

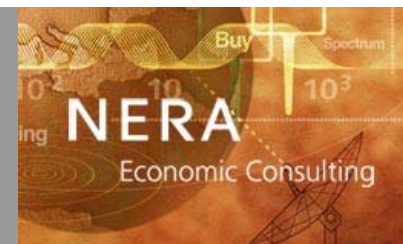
IP Interconnection



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ICT Regulation Toolkit

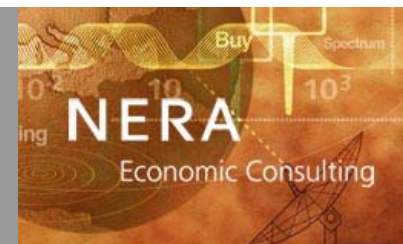


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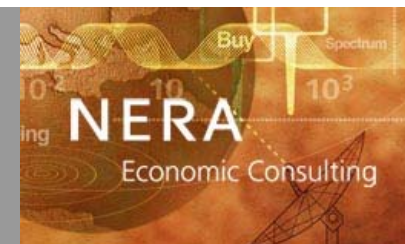
<http://www.ictregulationtoolkit.org>

How will VoIP affect today's pricing and interconnection practices?



- Implications of VoIP for regulators
- Trends in VoIP regulation
- Differential regulation of VoIP and conventional telephony
- Implications for interconnection pricing

VoIP and Regulation



- Key implications of VoIP for regulators
 - Remove asymmetric regulation on incumbents?, or
 - Protect incumbents from competition?
- Trends in the regulation of VoIP services
 - Telephone numbering assignments
 - Telephone number portability
 - Access to emergency services
- The effect of differential regulation of VoIP and conventional telephony
 - Focus new investment into unregulated broadband networks
 - Migrate services onto those new networks

Trends in VoIP regulation



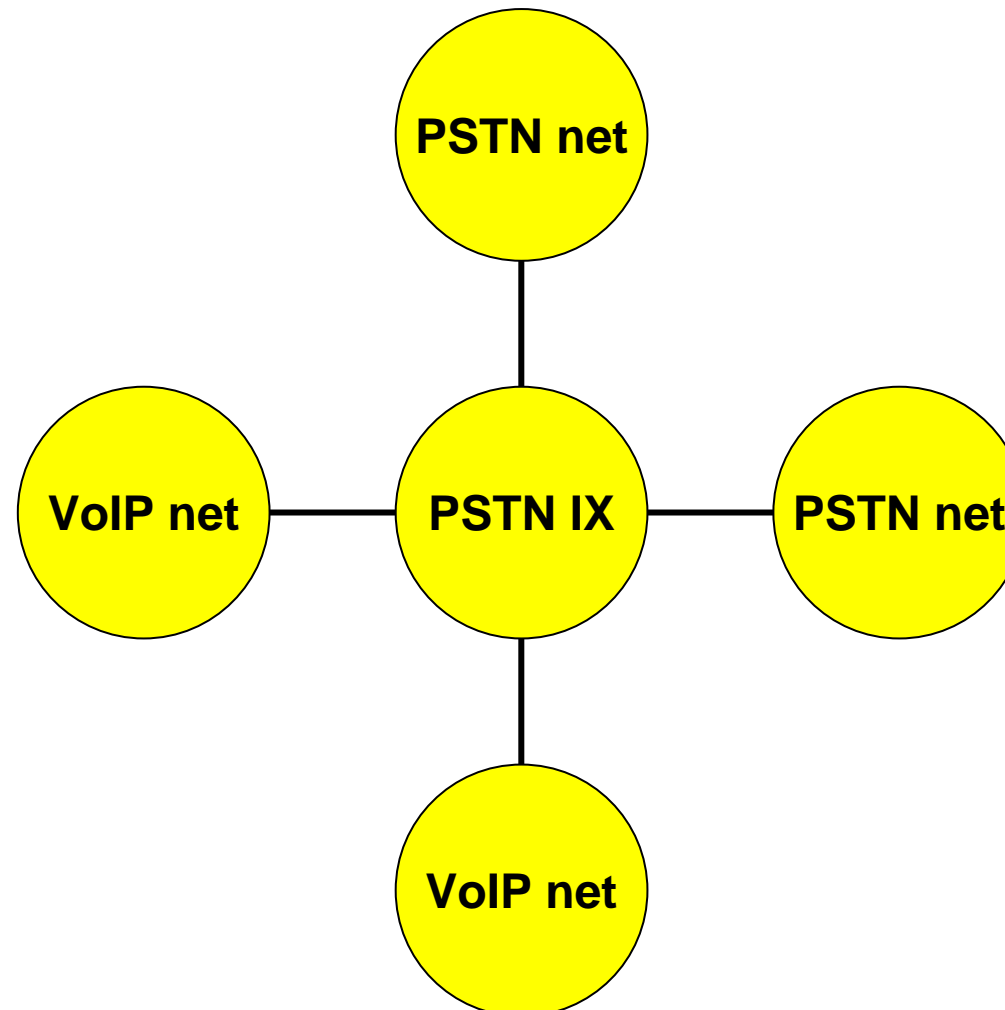
- In many countries Internet telephony is only lightly regulated, on the basis that it is an “enhanced” or “value added” service (consistent with regulatory treatment of the Internet generally).
- As VoIP is increasing, and is becoming a closer substitute for conventional voice telephony, regulators may be less inclined to exempt VoIP from regulatory requirements. This is particularly the case where VoIP services are close substitutes for traditional telephony, for example where VoIP operators seek telephone number assignments and number portability.
- However, regulators have generally kept to a “light-handed” approach and have targeted regulatory interventions to specific matters, such as access to telephone numbers, number portability, access to emergency services, universal service, and national security.

