

Organizational and Business Issues for Internet Telephony

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Areas 3 & 5 of the Revised Proposal

Internet Telephony: myths and realities

- **Myth 1: Internet Telephony is cheap telephony**
 - It is absolutely cheap if the quality is “random”
- **Myth 2: Internet Telephony can never reach the quality of the public switched telephone network**
 - It can reach satisfactory levels of quality... under certain conditions

In order to evaluate the business opportunities related to Internet Telephony we must understand:

- i) the Internet's patterns of evolution
- ii) the way in which a new product or service can be successfully introduced in the Internet

What is the Internet?

- A global network of local networks, with...
- a very *distributed* architecture and *edge* rules of behavior
 - egalitarian model: one class of service (i.e. best-effort model)
 - capacities of auto-organization in the long-term: coherent rules emerge on the basis of an interactive adaptation and learning
 - only technical mechanisms for resolving problems in the short-term (as the congestion problem): the input source detects the congestion event and slows down the rate of input -- there are no pricing mechanisms for cost allocation during the congestion times
 - users: a “statistical culture” -- they learn to “share” and leave with expectations rather than certainty for delays [Clark 1995]
- However, the Internet architecture is going to change somehow... Why?
 - Web pressure / the real-time services perspective

How will the Internet evolve?

- **Direction of change:**
 - meeting the users' needs: more classes of service
- **Emerging technological trajectory:**
 - Integrated Services Internet, with elastic and real-time application [Shenker 1995] -- telephony could be the first step towards ISPN networks
 - ... and with dynamically controllable Quality of Service (set-up protocols and “flow state” along the route of data packets) [Braden et al. 1995]
- **Possible consequence:**
 - The pressure for service differentiation and price discrimination (with provision for cost recovery) will become much stronger

Any change takes time...

... and Internet Telephony has short-term requirements

We might accept two different time frames for Internet Telephony:

short term

Possible scenario:

Current architecture with RTP
RTP: adaptive protocol to
network delays -- non-reliability
in the sense of bound packet
delivery time (but feedback)

Innovation type: Modular

medium term

Possible scenario:

RSVP architecture
RSVP: resource reservation and
service guarantee (but requires
changes in the routers)

Innovation type: Architectural

Organizational challenges

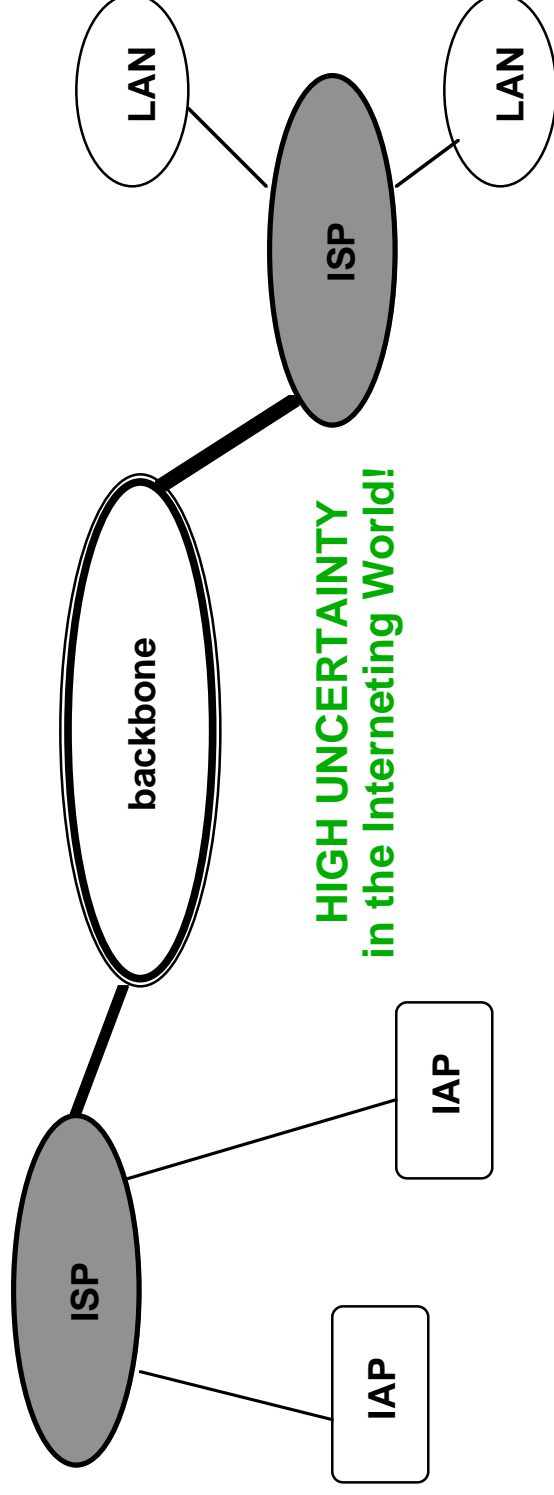
- **Real-time applications require the efficient allocation of network resources; both scenarios for Internet Telephony, the medium and the short term, push towards the development of new cognitive models for cost allocation**
 - bandwidth management techniques
 - pricing policies
- **Hypothesis: The RSVP-type architectures create the necessary framework for policing and thus, efficiently allocate the resources**
 - price discrimination and resources management are easier to apply when the network offers different levels of QoS
- **The problem is harder in the short term:**
 - How we could efficiently organize the delivery of voice services under the current Internet architecture (offering some quality of service and avoiding an “Internet winter”)

Research framework for short term solutions

- **Objectives**
 - Protect the TCP-users
 - Dynamically share the bandwidth between real-time and TCP-based applications (... and probably within the family of real-time applications)
 - **Research directions**
 1. Start from demand (apply Clark's idea of "expected capacity")
 - Research question: study the generation of a market at the periphery of the network
 2. Look at traffic and segregate it (in order to apply yield management techniques)
 - Research question: Criteria for traffic (and service) discrimination
 3. When congestion: admission controls for real-time applications' users
 - Research question: what is the quality of feedback from the congestion conditions within the network and who and how can act against congestion?
- Constraints: Forward compatibility: we have to think in a way that takes into consideration the medium term perspective

We know...

➔ The Internet is decentralized and rules can not be *de jure* imposed



➔ Yes, the law of Internet is that innovation and pricing should be local...
But complex systems have their ways to converge local interests...

Research framework for the ITI Consortium members

- Internet Telephony could have two patterns of evolution (short and medium time framework)
- Organizational solutions for efficient bandwidth allocation should be developed in order to provide voice services over the Internet
- ... but the Internet's localized patterns of evolution create strong uncertainty

A new problem emerges

For Access providers & Network operators:

➔ Services development in Uncertain Infrastructures

For Hardware & Software providers:

➔ Product Development in Uncertain Infrastructures

We know...

that in uncertain environments
“system focused product development” is necessary

[Iansiti 1994]

- **Yes, all are important!**
control change and uncertainty in the evolution of technology and market
evaluate the “entry window”,
flexibility, sequential and fast learning...
- **but in Uncertain Infrastructures success probably needs:**
a network-based systemic view...

What systemic view?

By which means could this view become a strategy?

This is the final objective of the Research we are proposing...