Transforming Network Interconnection and Transport

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Where Does this Work Come From?

CPD pricing flexibility rule-making

How does competition for high-capacity circuits work?

How do we measure the extent of competition and its relationship to pricing regulations?

Continuing analysis of economics of network transport as part of access tariff reviews

Is this important?

There are huge economic stakes associated with getting a sound regulatory regime for new network-based services.

Create jobs: from 1988 to 1998 services (excl. wholesale and retail trade, gov't, and utilities) generated 57% of total U.S. employment growth.

Promote economic growth: between 1995 and 1998, IT producing industries (8% of GDP) generated 35% of U.S. real economic growth.

Generate business value:

Internet businesses using dial-up are worth a lot relative to physical facilities that could provide broadband			
Yahoo	$90 bil	SBC	$150 bil
EBay	$29 bil		
Amazon	$23 bil		

Telecom industry is about telephony revenue, but telecom infrastructure is key to economy-wide value creation in new, advanced services.

Three Topics for economic analysis and discussion

1. Structural issues (aspects of the over-all organization of the industry) are constraining beneficial developments for Internet services and telephony.

2. Local facilities investment and investment in wide-area services have fundamentally different economic characteristics.

3. The physical and institutional architecture for telephony interconnection is a simple, significant policy lever.

Topic 1 – Structural Constraints

The Internet is

Wonderful

Topic 1 – Structural Constraints

but

Upgrading network protocols across the Internet is a major challenge:

1) e-mail attachments

2) IPv4 to IPv6

3) Quality of Service (IP telephony on separate IP network)

Topic 1 – Structural Constraints

Sensible billing models are difficult to establish for Internet infrastructure:

1) difficult to transact with respect to interconnection value (packet-based interconnection doesn't transmit end-user service value)

2) dynamic, multi-network routes make billing relationships complex

3) Absence of quality of service differentiation makes service and billing converge difficult

Topic 1 – Structural Constraints

The Telecom Act of 1996 is

Wonderful

Topic 1 – Structural Constraints

but

1) Is there a good industry structure and sufficient incentives for developing new, advanced services?

2) Under current regulations, are new advanced services likely to develop in a relatively even fashion for **all** Americans?

3) Are we heading towards less intrusive regulation and a more commercially driven industry?

Topic 1 – Structural Constraints

Are there any feasible regulatory steps that can help advance the successes of the Internet and the Telecom Act?

Topic 2 – Local access facilities vs. wide-area services

How important are the different economic characteristics of local access facilities and wide-area network services?

local access facilities – connect end-users to a specific point (“going to a cyberspace”)

wide-area services – services that are independent of user and service providers physical locations (“being in a cyberspace”)

Topic 2 – Local access facilities vs. wide-area services

Economic factors for investment in local access facilities

1) state of existing local infrastructure (telephone, cable, electric, etc.). Note significant local technological heterogeneity

2) local physical geography – soil type, terrain and line-of-sight, weather

3) local politics – gaining access to rights of way, antenna sites

4) micro local politics – gaining access to inside wiring in MDU's

Investment in local access facilities depends on highly location specific, idiosyncratic knowledge.

Topic 2 – Local access facilities vs. wide-area services

Economic factors in the development of wide-area services

1) Ability to attract highly mobile human talent

a) tech talent -- knowledgeable concerning standardized, highly scalable network hardware and software

b) managerial talent – manage flat, flexible, fast-growing organizations

c) marketing talent – knowledge of old and new channels, know how to create net buzz

2) Cheap, diverse network platforms for projecting services across a wide geographic area

a) outsourcing content distribution

b) the on net/off net problem

Wide area services depend on location-independent human talent and standardized, highly scalable hardware and software.

Topic 2 – Local access facilities vs. wide-area services

What sort of interface will there be between local access facilities and wide-are network services?

1) None. A few big networks will compete to provide on-net end-to-end service (MCI WorldCom? AT&T/BT in Concert?)

2) Network interfaces will be everywhere for everybody. Unstructured internetworking will lead to the best of all possible worlds.

3) Something in between. Big cities will have every sort of networking interface imaginable. Small cities will have every sort of policy intervention imaginable to try to get what big cities have.

Topic 3 – Telephony interconnection architecture as policy lever

What determinations the location of network interconnection nodes?

Like question of what determines the location of cities. A lot of factors matter.

1) History – telephony end office structure largely established prior to 1917.

2) Regulation – end offices currently an important focus of interconnection (collocation, UNE access)

3) Traffic patterns – data bandwidth growing much faster than voice bandwidth, but voice bandwidth still has major network significance (see Table 5; RBOC non-voice bandwidth 2.4 times voice bandwidth in 1998; non-voice bandwidth has been growing 40% per year since 1989)

Topic 3 – Telephony interconnection architecture as policy lever

What sort of interconnection architecture is important from a policy perspective?

1) geographically comprehensive. Want new wide-area services to be easily projected to all Americans.

2) non-adversarial environment. Hostile roommates create an unending stream of problems.

3) competing options. Choke points invite either regulation or value extraction.

Topic 3 – Telephony interconnection architecture as policy lever

Ensuring the existence of a good interconnection architecture

1) Divide area of focus into interconnection regions (SIP regions).

2) Choose 3-5 certified service interconnection points (certified SIPs) in each region. Certified SIPs in a region must be owned independently of each other. A certified SIP is not allowed to own local access facilities in its region or transport facilities connecting it to other certified SIPs.

3) Require local telephone networks to provide zero-price termination for all telephone calls (inc. fax and modem) delivered to 2 selected certified SIPs in the SIP region associated with the called customer.

Points 1) and 2) ensure the existence of a comprehensive interconnection lattice and competing options, point 2) ensures that the lattice provides a non-adversarial interconnection environment, and point 3) ensures that certified SIPs have industry significance.

Topic 3 – Telephony interconnection architecture as policy lever

Questions

1) Would a sufficient number and quality of potential candidates to be certified SIPs volunteer to exchange the facilities ownership restrictions described in point 2) for the privileged telephony termination position described in point 3)?

2) Would decentralizing the choice of certified SIPs and the regulation of originating access make this proposal attractive to state regulators?

3) How rapidly could all other regulation concerning relations among network operators and service providers be phased out?