VoIP interconnection and pricing

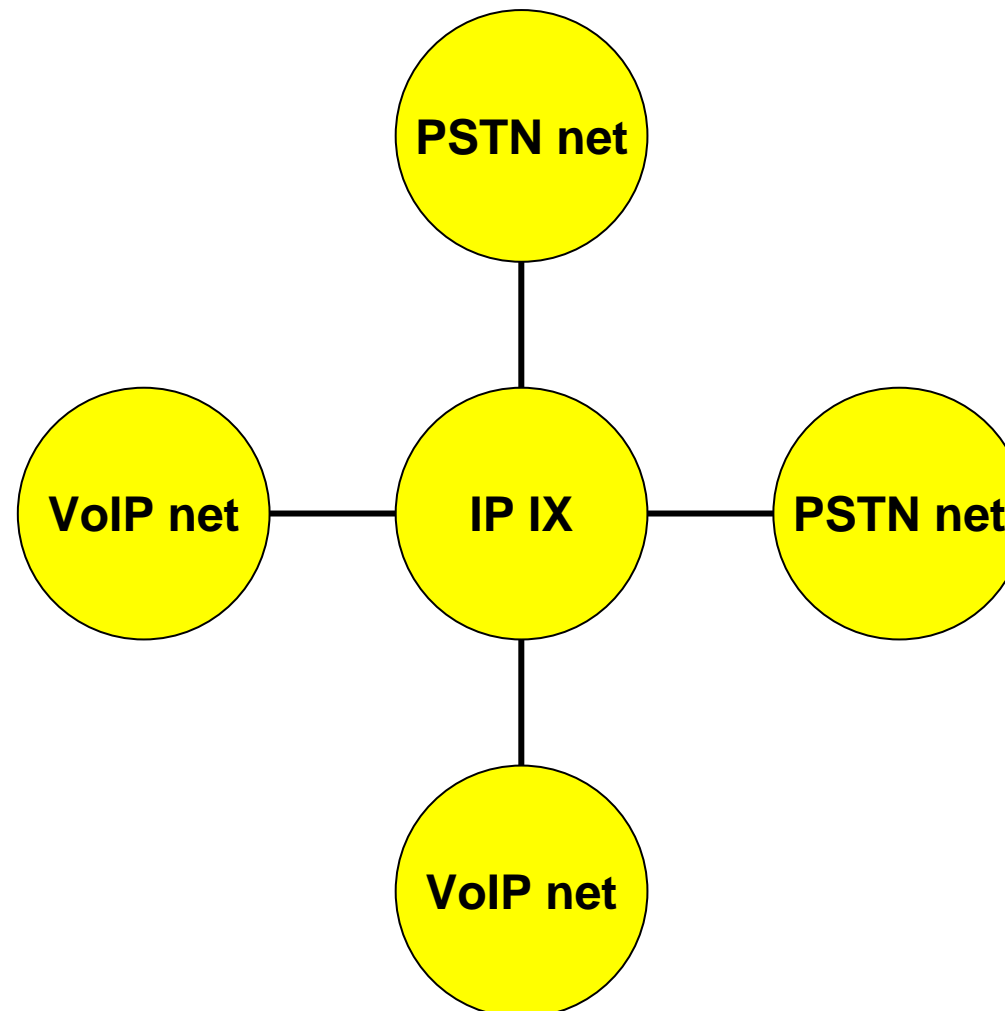


- Few countries have addressed these subjects directly as of yet.
- VoIP operators have found suitable commercial arrangements.
- At this point, interconnection arrangements are still predominantly priced on a per-call or per-minute basis.

