

1.4 Interconnection

Networks interconnect to exchange traffic and supply inputs in situations where the operators both compete and cooperate. As explained above, such inputs are “essential facilities.” As the OECD observed: *“the regulation of the terms and conditions under which competing firms have access to essential inputs provided by rivals has become the single biggest issue facing regulators of public utility industries. This issue is both theoretically complex and inherently controversial. Since the development of competition and the success of liberalization often depend on the access terms and conditions chosen, there is also a strong public policy interest in getting these terms and conditions “right”. At the same time, new entrant firms and incumbents often have a substantial financial stake in the outcome and therefore a strong interest in negotiating aggressively.”**

The legacy of the initial liberalization of markets and required interconnection lingers in current interconnection practices. Interconnection charges are often characterized by the same features as retail voice tariffs with a dependency on time of day, length of call, and distance covered. These characteristics are coming under increasing pressure from disruptive technologies. For example capacity-based charging* has been implemented by ISPs in some instances while most large Internet backbone providers use “sender keeps all” (or “bill and keep”) for interconnection with equivalent “peers.”

In order for a new entrant to compete with the incumbent on a wide range of services, it needs access to different, separately priced facilities on a network, often on a shared basis. To ensure access, many regulators have required incumbents to “unbundle” their facilities, particularly the local loop, which allows the competitor to lease the incumbent’s local line to the customer on a wholesale basis. Although unbundling can help ensure competition, in developing countries where fixed penetration is limited, such unbundling may discourage network roll out. The availability of wireless access and the authorization of multiple services via cable TV and other platforms are diminishing the “essential” nature of some facilities and thereby the need for *ex ante* regulation.

Many agree that interconnection charges should be based on the necessary cost incurred by the receiving party of the additional traffic it has to carry – that is, the requesting party pays the providing party the relevant costs caused by the request. However, there is much less agreement on the underlying theoretical models. Fundamental disputes surround the issues of sunk, variable, shared, common, replacement, historic, depreciation, incremental and forward-looking costs, and differing pricing models* that are found in the Toolkit. Benchmarks may be more appropriate in developing markets where the informational requirements of these various approaches are too onerous for operators and regulators.

Disputes over local loop unbundling have declined as mobile voice services and IP-based services have risen in importance. Two areas in which interconnection policies continue to develop and mature are issues relating to mobile termination rates (MTRs) and interconnection between traditional and IP-based services, particularly Voice over Internet Protocol (VoIP.)

Interconnection charges on calls from fixed to mobile operators continue as a legacy from introducing competition in the voice services market. The mobile sector was originally perceived as an “elite” rather than a “mass” market and, at the time, the technology was new and fairly costly. Furthermore, incumbents were frequently members of the first wave of authorized mobile service providers. In these circumstances, there was a tendency for the incumbent operator to set high fixed-to-mobile interconnection (or termination) charges as a means of transferring funds internally to its start-up subsidiary. When additional authorizations were issued, the new entrants willingly accepted these high charges and such payments became an important element of mobile business plans. There has been a tendency for regulators to focus on the charges paid by mobile operators to fixed operators for call termination rather than the reverse. This tendency has persisted even when the total number of mobile customers has surpassed the number on the fixed network. The decline in the interconnection charges of mobile operators has not kept pace with the dramatic fall in the capital expenditure of mobile operators to less than USD \$100 per subscriber.

Now regulators are paying much closer attention to mobile interconnection and termination charges* rather than allowing operators to set fees themselves. This is especially the case when operators switch to “calling party pays” billing* and for international roaming charges as more customers complain*. Regulators sometimes pursue market-based solutions to bring down interconnection charges. They can promote competition by encouraging new (e.g., “virtual”) mobile operators or by allowing customers greater opportunities to choose between mobile operators (by for instance number portability) and

generally increasing transparency. Indirectly, more intense competition will reduce mobile termination charges. Regulators have continued to play a role in determining the interconnection charges of fixed operators.

There is a myriad of ways for a country to handle mobile termination charges, including:

- Full regulation of mobile termination rates (e.g., Austria, Portugal and Cuba);
- No regulation of MTRs by allowing operators to negotiate freely (e.g., Brazil);
- Only regulate mobile termination charges for fixed-to-mobile calls (e.g. Jamaica);
- Require mobile network operators to apply a single regulated termination charge regardless of where the call originates; and
- Apply asymmetric regulation where only the MTRs of mobile operators with SMP are regulated (e.g., Colombia). *

With so many possibilities, the decision on which type of MTR regulations to implement should be based on a complete analysis of each country's particular needs. However, MTRs tend to be high where there is no regulation. For example, the MTRs in Brazil, a country without rate regulation, are among the highest in the world. Several factors should influence the decision, including the amount of price competition in the mobile market; potential costs and delays associated with reliance upon negotiation; the regulator's available resources; and consumer complaints regarding prices.

