TCP over ATM

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Recap

- TCP over ATM
- Possible mapping (UBR/ABR)
- Performance over UBR
- Performance over ABR

Today's lecture

- Need for RT protocols
- RTP
- RT traffic characteristics

Real-time Transport Protocol

- The growth in using the net even for real-time applications such as voice and video, has created a demand to propose new protocols to satisfy the requirements of these applications.
- Non RT applications, the metrics of interest are: throughput, delay, and reliability. However with RT, timing issues are of interest
- TCP and UDP are not suitable to support these applications

RTP

- TCP is not suitable due to:
  - TCP is a point-to-point protocol, no multicasting is possible
  - TCP uses retransmissions, in addition to the additional delay, out of order segments may not be desired in RT applications
  - TCP does not provide timing information
- UDP does not provide guarantees for RT applications

RTP

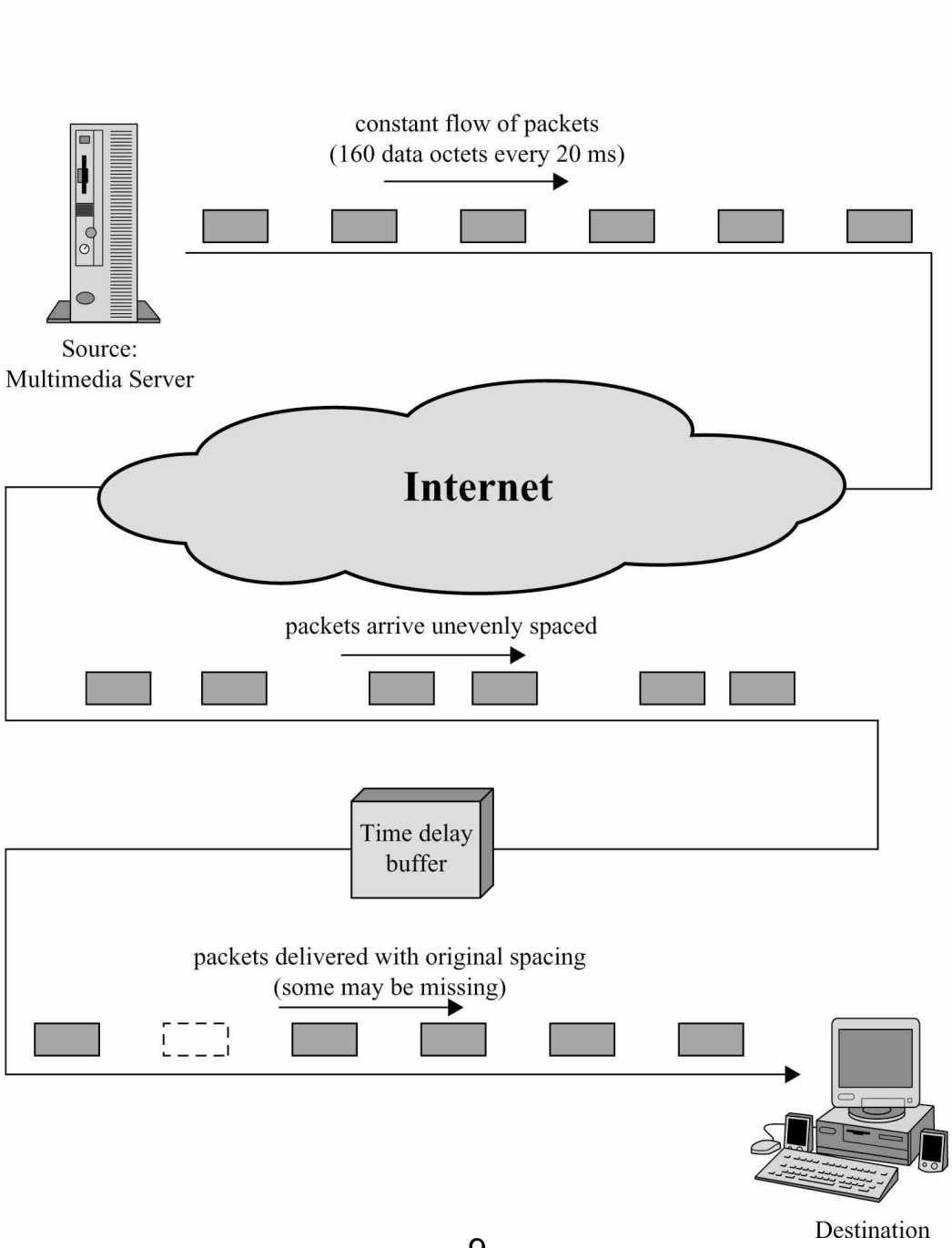
- To satisfy RT application requirements new standard was proposed
  - RFC 1889 defines RTP
  - Data transfer RTP
  - RTP control protocol (RTCP)

