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  • draft-ietf-detnet-use-cases-09
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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 < 1ms)

- 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?