

DetNet WG Overview

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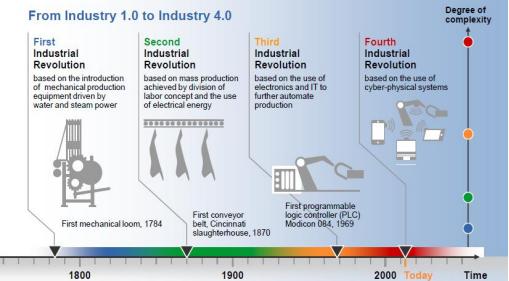
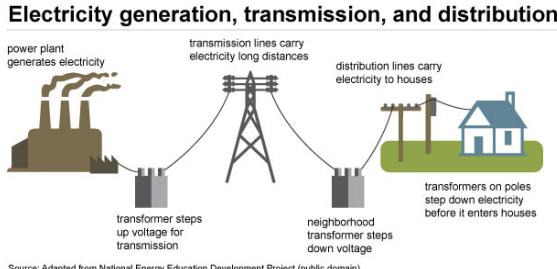
IETF 101 – March 22, 2018

What is DetNet

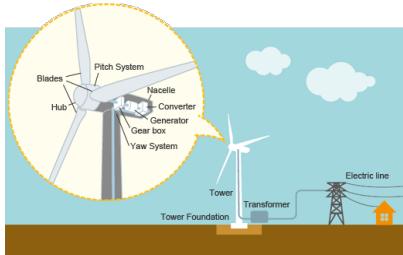
DetNet aims to deliver:

- Guaranteed packet delivery with bounded low latency, low delay variation, and extremely low loss
- Often extreme values (μ sec, zero congestion loss, ...), the main target is guaranteed upper bound on these parameters
- Operates over Layer 3 routed and Layer 2 bridged nets
- Compatible architecture for both Layer 3 and Layer 2
 - Collaboration with IEEE 802.1 TSN
- WG has single administrative domain scope

