1722 over IP

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1722 fields

- 802.3 header
- 802.1Q tag
- Ethertype
- Control/data
- Subtype
- Version
- Type specific data
- Stream ID
- Media clock restart
- Sequence number
- 802.1AS timestamp
- Timestamp uncertain
- Gateway info
- Length
- Payload

IP fields

- IP header
  - Version
  - Header length
  - DSCP
  - Total length
  - ID
  - Flags
  - Fragment offset
  - TTL
  - Protocol
  - Header checksum
  - Source IP
  - Destination IP
- UDP header
  - Source port number
  - Destination port number
  - Checksum
  - Length

RTP fields

- Version
- Marker
- Payload type
- Sequence number
- Timestamp
- Synchronization source
- Synchronization routes

1733 RTCP fields

- Name
- Grandmaster ID
- Time base indicator
- Stream ID
- 802.1AS timestamp

1722 over IP

- Ethernet header
- 802.1Q tag
- IP header
  - DSCP
- UDP header
  - Length
- Control/data
- Subtype
- Version
- Type specific data
- Stream ID
- Media clock restart
- Sequence number
- 802.1AS timestamp
- Timestamp uncertain
- Gateway info
- Length
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Overhead

- 1722
  - Ethernet – 38 (includes preamble, header, FCS and IFG)
  - 802.1Q tag – 4
  - 1722 header – 24
  - Total = 66 octets
- 1733
  - Ethernet – 38
  - 802.1Q tag – 4
  - IP header – 20 or 40
  - UDP header – 8
  - RTP header – 12
  - Total = 82 or 102 octets
- 1722 over IP
  - Ethernet – 38
  - 802.1Q tag – 4
  - IP header – 20 or 40
  - UDP header – 8
  - 1722 header – 24
  - Total = 94 or 114 octets

IP multicast

- Internet Group Management Protocol (IGMP) – IPv4 group membership
- Multicast Listener Discovery (MLD) – IPv6 group membership
- Multicast Address Dynamic Client Allocation Protocol (MADCAP) – RFC 2730. Implemented in Microsoft DHCP servers. Not widely deployed.
- Unicast-Prefix-based IPv6 Multicast Addresses – RFC 3306, 3307. Requires ZMAAP.
- ZMAAP – Not in use. IETF draft (draft-ietf-zeroconf-zmaap-02.txt) expired in 2003.
- Protocol Independent Multicast (PIM) – Multicast routing across layer 3 networks

Source-specific multicast

- Requires IGMPv3 (IPv4) or MLDv2 (IPv6)
- Specify multicast destination address and unicast source
  - Reserved destination addresses 232.0.0.0/8 (IPv4) and FF3x::/32 (IPv6)
  - Locally administered addresses – 239.0.0.0/8 or Unicast-Prefix-based IPv6 Multicast Addresses
  - IANA registered addresses

802.1AS across routers

- 802.1AS system as distributed boundary clock
- Require UTC traceability
- Map between Grandmaster timelines
- Identify Grand-grandmaster
- Relax synchronization specifications

802.1Qav across routers

- Map between 802.1p and DSCP
  - All switches already map 802.1Q PID and DSCP to queues
  - Some switches (e.g. ProCurve) map DSCP to PID then map PID to queues
- Maps are administratively configured
- Hard mappings would be at odds with extant QoS policies and best practices
- Secured networks do not generally trust host-generated DSCP markings

802.1Qat across routers

- Best effort (with prioritization)
- IntServ (RSVP)
- IntServ with RSVP aggregation

1733 across routers

- Already IPv4 router ready
- Not in P1722 scope
- P1733 may choose to improve IEEE 1733
  - IP multicast
  - IntServ
  - DiffServ
  - IPv6

Conclusions

- Inserting UDP/IP headers between Ethernet header and 1722 header does not create unreasonable redundancy
- 1733 is more efficient than 1722 over IP
- Several alternatives for IP multicast address management. Many not well developed. Source specific multicast is most recent and most scalable scheme.
- 802.1AS/IEEE 1588 can scale beyond LAN with impaired performance but probably not past enterprise scale.
- DSCP $\leftrightarrow$ 802.1av (802.1p) mapping and sophisticated classification is common practice in today's IP networks.
- Admission control was attempted with IntServ but is now not considered an promising approach on large-scale IP networks.

Selected references

- RFC 3569 – An overview of SSM
- Benjamin Teitelbaum, Stanislav Shalunov (3 May 2002). "Why Premium IP Service Has Not Deployed (and Probably Never Will)". Internet2 QoS Working Group