

# UPnP QoS / AVB Interface Parameters (tspec)

Fred Tuck  
EchoStar

# Background on UPnP

- Layer 3 IP interface for applications
- SRS: Scheduled Recording Service
- CDS: Content Directory Service
- QoS: Quality of Service
- Devices
  - Endpoints: TVs, Recorders, DVD Players
  - Network parts: Gateways, bridges

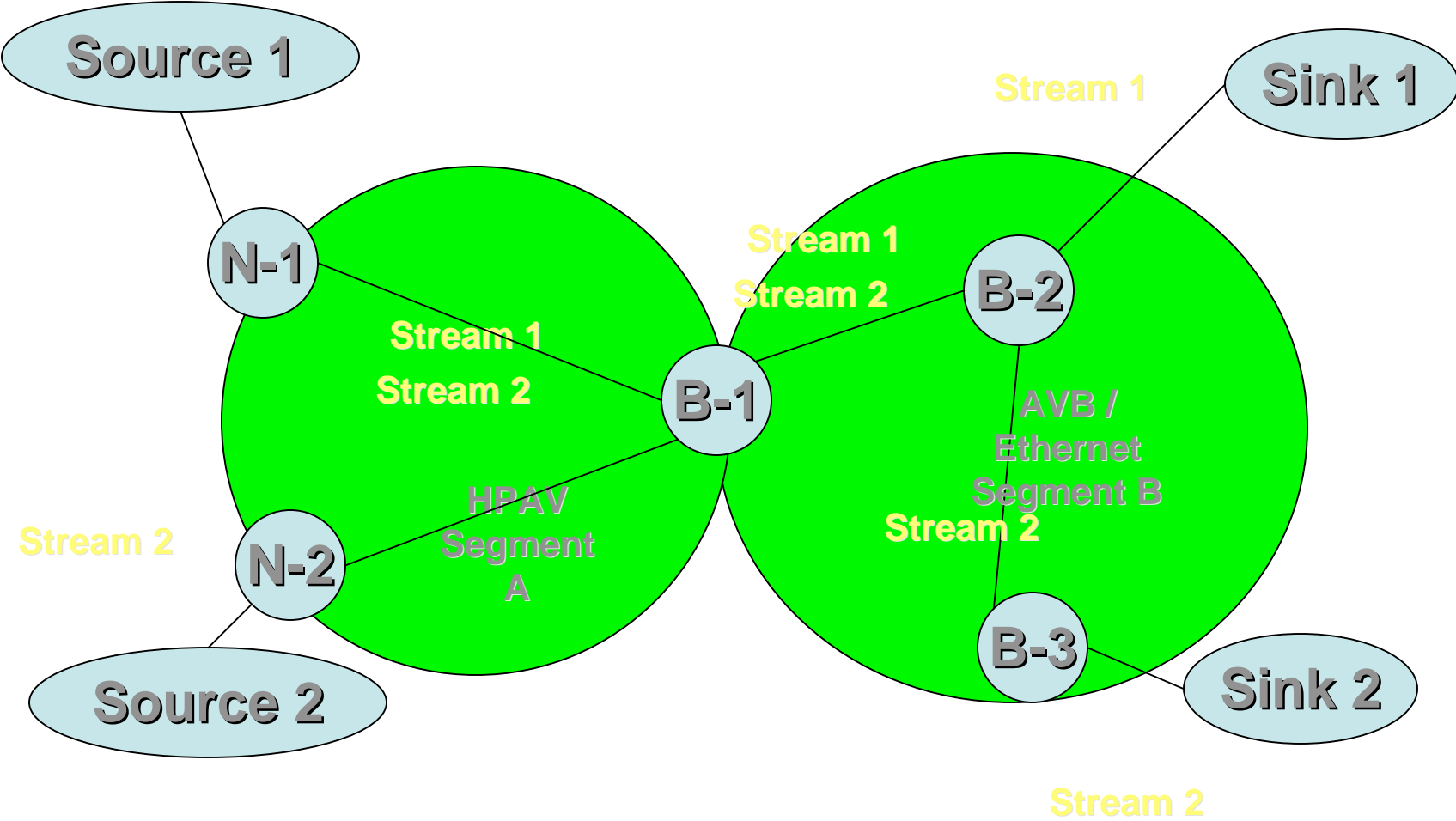
# UPnP QoS V 3.0

- Parameterized QoS
- Resource Reservation (Bandwidth, Delay)
- Multiple phy types (Ethernet, MoCA, WiFi, Homeplug AV, WiNet)
- Phys with layer 2 parameterized QoS
- Phys without layer 2 parameterized QoS

# UPnP QoS Segment

- One or more physical segments with a common layer 2 QoS
- May be common phy
- May be different phys that can communicate QoS at layer 2 (SRP)