Use Case Examples



Electrical Utilities



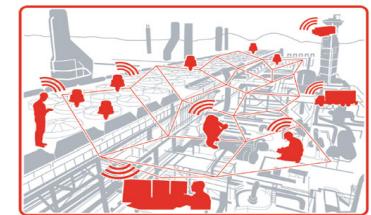
Wind



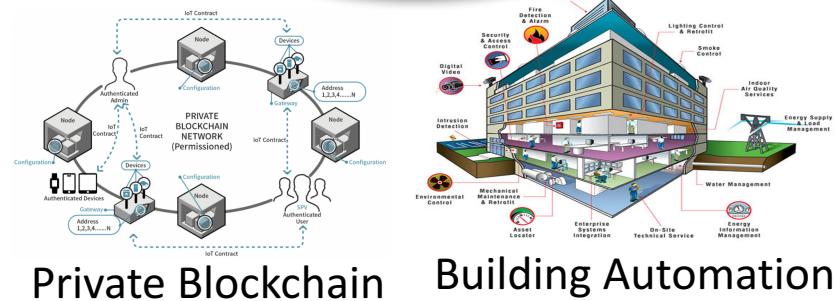
Pro Audio & Video

Deterministic,
low latency,
reliable,
secure

Industrial Automation



Wireless for Industrial

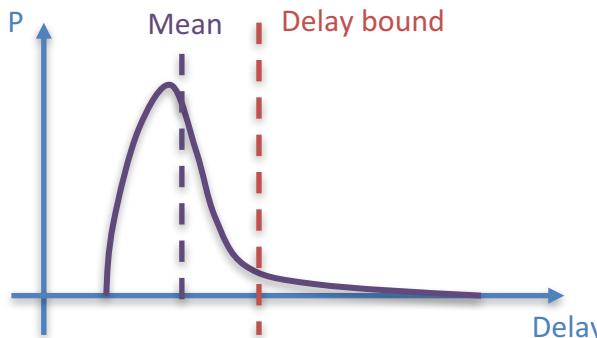


Mining

Traditional vs. Deterministic Service

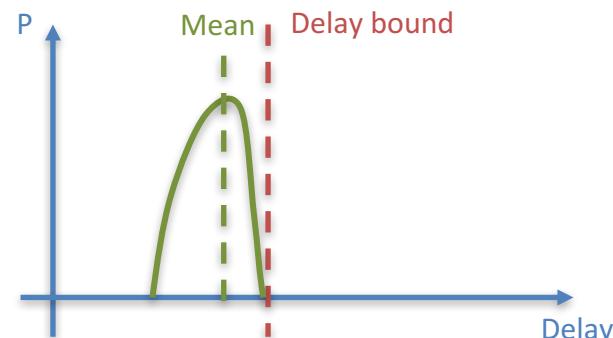
Traditional Service

- Target: Elastic traffic
- Network centric:
 - Network utilization
 - Maximize throughput (stat mx)
 - Good average latency
- Delay probability curves with tail
- **Bounding the latency** means **losing packets** (or overprovisioning)



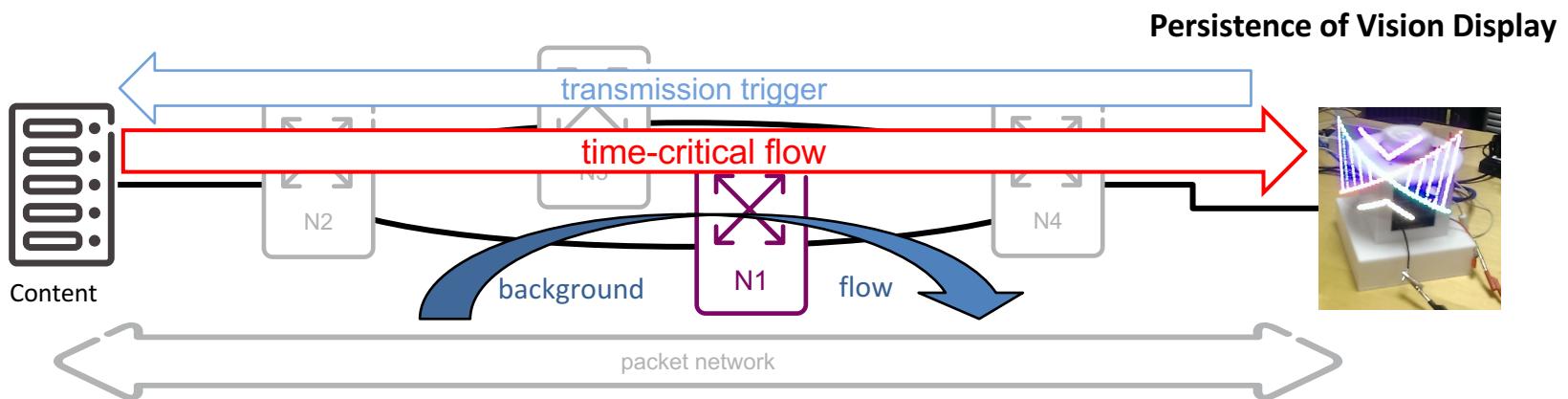
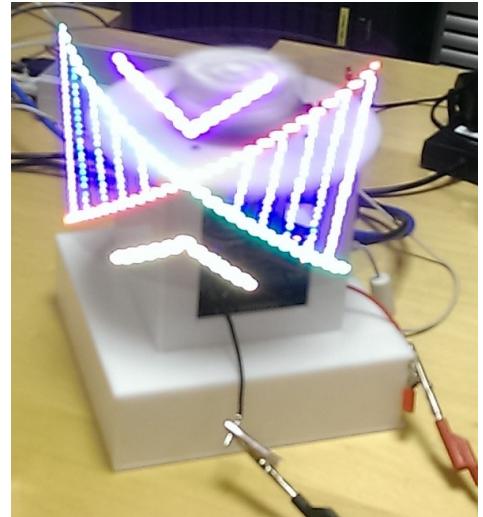
Deterministic Service

