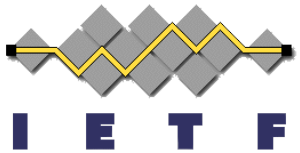
DetNet WG

IETF #96, Berlin

Use Cases Draft

Monday, July 18th, 2016

Ethan Grossman, editor



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Contents

- Updated Use Case draft
  - draft-ietf-detnet-use-cases-10
  - Goals
  - Status
  - Future
  - Common themes
  - Conclusions from discussions on “use case statements not covered in Problem Statement or Architecture drafts” as presented at IETF95

Use Case Draft Goals

- Provide Industry context for DetNet goals
  - What are the use cases?
  - How are they addressed today?
  - What do we want to do differently in the future?
  - What do we want the IETF to deliver?
- Highlight commonalities between use cases
- Yardstick for functionality of any proposed design
  - To what extent does it enable these use cases?
- This DetNet use case draft explicitly **does not**
  - State specific requirements for DetNet
  - Suggest specific design, architecture, or protocols

Use Case Draft Status

- Resolves Use Case questions from IETF 95
  - Statements from use cases which had no corresponding support in the Problem Statement and Architecture drafts
  - Statements from use cases which needed clarification on their relation to DetNet goals and scope
- Resolutions are based on conclusions drawn from DetNet list discussions of each of 21 questions
- Resolutions will be summarized briefly here, please see Use Cases draft for more info
- These resolutions are still for open for your review, please contribute
- There is no “Requirements” draft planned, so we need to be clear on what is in scope based on the Use Cases draft

Use Case Draft Future Plans

- Continue to review the ongoing architecture and design drafts to identify cases in which they may not support user needs (as described in the Use Cases draft)
- Adapt and clarify the Use Cases draft to be in alignment with practical considerations of the proposed architecture and design
  - Subject to agreement from the WG

DetNet Use Cases

- Presented at IETF93, 94, and 95
  - Professional audio
  - Electrical utilities
  - Building automation systems
  - Wireless for industrial applications
  - Radio/mobile access networks
  - Industrial Machine-to-Machine (M2M)
  - Internet Applications
- Today: Just review common themes

Common Themes (1/2)

- Unified, standards-based network
  - Extensions to Ethernet (not a ”new” network)
  - Centrally administered (some distributed, plug-and-play)
  - Standardized data flow information models
  - Integrate L2 (bridged) and L3 (routed)
  - Guaranteed end-to-end delivery
  - Replace multiple proprietary determinstic networks
  - Mix of deterministic and best-effort traffic
  - Unused deterministic BW available to best-effort traffic
  - Lower cost, multi-vendor solutions

Common Themes (2/2)

- Scalable size
  - Long distances (many km)
  - Many hops (radio repeaters, microwave links, fiber links...)
- Scalable timing parameters and accuracy
  - Bounded latency, guaranteed worst case maximum, minimum
  - Low latency (low enough for e.g. control loops, may be < 1ms)
  - Ability to create symmetrical path delays
- High availability (up to 99.9999% up time, even 12 nines)
  - Reliability, redundancy (lives at stake)
- Security
  - From failures, attackers, misbehaving devices
  - Sensitive to both packet content and arrival time
- Deterministic flows
  - Isolated from each other
  - Immune from best-effort traffic congestion

Conclusions – DetNet Scope

- The following statements from the Use Cases draft (and live discussion from IETF95) for each asking essentially ”Is it in scope?”
- Here are the conclusions to each, based on discussions on the DetNet list
- ~~Strikethrough text~~ means ”Not In Scope”
- ”?” means needs discussion, e.g. today

Statement Resolutions

- ~~The Open Internet~~
  - Linking multiple islands is supported
- ~~Providing Synchronized Time~~
  - Must be provided by other means e.g. IEEE 1588
  - ?How to express app time accuracy and reliability needs?
- Plug-And-Play (new device, replace, remove device)
  - Important for many use cases
- ~~Stream Start-up (or re-start) Time~~
  - ?Beyond DetNet, must be handled by app, e.g. redundancy
- ~~Link Authentication/Encryption~~
  - Not responsibility of DetNet, presumably link layer
- ~~Link Aggregation (use of multiple paths to route a single flow)~~
  - Implies guarantee of in-order packet delivery, bad for low latency, leave to app
- Latency matching – single- or bi-directional
  - ?Utilities needs this, but not clear how to address in DetNet?
- Traffic Segregation (multicast MAC addrs to many devices, IPv4)
  - ?Problem for P-N-P networks – not for centrally configured networks? (No discussion on thread)

Statement Resolutions

- DetNet consideration of 6TiSCH expectations
  - ~~Path set/get protocol, must be direct to PCE~~
    - Cannot eliminate all peer-peer protocol
  - ~~Push neighbor info to PCE over CoAP?~~
    - (CoAP: Constrained Application Protocol [RFC 7252])
    - Alternatives exist (e.g. Gateway) – don't force CoAP on DetNet
  - ~~Multiple metrics same as RPL Ops (RFC6551), CoAP~~
    - DetNet will define communication of device info, but specialized subnets e.g. CoAP may require gateway
  - One-Shot vs Update of paths
    - Network conditions may change thus must be able to update paths
  - Read energy data from devices (app layer?)
    - Taken to mean "arbitrarily extensible protocol for communicating device info"
    - No discussion – assume PCE will support such protocol?
  - ~~ARQ protocol (auto retry, specific to wireless)~~
    - No discussion – Packet Rep and Elim is core to DetNet – take this as a possible design suggestion, not a use case

Statement Resolutions

- DetNet will stay consistent with 802 TSN
  - DetNet Architecture team assures us it will be
- ~~Delay accuracy +/-8ns (jitter)~~
  - Nanosec is below DetNet, needs HW support
  - Keep statement in Use Case draft, with disclaimer
- ~~Transport contrib to RF error +/- 2PPB (2ns)~~
  - (Same as 8ns above)
- ~~Security must allow for long leases~~
  - Not DetNet, but security policy should support this
- Data plane xport std ”unified among xhauls”
  - Means “Different flows with diverse DetNet requirements must coexist in the same network and traverse the same nodes without interfering with each other”, a core property of DetNet

Additional Topics

- Privacy (e.g. considering RFC 7258)
  - Architecture team agreed to address this topic
- Support of interconnecting DetNet networks
  - Explicitly supported by DetNet WG Charter

Remaining Questions

- ~~Providing Synchronized Time~~
  - ?How to express app time accuracy and reliability needs?
- ~~Stream Start-up (or re-start) Time~~
  - ?Beyond DetNet, must be handled by app, e.g. redundancy
- Latency matching – single- or bi-directional
  - ?Utilities needs this, but not clear how to address in DetNet?
- Traffic Segregation (multicast MAC addrs to many devices, IPv4)
  - ?Problem for P-N-P networks – not for centrally configured networks? (No discussion on thread)
- Any new topics?