and the purchase of data dongles (which have their own individual SIMs); and
- In RPP countries, there has not been any significant on-net/off-net arbitrage which means that instances of multiple SIM ownership have been much less common. Multiple SIM ownership tied to work/personal separation has also had much less of an effect in those countries (such as the USA and Canada) where much larger bundles of minutes are available even on the lowest packages in some countries (*vis-à-vis* CPP countries)³; these are usually more than sufficient to satisfy all of a users needs (personal and otherwise) making it much less efficient to maintain more than one subscription.

In Hong Kong and Singapore, it seems likely that a combination of low prices, and prepaid subscriptions leads to SIM penetration rates of over 100%.

SIM penetration measures in the USA and Canada are likely to be closer to the actual user penetration levels given the very low incidence of prepaid subscriptions. Additionally very large bundles of minutes and equal pricing for on-net and off-net pricing also minimise the incentive to maintain multiple subscriptions. However SIM and user penetration measures are likely to diverge as the saturation of the contract market in the USA and Canada leads to a growing proportion of prepaid subscriptions.

A number of other factors (such as the geographical size of landmasses, which affects the cost of coverage) influence the understanding of SIM penetration in relation to perceived development of the mobile market. It would therefore be inappropriate to draw any definitive conclusions about how the interconnection charging regimes affect the penetration of SIM cards without further comprehensive investigation and analysis;

- All four countries exhibit higher average usage figures than the UK. An RPP retail regime contributes towards higher usage for two reasons. First, for any given retail regime, overall call volumes are more sensitive to outgoing call rates than the incoming call rates. Lower outgoing per-minute rates in RPP countries relative to CPP countries (because the cost of the call is shared with the call recipient) are thus a contributory factor in the higher MoUs

³ For example, the cheapest contract plans in the USA (typically USD40) will have 5000 or unlimited nights and weekend minutes to all USA domestic numbers in addition to unlimited on-net calls and 400-500 all purpose peak minutes. This allowance is more than enough for the totality of most users requirements (work, personal or otherwise)

exhibited. Secondly, operators in RPP countries offer large bundles of minutes that are typically not available in CPP countries (including the UK), meaning that the marginal cost of a call within the bundle is perceived to be zero. Further, in some packages, calls made at night and at weekends are free, promoting higher usage.

While all four countries have RPP retail charging regimes, there exist free incoming call plans in most of these jurisdictions. These plans typically come with higher outgoing call rates or additional monthly charges. As noted previously, the interconnection charging regimes in all four countries differ, some significantly. The existence of similar retail regimes with markedly different interconnection regimes emphasises the point that there is not necessarily a lock-step relationship between the interconnection and retail charging regimes, and that features that consumer find essential under a CPP calling regime (such as uncharged incoming calls) can be replicated in tandem with various interconnection charging regimes⁴;

- At the wholesale level, BAK is always associated with a RPP retail regime as CPP at the retail level does not provide a straightforward avenue for recovering termination costs from an operator's own subscribers. BAK arrangements for termination settlement are common in the four case study countries. There are different agreements (regulated and unregulated) governing the arrangements currently in place in these countries;
- Finally, any regulator considering significant changes to a termination framework must weigh any determined advantages against the overall burden imposed by such changes. This is not trivial, and could include tasks such as wholesale changes to billing and interconnection systems and comprehensive consumer education and media advertising.

Changes currently being considered by regulators in the case study countries are not intended to radically modify the existing retail and termination principles. Change to an alternative system deemed as more efficient in theory, but with radically different base principles will certainly be much more costly and may require different approaches to those taken in the case study countries in order to be deemed feasible and beneficial.

⁴ Note that free incoming call plans only strictly simulate a CPP-like regime from the perspective of a call recipient. The caller's origination charge is independent of what plan the call recipient subscribes to, and is dependent on whatever customer-operator relationship is present between the caller and the originating network i.e. a call recipient moving to an free incoming call plan does not change whatever rate or charging regime the caller has signed up to on their network

2 Mobile termination regime in Canada

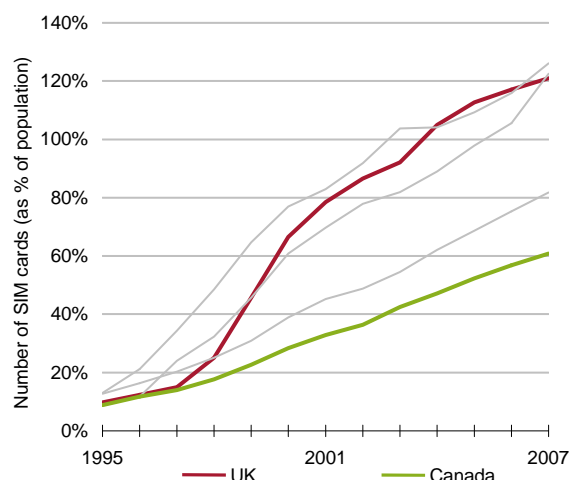


Figure 2.1: Overview of the Canadian mobile telecoms market

	Canada (YE 2007)	UK (YE 2007)
Population (million)	33	61
SIM penetration (%)	61	121
Monthly MoU (minutes)	380	190
Monthly ARPU (GBP)	40	30
Revenue per minute (GBP)	0.074	0.108
Retail charging regime	RPP ¹	CPP
Interconnection charging regime	BAK with mutual compensation ²	CPNP / LRIC MTR

¹ Note that free incoming call plans are available which simulate CPP like experience. However the predominant calling system is still RPP

² Mutual compensation rate based on incremental costing approach known as Phase II

2.1.1 Current regulatory framework governing mobile termination

All interconnection prices in Canada are determined using a cost-based capacity charging model, and are specific to each carrier⁵. In contrast to most other jurisdictions, termination or transit rates in Canada are assessed on a capacity basis (per DS0/E1) rather than attracting a per-minute charge. The cost standard used is referred to as 'Phase II' costing. Phase II costing is an incremental

⁵ All LECs must file cost studies and tariffs for any services that they offer to other operators with the CRTC following any determinations by the CRTC that affect these tariffs, or whenever they are able to show that the costs for these services have changed enough to warrant a change in the applicable rates. The determined rates are thus based on actual costs incurred (or expected to be incurred) by each carrier

costing approach first defined by the Canadian Radio-television and Telecommunications Commission (CRTC) in 1979, and revised in 2008⁶.

Termination arrangements for a mobile operator in Canada are determined by the official regulatory classification under which the operator provides services. There are two classification options available to mobile operators.

Classification as a competitive local exchange carrier

Competitive local exchange carriers (CLECs) are entitled to be treated in the same way as incumbent local exchange carriers (ILECs). This includes the right to equivalent interconnection agreements and costs, but comes with the same competitive obligations as ILECs⁷.

Termination charges are determined according to whether the traffic being exchanged is local or long-distance traffic:

- Local termination – traffic exchanged between two local exchange carrier (LECs) within a given local interconnection region (LIR)⁸ is exchanged on a BAK basis. However on these BAK links, an operator is permitted to track the volume of traffic exchanged, and claim termination payments from the other interconnected operator if a net traffic imbalance is observed. This process is referred to as ‘mutual compensation’. In this case, an operator may levy a set charge per DS0 based on the level of imbalance observed; and
- Long-distance traffic – for traffic that is to be terminated in a different LIR from where the traffic is exchanged, a CLEC can either pay the terminating LEC a set long-distance rate (again, based on a per-DS0 charge, with the traffic carried over separate links set aside for long-distance traffic) or can set up agreements with an independent inter-exchange carrier which already has arrangements to terminate traffic in the required LIR.