- Target: Delivery sensitive traffic
- Service centric:
 - Service parameters
 - Zero congestion loss
 - Bounded latency
- Delay probability curves bounded
- **In-time delivery** ensured: right packet at the right time



Deterministic Networking Demo

- Application
 - Remote, time-critical content on Persistence of Vision Display
 - Time-critical and background flows share the same packet network
- Network scenario



Latency Considerations

1) Single Queue



- Time-critical and background traffic are not distinguished
- Worst case delay variation depends on actual traffic mix

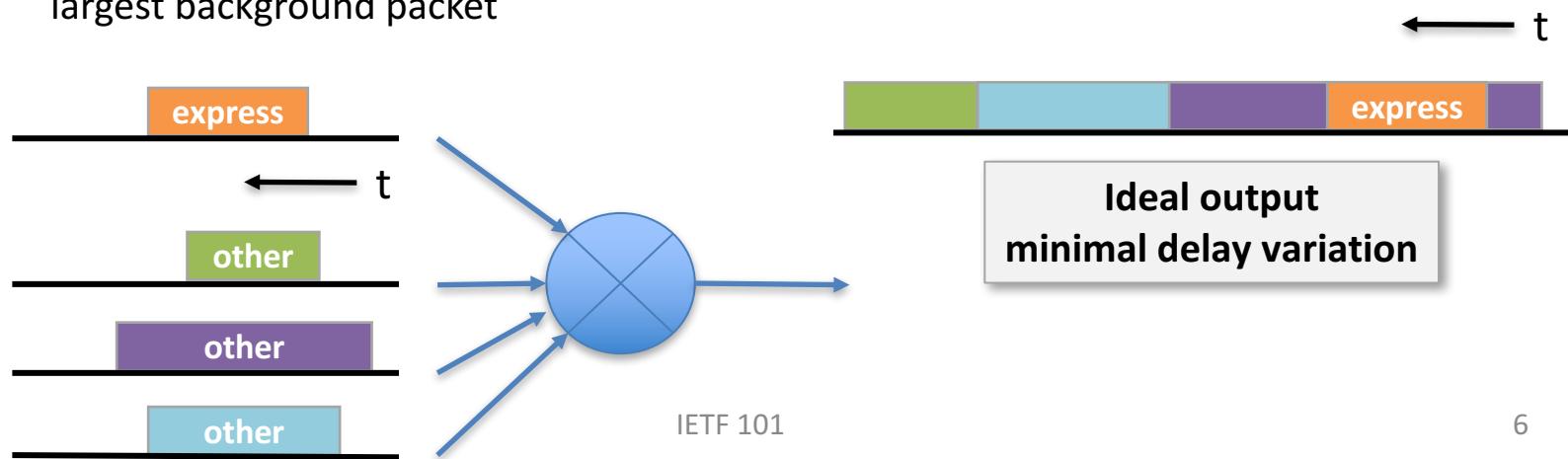
2) Strict Priority



- Time-critical traffic has high prio
- Worst case delay variation corresponds to transmission of largest background packet

