IETF DetNet and IEEE 802.1
Time-Sensitive Networking

Status update
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Outline

• The common vision
• TSN description and status
• DetNet description and status
• Cooperation status
TSN and DetNet: a common vision

• A DetNet/TSN data stream:
  • May be unicast or multicast.
  • Has an absolute maximum bandwidth, and uses most of it.
  • Requires an absolute upper bound on end-to-end latency.
  • Requires 0 congestion loss in the network.
  • May require extraordinary protection against random or equipment failures.
  • Can afford to make and wait for a resource reservation to obtain these goals.

• A small to enterprise-sized network can carry any mix of TSN and non-TSN traffic.

• DetNet/TSN applications typically require time synch to < 1 µS.
Time-Sensitive Networking Task Group

• TSN is one of 5 Task Groups of the IEEE 802.1 Higher-layer LAN Protocols Working Group of the IEEE 802 LAN/MAN Standards Committee.
• IEEE 802.1 chair: Glenn Parsons. TSN chair: János Farkas.
• TSN TG (née AVB TG) has been active since 2005.
• Typically, 2/3 of the 50-60 voting members of 802.1 participate in TSN.
• Six face-to-face meetings / year, approx. 24-32 hours / meeting
• 2 hours/week teleconferences.
TSN completed standards

- Amendments to IEEE Std 802.1Q Bridges and Bridged Networks:
  - 802.1Qat Stream advertisements and resource reservation
  - 802.1Qav Credit-based shaper
  - 802.1Qbu Transmission preemption (along with IEEE Std 802.3br)
  - 802.1Qbv Time scheduled output queues
  - 802.1Qca Extensions to ISIS for multi-pathing and reservations
  - 802.1Qch Cyclic Queuing and Forwarding
  - 802.1Qci Per-Stream Filtering and Policing

- Stand-alone IEEE standards:
  - 802.1AS Timing and Synchronization
  - 802.1BA Profile for plug-and-play AVB networks
  - 802.1CB Frame Replication and Elimination for Reliability
TSN standards in progress

• Amendments to IEEE Std 802.1Q Bridges and Bridged Networks:
  • 802.1Qcc Enhancements for stream reservation protocol
  • 802.1Qcp YANG models for bridges
  • 802.1Qcr Asynchronous Traffic Shaping
  • 802.1Qcw YANG models for all TSN queuing and filtering techniques

• Stand-alone IEEE standards:
  • 802.1AS Timing and Synchronization revision and enhancements
  • 802.1CM Profile for CPRI front-haul networks over bridges
  • 802.1CS Link-local Registration Protocol
TSN Acceptance

• Increasing interest, actual deployments.
• Many vendors, including major bridge/switch vendors, claim compliance with AVB standards.
• Multiple vendors are claiming compliance with just-completed TSN standards, including credit-based shapers and cyclic queuing and forwarding.
• Active participation in TSN and in industry fora (ODVA, Avnu) by industrial, automotive, infotainment, and audio-video studio users.
• IEEE 802.3 has several TSN-specific MAC/PHYs started or starting.
• AVB deployment is growing. TSN deployments have commenced.
TSN issues

• Vendors and customers have both been waiting for each other.
• Many relatively small vendors of end stations must make a big leap from dedicated digital busses to a protocol stack.
• Standards are often ahead of products.
• No support for routers.
TSN summary

• A vendor can build a network claiming compliance to TSN standards that meet all of the goals in the “common vision”, above.
• There are gaps in management capabilities that hinder interoperability among different vendors, for which projects are now in place to close.
• Additional capabilities, as requested by certain verticals, are now in progress.
IETF Deterministic Networking WG

- DetNet is in the Routing Area, AD Deborah Brungard
- Charter approved October 5, 2015
- Chairs: Pat Thaler, Lou Berger
- 3 face-to-face meetings / year, 2-3 hours/meeting,
- 2 hours/week teleconferences
- Appreciable, but not heavy, activity on 3 mailing lists
DetNet status

• Two drafts adopted by WG:
  • Deterministic Networking Architecture
  • Deterministic Networking Use Cases
  • One or both may progress from this meeting

• Other DetNet drafts:
  • 4 Additional use cases
  • 1 Security
  • 1 Data plane
  • 2 Information model
  • 1 Architecture
  • 1 Control plane
  • A few are likely to be adopted from this meeting, especially the data plane draft.
DetNet issues

• Approximately one year behind original milestones.
• Standards are often ahead of products.
• The target users are still awakening to the value of networking, and to
  the differences between bridging and routing.
Cooperation status

• Significant common membership
  • More than half of active DetNet participants are also active in TSN.
  • Official liaisons have not been necessary.

• Apparent agreement on L2 vs. L3 data plane issues.

• Work on information models (YANG) is just blossoming in both TSN and DetNet.
  • There is a potential for conflict; perhaps a mailing list and teleconference series for information modeling is in order.

• Potential participants must ask in order to get access to TSN resources.

• All in all, cooperation has been very successful.