Classification as a wireless service provider

Mobile operators classified as wireless service provider (WSPs) are effectively treated as very large customers of the LECs with whom they interconnect. As such they are typically responsible

⁶ Telecom Decision 2008-14. Full details of the Phase II incremental costing approach can be found in Telecom Decision 79-16 and Telecom Decision 2008-14

⁷ These obligations include:- equal access to interexchange carriers within the LEC territory and WSPs wishing interconnection at CRTC-approved rates and under CRTC approved guidelines; emergency 911 access; privacy protection as defined by existing and future regulatory rules; provision of information as required by the CRTC at any point; provision of CRTC-defined list of information to any consumer upon request

⁸ LIRs are defined by the CRTC, generally to coincide with provincially defined administrative regions, with multiple local exchanges encompassed in each LIR. Each LEC must designate at least one point of interconnection (PoI) in each local interconnection region in which it provides services, and the costs of set-up and regular maintenance of interconnection links between the PoIs of a pair of interconnected LECs in a defined LIR are shared equally between these LECs

for all costs caused by their interconnection. However, as a consequence of the fact that the CRTC does not regulate the operations of mobile providers, WSPs are not subject to any of the obligations on ILECs, and are generally free to deploy network and services in whatever way they deem suitable, which can be an attractive proposition when compared with the regulatory burdens on operation as a CLEC.

For local WSP-LEC interconnection⁹, a WSP must set up, provision and upgrade interconnection links to the LEC such that there is always sufficient capacity to carry any traffic (outgoing or incoming) between the two networks. How the WSP chooses to do so (self-provisioning or commissioning from the LEC) is up to the WSP. There are additional separate termination charges (per DS0) assessed for traffic that is terminated in a different local exchange than that in which it was exchanged.

WSP-WSP interconnection is completely unregulated.

2.1.2 Historical development of regulatory framework

Telecom Decision 97-8 – Local competition was the landmark regulation that established the framework for local competition, setting out, among other things, rules that govern interconnection between and amongst telecommunications operators.

In 2001, the CRTC launched a major consultation process to review the interconnection arrangements first defined in 1997 with the stated objective of:

“... determining whether more efficient and effective arrangements could be found to provide for a more equitable distribution of the costs, lower the overall costs for interconnection and further the co-carrier relationship between competitive local exchange carriers (CLECs) and incumbent local exchange carriers (ILECs).”

The outcome of this process was codified in *Telecom Decision 2004-36* and *Telecom Decision 2006-35*. The key modification made to the framework concerned a transition from an interconnection framework initially based on local exchange boundaries to one based on the larger LIRs¹⁰. In the following paragraphs we provide some details regarding this transition, and discuss the reasons underlying the CRTC’s determinations:

- At the time Decision 97-8 was passed, contributions to universal service funds were based on the amount of long-distance minutes generated by operators. For this reason, local interconnection regions larger than a single exchange were deemed not suitable, as that would

⁹ Based on actual local exchange boundaries rather than the larger LIRs used for LEC-LEC interconnection

¹⁰ LIRs are defined by the CRTC, generally to coincide with provincially defined administrative regions. They generally consist of multiple local exchanges in close proximity, while in one case an entire territory is a single LIR.

compromise the integrity of the contribution system, and local traffic was defined as traffic exchanged and terminated within the boundaries of a given local exchange;

- However changes to universal service funding to base contributions on annual revenue of operators meant that using local exchange boundaries as the basis to distinguish between long distance and local traffic was no longer necessary. The CRTC determined that as technology advancement gave rise to network architectures requiring fewer switches to cover a given area, local interconnection regions larger than a single local exchange would increase interconnection efficiency by reducing the number of points of interconnection (POIs) required, alleviating the problem of underutilised interconnection links in sparsely populated exchanges, and simplify entry conditions for competitive operators;
- While recognising that backhaul costs for ILECs would likely increase under this scenario, CRTC was of the opinion that this increase would be mitigated by limiting LIRs to a reasonable size, and the reduced number of POIs the ILEC would have to deploy; and
- Note that while this decision changed the definition of local traffic for LEC-LEC interconnection, WSP-LEC interconnection was left unchanged, and local traffic in this scenario continues to be defined as traffic exchanged and terminated within local exchange boundaries

2.1.3 Future changes to the rules governing traffic termination

*Telecom Decision 2008-17*¹¹ was a major landmark determination passed in March 2008 which sought to comprehensively revise the wholesale regulatory framework in light of the government telecommunications policy objectives issued in 1996.

While this Decision did not directly change any of the rules that currently govern traffic termination¹², the CRTC did identify this Decision as a necessary milestone to revising certain high priority issues with regard to interconnection and termination. These issues, which are now due for consideration in the near future are:

- BAK termination for WSP-LEC interconnection – the impetus for a focus on this particular issue is the contention that it no longer makes sense for WSPs to simply be treated as large customers of LECs given their relative sizes and importance

¹¹ *Telecom Decision 2008-17 – Revised regulatory framework for wholesale services and definition of essential service* defined set out to review the regulatory framework for all wholesale services, and set out updated definition for essential services, superseding those set out in the previous major revision in 1997.

¹² This particular Decision did not change the principles of the interconnection framework as set out in Decision 97-8 (and modified in subsequent determinations), but rather updated created a class of services called interconnection services. All services under this classification are mandated but are not subject to some of the requirements placed on other telecommunications services such as unbundled local loops.

- A review of the appropriate pricing of shared-cost interconnection facilities;
- A review of interexchange carrier interconnection; and
- A review and streamlining of CLEC interconnection obligations as they apply to small CLECs.

2.1.4 Issues of interest

Spam

Industry sources noted that spam became a public issue in the second half of 2008 when two of the three major carrier (Telus and Bell) indicated that they would begin to charge for receiving incoming SMS messages where before they had not. The outcry concerning the problem of unwanted text messages prompted the operators to offer refunds when customers forward on to a support number any unwanted text messages received.

The volume of concerns raised by consumers on the issue of unsolicited telemarketing calls spurred the creation of the national Do-Not-Call List (DNCL) in 2006, which works along the same lines as any do-not-call registry around the world – registering a number on the list limits most types of unwanted calls with a few exemptions¹³. This is the primary means by which the problems of unsolicited voice calls are dealt with. Our research did not indicate that any other measures geared towards dealing with spam are either in place or currently under consideration by the CRTC.

Arbitrage

Our research did not uncover any arbitrage opportunities that have been identified or addressed by the CRTC.

The current disparity in treatment of WSPs versus LECs with regard to interconnection does create an incentive for mobile operators (who are likely to prefer the ‘hands-off’ regulation afforded WSPs) to attempt to avoid the high interconnection charges associated with exchanging traffic as a WSP by partnering routing traffic through associated entities (LECs or interexchange carriers) with more equitable interconnection treatment. However this is not seen as an arbitrage opportunity, but rather an explicit option afforded by the framework, albeit one that might lead to less efficient routing architectures.

While this is not currently an issue given that all the major mobile operators are associated with LECs, the entry of a number of new wireless carriers following a spectrum auction in 2008 played

¹³ From the official DNCL site: ‘Canadian registered charities, political parties, and candidates are still allowed to call for donations. Newspapers may also call you to sell you a subscription. If you have done business with a company in the last 18 months or inquired about a product or service in the last 6 months the company is considered to have a relationship with you and is allowed to call you.’

a part in the CRTC making the reform of WSP-LEC interconnection to be based on BAK a high priority in 2008/2009.

Investment levels

Network investment has been influenced primarily by the CRTC's Decisions in 1997 and 2004 which modified the basis of POI regulation from local exchanges to LIRs. As briefly discussed earlier, this did have the effect of increasing the required investments in terms of backhaul. However, the CRTC also noted that this would be somewhat mitigated by reductions in cost associated with number of POIs, and the change would in fact support the development of even more efficient architectures.

