The Real Time Streaming Protocol (RTSP)

Rob Lanphier
Progressive Networks
October 25, 1996

RTSP

- Open communications protocol for control and delivery of streaming media
- Supports on-demand access of multimedia items such as real-time audio/video files and live real-time feeds
- Supports any type of live or other paced-content information

RTSP Design Considerations

- Implementations must be interoperable while fostering innovation
- Protocol must be usable over low-bandwidth
- Must push the industry forward by offering easy transition to new technologies, such as multicasting

RTSP Features

- Provides a complete set of functionality for streaming multimedia
- Reduces RTP packet headers by up to 75%
- Privately unicasts reporting packets from client to server, saving bandwidth
- Validation and authentication mechanism built into the protocol

(more..)

RTSP Features (cntd.)

- Sophisticated options negotiation for multi-party extensibility
- Choice of transport
- Independent control for each stream

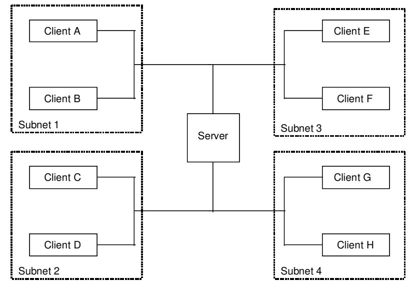
Complete One-to-Many Specification

- Provides a complete set of functionality for one-to-many streaming of multimedia
- Not designed for conferencing (that's best left for conferencing protocols)
- RTP leaves the concept of a control channel largely undefined. RTSP compliments RTP by filling this gap.

RTSP Benefit: Private Reporting in Low Bandwidth

- Privately unicasts reporting packets from client to server, saving bandwidth
- Reduces the 5% overhead of RTCP reporting data sent to every client by every other client, which is not useful enough in a broadcasting model to justify such overhead.

RTCP reporting structure



RTSP Benefit: Private Reporting

- Privately unicasts reporting packets from client to server, saving bandwidth
- Reduces the 5% overhead of RTCP reporting data sent to every client by every other client, which is not useful enough in a broadcasting model to justify such overhead.

RTSP Benefit: Compressed RTP

- Compressed RTP reduces UDP packet headers by up to 75% over standard RTP
- Eliminates the RTCP requirement, saving 5% in the data stream

Problems with RTP/RTCP in Low Bandwidth Situations

- RTCP traffic is limited to 5% of RTP traffic
- 25% of that is for senders
- At 2 kilobytes per second, this is only 75 bytes per second
- 75 bytes per second, shared 1000 clients is one 80 byte packet every 17 or 18 minutes

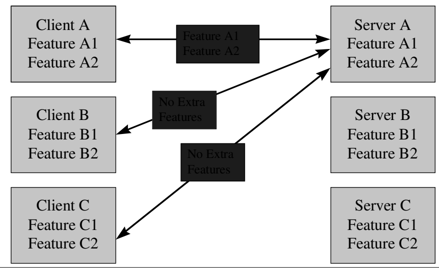
RTSP Benefit: Validation and Authentication

- Validation and authentication mechanism built into the protocol
- Extensible feature which allows for content protection and security from both client and server.

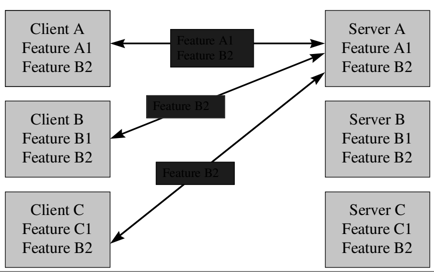
RTSP Benefit: Options Negotiation

- Time-tested format: based on Telnet protocol
- Sophisticated options negotiation for multi-party extensibility
- Allows easy creation of extensions while maintaining a base-level of interoperability
- By breaking up options, implementors can pick and choose which options work best

Options Negotiation

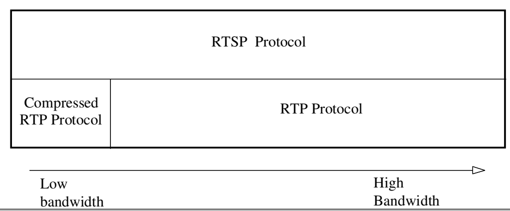


Options Negotiation



RTSP Usage

- Depends on bandwidth and infrastructure



RTSP Architecture

- Control channel: Multiplexed TCP using SCP
- Data Channel: TCP, UDP or Multicast UDP
- Data Packet Format: RTP or Compressed RTP

TCP Control Channel

- Provides reliability in a time-tested manner
- Provides slightly better security
- Easier implementation for firewalls
- Abstraction of the data channel is a possibility for future versions

TCP control

- SCP "sessions"
- Based on HTTP-NG

Data Channel Flexibility

- Data channel transport determined by a control message
  - TCP/SCP
  - UDP
  - Multicast UDP
- New data channel types may be added in the future

Transport Level Data Transports

- TCP: Provides reliable delivery and easiest firewall traversal
- UDP: Provides application control of packets, allowing loss forgiveness
- Multicast UDP: Provides highly-scalable delivery of live content

Application Level Data Transports

- SCP: Used to multiplex several data and control sessions on a single TCP connection
- Compressed SCP: what the name implies
- RTP: Provides fully compatible RTP/RTCP support
- Compressed RTP: Provides RTP functionality with lower overhead

SCP Delivery

- Allows control connection to be used as data channel
- Easy for packet-level filters: all they see is one outbound TCP session
- Works well with operating systems that limit the number of open connections

Compressed header SCP

- Reduces the typical SCP header from four bytes to just one in most cases
- Works with existing SCP

RTP/RTCP

- Useful in maintaining compatibility with the existing MBONE
- Full compatibility with tools that require RTCP complience
- Offers jitter calculation and stream synchronization

Compressed RTP

- Eliminates RTCP requirement
- Reduces RTP header from 12 bytes to as low as 3 bytes in many cases
- Doesn't rely on previous packet: packet loss is OK
- Great for low-bandwidth connections

Future Directions

- Event file format
- Event stream format

RTSP Resources

- http://www.ietf.org (mmusic working group/confctrl working group)
- http://www.realaudio.com
- Reference implementation