

Session Description Protocol (**SDP**) and Real-Time Streaming Protocol (**RTSP**)

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CSC557 ♦ Multimedia Computing and Networking

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Lecture # 24

“Roadmap” for Multimedia Networking

1. Introduction
 - why QoS?
 - what are the problems?
2. Basic operations
 - jitter buffers (at hosts)
 - task scheduling (at hosts)
 - packet shaping (at hosts)
 - packet dropping (at routers)
 - packet scheduling (at routers)
3. Types of service
 - Integrated Services (IntServ) and Resource Reservation Protocol (RSVP)
 - Differentiated Services (DiffServ)
4. Application-level feedback and control
 - Real-time Protocol (RTP), Real-time Control Protocol (RTCP)
5. Application signaling and device control
 - **Session Description Protocol (SDP)**
 - **Real-time Streaming Protocol (RTSP)**
 - Session Initiation Protocol (SIP)
 - Media Gateway Control Protocol (MGCP)
6. Routing
 - Multi-protocol Label Switching (MPLS)
 - multicasting

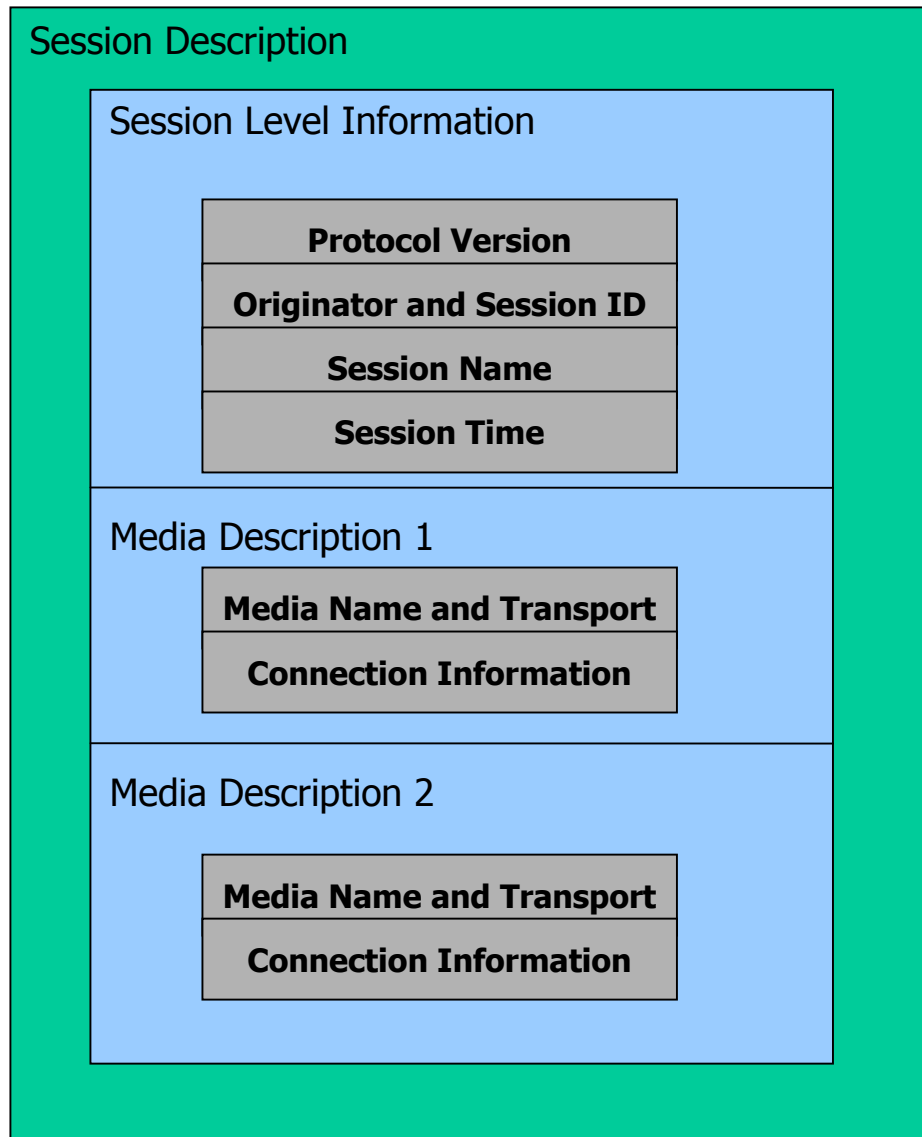
Today's
Lecture



The Session Description Protocol (SDP)

- Originally designed for multicast conference announcements
 - now being used for unicast and multicast, many application types
- Text-based format
- Runs over many transports: SAP, SIP, RTSP, MIME, H.332, HTTP, ...