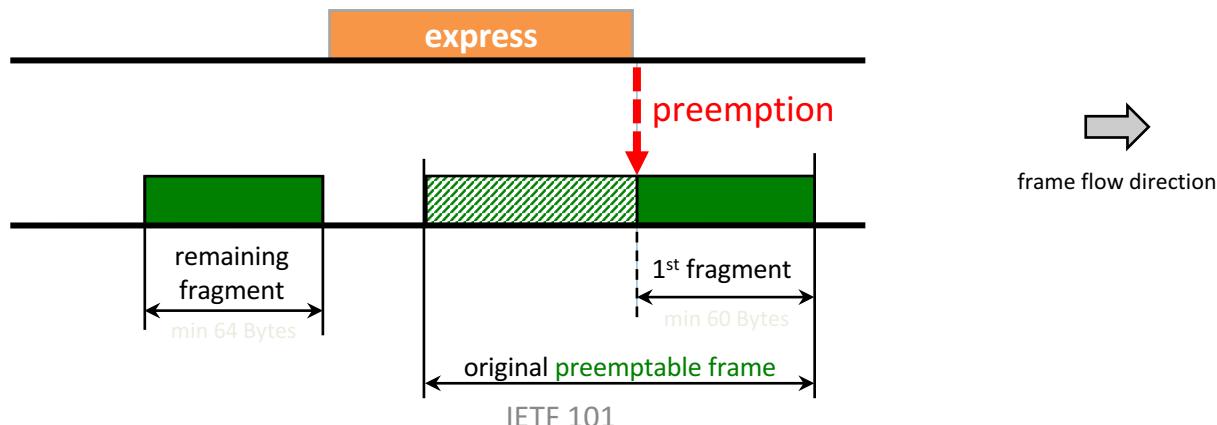
3) Preemption

- Time-critical traffic: high priority express traffic
- Background traffic: low priority preemptable traffic
- Worst case delay variation corresponds to transmission of 123-Byte packet



Preemption

- Express packets suspend the transmission of preemptable packets
 - Decrease delay variation for express traffic
 - Increase bandwidth for preemptable traffic
 - It is link local per hop, it is not IP fragmentation
- Packet transmission example at a port:



Packet Protection

- Packet Replication and Elimination Function (PREF)
- Per-packet 1+1 (or 1+n) redundancy
 - NO failure detection / switchover
- Send packets on two (or more) disjoint paths, then combine and delete extras



Data Plane

Finalizing* Data Plane Encapsulation is objective for IETF 101

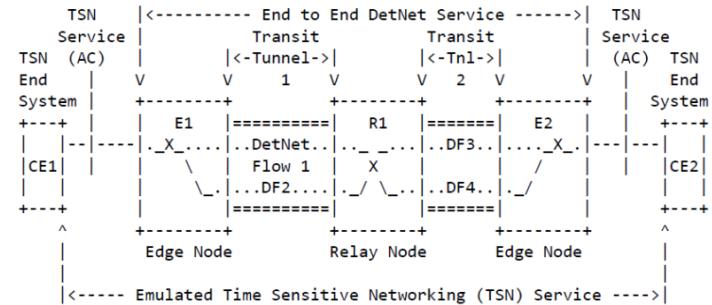
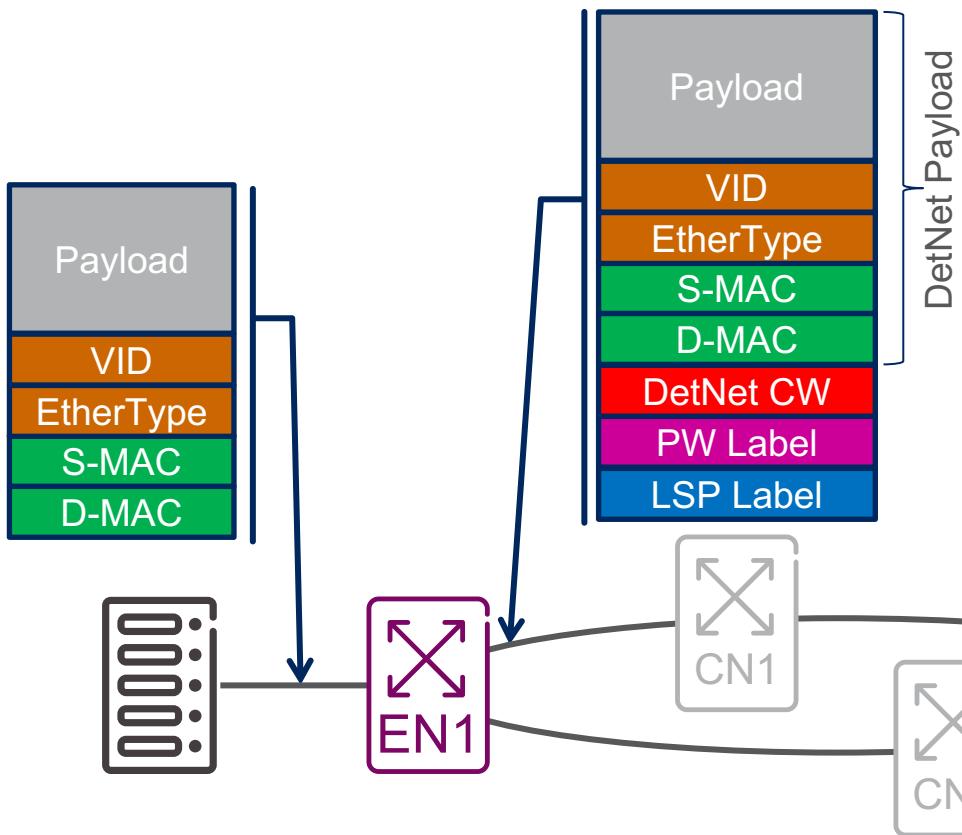
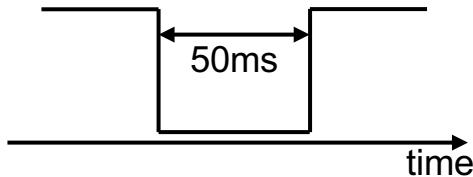