Our research did not turn up any concerns with regard to the impact of the current interconnection framework on the investment capabilities of operators, given that there are clear guidelines that have been in place since the advent of the local competition rules that govern where operators exchange traffic.

Again note that the CRTC has historically had a 'hands-off' approach to regulating mobile operators unless they choose to register as CLECs.

Affordability and Availability

As in the USA, universal service and affordability undertakings by the CRTC have tended to focus on fixed telephony services. As such, CRTC staff again highlighted the fact that although the CRTC monitors the state of development in the mobile industry it has instigated no processes to address affordability of mobile services.

Any efforts in this area have been directed towards reducing barriers to switching for consumers in order to allow them to 'shop around' for better deals thus incentivising operators to offer more affordable services.

Research into the issue of low-cost subscribers who tend to prefer prepaid services and are thus more disadvantaged under an RPP retail/BAK system relative to CPP/CPNP, turned up the following pointers:

- While there was regulatory concern a few years ago about the dearth of prepaid options, the entry of Virgin Mobile into the prepaid mobile market invigorated the sector, and its success prompted incumbent operators – who had previously shown themselves to be reluctant to offer these services – to compete more vigorously. Since then all three major national mobile providers have launched subsidiaries that are focused on the low-cost user segment;
- The increasing availability of triple- and quadruple-play options reduces the effective mobile retail prices within those bundles; and

- The fact that these are happening without requiring modification of interconnection arrangements is corroboration for the CRTC of its decision with regard to the interconnection charging regime in place.

3 Mobile termination regime in Hong Kong

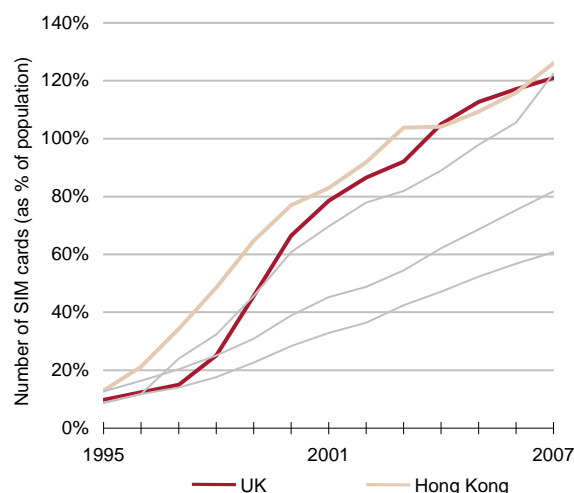


Figure 3.1: Overview of the Hong Kong mobile telecoms market

	Hong Kong (YE 2007)	UK (YE 2007)
Population (million)	6.9	61
SIM penetration (%)	126	121
Monthly MoU (minutes)	462	190
Monthly ARPU (GBP)	14	30
Revenue per minute (GBP)	0.027	0.108
Retail charging regime	RPP*	CPP
Interconnection charging regime	MPNP	CPNP / LRIC MTR

* Note that free incoming call plans are available which simulate the CPP experience. However the predominant calling system is still RPP

3.1.1 Current regulatory framework governing mobile termination

The regulatory structure currently in place for mobile termination in Hong Kong is MPNP. In the next few paragraphs, we briefly describe the features of this termination regime. However we do note that this regime is due to be phased out in favor of complete deregulation of termination (both fixed and mobile) by April 2009.

Under the MPNP regime, interconnection between fixed and mobile operators is regulated asymmetrically and mobile operators receive no revenue from fixed operators when they interconnect with them.

A regulated interconnection charge – the fixed-mobile interconnection charge (FMIC) – is applicable for all traffic exchanged between fixed and mobile customers. The original FMIC rate set up in the 1980s was based on a fully distributed model, which was then reviewed annually. The initial cost worked out at HKD0.09/minute (GBP0.0783 per minute at 2008 conversion rates¹⁴) and has fallen over the years to HKD0.0545/minute (GBP0.0474 per minute at 2008 conversion rates). The model was developed in conjunction with the incumbent, and as it is a model that has been agreed upon by all parties, there is usually little dispute to the cost it produces. This rate works out as roughly double the termination rate charged by fixed operators to terminate a call on a fixed network.

In the following paragraphs we outline in more detail the interconnection payment flows for various combinations of calls between fixed and mobile customers:

- **Fixed-mobile or mobile-fixed calls:** Since mobile telephony was initially seen as a luxury, mobile operators were required to pay an interconnection charge to the fixed operator on every call with a mobile and a fixed leg, whether *originating from* or *terminating on* a fixed network. The mobile operators recovered their costs as best as they could from other sources. This they did by charging their subscribers for incoming and outgoing calls. Fixed operators receive revenue every time traffic is exchanged with the mobile network irrespective of the direction of the call. This is a situation not commonly found anywhere else.

The origination and termination charges paid by the mobile operators for calls to the fixed network are the same. As the usage of mobile networks increased rapidly, the fixed operators expressed concern that the costs of providing existing and new services on the fixed networks was increasing at the same time as traffic was increasingly being carried only on mobile networks.

According to confidential OFTA statistics, well over 50% of traffic minutes were generated by mobile subscribers by 2006. A rebalancing of fixed line charges was carried out, but many fixed operators are still wary of how a change to the interconnection regime would affect their revenues;

- **Mobile-Mobile call:** For interconnection between mobile operators, OFTA historically did not state any preferred or default position, and left arrangements between operators to be commercially negotiated. The only obligation under the licence conditions is to interconnect with other networks and services. In case of disputes, OFTA may be requested to make a determination on the appropriate terms. There is also a requirement under the law that any interconnection charge determined by the regulator must be based on the "*reasonable relevant costs attributable to interconnection*". Since they have not been called upon to arbitrate in any disputes between mobile operators, there is no indication as to what the likely interconnection system would have been if OFTA were to regulate this area.

¹⁴ Exchange rate on 13 November 2008

Given that a fully deregulated framework is due to come into force in 2009, OFTA is unlikely to rule on any disputes brought before it in the near future under the current framework. However, there is some internal preference toward BAK in general as the most efficient solution, although nothing public or official has been indicated.

3.1.2 Development of the Hong Kong mobile market under RPP and MPNP

An MPNP interconnection charging regime for mobile calls has always been present in Hong Kong. At the time of the initial introduction of mobile telephony in Hong Kong in the 1980s, fixed lines were in widespread use. There was regulation concerning the provision of fixed-line services as the incumbent provider was deemed to have significant market power. A number of retail services were provided below cost and flat-rate pricing was prevalent in the market.

As discussed, when mobile networks were launched in the 1980s, the service was perceived as a luxury, and thus the RPP/MPNP system was meant to ensure that the cost of using a mobile network was borne fully by the mobile subscriber through origination and termination charges to fixed lines. As a result, mobile retail prices during the 1990s remained relatively high, and there was some concern that mobile penetration was low (13% in 1999). There were documented instances of consumers switching off their handsets and carrying pagers in order to control their costs arising from incoming fixed calls.

However OFTA never considered the matter pressing enough to seriously investigate a change to the interconnection regime, and was satisfied with the development of the market. Indeed, by December 2007, Hong Kong had one of the highest mobile penetrations in the world, at 126%. An MoU per month of 462 at the end of 2007 is also one of the highest in the world, and seems to validate the positions that OFTA has taken, in particular the conclusion that RPP/MPNP did not retard the development of mobile services in Hong Kong.

In the mid to late 1990s, some mobile operators called for a switch to CPNP, or (failing that) for mobile-fixed termination rates to be reduced to converge with fixed-fixed termination rates to address the perceived imbalance in termination revenues in favor of fixed operators. The reasons cited by mobile operators for a switch to CPNP also included the problem of unsolicited calls to mobile customers from commercial organisations with fixed lines. Mobile operators contended that this was encouraged by the fixed operators to stem the tide of revenue away from fixed networks.