SDP: Format



SDP: Example

```
v=0
o=reeves 123456 001 IN IP4 station1.work.com
s=meeting
i=research project discussion
c=IN IP4 station1.work.com
t=0 0
m=audio 4444 RTP/AVP 2 4 15
a=rtpmap 2 G726-32/8000
a=rtpmap 4 G723/8000
a=rtpmap 15 G728/8000
```

Version

Originator, session identifier, version, network type, protocol type, address

Subject

Information

Connection type, address

Start and stop times

Media type, port number, transport protocol, RTP profile

Dynamic payload type description

Dynamic payload type description

Dynamic payload type description

SDP: Time Information (Schedule)

- Represented using UTC (universal time code)
- Can specify start and stop times, and repetition intervals

SDP: Fields (in proper sequence)

| Field Name | Meaning | Required ? |
|------------|--------------------------------------|------------|
| v | Protocol version | Y |
| o | Owner/creator and session identifier | Y |
| s | Session name | Y |
| i | Session information | N |
| u | URI of description | N |
| e | Email address of contact person | N |
| p | Phone number of contact person | N |
| c | Connection information | N |
| b | Bandwidth information | Y |
| t | Time session is active | Y |
| r | Repeat times | N |
| k | Encryption key | N |
| a | Session attributes | N |

SDP: Media Descriptions

- Attributes and media descriptions
- Attributes preceding media descriptions apply to them all
 - otherwise, apply to the nearest preceding media description
- Subfields of the media field
 - Type, e.g., audio, video
 - Transport, e.g., RTP, H.320
 - Format, e.g., H.261, G.711
 - Codec-specific attributes

SDP: Media Description Fields

| Field Name | Meaning | Required? | Example |
|------------|----------------------------------|-----------|--|
| m | Media name and transport address | Y | m=audio 45678 RTP/AVP 0. |
| i | Media information | N | |
| c | Connection information | N | |
| b | Bandwidth information | N | |
| k | Encryption key | N | |
| a | Media attributes | N | a=sendonly a=recvonly a=orient:landscape |

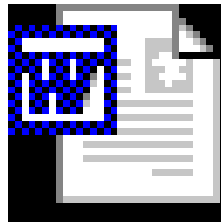
The Session Announcement Protocol (SAP)

- Session originator multicasts **conference announcements** to a well-known multicast group
 - to receive announcements, just join that multicast group
- Contents of packets are essentially a SDP payload
- Announcement rate is low (every few minutes)

The Real Time Streaming Protocol (RTSP)

- For **remote control** of playback
 - play, pause, stop, rewind, fast forward, etc.
 - used by Realplayer, MS Media Player
- RTSP does not have to be used with RTP
- Normally transmitted over TCP
 - commands need to be reliably received, processed in sequence
- Time specified either through relative or absolute time
 - supports SMPTE, real clock time (UTC), etc.

RTSP Example: Movie on Demand



Microsoft Word
Document

RTSP: Presentations

- Multimedia *presentations* are identified by URLs
 - **protocol scheme** = "rtsp"
 - **hostname** = server containing presentation
 - **port** = where RTSP control requests should be sent
- Can identify portion of a presentation, e.g.
 - rtsp://media.example.com:554/twister, or
 - rtsp://media.example.com:554/twister/audiotrack

RSTP Sessions

- A client uses RTSP to request a presentation be started by a presentation server
- The server responds with **session identifier**
 - used in all subsequent requests
 - session identifier corresponds to shared state between client and server
- If session is disrupted (machine crashes), no real recovery built into RTSP

RTSP: Basic HTTP Exchange

- RTSP is modelled on HTTP V1.1
 - a generic "remote procedure call" mechanism available almost universally
 - application-level, object-oriented
- General format of a message
 - Type of request / response
 - General header
 - Request or response header
 - Entity header
 - Message body (if any)

RTSP: Message Details

- Type of request
 - command (get / head /options / post / put / delete / trace), followed by URL
- Type of response
 - numeric code, and textual description (e.g. "404 Not Found")
- General header
 - ex.: cache-control, connection, date, pragma, transfer-encoding, upgrade, via
- Request header
 - ex.: encodings that are acceptable, software being used, date of most recent entity

RTSP: Message Details

- Response header
 - ex.: age of response, when to retry on failure, type of server
- Entity header
 - optional info about body of the message, e.g., length, type, expiration date, last-modified date
- Body of message
 - actual data associated with request and response

RTSP Requests

- Describe
 - server sends description using SDP
- Announce
 - register description of the presentation using SDP
- Options
 - server returns list of supported methods
- Setup
 - server allocates resources for a stream and starts RTSP session

RTSP Requests (cont.)

- Play, Record, Pause
 - server starts data transmission over the session
- Teardown
 - server frees up resources allocated for stream
- Get parameter / Set parameter
 - allows parameters to be exchanged
- Redirect
 - causes client to go to another server for part of the presentation
- Requests that modify the session state = Setup, Play, Record, Pause, Teardown

RTSP: Displaying a Presentation

- Application must have the URL of the presentation
- Client requests description of the presentation media streams, using Describe method
- Client requests session setup, receives sessionID, server allocates state and resources
- Client requests media stream(s) be played, specifies URL, sessionID, start and stop times
- Client can pause at any time, or change playback by specifying new time range in Play request
- Client issues teardown request, server deallocates state and resources

Sources of Info

- Recommended Books
 - Online!: [J. Crowcroft et al., *Internetworking Multimedia*, 1999](#)
 - D. Collins, *Carrier-Grade Voice over IP*, 2001
 - Chapter 5
- Other books
 - O. Hersent et al., *IP Telephony*, 2000
 - Chapter 2
 - B. Douskalis, *IP Telephony*, 2000
- RFCs
 - [SDP: Session Description Protocol, RFC 2327](#)
 - [Real-Time Streaming Protocol, RFC 2326](#)
 - [SIP: Session Initiation Protocol, RFC 2543](#)