# Segments



# UPnP QoS Segments

- IF B1 is a UPNP QoS bridge
  - Segment A is a UPnP QoS Segment
  - Segment B is a UPnP QoS Segment
- IF B1 is a AVB bridge
  - Entire Diagram is one UPnP QoS Segment

# Potential Traffic Specification (tspec) Parameters for Phys

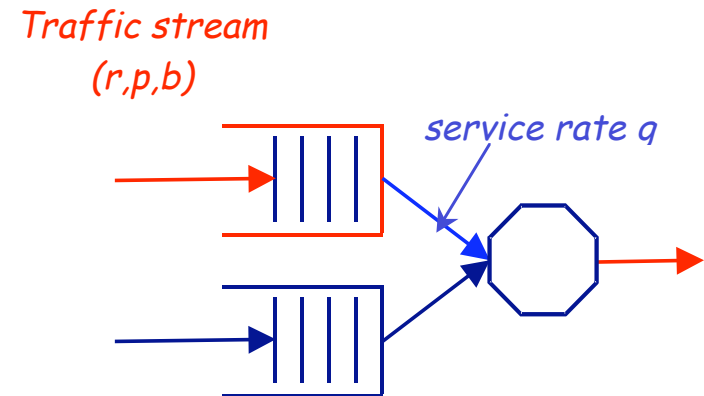
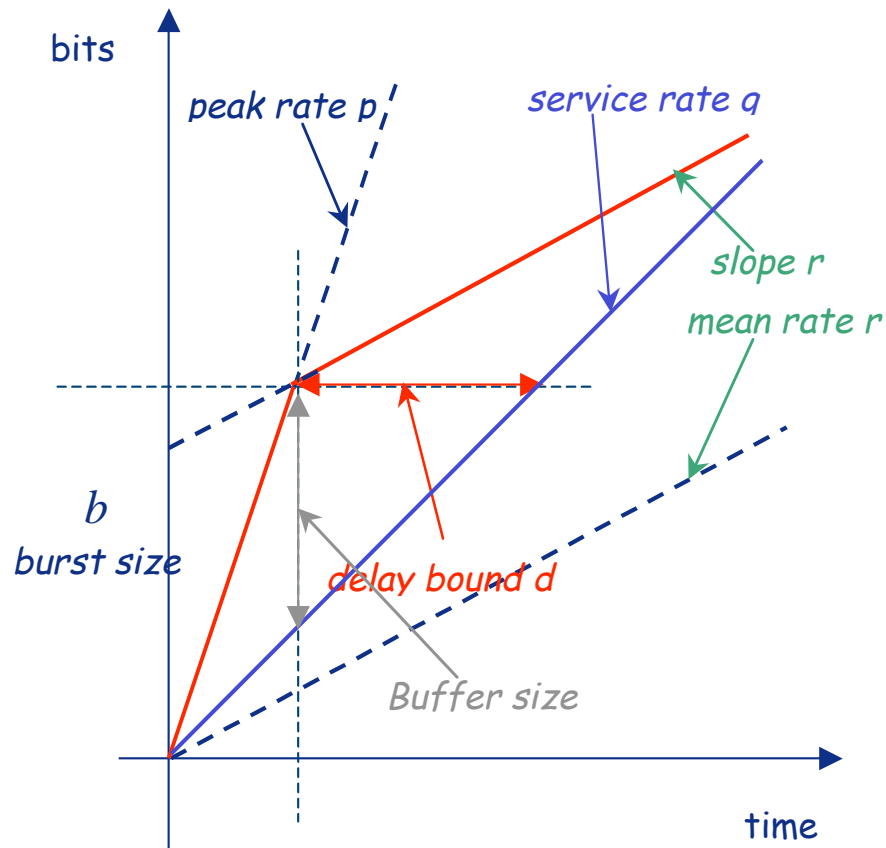
- HomePlug AV: (17)
  - 802.11e WMM-SA: (23)
  - MoCA: (6-tentative)
  - AVB: (??)
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- Note:(number of potential parameters)

# Tspec / UPnP Mandatory

- PeakDataRate: Max instantaneous data rate
- MaximumBurstSize: Max bits above MeanDataRate at any time
- MeanDataRate: Long term data rate,
- DelayBound: burst delay
- TimeInterval: Time Unit over which other parameters are computed
  - (may not need to be mandatory)



# Source of Parameters



# Delay

- End to End Delay: imposed by network
- Delay bound is the delay imposed by maximum burst with a service rate  $<$  PeakDataRate
- Total Delay is E to E Delay + Delay Bound

# Tspec / UPnP

TrafficClass (used to determine the Total Delay range)

(Still under discussion)

- If there is no traffic class requested then total delay can be  $>5\text{ms}$
- If class 4 is requested then the total delay must be  $< 5\text{ms}$
- If class 5 is requested then the total delay must be  $< 1\text{ms}$

# Optional Parameters

- Mandatory parameters are sufficient (with some predefined defaults) to make a valid reservation
- Mandatory parameters may not provide optimal resource allocation on some phys.

