

## **Internet peering: What does it mean for developing countries?**

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The international telecommunications regime has traditionally been characterised by bilateral, correspondent relations between countries, operating under what is known as the accounting rate system. This system, rooted in the principle of national sovereignty, has operated in one form or another for more than one hundred years and is based on an international treaty, the International Telecommunication Regulations (ITR), last revised in 1988. This system is based on revenue-sharing rather than cost-orientation and is often blamed for keeping the price of international telephone calls at too high a level. While the accounting rate system is remarkable for its longevity, it is now widely perceived to be in danger of collapse, under pressure from competitive market entry, technological change and by-pass.

The Internet has evolved a very different system of relations between networks which might broadly be described as peering arrangements. Traffic is exchanged between networks in a manner which is independent of its ultimate origin and destination. While peering began as a convenient and non-for-profit arrangement between academic networks, it has subsequently become more commercial with the progressive privatisation of the Internet backbone. Peering arrangements are not currently regulated and are not subject to any international treaty.

It is widely believed that networks running IP traffic become the major bearer for both voice and data traffic in the future. If so, does this mean that peering arrangements will steadily replace the accounting rate system on the public network? In particular, what are the implications of such a shift for developing countries, who are among the major beneficiaries of payments made under the existing regime? Will the transition from a half-circuit to a whole-circuit regime mean that developing countries end up paying, rather than receiving money, to terminate traffic? What potential role could international organisations, such as the ITU, play?

### **Why is the Internet so cheap?**

Probably the single most important factor in explaining the phenomenal success of the Internet is that it is *cheap*, or at least is popularly perceived to be cheap. Of course, when one remembers that possession of a Personal Computer, appropriate software, a modem and a telephone line are all fairly essential prerequisites for Internet access, then maybe it is not so cheap, especially for developing country citizens. And when one adds to that the constant pressure from the computer industry to upgrade to the latest models, to use a higher bandwidth connection, or to start paying for information that was previously available for free, then Internet begins to look distinctly like a luxury item.

The perception that Internet is cheap really relates to the *usage* costs rather than the fixed costs. For many users, their initial contact with the Internet would be at school or university, or perhaps at work, where the fixed costs of installation and maintenance are largely hidden to them. Thus they are aware primarily of the “saving” they are making, say, by placing a telephone call over the Internet rather than over a fixed line network, rather than the total picture of what that call costs. Certainly, the rates which are available for an Internet telephony call are considerably cheaper than for an equivalent telephony call, especially when the call crosses international borders.

Why should per minute usage costs for international telephone calls on the Internet be so much lower than on

duration of the call, including the pauses between words or between replies. A call placed over the Internet however could theoretically be routed over several different circuits, each of which would be occupied for a few thousandths of a second at a time, as packets are routed across the network to be reassembled at the distant end. The PSTN is optimised for voice transmission, sampled in 8 bit bytes, 8'000 times a second, for an aggregate rate of 64 kbit/s. The Internet, by contrast, is designed to be platform independent, collecting and terminating traffic up to the maximum speed that the weakest link on the network will bear. The quality of the Internet connection may be lower, but it's efficiency will invariably be higher.

- A further element is the greater **capacity utilisation** achieved for Internet use. The Internet is engineered to meet average loads, and the typical utilisation over an extended time period is around 60-70 per cent. By contrast, the Public Switched Telephone Network is engineered to meet the business peak hour and thus utilisation is typically below 20 per cent.
- A third factor is **economies of scale**. If you could draw the PSTN, it would look like a dense mesh of connections in that most of the nodes in the network are connected to every other node or, if they lack a direct connection, could be connected by just one intermediary. By contrast, a picture of the Internet would look much more like an airline route map in which a small number of hubs are connected to each other and are each surrounded by a star-shaped network of local peering arrangements. A typical international voice telephony call would pass between the hands of two or perhaps three carriers; a typical Internet telephony call would pass through an average of 15 hops and multiple different carriers. The logic of the routing is unrelated to geography and instead related to the volume of traffic flows. Traffic gravitates to thick routes, that is those cables which have the highest (available) capacity. These are invariably the ones within the United States, or which link the United States to other countries.

What these examples illustrate is that the “cheapness” of the Internet depends on one's viewpoint. Internet appear cheap if one considers usage costs only rather than the complete picture of usage and fixed charges. Similarly, Internet appears cheap when compared to comparable international calls but less so when compared to local calls. The Internet is also cheaper the closer the user is to a high bandwidth pipe. That means that it tends to be more expensive for users outside the United States.

### **Why are international telephone calls so expensive?**

The corollary to the question “Why is the Internet so cheap?” is “Why is the telephone network so expensive?”, particularly for international calls. Typically, a user in, say, sub-Saharan Africa, would pay many times more for a three minute international telephone call to the United States than they would to be logged on for an hour or so to a website located in the United States. And yet, the facilities used in the two calls would be similar. Indeed, the two messages would probably pass under the Atlantic on the same cable, albeit on different fibre strands, with the telephone message bringing perhaps a hundred times more revenue to the carriers involved than the web browsing session.

The simple, though not entirely convincing answer to the question is that international telephone calls are expensive because they have *always* been expensive. Originally, international telephone calls were priced as a luxury commodity because the bandwidth that conveyed them—initially HF radio, later satellites and undersea cables—was in short supply. The most significant price reductions in international service were achieved in the 1960s and 1970s. Since the early 1980s the price has been relatively stable (albeit decreasing relative to inflation). On the other hand, the costs of terminating the call, as shown by the settlement rate, have fallen substantially on almost all routes. Since 1995, the average rate of reduction in settlement rates globally has been of the order of 12 per cent per year, and in 1998 the reduction is likely to exceed 20 per cent. This has

passed on in full to telephony consumers. It is thus not surprising that there is considerable interest, in developing countries as well as developed ones, in the potential for Internet Telephony, to bring lower prices for consumers.

