

DetNet WG

IETF #95, Buenos Aires

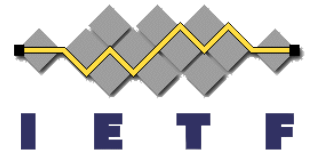
Use Cases Consolidated Draft

Tuesday, April 5th, 2016

Ethan Grossman, editor

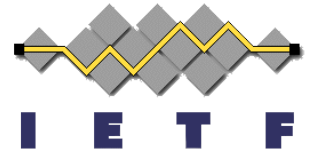
Use Case Authors

Pascal Thubert (Cisco) (Wireless for Industrial)
Craig Gunther (Harman) (Pro Audio)
Ethan Grossman (Dolby)
Patrick Wetterwald (Cisco) (Electrical Utilities)
Jean Raymond (Hydro Quebec)
Jouni Korhonen (Broadcom) (Cellular Radio Access Networks)
Bala'sz Varga (Ericsson)
Subir Das (Applied Comm Sci) (Building Automation Systems)
Yu Kaneko (Toshiba)
Yiyong Zha (Huawei Tech) (Industrial M2M, Internet-Based Apps)



Contents

- Updated Use Case draft
 - draft-ietf-detnet-use-cases-09
 - Goals
 - Status
 - Future
 - New use case (Industrial M2M)
 - Common themes
 - Discussion – use case statements not covered in Problem Statement or Architecture drafts

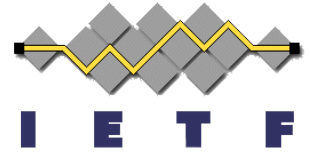


Use Case Draft Goals

- 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

- Meets goals established at IETF 94:
 - Unified document (was set of individual drafts)
 - Adopted by the WG
 - Improve readability, ease of understanding
 - Sufficient detail to show the use cases, not more
 - (Well, almost achieved :-)
 - Highlight commonalities between use cases
 - Add use cases as needed (e.g. Industrial)
 - (Added Industrial M2M)



Use Case Draft Future Plans

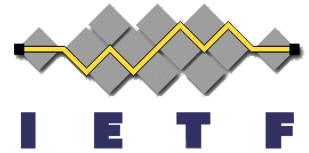
- Clarify remaining statements in the use cases which don't appear to be addressed by the current Problem Statement and Architecture drafts
- There is no plan for a “Requirements” draft so we need clarity in this “direct” interface

DetNet Use Cases

- Presented at IETF93 & 94
 - Professional audio
 - Electrical utilities
 - Building automation systems
 - Wireless for industrial applications
 - Radio/mobile access networks
- New for IETF 95
 - Industrial Machine-to-Machine (M2M)

Industrial M2M

- Industrial Machine-to-Machine (M2M)
- Machine units in a plant floor which periodically exchange data with upstream or downstream machine modules and/or a supervisory controller within a local area network
- Communications between Programmable Logic Controllers (PLCs)



Industrial M2M Today

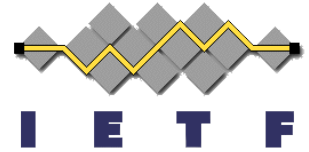
- Proprietary networks
- Daisy Chain, Ring, Hub and Spoke, Comb
- PLC-related control/data streams are transmitted periodically and carry either a pre-configured payload or a payload configured during runtime
- Time synchronization accuracy 1 microsecond
- Prevention of critical flows from being leaked outside a domain typically handled by firewall filtering policies

Industrial M2M Future

- Converged IP-standards-based network with deterministic properties that can satisfy the timing, security and reliability constraints
- Today's proprietary networks could then be interfaced to such a network via gateways or, in the case of new installations, devices could be connected directly to the converged network

Industrial M2M Asks IETF

- Converged IP-based network
- Deterministic behavior (bounded latency and jitter)
- High availability (99.999%)
- Low message delivery time (100us - 50ms)
- Low packet loss (burstless, 0.1-1 %)
- Precise time synchronization accuracy (1us)
- Security (e.g. flow leak between physically separated networks)

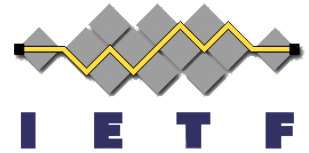


Common Themes (1/2)

- 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 deterministic networks
 - Mix of deterministic and best-effort traffic
 - Unused deterministic BW available to best-effort traffic
 - Lower cost, multi-vendor solutions

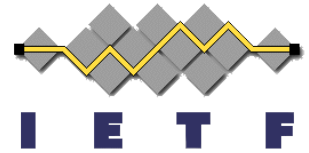
Common Themes (2/2)

- 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 $< 1\text{ms}$)
- 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



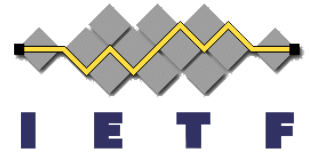
Discussion – DetNet Scope

- The following is a list of statements in the Use Case draft which I don't see directly addressed in the Problem Statement or Architecture drafts
- Can we decide for each if in scope?
- Some statements may be candidates for Post-DetNet IETF work?



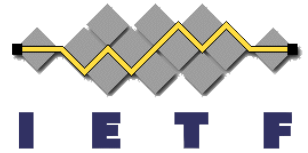
Use Case Statements (1/3)

- The Open Internet – (not in scope)
 - But does future planning for this affect DetNet?
- Providing Synchronized Time (not in scope)
- Plug-And-Play (new device, replace device)
- Stream Start-up (or re-start) Time
- Link Authentication/Encryption
- Link Aggregation
- Latency matching – single- or bi-directional
- Traffic Segregation (multicast to many devices)



Use Case Statements (2/3)

- DetNet consideration of 6TiSCH expectations
 - path set/get protocol, must be direct to PCE
 - Push neighbor info to PCE over CoAP?
 - Multiple metrics same as RPL Ops (RFC6551)
 - One-Shot vs Update of paths
 - Read energy data from devices (app layer?)
 - Extensible protocol – vendor specific?
 - ARQ protocol (auto retry, specific to wireless)



Use Case Statements (3/3)

- DetNet consistency with 802 TSN
 - Hard or soft requirement?
- Delay accuracy +/-8ns (jitter?)
- Transport contrib to RF error +/- 2PPB (2ns)
- Security must allow for long leases
- Data plane xport std "unified among xhauls"
 - Is there any special meaning to this for DetNet?