New interconnection regulations are also arising with the transition from analogue to digital, voice to data, narrowband to broadband, circuit-switched to packet-switched and the growing role in this context of wireless has radical consequences for existing interconnection regimes. In a converged environment, interconnection may frequently entail interconnection between different services and devices, as well as a wider range of platforms. A major challenge facing regulators is the management of tensions between the traditional, closed-network model in which the network operator owns and runs the public-switched telephone network (PSTN), and the new IP-based network model, which is open and decentralized. Since the IP-based model separates services from the platform, the network operator loses significant control over which applications and content users may run over the network.*

While VoIP originally involved two customers connected to the Internet (by different devices) making voice calls or other forms of communications over the Internet without connecting through the PSTN or incurring any additional charges over their monthly payments to their ISPs, VoIP has become interconnected.

"Interconnection" in these IP-based business models is fundamentally different from interconnection as it has been widely practiced. Instead, interconnection refers to peer-to-peer (P2P) network operator relationships, which are much more harmonious than the traditional interconnection relationship, which has been characterized as confrontational (incumbent versus new entrant, big versus small), especially in the early phases. Peers are by definition of equivalent scale. Generally, P2P agreements are not subject to regulatory supervision.

A hierarchy of "peers" has developed with an ascending ladder of "aggregators" or transit providers. Within a peer group, traffic is exchanged on a sender-keeps-all basis and there is consequently no need for interconnection models. Peers exchange traffic but do not charge each other, because this is a largely symmetrical relationship. Traffic between different peer groups is exchanged on commercially negotiated rates for a given capacity and maximum peak load for "transit" services. Where there is sufficient choice and competition between rungs on the ladder or peer groups, market solutions will prevail for commercially negotiated rates. "Fair" cost-based charges emerge from a well-functioning market and in those instances where a dominant peer group emerges, any abuse of such a position would be the subject of *ex post* regulation via the application of competition law. For many operators in developing countries, the advantages of P2P may be slow to materialize where the choice of "transit" providers is restricted and international access capacity is limited. Further, while many developed economies have established cooperative or joint application of competition law (thereby extending jurisdiction beyond a national boundary), there is much less experience of such relations in developing countries. Consequently, action to improve regional connectivity may be necessary, accompanied by appropriate regional regulatory initiatives.

It is widely held that the costs of IP-based networks are substantially below those of public switched telephone networks (PSTN), so that any form of cost-based interconnection (or capacity charging) will be cheaper than those prevailing for traditional operators,* thereby implying a generalized downward pressure on fees. All these P2P "interconnection" charges are already factored into the monthly charges to final customers rather than individual tariffs billed to customers of the traditional model.

While "traditional" interconnection is on the wane, its legacy will linger. VoIP is permitted in a substantial and growing number of jurisdictions, such as the Philippines, South Africa, and Ecuador.* It is also possible to use VoIP services to call

PSTN customers with a “breakout” from a local Internet point of presence to the final destination. In these circumstances a “traditional” domestic interconnection fee will be charged to the originating customer even if the call is international. It is also possible to reverse the breakout, with similar consequences, and to provide two-way breakouts. All of these possibilities are disruptive for PSTN business models. The leaders in VoIP services (Skype, Google Talk, Yahoo! IM with voice, VoIP Buster) are not traditional telecommunications operators and their core revenue sources are not necessarily from the provision of voice services.

Many developing country operators are already under pressure from operators in developed countries. The latter, both privatized incumbents and new entrants, seek lower international termination charges, which challenge the finances of their developing country correspondents. VoIP and its impact on international termination fees further intensifies these downward pressures.*

* Mike Jensen, Open Access Lowering the Costs of International Bandwidth in Africa (2006) at

Practice Notes

- [Interconnection Principles Contained in the WTO Regulation Reference Paper](#)

Reference Documents

- [GSR 2009 Discussion Paper, Coexistence of Traditional and IP Interconnection](#)
- [GSR 2009 Discussion Paper, Mobile Termination: To Regulate or Not?](#)
- [GSR 2009 Discussion Paper, Voice over Internet Protocol \(VoIP\): Enemy or Ally](#)

[Next: 1.5 Universal Access](#) ➔

The ICT Regulation Toolkit is a joint production of infoDev and the International Telecommunications Union (ITU).



[About this Toolkit](#) | [How to Use the Toolkit](#) | [Authors](#) | [Frequently Asked Questions](#) | [Contact](#) | [Terms of Use](#)