Figure 2 in [draft-dt-detnet-dp-sol-01](#)

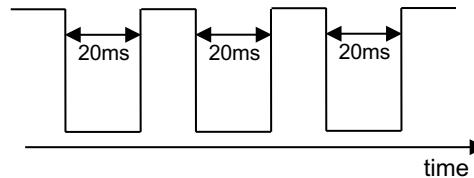
Protection Demo

Link Failure



- Protection switching
 - Triggered by the failure
 - 50ms outage
 - Impacts the application
- PREF eliminates packet loss caused by outage

Link Flapping

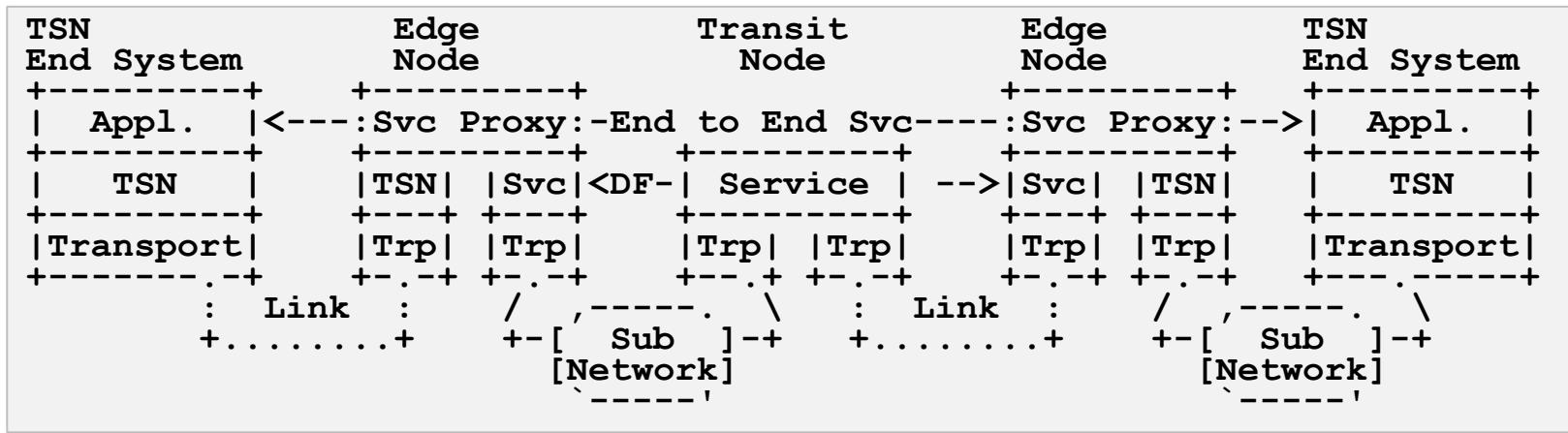


- Protection switching
 - Does not react
 - Multiple 20ms loss periods
 - impact the application
- PREF eliminates packet loss caused by outages