At the time, there was anecdotal evidence that the majority of mobile subscribers were regularly subject to unsolicited calls from fixed lines. However OFTA was not convinced that a switch to CPNP was the best way to solve what was not in their eyes a critical issue. Nonetheless, as described below, they did take alternative actions to reduce such spam calls.

Our research indicates that CPNP was never seriously considered as an alternate interconnection regime for fixed-mobile calls for a variety of reasons. Chief among these was the feeling that since

OFTA does not regulate the actual retail charging structure, changes in the interconnection charges between operators would not necessarily be passed on to consumers (as part of a CPP retail charging regime for instance) barring any regulatory intervention in retail pricing. Additionally, OFTA was of the opinion that no market failure had occurred which would have necessitated serious consideration of a switch to CPNP as an appropriate solution.

However, following an official review of the termination framework as part of an assessment of the impact of fixed-mobile convergence in 2006¹⁵, OFTA is set to completely deregulate mobile termination over a two-year transition period culminating in the withdrawal of the MPNP arrangement by 27 April 2009.¹⁶ After this date, termination between all operators is set to be governed by commercial agreements.

3.1.3 Preparation for convergence in Hong Kong, and current interconnection charging arrangements

The 2006 fixed-mobile convergence review was the first consultation since the 1980s where a serious consideration of a change in interconnection framework was discussed, and the key focus appeared to be a push towards unified licensing and interconnection frameworks. The primary drivers behind the consultation included the advent of fixed-mobile convergence (FMC), the desire to have up-to-date market definitions that were technology-neutral, a concern that the current regulatory framework would be inadequate to deal with new services, and significant lobbying from mobile operators still unhappy with asymmetric connection rates.

The outcome of this regulatory review was that the current MPNP interconnection framework would be phased out over a two-year transition period; the current deadline for implementing new termination agreements, corresponding to the withdrawal of rules governing interconnection rates is 27 April 2009.

During this ongoing two-year transition period, fixed and mobile operators are encouraged to reach commercially negotiated interconnection arrangements. However, as far as OFTA is aware, there do not appear to have been any substantial negotiations on commercially negotiated rates since the issuing of guidance on deregulation in 2007.

While there is some concern at OFTA that a failure to agree new rates prior to the advent of deregulation in 2009 may lead to some instability, there is no indication currently that OFTA will intervene in the establishment of these interconnection rates other than to continue to encourage the operators to sign commercial agreements as soon as possible.

¹⁵ *Deregulation for F-M Convergence 14-7-06*, OFTA statement

¹⁶ TA Statement, *Deregulation for Fixed-Mobile Convergence*, 27 April 2007

3.1.4 Issues of interest

Spam

In order to deal with the problem of spam (caused in part by an interconnection framework in which fixed networks receive no charge for initiating calls to a mobile customer), OFTA introduced the '*Unsolicited electronic messages ordinance*'¹⁷:

- This document sets out guidelines for contacting any mobile customer with pre-recorded voice messages or SMS that are commercial in nature and prohibits senders of such messages from contacting any customer who has specifically requested not to be contacted;
- All such communications must have an 'unsubscribe' facility that allows users to opt out of receiving any such message lists they find themselves in; and
- OFTA established three 'do-not-call' registers (for fax messages, pre-recorded voice/video calls and SMS messages) for users to opt out of receiving unsolicited messages from any commercial sender of such communications.

Currently person-to-person telemarketing calls are not covered under this ordinance, with the stated reason of leaving room for normal and legitimate marketing activities. However customers are encouraged to exercise their rights under the Personal Data Privacy Ordinance to ask such marketers to cease contacting them. If such requests are not honoured, the appropriate arena for complaint is the Privacy Commissioner's office.

Arbitrage

Our research did not highlight any concerns with arbitrage opportunities under the current system. Given the current interconnection structure, it is clear that fixed networks have an incentive to exchange as much traffic as possible with the mobile network. However, since this incentive is not predisposed towards traffic in any particular direction, commercial distortions because of this incentive (such as specifically targeting net receivers or originators of traffic) have not been an issue.

Investment levels

Given the relatively small size of Hong Kong, and in the absence of long-distance domestic calling rates, investment impediments never arose as an issue relating to the interconnection regime.

In deciding to remove deregulation from mobile termination in 2006, OFTA did note that the mobile operators stood to gain significantly in terms of interconnection cost savings which could increase the funds available for general network investment, while the fixed operators would lose substantial amounts of revenue. OFTA noted however that the previous asymmetrical arrangement

¹⁷ Passed in November 1997

was a historical decision that on balance is not appropriate for current and future telecommunications services, and in their considered opinion, competition concerns are likely to dissuade fixed operators from reducing investment markedly (if at all) as a result of the change to the termination framework

Affordability and availability

As is the case in the USA and Canada, universal service and affordability determinations and obligations have historically been focused on fixed telephony services (in particular the incumbent PCCW), and as such no official processes have considered the impact of the termination framework and any considered changes on affordability of mobile services. While information from OFTA did indicate that the subject of mobile services prices did come up during the review of universal service carried out in 2007, official focus continues to remain on fixed services.

Additionally, other industry sources expressed the opinion that mobile retail prices continue to be much more affected by the vigorous retail competition in the market today. OFTA's uncertainty about how any cost savings due to changes in the termination framework are passed along to consumers also contributes towards the opinion of the low impact of termination arrangements on affordability of mobile services.

4 Mobile termination regime in Singapore

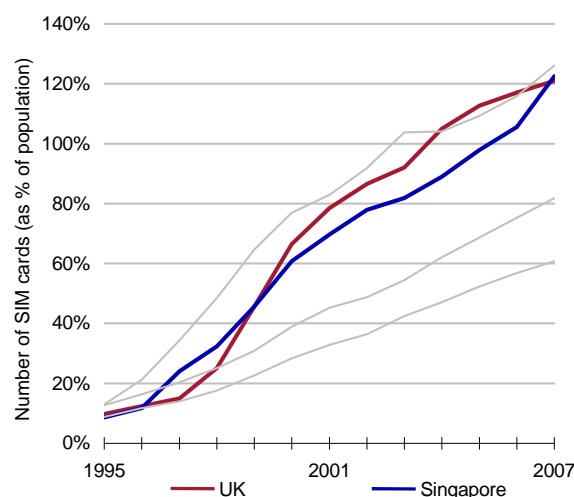


Figure 4.1: Overview of the Singapore mobile telecoms market

	Singapore (YE 2007)	UK (YE 2007)
Population (million)	4.6	61
SIM penetration (%)	123	121
Monthly MoU (minutes)	348	190
Monthly ARPU (GBP)	24	30
Revenue per minute (GBP)	0.054	0.108
Retail charging regime	RPP*	CPP
Interconnection charging regime	BAK / zero MTR	CPNP / LRIC MTR

*Note that free incoming call plans are available which simulate CPP like experience. However the predominant calling system is still RPP

4.1.1 Current regulatory framework governing mobile termination

The mobile termination rate is set at zero. As such, the following standards apply for calls between fixed and mobile customers

- **Fixed-mobile and mobile-mobile calls** – For any calls that terminate on a mobile operator's network, no termination charges are assessed. Thus, this system can be defined as a BAK system with no provisions for compensation of traffic imbalances

- **Fixed-fixed and Mobile-fixed calls** – A low cost-based termination rate (SGD0.0084¹⁸) is assessed for all traffic that terminates on incumbent fixed networks

4.1.2 Development of the regulatory framework governing mobile termination

Prior to the establishment of the Infocomm Development Agency (IDA) in 1999 and the first official review of the interconnection framework, the termination regime in Singapore arose from the retail pricing systems already in place for fixed and mobile services.

