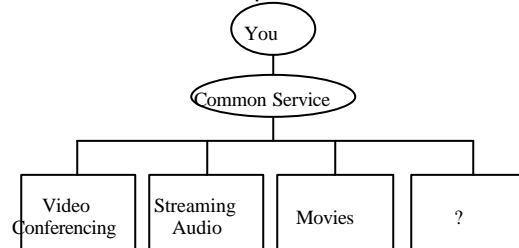


Real-time Transport Protocol

Matt Boutell
CS457: Computer Networks
November 15, 2001

Fast-forward to the Year 2021

- Director of Development for MME, Inc.

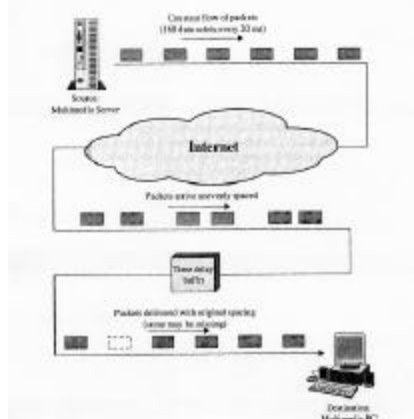


Two Goals of RTP's Common Service

- General enough to be truly "common"
 - Who knows what applications are coming?
 - Throughout history, communication has changed:
 - Oral (traditions passed between generations)
 - Written
 - Visual
- Specific enough to actually be useful

Outline of Talk

- Multimedia applications' requirements
- RTP architecture
- RTP details
- *Vic*: an application using RTP
- Summary: RTP does meet the requirements



Requirements (1)

- Timing
 - Time-stamping for buffered playback
 - to minimize jitter
 - Synchronization of multiple streams
 - Dynamic frame boundaries
 - Video: frame length varies due to compression
 - Audio: "talkspurts"

Requirements (2)

- Network issues
 - Dealing with packet loss
 - Dealing with congestion
 - Even with multicast
 - Bandwidth utilization
 - Minimize header bits

Requirements (3)

- Miscellaneous
 - Interoperability
 - Encoding
 - Compression
 - ID of source
 - To whom am I listening?
 - Useful especially in video-conferencing

Requirements Summary

- This is *not* TCP!
 - Who cares if we lose a packet or two?
(*Not us!*)
 - Who cares if we have jitter?
(*We do!*)
- Calls for a different protocol...

RTP Architecture

"ALF" and "ILP"

- Application-level framing:
 - The application best knows its own needs
 - May not ask for retransmission, but for lower resolution
- Integrated Layer Processing
 - Tightly coupled layers
 - Keeps data presentation from being the bottleneck
 - Gives the app. access to the data ASAP!

D. Clark and D. Tennenhouse, 1990
"Architectural considerations for a new generation of protocols"

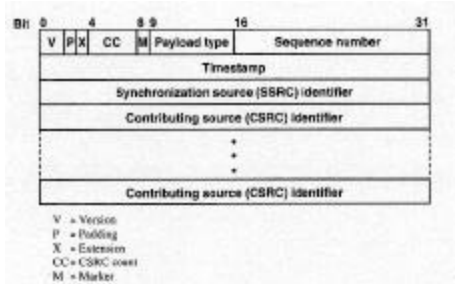
RTP: Summary

- A very thin protocol
 - Usually built into application
- No hard QoS guarantees
 - Designed for *soft* real-time apps
 - Depends on underlying network
 - Can run over ATM
- Two components:
 - Media(data) transport: RTP
 - Control: RTCP

RTP Concepts

- Port numbers for both RTP and RTCP
- Participant IP addresses
 - Strength is *multicast*
- Relays
 - Mixers
 - Translators
 - (More about these two later)

RTP Header



RTCP

- ID of sender
- Provides various reports for use in:
 - QoS and congestion control
 - so an app can change resolution or compression strategies
 - Session size and scaling
 - conferencing

Mixers and Translators

- Mixer
 - Could receive and combine various sources in an effort to reduce bandwidth
- Translator
 - Keeps incoming sources separate
 - To transform to a lower quality format to broadcast on lower-speed networks
 - To send through firewalls

Compression

- Can use various types
 - JPEG
 - MPEG
 - H.261
- Provided by application
- Negotiated using RTCP

Vic: a Video Conferencing Tool



Vic (2)

- Based on Mbone
- Motivation:
 - A composable tool
- Helped drive the evolution of RTP
 - JPEG payload format
 - H.261 payload format
 - Overall specifications

Vic (3)

- User Interface
- Proprietary compression: "Intra-H261"
- Security provided by DES
 - Confidentiality only
 - no key distribution
 - Data Encryption Standard: *Remember?*
 - Much cheaper than compression!

Summary

- Multimedia applications have much different needs than http or ftp!
- RTP meets those needs:
 - Minimized jitter
 - Synchronized sources
 - Dynamic, payload-specific frame length
 - Adaptation in the face of congestion
 - Interoperability
 - Effective use of bandwidth
 - Support for video-conferencing (multicast, IDs)