

Noam, Eli: *Interconnecting the Network of Networks*, , 318 pp. MIT Press, Cambridge, MA, 2001. Hardcover \$49.95.

Interconnection – what could be the interest in interconnection? It turns out that interconnection is pivotal in determining market structure, the viability of competitors and the success of deregulatory programs. *Interconnecting the Network of Networks* by Professor Eli Noam (2001) provides a remarkable review of the issues surrounding this topic. Interconnection's importance is clear upon a moment's reflection. In today's society, we have mobile telephones talking to subscribers on wireline networks; the same mobile phone can read e-mail messages, and surf the web. Computers, via voice over internet protocol (VoIP), can be used to replace the traditional phone over broadband cable connections. The list goes on...

The book is an omnibus approach to the subject. It begins with a brief history of the industrial segment and interconnection's role in the development of the telecommunications industry's structure. From the beginning of the telecommunications industry, starting with the telegraph, interconnection has been important in ensuring the connectivity of networks. In 1865, the predecessor of the International Telecommunication Union was formed to ensure interconnection of telegraph service across national boundaries. The issues related to network access have become more critical in the age of multiple communications technologies – internet, mobile phone, WiFi (802.11.b) wireless networks, wide and local area networks (WANs and LANs), satellite systems, cable broadband – all of which are capable of interacting with one another if the interconnection arrangements can be made. Not only must these arrangements be made on a physical, technical basis, but also on an economic foundation.

Because interconnection is an inter-firm matter, the access issues do not have the visibility of the retail side of telecommunications, nor can the casual observer have the same level of intuitive understanding.

While the traditional telephone monopolies are quickly disappearing, their market power is not diminishing as quickly. New regulatory tools of incentive regulation and competitive entry have replaced the traditional rate-base, rate-of-return regulation and rate structure setting methodologies. Recent policy goals have aimed to replace regulation with competition as the policy instrument of choice. As noted, many networks have the potential to enter each other's markets; thus interconnection is a means by which the objective of competition can be obtained. Interconnection is the tool and pricing is the blade. From the monopolist point of view, the same blade can be used to cut off competition. Truly a versatile instrument. Indeed this is the dilemma. Thus the pricing of intermediate services is a thorny, but extremely important issue.

Interconnection or intermediate pricing represents the price of the intermediate good or service needed by a firm to provide its service. In the telecommunications industry, this price is also known as the "access price" and would be the price charged by one service provider for connection to its network so that another provider can complete the service for its own end-user customers. For example, in the United States, it would represent the price that long-distance carriers must pay to exchange carriers to complete a call on the public switched telecommunications network (PSTN).

Imagine sitting in your local Starbucks (not the other Starbucks three blocks away) with your computer operating on Starbucks' WiFi network. You receive an e-mail from a friend, so you decide to call her by activating your VoIP software on your computer. She answers on her mobile, but wishes to call you back on a landline because of the high roaming costs in Europe on her mobile. You did not even realize she was out of the country! She used her AT&T Direct card to call you on your home phone, which was forwarded to your mobile phone. You forgot to tell her you were not at home (where you would have used your cable modem to make the VoIP call).

This "simple" call went from the wireless WiFi network to the ISP which carried the data to a VoIP gateway service provider which sent the call over an internet backbone to a gateway in Europe which routed the call into the European PSTN, which sent the call to a mobile service provider which has an arrangement with your friend's mobile service provider to deliver calls to its customers when the United States mobile customers are in its cellular territory. This is the world's largest computer in action. Not only does the data/call physically traverse all of these variegated networks, but also the companies

involved get paid and are able to bill the appropriate entity. Every leg in this transmission expects some compensation for carrying the data/call.

Moreover, when she calls you back, the European telephone company receives compensation from AT&T; it also compensates the local exchange carrier who in turn compensates the mobile carrier. Your mobile carrier will bill you for the call later in the month; AT&T will bill your friend at the end of the month. So it goes.

Interconnecting the Network of Networks not only explains how this all works together, but how it should be priced, and suggests why the industry is configured as it is because of the role of interconnection.

The pricing becomes more complex when the company charging the interconnection price also competes with the company to which it supplies the intermediate service. The company charging for interconnection has an obvious incentive to overcharge the competing company – not only to enhance its own revenue, but also to make the competing company's cost, and hence its price, higher.

From the economics perspective, what should be the goals of interconnection? We suggest the following (Alleman 1998):

- Incentives be correct to avoid inefficient bypass
- Prices should be equivalent for comparable facilities, and
- Prices be transparent.

This means that that companies will not have the incentives to invest in uneconomical assets. The access charge should be applicable to all services -- wire and wireless, telephone and cable, internet and voice services. If these are not priced correctly, it leaves room to arbitrage the uneconomical prices. Equivalent access prices may ensure that inefficient bypass would be avoided. Transparency is a criterion to assure that prices will be comparable. Market power should not be a factor in negotiations for determining the interconnection price.

Pricing methodologies are specifically covered in Noam's chapter 4. The chapters preceding this chapter address pricing issues in the historical/operational context, as does the following chapter from the international perspective, but pricing issues permeate all the other chapters with the possible exception of the short technical section (chapter 7). (Chapters 3, 4, and 5 comprise over forty percent of the book's content.)

Chapter 4 is a comprehensive overview of pricing of interconnection and access. The author argues that interconnection prices are the tool for regulators to reach their goals, while economists provide the rationale with their economic theories. Noam makes the important observation, which cannot be stressed too much – that regulators should be careful with their choice of rationale, because it may take on the role of axiom, which will be impossible to escape when they wish to do something else due to changed conditions.

After noting the method by which a monopolist could price a potential entrant out of the market, he turns to regulated prices. He explores all of the alternative pricing options: bill-and-keep, average cost pricing, fully distributed cost pricing, two part-tariffs, capacity pricing, price caps, Ramsey, wholesale, efficient component pricing, marginal cost pricing, and total element long-run incremental cost pricing,

In a few paragraphs the author is able to examine the nuances of these various alternatives, including their advantages and disadvantages. Overall, chapter four is useful to anyone who has to deal with interconnection pricing issues. Noam provides a broad sweep for an initial understanding of the variety of pricing techniques and their respective advantages and disadvantages. Much heat has been generated by these topics beginning with Willig (1976) and more recently Baumol and Sidak (1998), and Laffont, Ray, and Tirole (1998a and 1998b). Noam cools it off.

But does the author find the correct pricing rule? No, and indeed, it may not exist. What he does do is provide a possible method which would ensure that proper pricing would obtain through a semi-market mechanism – third-party neutrality (TPN) pricing. “The basic principle is that while a carrier need not interconnect with any other carrier, and while it may charge for interconnection whatever price it wishes, it

cannot restrict its customers as to the origin of their traffic. These customers therefore can accept the traffic from third parties..." (Noam 2001 page 111). He later suggests the same mechanism to replace common carriage to ensure the nondiscriminatory flow of information.

While the copy editor could have been more careful – there are numerous typographical errors – most of these have been noted and an errata sheet has been posted on the Columbia Institute of Tele-Information (CITI) website <http://www.citi.columbia.edu/books/>.

But this is only in a minor quibble in an otherwise outstanding book. It is a "must read" for any policy maker or analyst who works in the ITC sector.

References

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