Retail prices for the fixed network had historically been set on a CPP basis which was accompanied by the principle that fixed termination charges were borne by the originating network.

By contrast, as mobile subscribers were charged for both incoming and outgoing calls, mobile operators were expected to recover the cost of terminating calls on their networks from their own subscribers and not from callers on other networks, be they fixed or mobile. Thus, the mobile termination rate in Singapore was set at zero, and remains so currently. As a result, given that fixed services charged a termination rate, mobile networks were required to pay that rate for outgoing mobile-to-fixed calls, even though they did not receive a termination rate for incoming fixed-to-mobile calls.

However, as retail prices are unregulated, operators have used this freedom to offer a variety of different retail pricing options, within the bounds of competitive pressure. These range from traditional RPP retail packages (where the mobile operator recovers the cost of termination through per minute call charges levied on the mobile subscriber for incoming calls) to free incoming call plans, in which the mobile operator must recover the cost either through a monthly subscription fee, or a daily fixed charge (as in the case of some prepaid free incoming call plans) or through higher charges for other services (such as outgoing calls) or a combination of these.

Through three reviews of the interconnection framework (1999, 2002 and 2006), the IDA has consistently decided to leave this termination structure unchanged, deciding in each case that on balance the telecommunications market was better served by not changing the system. The following paragraphs briefly describe each of these consultation processes highlighting the most prominent factors and outcomes in each process.

4.1.3 1999 Consultation on potential move from MPNP to CPNP interconnection framework

The fixed-mobile interconnection regime was first reviewed by IDA in 1999. During that process, IDA issued a consultation paper to the public and elicited views from industry players to determine if the method of charging for interconnection should remain a zero mobile termination or whether

¹⁸ GBP0.0037 at November 2008 currency rates

it should be changed to a CPNP system with cost-based termination charges for mobile networks. IDA stated that trends at the time (such as the changes in the international settlement regime under ITU-T Study Group 3, which implied that rates could be destination-dependent) prompted it to consider CPNP as a possible option. In addition, IDA also wanted to determine ways to increase competition and introduce innovative pricing in the market as the penetration rate was only 42% at the time, likely to be due in part to the need for mobile subscribers to bear the cost of incoming and outgoing calls.

StarHub was the only mobile operator in favour of changing the regime to a CPNP scheme, in part because it had already launched free incoming call plans at the retail level. A move to CPNP would have enabled it to begin charging a mobile termination rate for the calls it was terminating at no retail charge. M1 and the incumbent SingTel were opposed to such a move, not having any free incoming call plans in place at the time. AT&T (now Lucent) and Nortel were the two vendors that responded to the request and did not see a switch to CPNP to be fully beneficial to the marketplace. IDA ruled that there had been no significant evidence that moving to a CPNP regime would increase demand for mobile services or cause an increase in total usage, and therefore decided against a switch at that time.

4.1.4 2002 Consultation on potential move from MPNP to CPNP interconnection framework

Three years after the first CPNP consultation IDA felt that the Singapore market had witnessed enough changes to warrant a second look at the fixed-mobile interconnection regime.¹⁹ Mobile penetration in Singapore had jumped from 42% in October 1999 to over 74% by 2002. Increased adoption of SMS messaging and other data services, and the impending launch of advanced 3G data applications caused some observers in industry to wonder whether a fixed-mobile interconnection regime based on primarily voice services would still be appropriate for data. At the same time, surveys and newspaper articles were promoting a move to a CPP retail regime as a means for consumers to not have to pay for incoming calls.

IDA considered these issues and drafted a consultation paper in January 2002, which asked industry players once again to voice their opinions of the current fixed-mobile interconnection regime, and whether current and future market conditions would react more favourably to a CPNP regime instead. Of all the respondents, only StarHub and Virgin Mobile (an MVNO at the time) were in definite favour of a switch to a CPNP regime.

An internal study undertaken by the IDA concluded that a switch to CPNP would not be appropriate at the time because the Singapore mobile market was mature, with high mobile penetration rates and a willingness to pay for incoming calls on mobiles that had resulted in high call acceptance rates (in part because most incoming calls were covered by fixed monthly

¹⁹

In the interest of full disclosure, IDA hired Analysys Consulting to assist them in this review.

subscription rates for contract subscribers). The study showed that shifting the entire cost of calling from the mobile party to the calling party would simply depress call volumes.

The outcome of the 2002 review was that IDA decided not to switch to CPNP at that time.

4.1.5 2006 consultation on new mobile interconnection framework

A third review in less than eight years of the mobile interconnection framework in Singapore was primarily spurred on by the advent of developments that blurred the differences between previously distinct services.²⁰ As the consultation itself noted, in the intervening years since the previous review, the transition to all-IP core networks had begun in earnest, with the migration to VoIP already well underway in national and international core networks of carriers all over the world. Mobile operators were looking towards IMS technology to enable them to interconnect with other IP-based networks in the expanding all-IP world. Other wireless technologies, such as standards-based mobile WiMAX (802.16e) and a number of proprietary technologies which are natively IP-based promised to deliver mobile VoIP within a few years, which could break the traditional hold of the cellular mobile operators over mobile voice.

In February 2006, the Singapore government announced the creation of a national next-generation broadband network with equal access conditions for all operators, citing the desire to maintain Singapore's position as a regional 'infocomm hub' in a climate of rapid technical advancements. Plans along these lines were at a more advanced stage in Singapore than in many other countries where related issues were also being considered.

The overarching theme of all these changes is convergence – previously distinct lines between fixed and mobile, voice and data beginning to blur. This suggested that the regulation of these services needed to become increasingly harmonised.

The IDA's initial proposal was to have a long-term interconnection arrangement based on the BAK system regardless of the nature of the interconnecting networks. However following concerns from industry participants on the appropriateness of the methodology across all classes and types of networks, the IDA decided not prescribe BAK but to monitor the development in telecommunications markets worldwide and domestically, and formulate the appropriate long-term approach when necessary.

The options investigated during this process included the following:

- Introduction of a mobile termination rate: IDA was in the position of having an option of setting a mobile termination rate in principle anywhere between a small non-zero figure and a cost-based rate;

²⁰ Again IDA hired Analysys Consulting as consultants for this review.

- Deregulation of mobile interconnection charging: IP interconnection charging arrangements developed in a competitive fashion without regulatory intervention, and given that mobile telephony appeared to be gradually moving in the direction of IP, helped along by IMS technology, withdrawal of regulations governing mobile interconnection (and over what time frame) was a valid question; and
- No change to existing arrangements.

The key outcome of this consultation process was a decision not to change the mobile interconnection framework, but rather a clarification that the distinction between fixed and mobile customers is predicated on assigning each type of customer a specific number prefix associated with that type of service²¹. The key reasons given for not changing this framework included the following:

- The market has prospered under the existing arrangements, and no specific market failures have been identified that require a change in the interconnection framework to address; and
- No change in the existing system puts the IDA in the best position to deal with any future requirements on harmonisation of interconnection. In particular, given the convergence of fixed and mobile services, there would be relatively little impact from eliminating the fixed termination rate to achieve full harmonisation, versus the potential for opposition if it became necessary at a later date to remove any introduced mobile termination rates.

4.1.6 Issues of interest

Spam

Our research determined that spam is not specifically outlawed (no do-not-call list, etc.) but mobile numbers tend not to be published and there have been few if any marketing ‘cold calls’ so this has not been an issue.