RT Traffic Characteristics

- Usually packets at the source are transmitted at a regular rate
- Due to network conditions, packet interarrival times are not preserved
- A buffer is needed to delay packets and release them at a constant rate to reconstruct the original RT session

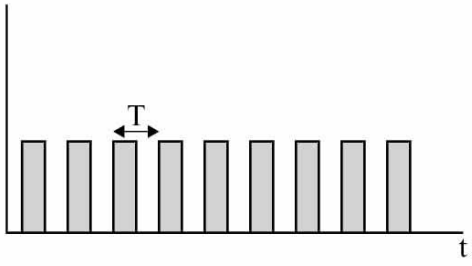
Delay Jitter

- It is the maximum variation in delay experienced by the packets in a single session.
- Any packet that that is received with in this jitter will be accepted for delivery; however if it is delayed more that the jitter value then it is discarded.

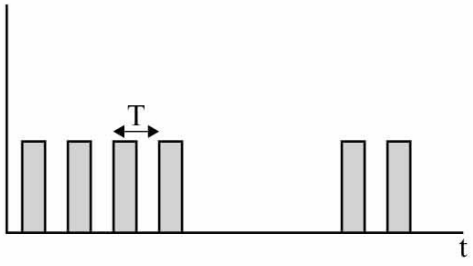

constant flow of packets
(160 data octets every 20 ms)
Source:
Multimedia Server
Internet
packets arrive unevenly spaced
Time delay
buffer
packets delivered with original spacing
(some may be missing)
Destination

RT Traffic profile

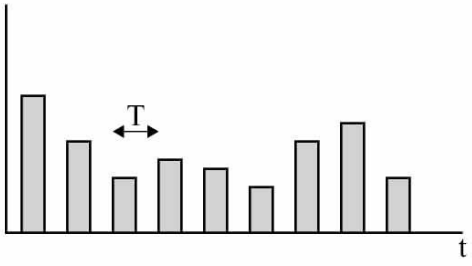
- RT is not usually of constant rate
  - Continuous data source: radar
  - On-off source: telephony, audio conf.
  - Variable packet size: Mpeg