DetNet Functions

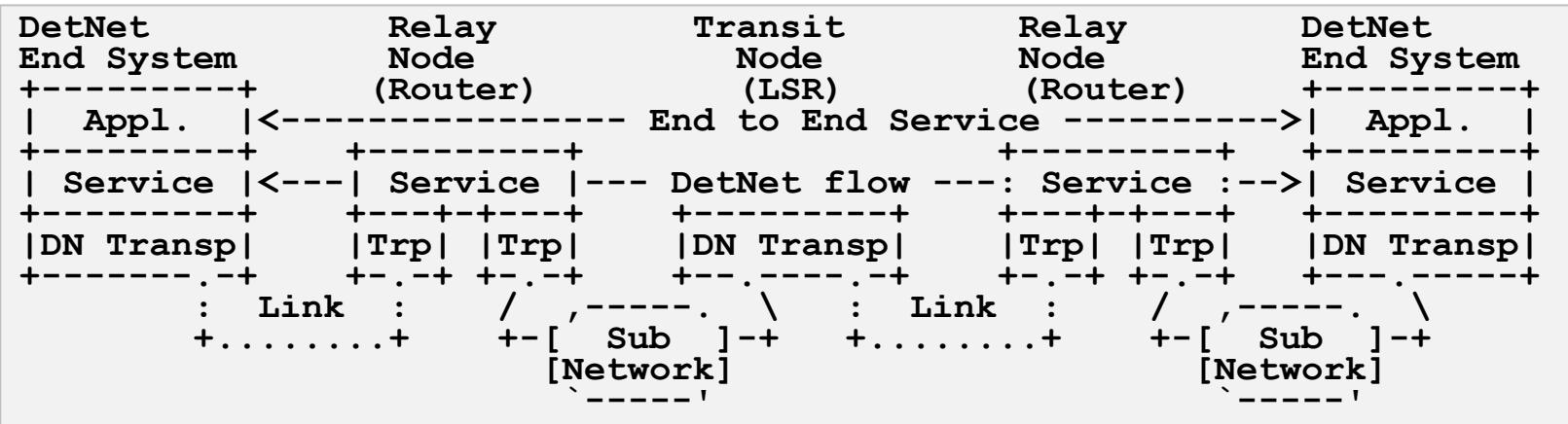
- Congestion protection and latency control
 - Reduce or eliminate congestion as a cause of packet loss for DetNet flows
 - Call admission, resource allocation, shaping and policing
 - Requires flow identification
- Explicit / pinned routes
 - Select and follow a flow specific path
 - Requires flow identification
- Service protection
 - Eliminate loss due to failures
 - Per-packet 1+1 (or 1+n) redundancy
 - Requires flow identification and sequence number

A Scenario: Layer 2 DetNet Service (TSN over DetNet)



- End to end service is Layer 2 (TSN Service)
 - Conceptually similar to an L2VPN
- DetNet Service is edge to edge
 - The edge nodes insert and remove required DetNet data plane encapsulation

Layer 3 DetNet Service



- End to end service is IP
 - Conceptually can be similar to an L3VPN or IP over MPLS
- DetNet Service is terminated by End System or Edge Node, depending on the capabilities/involvement of the End System
- L3 PSN providing DetNet: IP or MPLS

Further DetNet Components

- DetNet Security

Security considerations, e.g., to address challenges when using a converged network instead of a dedicated one

<https://datatracker.ietf.org/doc/draft-ietf-detnet-security>

- Service and flow information model

Information model for DetNet service deployment and flow management, e.g., resource allocation

<https://datatracker.ietf.org/doc/draft-ietf-detnet-flow-information-model>

- Configuration YANG model

YANG data model based on the information model for the configuration of a DetNet network

<https://datatracker.ietf.org/doc/draft-geng-detnet-conf-yang>

Summary

- DetNet meets this Friday
- Morning Session 1 is a normal WG session
- Session 2 is an extended session lasting until 14:30
 - Objective is to finalize initial DetNet encapsulations
 - (With confirmation on-list)
- Please come and contribute!