Arbitrage

Given that the fixed termination rate was very low, there was no incentive to arbitrage the slight differences in termination rates in any direction, and thus this was not an issue in the reviews. Interestingly, arbitrage did arise in the third review described above, resulting from the free incoming call plans that all three operators had adopted following its introduction by StarHub. Under this system (which was similar to international call back services), one mobile subscriber would use a special prefix to dial a fixed service which would then disconnect and dial the called party, and also call back the calling party, so that both would receive free incoming calls while paying only the much lower fixed calling rates. It was decided that this resulted from commercial

²¹ Customers are assigned numbers with prefixes dependent on the nature of their service – 6 for customers with fixed service, 8 or 9 for mobile customers

decisions on the part of the operators to offer free incoming call plans, and thus did not warrant changes to the interconnection regime.

Investment levels

Given the relatively small size of Singapore, and in particular the absence of long-distance domestic calling rates (along with low transit rates), investment impediments never arose as an issue relating to the interconnection regime.

Affordability and availability

Given the relative affluence of Singapore, and the competitive contract offerings, along with free incoming call plans for mobiles, any desirable impact of moving to CPNP in terms of lowering the cost of mobile service for low income subscribers, while considered, was not considered paramount in the deliberations to move to CPNP.

5 Mobile termination regime in the USA

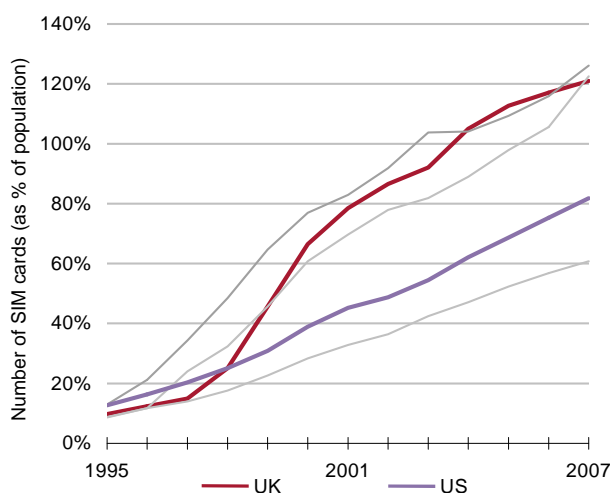


Figure 5.1: Overview of the US mobile telecoms market

	US (YE 2007)	UK (YE 2007)
Population (million)	302	61
SIM penetration (%)	82	121
Monthly MoU (minutes)	766	190
Monthly ARPU (GBP)	35	30
Revenue per minute (GBP)	0.034	0.108
Retail charging regime	RPP ¹	CPP
Interconnection charging regime	CPNP / reciprocal compensation ²	CPNP / LRIC MTR

¹ Note that free incoming call plans are available which simulate CPP experience. However the predominant calling system is still RPP

² Reciprocal compensation based on TELRIC methodology

5.1.1 Current inter-carrier compensation framework

The Federal Communications Commission (FCC) sets the principles that govern the interconnection rates at a federal level and determines inter-state toll rates, while state public utility commissions (PUCs) are in charge of determining the actual interconnection rates for traffic that remains within state borders (intra-state traffic) which includes both local and long-distance (toll) traffic. Commercially negotiated agreements can always be set outside the official rate guidance process, with the understanding that any disagreements brought before regulatory authorities will be settled based on the established mechanisms.

Traffic termination payments made between operators in the USA are generally referred to as *inter-carrier compensation* payments. Current inter-carrier compensation rates are determined

based upon a host of complex factors and both federal and state regulations which cover geography, type of traffic and type of carrier among other factors. We give a brief overview of the interconnection arrangements here, noting that that a lot of complexity is concealed by this necessarily brief profile:

- Interconnection between two mobile operators, also known as commercial mobile radio service (CMRS) interconnection between CMRS and non-incumbent LECs, and interconnection between two non-incumbent LECs is currently unregulated. Although the FCC does not have any direct visibility of the nature of the interconnection arrangements between these carriers, our research indicated that the FCC is of the opinion that the majority of current agreements are based on a BAK methodology;
- Inter-carrier compensation payments exchanged between CMRS/CLEC and ILECs are treated differently based on whether the exchanged traffic is local or toll traffic:
 - Toll traffic – *Access charges* are defined as “ *compensation payments that are due to an operator for traffic that is to be terminated in a local interconnection area different from the local interconnection area where the traffic is exchanged*”. There are two types – Interstate Access charges set by the FCC and Intrastate Access charges set by the state PUCs. CMRS providers not allowed to file access tariffs, and thus as a practical matter, CMRS carriers do not receive any intra-state or inter-state access revenues;
 - Local traffic – inter-carrier compensation for traffic exchanged and terminated in the same local area is generally based on a ‘reciprocal compensation’ principle as established by the 1996 Act²². As noted by the FCC “*Historically, reciprocal compensation rates have been lower than access charge rates, and inter-state access charge rates have been lower than intra-state access charge rates. The difference between these rates can be large, with some reciprocal compensation rates as low as USD0.00 per minute, and some intra-state access charge rates greater than USD0.30 per minute*”;
- There is a provision for mobile network operators to charge a higher termination rate if they can demonstrate that the cost of terminating calls on their network is higher than that of the ILEC in a particular state, but to date no operator has taken that route.

5.1.2 Development of regulatory framework governing mobile termination

Mobile airtime in the USA has historically been charged on an RPP basis, but there have always been small (non-zero) termination rates. Specifically, the interconnection settlement regime generally set fixed and mobile termination rates at the same level for different carrier types, and differed either by geography or classification (e.g. rural carrier).

²² The Act expresses a preference for negotiated agreements in the first instance, while also providing a basis for settling interconnection disputes where they arise.

Prior to 1996 and the enactment of the Telecommunications Act, wireless operators were not legally entitled to recover the costs of terminating calls on their networks by charging a termination rate, in contrast to the situation among wireline operators who charged each other for termination. As a result, the wireless operators chose to recover their costs by charging their own subscribers for all airtime, both incoming and outgoing, which is what came to be known as a RPP calling regime.

The Telecommunications Act of 1996 is the landmark legislation that established the principle of reciprocal compensation between LECs and other requesting interconnecting parties for the transport and termination of telecommunications traffic. According to these regulations, compensation between fixed LECs and mobile operators for terminating traffic is on a symmetric basis, based on the ILECs termination rate, and there is no specific difference made between a mobile termination rate and a fixed termination rate. ILECs could propose BAK with interconnecting operators, but in case of a disagreement the default was to charge the regulated interconnection rates.

Circa 1997, there was some concern in government circles that mobile growth rates were not matching those seen in other countries, and that this could be based on subscribers bearing the cost of incoming and terminating calls. The chairman of the FCC at the time had just been on several international trips and was impressed by the mobile growth rates seen in some other countries.

Thus the impetus for the consideration of promotion of CPP was generated within the FCC, although there had been no great complaint from operators or consumers prompting this consideration. In a drawn out process that began in 1997, the FCC sought to explore whether CPP *“could serve as one means of promoting and expanding competition in the local exchange telephone market”*.

At the termination of the enquiry in 2001, the FCC decided that there was no need for any regulatory action on their part, and that market forces would determine whether retail calling based on a CPP system would become widespread.

The FCC, has attempted to deal with a number of concerns that have arisen under the current interconnection framework. Note that none of these concerns are specific to mobile carriers. Of particular concern to the FCC were the following:

- Arbitrage opportunities that arose from the fact that reciprocal compensation rates set by some states were high enough to incentivise LECs to target net receivers of PSTN traffic such as dial-up ISPs. This led to significant traffic imbalances, and claims for reciprocal compensation payments worth billions of dollars, and has since been addressed with regulations relating to ISP bound traffic;
- The incentive for service providers to conceal or misidentify the source of traffic in order to avoid or reduce payments to other service providers. This opportunity arises because of the disparity in rates that may arise because of the difference in treatment of ‘like’ traffic based on other factors such as carrier type; and

- The ongoing need for patchwork regulation which contributes to an inefficient and complex regulatory structure. Two example are described below:
 - One of the earliest FCC decisions not to regulate inter-state long-distance (toll) charges for CLECs led to many CLECs filing rates significantly above those filed by ILECs for similar services, thus leading the FCC to adopt new rules on those CLEC rates on top of the previously established guidelines; and
 - The ‘Access Stimulation’ problem relates to the claims made by various commentators to the FCC indicating that some LECs deliberately target customers that generate large incoming call volumes (such as conference call providers) which enable these LECs to receive large net volumes of reciprocal compensation payments.

