Modeling RTP Streams over ATM AAL5

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Outline of Presentation

• Project Overview
• Background Information
• Theory and Methodology
• OPNET Implementation
• Conclusion
• References
Project Overview and Objectives

• End-to-end duplex system
• RTP streams over ATM
• Model system and simulate in OPNET
• Verification and analysis
• Topic chosen out of personal interest
• ATM Forum contribution by AT&T Labs
  (A. Fraser, P. Onufryk, K.K. Ramakrishnan)
Background Information: Real-Time Transport Protocol

• RFC1889
• Standard for conveying real-time media streams
• Typically over UDP/IP
• Applications in VoIP telephony, multimedia conferencing
• RTP sessions with multiple context sessions or RTP streams
  • defined by source/destination IP addresses, UDP ports, and RTP Synchronization Source (SSRC)
Background Information: Asynchronous Transfer Mode

- ITU-I.361
- Circuit-switched network technology
- Fixed-size cells
- ATM Adaptation Layer type 5 (ITU-I.363.5)
  - Simple and efficient adaptation layer (SEAL)
  - Used for IP data
Theory and Methodology

• End-to-end system
Theory and Methodology:
RTP/UDP/IP Header Compression/Decompression

• RFC2508
• Based on TCP/IP header compression
• Most header fields stay constant or change by fixed amount
• Requirement: Link layer handles error detection
• Our focus on IPv4
Theory and Methodology:
RTP/UDP/IP Header Compression/Decompression (cont’d)

• Regularly changing field values in red
Theory and Methodology:
RTP/UDP/IP Header Compression/Decompression (cont’d)

• Field values that must be sent in red
Theory and Methodology:
RTP/UDP/IP Header Compression/Decompression (cont’d)

• Compressed packets must carry
  – 8 or 16-bit Context Identifier (CID)
    • Identifies context session
  – 4-bit link sequence
    • Detects packet loss
Theory and Methodology:
RTP/UDP/IP Header Compression/Decompression (cont’d)

• 3 packet formats sent from compressor
  • COMPRESSED_RTP
  • COMPRESSED_UDP
  • FULL_HEADER
Theory and Methodology:
RTP/UDP/IP Header Compression/Decompression (cont’d)

• COMPRESSED_RTP
  – Compresses RTP/UDP/IP headers

```
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
   MSB of CID
(if 16-bit CID)
   Link Seq
   UDP Checksum
   "RANDOM" fields
   Delta IPv4 ID
   Delta RTP Sequence
   Delta RTP Timestamp
   Contributing Source (CSRC) Identifiers
   RTP Header Extension
   ... RTP Payload ...
```

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April 04, 2002
**Theory and Methodology:**
RTP/UDP/IP Header Compression/Decompression  (cont’d)

- **COMPRESSED_UDP**
  - Compresses UDP/IP header only

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![Diagram of RTP/UDP/IP Header Compression/Decompression](image-url)
Theory and Methodology:
RTP/UDP/IP Header Compression/Decompression (cont’d)

• **FULL_HEADER**
  – No compression
  – Either UDP or IP header cannot be compressed

![UDP/IP Header Diagram](image-url)
Theory and Methodology:
RTP/UDP/IP Header Compression/Decompression (cont’d)

• Context information shared by compressor and decompressor
Theory and Methodology:
ATM Encapsulator/Decapsulator

- **UNI must support RTP/UDP/IP formats**
  - AAL5
    - Service Specific CS
    - Common Part CS
    - SAR
- **ATM encapsulation**
Theory and Methodology: ATM Encapsulator/Decapsulator (cont’d)

- Common Part Convergence Sublayer (CPCS)

Real-time AAL5 Encapsulation Packet
(Voice over ATM to the Desktop)
Theory and Methodology: ATM Encapsulator/Decapsulator (cont’d)

• ATM encapsulation
  – VC assignment based on CID

IP addr: 100.100.100.100
RTP session 1: port 100
stream 1: CID=1
stream 2: CID=4
RTP session 2: port 101
stream 1: CID=2
stream 2: CID=3

IP addr: 201.201.201.201
RTP session 2: port 201
stream 1: CID=2
stream 2: CID=3

VPI/VCI=0/32
CID=1 => IP=200.200.200.200
CID=3 => IP=201.201.201.201

CID=1 = destn=200.200.200.200
=> VC=0/32
CID=3 = destn=201.201.201.201
=> VC=0/32

IP addr: 200.200.200.200
RTP session 1: port 200
stream 1: CID=1
stream 2: CID=4
OPNET Implementation

RTP/UDP/IP Generator/Sink → RTP/UDP/IP Header Compressor/Decompressor → RTP-ATM encapsulator/decapsulator

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ATM Network

IP Network

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OPNET Implementation: RTP Generator/Sink
OPNET Implementation: RTP Generator/Sink (cont’d)
OPNET Implementation: RTP/UDP/IP Header Compression/Decompression

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OPNET Implementation:
ATM Encapsulator/Decapsulator
OPNET Implementation: ATM Encapsulator/Decapsulator (cont’d)
OPNET Implementation:
Assumptions

• Session setup / termination
  – RTP session: SIP (RFC 2543), H.323
  – ATM: PVC vs. SVC
• Ideal network 😊
• One RTP session, multiple RTP streams
• IPv4 only
OPNET Implementation: Verification Methods

• Stage by stage accuracy

– Collection of packet information at “symmetrical” stages of transmission
Conclusion

- Compression and encapsulation of RTP/UDP/IP packet
- Implementation in OPNET
- Programming in OPNET
- Knowledge of RTP, ATM protocols
References


Thank You 😊
for listening so attentively

¿Questions?

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