### **Settlements and peering: What's the difference?**

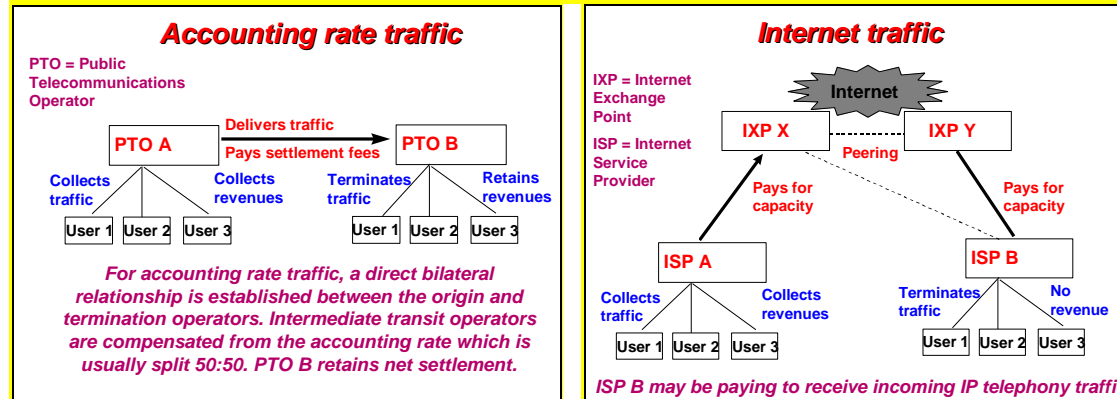
For developing countries, the implications of a shift away from settlements towards a peering regime are mixed. On the one hand, it could mean a reduction in price for outgoing international calls if the promise of Internet Telephony is embraced. On the other hand, it could mean that inpayments received for terminating international calls are substantially reduced. Developing countries are estimated to gain some US\$7-10 billion per year in net settlements, much of which comes from the United States. As these payments are made in the form of regular monthly cheques, cashed in hard currency, they form an invaluable support for a developing country's balance of payments, as well as their telecommunication infrastructure investment programme.<sup>2</sup>

An incoming international telephone or fax call would bring with it a settlement payment of up to a couple of dollars per minute. By contrast, an incoming Internet call which is patched to the PSTN might bring only sufficient revenue to cover the cost of a local call, which would amount, at most, to a few US cents per minute. Indeed, in the case where the developing country Internet Service Provider (ISP) pays for the whole circuit which connects it to the Internet backbone network, say in the United States, then it may find that it actually loses money on the transaction as well as the lost settlement payment.

The difference between the treatment of an incoming PSTN call and an Internet Telephony call is illustrated in Figure 1. In the left chart, the developed country public telecommunication operator (PTO A) which delivers a PSTN call to the developing country (PTO B), also makes a settlement payment, in line with its correspondent relationship with PTO B. This would normally be half of the accounting rate negotiated between the two. In the right chart, an Internet Service Provider in a developed country (ISP A) picks up a call which it passes on to its local Internet Exchange Point (IXP X). This is then delivered to an IXP with peering arrangements with the destination country (IXP Y). It is then delivered over a leased line to ISP B in the developing country (presuming ISP B has no direct peering arrangements with IXP X) where it is patched on to the PSTN and delivered to the user. There is no financial payment whatsoever between ISP A and ISP B, except insofar as ISP B is able to recover the cost of a local telephone call (though the process of billing this call from ISP A may prove to be more expensive than the call itself!). Furthermore ISP B may actually be cross-subsidising the call in that it is paying for the whole circuit leased line to IXP Y in a foreign country. It is required to pay for the costs because ISP B's users wish to browse content on websites in the foreign country (invariably the United States). Thus the incoming Internet Telephony call is effectively freeriding the network.

### Figure 1: Equity and inequity?

Contrast between accounting and settlement arrangements from developed country A to developing country B, via the Public Telephone Network and the Internet



Source: ITU "Challenges to the Network: Internet for development", 1998.

### Strategies for developing countries

Developing countries up to now have been much more focused on the implications of accounting rate reform than on any possible implications of Internet peering arrangements. For instance, when the FCC, the US regulator, launched its Notice of Proposed Rulemaking late in 1997 on the so-called "benchmarking" of settlement rates, it drew complaints from some 90 countries, many of them developing. On the other hand, little attention has been paid to Internet Peering. Few developing countries have developed policies for Internet telephony and fewer still have questioned existing peering arrangements.

It may well be that developing countries have been fighting yesterday's battles rather than tomorrow's wars. Settlement rates are undoubtedly trending towards costs, albeit more slowly than most consumers would like. Developing countries may conceivably be able to slow this process down, but only at the cost of seeing large traffic streams leaving the accounting rate system altogether. On the other hand, prices for international leased lines remain stubbornly high, both for half circuits from the United States and for half circuits from developing countries. Developing countries wanting to connect to the Internet have to pay for both. What this means is that, as more traffic shifts off public switched networks and on to the Internet which operates over leased lines, then it will be the price of the leased lines which will become the major determinant of service costs. Furthermore, the traditional system of cost and revenue-sharing for international services is likely to be eclipsed by a new paradigm of developing countries having to pay the full costs of both half circuits, as well as paying for peering, if they want to connect to the Internet backbone. There is a very real danger that developing countries may have to pay a lot more than developed countries if they want to avoid being bypassed by the global information superhighway.

The ITU is trying to bring the attention of policy-makers in developing countries to this issue. Accounting rate reform discussions are currently being debated on a fast track basis through a Focus Group, set up in March 1998 and due to report on 6th November 1998. Also a Department's Group has been established to examine