5.1.3 1997-1999 Proposed rulemaking and consideration of mandating CPP as a retail option

In a process that started with a notice of inquiry (NOI) in September 1997, the FCC sought to remove any regulatory barriers to offering CPP (over the existing CPNP interconnection system) as a system for calls between mobile subscribers and other parties. Prior to this, there had not been any feedback from operators or customers indicating dissatisfaction with the calling regime. The FCC’s stated purpose was:

“...to explore whether Calling Party Pays could serve as one means of promoting and expanding competition in the local exchange telephone market. The Commission is committed to taking the necessary actions to increase consumer options for local telephone service”

In a subsequent notice of proposed rule-making (NPRM) issued in 1999, the main issue the FCC sought comment on were legal rather than competitive in nature. There was also a concern about whether market conditions were likely to exert competitive pressure on rates charged to calling parties on CPP calls. Other points highlighted as being important included:

- **Consumer protection issues.** In the USA, mobile numbers were provided from the same numbering range as fixed numbers, and thus there was no indication to callers that they were calling a mobile line (and so would incur the associated charges). Written into the NPRM was the intention to develop a uniform notification requirement that would protect consumers by providing them with sufficient information as well as the opportunity to decide whether to complete or terminate the (higher-priced) CPP call to a mobile subscriber. Such information would include the prices to be charged to the caller and the identification of the mobile provider. It was not specified what form the notification would take, although a pre-recorded voice announcement was the most likely scenario; and
- **Technical and contractual requirements needed to implement the CPP retail system.** In particular, the FCC required comment on whether incumbent fixed operators had to be required to provide billing and collection services to all mobile operators, or provide billing

name and address information to the operators or third parties to bill the subscribers, given some raised concerns about the cost of implementing such measures.

The FCC brought the proceedings to a halt in 2001 without taking any action on the issues raised in the NPRM. A number of reasons were put forward for terminating the proceeding without any specific rules defined:

- Existing rules did not prevent a carrier from offering consumers retail CPP options if they so chose, and there were avenues to negotiate higher mobile termination charges if justified;
- Flat-rate pricing and ‘free first minute’ plans that were not available at the time of the proceedings had since become widely available. These plans reduced or eliminated the disincentive to accept incoming calls, and thus provided similar benefits to those available under a CPP retail regime; and
- Retail prices had generally fallen, and mobile penetration grown substantially since the proceedings were opened hence action was felt to be less necessary.

For the reasons given above, the FCC decided not to rule on the specifics of how any carrier could offer CPP retail options, but did note that it would examine any cases where an individual operator chose to offer CPP calling and make appropriate determination at that time. The fact that no party was strenuously pushing for the availability of CPP options also contributed to the decision by the FCC to not pursue this proceeding.

5.1.4 Development of a unified inter-carrier compensation regime

The FCC is currently in the process of soliciting comments on a major revision to the inter-carrier compensation framework which aims to unify and harmonise current rates.

As the FCC itself has noted²³, there are a number of significant issues associated with the current framework, particularly with regard to the complex patchwork of regulations that are currently in force. In particular, the key impetus for this review stems from differences in access rates based on the distance of the call (whether they are local or long-distance) and the location of the terminating party (if they are rural), based on legacy universal service subsidies, and does not specifically stem from issues relating to mobile termination. Other reasons given for initiating this proceeding included the advent of increasing competition and new technologies in the market. The higher cost access charge regime gave an incentive to VoIP providers to arbitrage by terminating long-distance calls locally to pay the lower reciprocal compensation rates.

²³ See *FCC Issues Order Responding to D.C. Circuit Mandamus and Joint Board Recommended Decision, Seeks Further Comment on Comprehensive Reform*. FCC Website, 5 November 2008

The FCC introduced an NPRM²⁴ in early 2001 with the intention of determining if a unified interconnection regime which would address these issues was feasible for all regulated payment flows between telecommunications carriers interconnecting with the local fixed telephone network. Thus the rules would apply to mobile networks since their termination costs were based on a reciprocal regime dependent on the incumbent fixed operator's calculated or set rates.

The primary impetus behind the initiation of the proceeding appeared to be a concern over opportunities for regulatory arbitrage with existing rules. At the time, there was a worry that carriers would be incentivised to chase customers like dial-up ISPs, which would lead a distortion of the market. On balance ISPs typically terminate significant traffic volumes to carriers due to a higher volume of download traffic versus upload traffic generated by consumers taking Internet services. If the termination rate were even slightly above cost, the net termination payments from such a customer would contain a windfall profit.

The NPRM did not seek to include in this discussion the following types of interconnection that were not already under regulation: Internet backbone interconnection, interconnection between two mobile providers and interconnection between two non-incumbent fixed operators.

5.1.5 FCC proposal for unified inter-carrier compensation regime

In the course of the unified inter-carrier compensation proceeding, a number of proposals to revise the current compensation framework were promulgated, the most prominent of which was the Missoula plan²⁵. On 11 November 2008, the FCC released a draft version of a unified inter-carrier compensation regime for telecommunications carriers in the USA²⁶, taking into account all consultation submissions received.

As an overall summary, this proposal's main objective was to replace a system that included a variety of exceptions and separate approaches (depending on numerous factors such as the type of calls and origination point) with a more uniform system, with a trend towards lower termination rates that were symmetric (i.e. the same for both fixed and mobile).

A more detailed account of the key objectives and highlights of the plan are presented below:

- **Eliminate implicit subsidies from inter-carrier compensation charges** – This objective has the key goal of treating like traffic in the same manner. While this objective has been paramount since the introduction of competitive long distance services, a key concern has always been how to balance the desire for more efficient interconnection charges and

²⁴ This NPRM was introduced just after the termination of the NPRM dealing with the CPP system

²⁵ Filed by the NARUC Task Force on Inter-carrier Compensation in July 2006.

²⁶ See *FCC Issues Order Responding to D.C. Circuit Mandamus and Joint Board Recommended Decision, Seeks Further Comment on Comprehensive Reform*. FCC Website, 5 November 2008

mechanisms with avoiding adverse effects on consumers in the form of higher flat-rated charges or even further reduced inter-carrier revenues for operators;

- **Transition plan** – In order to minimise the adverse impact on both carriers and consumers from the move to a new framework, the proposal establishes a ten-year transition period that is broken up into three phases:
 - In Phase 1, intra-state access rates are reduced to the level of the inter-state access rates which are established by the FCC over a two-year period, by 50% per annum;
 - In Phase 2, all carriers will reduce their rates over a two-year period to an interim uniform termination rate (uniform across all traffic types – local, intra-state and inter-state), which will be set by the state PUCs. Note that any carriers whose rates for any of these types of traffic are less than the interim rate are prohibited from increasing their rates; and
 - In the third and final phase, all rates that are established at the end of Phase 2 will be gradually reduced towards the final rate that is to apply at the end of the ten-year period in a manner determined by the state to minimise market disruptions within its jurisdictions.
- **Final rates are to be based on new additional costs standard** – inter-carrier compensation rates are no longer to be based on the TELRIC standard. It is the FCC’s belief that the traditional economic definition of incremental cost (as applied to multiproduct firms) is most appropriate for determining termination rates. Key differences between these methodologies as enumerated by the FCC include:
 - the exclusion of all common costs and overhead allocations under the traditional approach (some recovery is allowed under the TELRIC methodology); and
 - TELRIC is an average cost methodology whereas the proposed approach determines the true incremental cost of call termination (equal to the cost of network providing all services minus the cost of network providing all services except call termination).

