

### Voice Over Internet Protocol in Massively Multiplayer Online Gaming

**Vasilios Mitrokostas** 

#### An introduction to Internet Telephony

- How VoIP works
- . Modern VoIP implementations
- · VoIP in massively multiplayer online gaming
- Final thoughts

Worcester Polytechnic Institute

### **Voice over Internet Protocol**

- Voice over Internet Protocol (VoIP) delivers Internet telephony:
  - Responsibility Convert analog audio signals into digital data
  - Intention Transmit digital data across network

## The heart of VoIP

- . The coder-decoder (codec or vocoder)
  - Digitizes and compresses audio signals
  - Done by sampling the signal to convert it into digital data
- . The tricky parts
  - Different codecs employ different sampling rates (samplings per second)
  - Different codecs feature tradeoffs in voice quality, bandwidth, delay, and CPU load

### **VoIP implementation methods**

- How is the digitized transfer of audio signals performed?
- Methods 1 and 2: traditional phone calls
  - Analog telephone adapter (ATA) interfaces with standard phone
  - IP phone features Ethernet connector instead of a phone connector
- . Method 3: software
  - Bypasses the need for a phone

## **VoIP** in traditional phone systems

- Domestic calls circuit-switch networks employed by phone companies
- Long-distance calls VoIP applied
  - Digitize and compress audio signals through IP gateway
  - Process reversed once digital data is received locally
- Impact
  - Reduces bandwidth usage (for greater distances)
  - Introduces VoIP-related benefits and challenges

### Miscellaneous benefits/challenges

#### • Benefits

- Existing data networks may support VoIP; no need for dedicated audio cables
- Easier to record and archive calls
- Inherent fault tolerance due to packet switching nature; more on this next
- · Challenges
  - Introduces VoIP-specific issues which call for a Quality of Service plan; more on this next

- An introduction to Internet Telephony
- How VoIP works
- . Modern VoIP implementations
- · VoIP in massively multiplayer online gaming
- Final thoughts

Worcester Polytechnic Institute

## **Circuit switching**

- Traditional phone systems maintain calls using open circuits
  - Continuously transmits data through a two-way stream
  - Inefficient; data transmitted even during silence

### **Packet switching**

- Instead of open circuit, packet switching sends data only when there is data to send
  - Eliminates one-way and two-way silence
- Does not rely on single connection between parties
  - Stream of audio data represented by packets
  - System of routers carries packets from source to destination
  - Packets may not take same path; reassembled at destination

### Packet switching: disadvantages

#### Quality issues

- Delay lag between two parties
- Jitter receival of late or out-of-order packets
- Packet loss lost, dropped, or too-late packets
- Quality of Service (QoS) plan
  - Monitors and mitigates these factors
  - Jitter buffer small window of time to group and organize packets

- An introduction to Internet Telephony
- . How VoIP works

### Modern VoIP implementations

- · VoIP in massively multiplayer online gaming
- Final thoughts

Worcester Polytechnic Institute

### **VoIP clients and services**

- Dedicated VoIP clients
  - Skype, Ventrilo, TeamSpeak, Mumble, other third party applications
- Business-wide VoIP services

- Cisco

- Most clients based on conferencing: multiple parties connected to . . .
  - . . . each other (i.e., Skype)
  - . . . a dedicated server (i.e., Ventrilo)

# **QoS supplements**

- In addition to QoS mitigation factors, clients may offer supplementary VoIP assistance
- Echo suppression or cancellation
  - Prevent party from hearing itself by inserting loss or recognizing previously transmitted signals

### **Embedded VoIP**

- Applications that do not serve as dedicated VoIP clients but support it
- · Classic example: multiplayer online games
  - World of Warcraft, Borderlands, Team Fortress 2
- Borne of necessity
  - Voice collaboration part of gameplay, but connecting to third-party VoIP is unwieldy, especially in fast-paced environment
  - All parties need same client and common server

### **Embedded VoIP: cont.**

- Embedded VoIP services within game/application client streamline the process
- . The price: increased network usage
  - Game servers must account for additional load
  - Players' systems carry processing burden
  - Wasteful if VoIP not used
- Decision to include must be measured against the utility and nature of the online game

- An introduction to Internet Telephony
- . How VoIP works
- . Modern VoIP implementations
- VoIP in massively multiplayer online gaming
- Final thoughts

Worcester Polytechnic Institute

### Increased challenge: scale

- Massively multiplayer online (MMO) gaming carries additional challenges
- . In a smaller-scale game,
  - the server users connect to may additionally handle VoIP
  - there are fewer players; typically only one or two conferences
- . In a larger-scale game,
  - There may be location/spatial challenges
  - Players on different servers may need to communicate

### Increased challenge: medium

- MMO supports VoIP through embedded methods
- Large variety of users call for different answers for the same question
  - Codec selection
  - Echo canceller selection

### Increased challenge: user count

- More users on a conference call naturally leads to higher bandwidth needs and aggravated quality issues
- The more users, the higher chance of a problem user
- QoS impact
  - Delay different users have different delay/latency
  - Jitter buffer different users call for different buffers

- An introduction to Internet Telephony
- . How VoIP works
- . Modern VoIP implementations
- · VoIP in massively multiplayer online gaming
- Final thoughts

- · VoIP in MMO has not matured to a viable point
- Biggest challenge is guaranteeing quality across a wide variety of users
- Secondary challenges
  - Third-party habits; players already have dedicated servers
  - Awareness; some are not aware of alreadyimplemented VoIP options
  - Conference call; admin options and control are missing
  - Out-of-game support; embedded VoIP only goes so far

### **Additional research points**

- VoIP has a challenge with QoS guarantees; specific examples on MMO-specific challenges
- Potential architecture-based advantages in embedded options; can MMO platforms leverage this?
- The impact of integrated services: voice, video, data