(a) Continuous data source



(b) Voice source
with silent intervals



(c) Compressed video source

RT Requirements

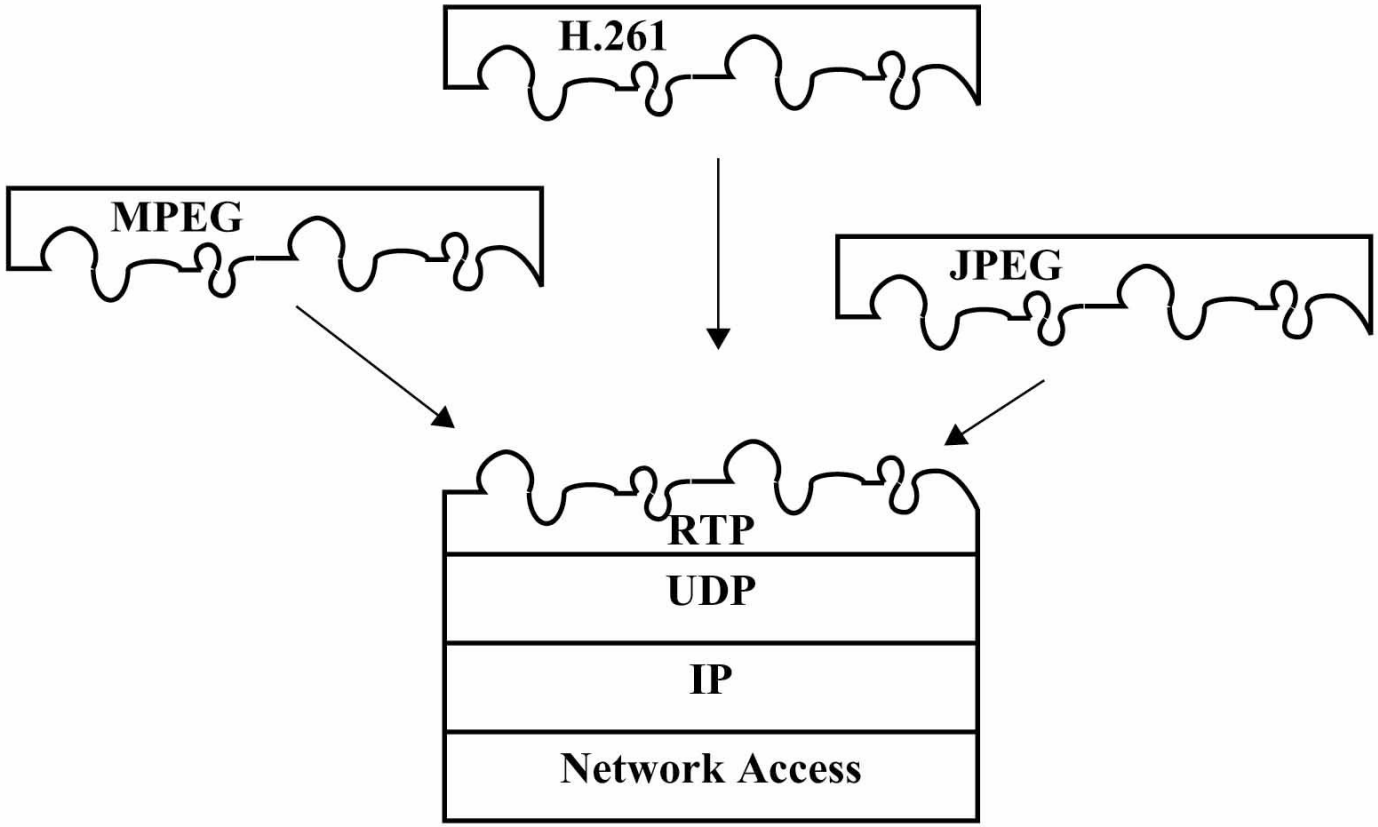
- Low jitter
- Low latency
- Adaptability to network changes
- Good performance for large networks
- Modest buffer requirements
- High utilization
- Low overhead
- Low processing overhead
- Ability to integrate NRT with RT

RTP Architecture

- Two key concepts:
  - Application level framing:
    - the source application is informed about the network conditions rather than the transport layer, then the source will decide to pick a lower QoS rather than retransmission.
    - Retransmission in this case is better implemented by the applications as it may recompute lost data rather than retransmit them, or send revised data that will fix lost portion of data.
    - Application should break the flow into ADUs.

RTP Architecture

- Integrated layer processing
  - Runs on top of UDP that provides port addressing
  - RTP implements sequencing


H.261
MPEG
JPEG
RTP
UDP
IP
Network Access

RTP Data Transfer Protocol

- RTP supports of RT transfer among many users in a single session.
  - A session is defined with:
    - RTP port number
    - RTCP port number
    - Participant IP addresses: multicast or set of unicast

RTP Relays

- RTP defines a relay
  - Which is an intermediate system that acts as both a destination and a source in a data transfer
  - Two kinds of relays are defined in RTP
    - Mixer
    - Translator

RTP Relays

- RTP Mixers:
  - It functions as a multiplexer
  - Many RT streams are multiplexed into a single stream (reshaping may be needed)
  - Audio streams of different FM stations are multiplexed together
- RTP Translator:
  - To meet requirements of the recipients, RT streams may be reformatted.
  - Firewalls, high to low quality video, multicast to multiple unicast