Today



Tomorrow?



Differential Regulation of VoIP and Conventional Telephony



- Many countries regulate information services and traditional telecommunications services differently.
- Differential regulatory treatment creates opportunities for arbitrage. It also encourages incumbent network operators to:
 - Focus new investment into unregulated broadband networks, and
 - Migrate services (including voice telephony using VoIP) onto those new networks wherever possible.
- This behavior achieves operational savings, and also qualifies voice telephony traffic for a lower level of regulation.
- The result will be an increase in the volume of information services, and a reduction in the volume of voice telephony minutes of use that are subject to interconnection charges, or international accounting rate settlements. Network operators' traditional sources of revenues will erode, forcing regulators to rethink how network operators should be permitted to recover their costs.

Cost Recovery



Traditional Telecoms Cost Recovery

- Cost recovery subject to significant regulation and government oversight. Settlements are generally transparent.
- Network operators provide transmission, possibly with service enhancements.
- Settlements based on traffic flows and charged on minutes of use. (May include a fixed component to recover non-traffic sensitive costs.)
- International traffic settled on measured traffic volumes, and a “half-circuit” approach to sharing the costs of the international link.
- Settlements typically operate on a destination specific basis.
- Under the accounting rate settlement model, the same system applies for all network operators, regardless of size, traffic volume, or geographical reach. (As traffic moves away from the accounting rate model, larger operators will be able to negotiate cheaper access arrangements.)

Internet Cost Recovery

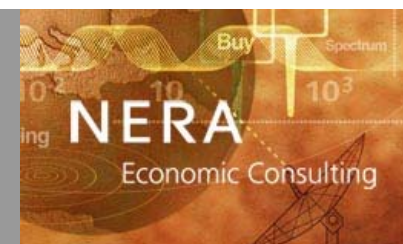
- Little or no regulatory oversight. ISP contracts are typically subject to non-disclosure agreements, making it difficult for outsiders to determine access terms and conditions.
- ISPs combine transmission and content, making it difficult to decouple the costs of each element.
- Cost recovery based on link capacity. Charged on bandwidth and derived throughput of the link.
- ISP network access provides onward transit to many other networks and destinations. In the extreme this provides global reach. ISPs can exploit this access to reduce their costs, using “hot potato routing”.
- ISPs use different charging models, depending on the characteristics (and bargaining power) of the ISPs involved.

Implications of VoIP for Interconnection Pricing



- The opportunities for arbitrage that VoIP creates will put pressure to:
 - Move towards cost-based pricing for interconnection
 - Adopt uniform charges for access
- Cost-based pricing
 - Rate rebalancing
 - More transparent funding of universal service obligations
- Uniform access charges
 - Single per-minute rate for calls in a wide geographic area
 - Flat monthly rate for unlimited local and long distance calls
 - Eliminate distance sensitive prices

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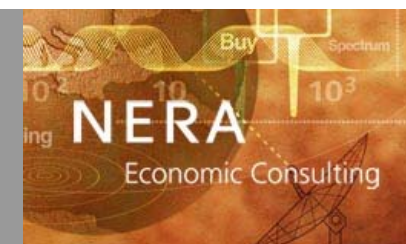
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A More Sustainable Charging Regime



- Regulators will need to:
 - Eliminate regulatory asymmetries that treat services differently based on the technology used (VoIP or conventional voice), or the type of provider.
 - Decide whether VoIP providers offering equivalent service to conventional voice telephony should pay the same charges and regulatory fees as other network operators.
- Changes in technology and telecommunications network cost structures mean that per minute pricing may be becoming an inefficient cost recovery mechanism. As more services are delivered as packets over digital networks, minutes of use are no longer an important cost driver.
- The premise that the calling party is the sole cost causer may no longer be valid. The Calling Party Pays approach to call pricing (and interconnection charges) may no longer reflect actual cost causation.

