# Suggestions for Service Provider Profile outline

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# Purpose of this presentation

This slide is for discussion of the TSN Profile for Service Provider Networks (P802.1DF):

- Stimulate thoughts within the 802.1 TSN group on the P802.1DF structure, organization, and planned contents
- Attract 802.1 TSN participants to contribute and improve the quality of P802.1DF

# Fundamental questions

- Are we building relationships (as with P802.1CM ←→ CPRI) with other SDOs who are writing standards that call out P802.1DF**? DISCUSS**
  - RFC 8578: DetNet Use cases
  - Use cases from 3GPP/MEF/ITU-T “5G+TSN”
- Security and synchronization
  - Existing security and synchronization in telecommunication networks could be referred in this profile.
  - No need to invent it again.
- These questions have a big impact on the document. If the above assumed answers are incorrect, this presentation is of questionable value.

# Use Cases Reference, service provider customers

- Professional audio/video
- Electrical utilities
- Wind Farm
- Building automation systems
- Industrial Automation
- Industrial Wireless
- Cellular radio access networks
- Private Blockchain
- Network Slicing
- Mining

Not all of these use cases will be discussed in P802.1DF.

We need to select a few representative use cases to continue discussion;

*https://www.rfc-editor.org/rfc/pdfrfc/rfc8578.txt.pdf

# Use Case Themes Reference

## Use Case 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

*https://www.rfc-editor.org/rfc/pdfrfc/rfc8578.txt.pdf

- Scalable Network Size
- Scalable latency and jitter requirements
- High availability
- Security
- Deterministic flows

# Requirements on Latency/Jitter and Packet loss ratio

Classify use cases from requirement perspective, and pick typical use case for each class;

- bounded Latency;
- bounded jitter;
  - ✓Hard/soft isolation;
  - ✓Network slicing;
- Reliability (Packet loss ratio)

# P802.1DF table of contents

1-5 **IEEE-SA required clauses**

1. Overview, 2. Normative references, 3. Definitions, 4. Abbreviations, 5. Conformance

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6-7 **Requirements**

6. Service Provider Networks
   - QoS over Backhaul/Metro Networks
   - Use cases
7. Security

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8-12 **Toolbox**

8. Asynchronized network model
9. Synchronized network model
10. Time Synchronization
11. Topology and redundancy
    - 802.1CB can handle MPLS
12. Interface with DetNet

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13 **The meat of the standard**

13. Profiles

    -- How many??? Maybe one for intserv/ATS, one for Time based methods;

# 1. Overview, 2. Normative references, 3. Definitions, 4. Abbreviations

- These sections, of course, are mandated by the IEEE Standards Association.
- Also:
  - Introduction
  - Table of Contents
  - Annex A: Profile Conformance Statement
  - Annex <last>: Non-normative references
  - Annex Z: Working Group scratch pad

# 5. Conformance

1. Requirements terminology (explains shall, must, should)
2. PCS: describes use of PCS in Annex A
3. Network edge nodes
4. Network core nodes

- There may be more than one profile defined, in which case the some of 5.3, 5.4 may be doubled.

# 6. Service Provider Networks

- The purpose of this clause is informative; the purpose is to justify a number of requirements over service provider networks. These requirements will be called out throughout the rest of the document to drive/justify the specifications.

1. Introduction to existing service provider networks
   - Including typical sample architectures to serve for further discussions
2. Related standards' requirements on P802.1DF (e.g. from MEF / IETF DetNet)
   - Use cases and requirements
   - High reliability

# 7. Security

- Suggest to refer to standards specific for security , defined in IETF DetNet or other SDOs.

# 8. A-synchronized Model

RFC 1633 IntServ, RFC 2475 DiffServ Model

IEEE TSN 802.1Qav, 802.1Qcr, etc

Network calculus will be helpful in delay calculation;

# 9. Synchronized Model

- IEEE Std 802.1Qbv
- IEEE Std 802.1Qch
  CQF Variants, e.g. Paternoster

# 10. Interface with DetNet

- Control plane interface for resource reservation;
- Data plane interface:
  -- Flow identification, flow aggregation; etc.

IETF DetNet has started working on the data plane;

# 11. Synchronized time

1. Precision Time Protocol
   - Pick a profile and options
2. Robust and Secure PTP
   - Certainly, 802.1AS-2019 will be useful.

# 12. Topology and redundancy

1. Typical hierarchical network topology consist of access level, aggregation level and backbone level;
   - Ring,  star, mesh topologies are all possible on each level;

2. Frame Replication and Elimination for Reliability (FRER)
   - Not necessary end to end, enabling on network node?
3. Customer End station duplication.
   - Impact on the network, relationship to FRER.

# 13. Profiles

- One or two (hopefully one) profiles, for devices conformant to Clause 5, that will meet the needs of a significant market.

1. Profile 1
    1. Overview
    2. Selection of tools
    3. Specific profile parameters
2. Profile 2 …

# Questions for TSN TG

DetNet does not like to talk about low-level matters such as queuing mechanisms.

Queuing mechanisms are critical to TSN/DetNet service.

IEEE P802.1DC talks about applying TSN queuing mechanisms to “relay systems,” not just Bridges.

How much should a TSN Service Provider Profile talk about “relay systems” and how much about “Bridges”???

- (data plane – not control plane)

# Thank you

# Notes

- The toolbox assumption leads this contribution to describe the tools in a bit more detail before dropping into the actual profiles that select among the tools presented.  It is even possible that we will want to define tools that no profile requires.  **But,**
- The document is a toolbox, not a catalog.  We only pick features that are definitely applicable, and do not describe obscure options.
- Security affects all aspects of the document. Security is likely too large a subject to be comprehensively covered in this document. Every clause will refer back to the Security clause.