# AVB Issues

- SRP needs the ability to pass a variable number of parameters
- Parameters not recognized by a bridge must be passed to next bridge.

# Proposed SRP Parameters

- Number of parameters: N
- Parameter 1 name (id) “PeakDataRate”
- Parameter 1 value “6,000” (Kbits/sec)
- Parameter 2 name (id) “MaximumBurstSize”
- Parameter 2 value “1,000” (Kbytes)
- ...
- Parameter N name (id) “MeanDataRate”
- Parameter N value “2,500” (Kbits/sec)

# Parameter Binary Details

- Number of parameters: 8 bits (256)
- Parameter id: 8 bits (256)
  - This may imply a mapping / registration of ids
- Parameter value: 16 bits (65K)

# Parameter Binary Details

- 1 byte for number of parameters
- 3 bytes / parameter
- 5 mandatory parameters
- $1 + 3 * 5 = 16$  bytes is minimum size for tspec in a SRP message.



# Returned Parameters (on reservation success)

- Delay used by segment
  - Actual delay needed in uSec for the segment.
- QoS Manager will add delays reported by all QoS Segments to see if total delay request can be met.

# Returned Parameters (on reservation failure)

- Bandwidth available
- Stream ids of blocking streams
  - Bandwidth reserved by each stream
  - Bridges provide MAC address
  - UPnP QoS needs reverse mapping of MAC address to IP stream address.
    - IETF involvement?
  - This information is needed to support preemption of existing streams.

# Failure issues

- Refreshing reservation
  - Provide Stream ID
- Ensuring sending stream is still active
  - Pause problem
- Notification of lower level failure

# Current Time

- No current plans to provide this through QoS or UPnP.
- That could change if an application requirement is found.
- UPnP AV is interested in the clock accuracy and may want to use it.

# Layer 3 / Layer 2 Stream Address Issue

- UPnP QoS stream id is IP addr + Port
- IP address may be unicast or multicast
  - (No current UPnP QoS support for multicast)
- What is the mapping between L3 and L2 address?
- How to do the reverse mapping L2 to L3?



# Old UPNP QoS / AVB Presentation

- Archived backup slides

# Disclaimer and Assumptions

- These are Preliminary suggestions.
- Still under discussion in UPnP QoS.
- UPnP QoS needs to work with some legacy devices in the network.
  - Bridges with No Layer 2 QoS
  - Different PHYs
  - Exact Topologies supported TBD



# Interface Categories

- Stream Admission and Bandwidth Reservation
- Failure Recovery
- Preemption Support
- Interoperation with other PHYs
- Stream ID / Addressing

# Stream Admission and Bandwidth Reservation Functions

- Reserve Bandwidth (Resources)
- Release Bandwidth (Resources)
- Traffic specifications / Parameters
  - Bandwidth
  - Packet size (min, average, max)
  - Max number of Packets
  - Delay

# Failure Recovery

- Presence Indication
  - Refresh Reservation to maintain receiver presence
  - Keep alive packet or null packet to indicate server still active (when there is no data to be sent)
- Failure Detection
  - If the Receiver dies the Res. Refresh times out
  - If the Server dies there is no keep alive or null packet
- Recovery
  - Free Layer 2/3 Resource Reservations
  - Signal Applications(s)

# Preemption Support

## Reasons for Preemption

- Consumer / User Decisions
- Incoming VOIP
- PVR automatically starts to record

# Preemption Support

## What is Needed

- ID of stream(s) that could be preempted
  - Only streams on path of failed reservation
  - Only streams on failed link on above path
  - Translate layer 2 ID to Layer 3 ID
- Bandwidth reserved for existing streams
- Bandwidth available on link where reservation failed.

# Interoperation with other PHYs

- UPnP defines a Segment as a part of the network that can manage QoS at layer 2 end to end.
- There may be non AVB bridges between some dissimilar phys
- There will be UPnP devices with multiple PHYs that can manage QoS at layer 3.

# Interoperation with other PHYs

- There may be legacy (non QoS) bridges between phys.
- Legacy bridges act are treated as wires.
- With a legacy bridge in the middle part of the reservation may need to be done from the server end.

# Stream ID / Addressing

- Need for both Unicast and Multicast IP stream addresses
- How do we get from a Unicast IP address to a group MAC address?
- How do we get from a Multicast IP address to a group MAC address?
- How do we get from a layer 2 MAC address to a layer 3 IP Address and Port (needed for preemption support)



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IEEE 802.1 AudioVideo Bridging TG

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