To address a common criticism of the traditional approach which is that it may not allow a firm to recover its total costs (especially if common costs are significant), the FCC noted that common pricing regimes that charge both a fixed fee and variable usage charge could be set up such that the usage charge only recovers the marginal costs while any remaining costs are recovered using the fixed fees.

One key driver behind this change of cost standard is the existence of huge regulatory arbitrage opportunities. As the FCC put it *“if reciprocal compensation rates truly reflected the incremental additional costs, regulatory arbitrage should not occur because a carrier would not make a profit by recovering its incremental cost”*;

- **Removal of potential for asymmetric rates** – CMRS providers are no longer allowed to request higher termination rates in their networks, where previously they could do so if they could file cost studies that showed just cause for higher rates.

In addition a number of issues not directly considered by the plan are subject to further discussion and consultation by the FCC. These include the elimination of originating access charges and the treatment of transit traffic.

This proposal represents the most comprehensive to date attempt by the FCC to both unify and simplify the interconnection rules in the US telecommunications market. Before this order is adopted, the FCC is in the process of general consultation on this proposal, with an emphasis on addressing the following key questions:

- Should the additional cost standard be the existing TELRIC standard; or the incremental cost standard described in the draft order?
- Should the terminating rate for all traffic be set as a single, state-wide rate or a single rate per operating company?

While the FCC has shown the desire to see this comprehensive draft proposal ratified, the extensive changes being proposed are likely to give rise to a vigorous consultation process which could potentially delay the final ratification of any new framework in a process that has been going on since 2001.

5.1.6 Issues of interest

Spam

As a result of a lack of directory listing of mobile numbers, along with rules against unwanted calls to mobile lines and a national 'do-not-call' registry, this is not currently an issue in the USA.

Arbitrage

As discussed earlier, the main arbitrage issues that have risen under this system have been related to the following:

- Reciprocal compensation rates that are higher than cost providing an opportunity for net receivers of traffic to make significant profit margins; and
- 'Phantom traffic' arises when appropriate signalling information is not attached to voice traffic making it difficult for the terminating operator to know which operator originated the traffic. This opportunity arises because of the disparity in rates of 'like' traffic based on other factors such as carrier type, which provides an incentive for some carriers to misidentify or conceal traffic origination details in order to reduce or avoid significant termination payments.

These and any other issues provide the impetus for the unified inter-carrier compensation proposal currently under review. Again, note that these concerns are not specific to mobile carriers.

Investment levels

The FCC currently operates under the principle that an originating carrier is responsible for transport of traffic to the appropriate established interconnection point of the terminating carrier. There are also rules in place that govern where and how POIs are established.

In terms of the impact of changes in the interconnection framework on future investment, the FCC is still in the process of understanding the long-term implications. In trying to understand this issue, two particular issues have been raised:

- Existing links, points of interconnection and arrangements will be a significant determining factor guiding future developments. Given the already extensive reach of most networks, it is unclear whether there will be significant departures from existing physical interconnection arrangements; and
- The trend to a packet-switched world will pose a challenge given that it is likely that fewer switches will be needed to deal with packet-switched traffic compared to circuit-switched traffic. As such, operators will then have the choice of restructuring their networks to take advantage of efficiencies that come with these switches.

However, the fact that proposed changes to the framework are still based on the reciprocal compensation principle enshrined in the Telecoms Act of 1996 along with the relevant rules and guidelines concerning minimum interconnection point requirements mitigates the relative effect of these key issues on future investment levels of interconnected operators under the current and proposed interconnection frameworks.

Affordability and availability

FCC staff related that most universal service and affordability investigations have been concerned with wireline operators, and are not generally applicable to wireless operators. In relation to the particular issue here (which is less in terms of mobile coverage, and more in terms of general affordability of mobile services), it is not an issue that the FCC is particularly worried about.

Earlier in the development of the mobile market, there was concern about whether the nature of the interconnection and retail charging regime was disadvantageous in terms of affordability to significant parts of the population (and hence slow take-up in the early years).

However given that average usage levels in the USA continue to be high (848 minutes at the end of 2007) even as penetration of the population is high (85% by the middle of 2008) indications from the regulator are that the current framework is not seen as any impediment to the widespread usage of mobile telecoms, and that reform concerns are more concerned with inefficiencies in the current structure as well as continuing to make sure that universal service funds are available for operators in high-cost areas.

Annex A: Key reference documents

The list below is a reference of the most significant publicly available documents that we have used to create these profiles. In addition to these, we also had access to a number of confidential documents that proved useful in creating the case study profiles, but which cannot, and have not, been reproduced here.

A.1.1 Canada

- [Telecom Decision 97-8: Local competition](#) – Regulatory order comprehensively establishing the general framework for licensing of and competition between telecommunications service providers in Canada.
- [Telecom Decision 2002-54: Model tariff for the interconnection services of competitive local exchange carriers](#) – This decision directed all CLECs to adopt the model tariff for their general tariffs and required all CLECs to file amended tariff pages reflecting the changed terms, conditions and rates of the model tariff within 60 days.
- [Telecom Decision 2004-46: Trunking arrangements for the interchange of traffic and the point of interconnection between local exchange carriers](#) – This decision modified the regulatory framework for the interconnection of local exchange carriers, in particular consolidating local exchanges.
- [Telecom Decision 2006-35: Follow up to Telecom Decision 2004-46](#) – This decision approved the amended definitions of the local interconnection regions proposed by each ILEC and also approved the interconnection rates for the termination of CLEC intra-local interconnection region rates for each ILEC.

A.1.2 Hong Kong

- [‘Deregulation for Fixed Mobile Convergence’](#) – This regulatory order de-regulated the current fixed mobile interconnection charge arrangement and created a study to implement fixed mobile number portability.
- [‘Increase in Charges for Mobile Network Interconnection by PCCW-HKT Telephone Limited’](#) – This order approved a request from PCCW to increase the tariff for interconnection rates between PCCW and mobile network operators.

A.1.3 Singapore

- [Review of Fixed-Mobile Interconnection](#) – IDA studied the benefits of changing the current fixed-mobile interconnection regime and determined that the costs of doing so would outweigh any benefits, continuing the current fixed-mobile interconnection regime and RPP charging system.
- [“Charging for mobile phone services: Mobile-Party-Pays \(“MPP”\) VS Calling-Party-Pays \(CPP\)”](#) – IDA examined the benefits of moving from a RPP to CPP but did not find a compelling reason to do so, claiming that a move to CPP would just shift costs from the receiving mobile party to the calling party. Therefore, they decided to retain the existing RPP charging regime.
- [Proposed Regulatory Framework For Telephony Services Over Wireless Broadband Access Networks And Interconnection Framework For Telephone Services](#) – An IDA study examined a regulatory framework for telephony services of wireless broadband access networks and interconnection framework for telephone services and determined that it was more efficient for each party to bear its own costs for any operational or administrative changes that emerged from the POI Interconnection Arrangement.

A.1.4 USA

- [Inter-carrier compensation reform proceedings](#) – This website acts as a repository for comprehensive intercarrier compensation reform proceedings.
- [FCC Issues Order Responding to D.C. Circuit Mandamus and Joint Board Recommended Decision, Seeks Further Comment on Comprehensive Reform \(November 2008\)](#) – This order concluded that the FCC had the authority to impose ISP-bound traffic rules.