Arbitrage Opportunities



- Traditional network operators often charge different interconnection rates, depending on the type of call or type of service provider involved. Often this reflects differences in regulatory treatment between service providers. This creates opportunities for service providers to engage in arbitrage (either legally or illegally).
- Certain features of VoIP traffic create additional arbitrage opportunities. VoIP traffic can readily enter the Internet without traversing the PSTN. Opportunities also exist for terminating VoIP traffic without traversing the PSTN, or through undetected transit of the PSTN. Even when a PSTN operator is able to detect VoIP traffic, it may not be able to differentiate between local, domestic, and international VoIP calls for billing purposes.

Pricing Mechanisms for VoIP Interconnection



- Cost drivers for VoIP:
 - Per minute cost recovery has a number of weaknesses in a VoIP world. Call duration has no meaningful relationship to the costs of a VoIP call. Charging on a per minute basis creates opportunities for VoIP operators to engage in regulatory arbitrage, or to avoid interconnection charges.
 - As VoIP traffic increases, interconnection charges based on bandwidth used would better reflect underlying cost drivers, and would be more consistent with economic efficiency.
- Cost-reflective interconnection pricing for VoIP could involve:
 - End user payments
 - Unbundling
 - Cost based VoIP origination and termination charges
- Reciprocal payment obligations

Interconnection between Internet Service Providers



- Peering model – reciprocal access to each other and free exchange of traffic
 - Initial government development
 - Move to commercial development
 - Essentially a Bill and Keep arrangement
- Hierarchical structure developed
 - Smaller ISPs treated as customers
 - Tier-2 ISPs provide link to Tier-1 ISPs Network Access Point or Point of Presence

Models for Internet Interconnection



- Peering arrangements

- “Sender Keeps All” or “Bill and Keep”
- Makes sense when two ISPs have roughly the same characteristics and traffic volumes
- How does an ISP qualify for peering status?
- Negotiated privately

- Transit arrangements

- Larger ISPs sell access to their networks, customers, and other ISP networks
- Charges are capacity based
- Negotiated privately

VoIP Clearinghouses and other commercially-negotiated arrangements



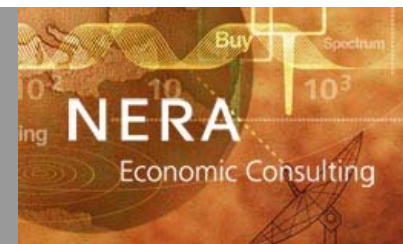
- Clearinghouse can provide single point of contact for termination of traffic to hundreds of service providers across the world
- Handoffs between PSTN and IP networks
- Help PSTN carriers identify VoIP users and traffic
- Managing VoIP traffic
- Network monitoring
- Managing QoS issues

VoIP applications



- Applications that run entirely over the Internet
- Applications that connect with the Public Switched Telephone Network at one end of the call
- Applications that connect with the Public Switched Telephone Network at both ends of the call

Elements of VoIP service



- Customer location
 - Internet connection (DSL, cable modem, wireless)
 - Telephone (softphone or traditional with adapter)
- Internet carries the call between the customer and the VoIP provider
- Gateway between Internet and PSTN
- PSTN carries the call to the called party

Sending and Receiving Calls



- Additional equipment is required at the user location to connect traditional telephones to the broadband connection.
- The VoIP provider needs to interface with other telecommunications operators to be able to receive and send calls.
 - Numbers
 - Links
 - Routing
 - Emergency services

Network neutrality



- Extensive discussion of this recently as conditions for approval of mergers between telecoms operators are defined.
- Operators are offering premium services
 - Prioritizing bitstreams
 - Offering different quality of service guarantees
 - Premium service, instead of best efforts service
 - Vertical integration of new features and services by network operators with broadband pipes
- Is this discrimination that violates a tradition of network neutrality?
- Should preemptive regulation be imposed or is vertical integration an essential part of the development of competition?

Changing laws and regulations



- Authorization to be flexible in regulation is needed. The regulator needs to be able to forbear from regulation as market forces take over.
- To apply flexibility, the regulator needs to understand how to analyze the competitiveness of a market
 - Define the relevant market or markets,
 - Assess the level of competition in the market, without the behavior or act in question, and
 - Assess the level of competition in the market, with the behavior or act in question.

Changing laws and regulations



- There will likely be a continuing role for the regulator in resolving interconnection problems.
- Most PSTN operators are still defining the price of interconnection in per call or per minute terms, but this is likely to give way to capacity-based interconnection arrangements that are typical in the Internet.
- Price regulation will need to adapt to permit greater flexibility as new services and technologies grow in size and influence. Tariff rebalancing helps minimize the impact of NGNs on vulnerable incumbents.

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