

# Internet Telephony

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# Outline

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1. **Introduction**
2. **Applications and Services**
3. **Technical Challenges**

# 1. Introduction

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- Circuit switching and packet switching are the two main technologies for computer and telecommunication networks.
- Because Internet supports data communications, a range of other services can be bundled together with Internet telephony.
- However, Internet is initially designed for non-real-time data communications, so it poses several technical challenges that must be overcome.

## 2. Applications and Services

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- **Video Telephony**

It's easier to support video telephony over IP telephony.

- **Sound Grading**

IP telephony can support high-quality stereo and surround sound.

- **Unified Messaging**

Users can get all the messages sent to one location from which he can access it at his convenience.

- **Web-based Call Centers**

It captures potential customers' attention by making direct calls when they are browsing the Internet.

# 3. Technical Challenges

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## Packet Loss:

- **Network Upgrade**

High speed transmission technologies include ATM (asynchronous transfer mode) for mb/s, SONET (synchronous optical network) for gb/s, WDM (wavelength-division multiplexing) for tb/s.

- **Silence Substitution**

Substitute silence in place of a missing packet.

- **Noise Substitution**

Substitute white (background) noise for lost packets.

# 3. Technical Challenges

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- **Packet Repetition**

Replay the last correctly received packet for lost packet.

- **Packet Interpolation**

Use the characteristics of the packets in the neighborhood of the lost one to produce a replacement.

- **Frame Interleaving**

The effect of packet loss can be reduced by interleaving voice frames across different packets.

The loss of a single packet will only result in multiple short gaps in different streams of the received data.

# 3. Technical Challenges

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## **Packet Delay:**

- **Codec Delay**

Time to convert analog voice to digital data and vice versa.

- **Serialization Delay**

Time to place a packet on the transmission line.

- **Queuing Delay**

Occurs at various switching and transmission points of the network, such as routers and gateways.

- **Propagation Delay**

Time required by signals to travel from one point to another.

# 3. Technical Challenges

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## **Network Jitter:**

- Jitter is the variance in the interframe arrival times at the receiver.
- To allow for variable packet arrival times and still achieve steady stream of packets, the receiver holds the first several packets in a jitter buffer for a while before playing them out.
- Selection of jitter buffer size is crucial to IP telephony systems.



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Thanks!

# References

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- Mahbub Hassan and Alfandika Nayandoro, et al. Internet Telephony: Services, Technical Challenges, and Products, IEEE Communications Magazine, April 2000.