P802.1DP Monitoring and Management

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Objective

- **Review requirements for aerospace networks**

- **Review IEEE/IETF management objects for TSN**

- **Discuss DP approach to monitoring and management**

Aerospace Network Monitoring Requirements

- Networks support flight critical and safety functions

- Networking devices need to be certified to certain design assurance levels.

- Requirements include avoiding unknown erroneous and silent failures. At network level, this implies monitoring key statistics, errors, and failures.

- Requires monitoring data from devices and a management system – sometimes referred to as "network health monitoring" or "network fault monitoring/management"

- Implication on P802.1DP: Compliant End stations and Bridges shall provide relevant data (statistics/metrics/objects)
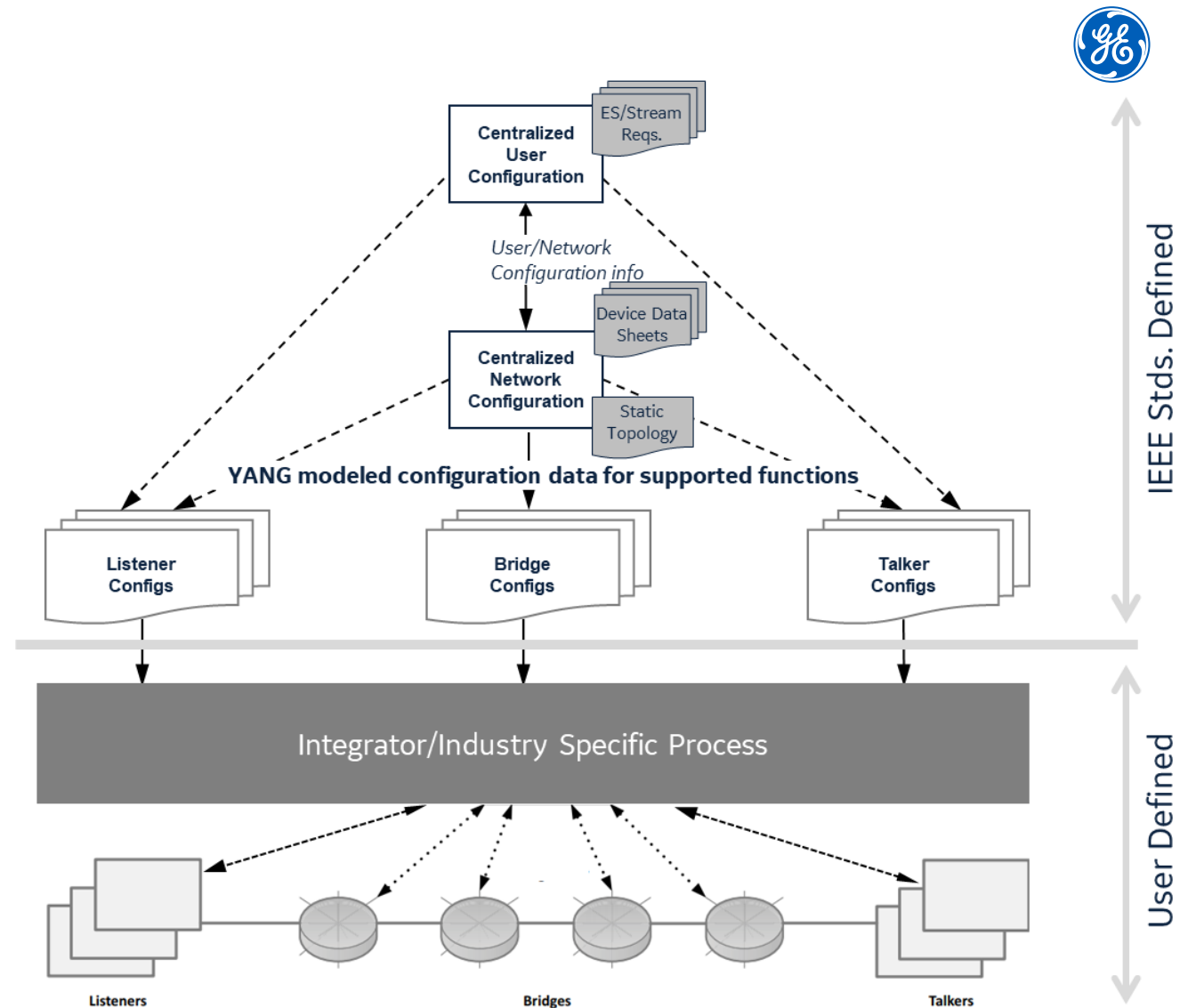
IEEE/IETF Managed Objects

- IEEE/IETF defines managed objects for end stations and bridges, which can be categorized in to following categories (IMHO):

  1. Identity and capability: information on the device attributes
     e.g. bridgeName, bridgeType, supportedListMax, supportedCycleMax

  2. Configuration: configure and/or query current configuration
     e.g. gateEnabled, adminControlList, operControlList

  3. Operational: status/statistics derived from operating conditions

     a. Status/health (capturing both normal and erroneous conditions)
        e.g. isSynched, GateClosedDueToOctetsExceeded,

     b. Statistics (capturing both normal and erroneous behavior)
        e.g. passingFrameCount, notPassingSDUCount, redFramesCount

IEEE/IETF Management Objects – Aerospace Use

Recap: DP Configuration Model

- Fully centralized configuration model

- Engineered network with static topology

- No direct comms between ES/Bridges and CUC/CNC

- Design/Engineering tool generates all input to CUC/CNC

- File based configuration for all end stations and bridges

- Integration and configuration across multiple TSN device vendors for an aerospace vehicle to be driven by YANG modeled configuration data.

- DP drives the interoperability

Offline configuration model for aerospace

IEEE/IETF Managed Objects – Aerospace Use

- IEEE/IETF defines management objects for end stations and bridges, which can be categorized in to following categories (IMHO):

    1. Identity and capability: information on the device a~~~~
       e.g. bridgeName, bridgeType, supportedListMax, supportedCycleMax

    > Defined offline via device datasheet

    2. Configuration: configure and/or query current confi~~~
       e.g. gateEnabled, adminControlList, operControlList

    > Abstracted via configuration models;
    > Config query useful in design phase

    3. Operational: status/statistics derived from operating conditions

        a. Status/health (capturing both normal and erroneo~~~~~~~~~)
           e.g. isSynched, GateClosedDueToOctetsExceeded,

        > Applicable during operation (flight)
        > Required to meet DAL certification
        > DP should mandate specific ones

        b. Statistics (capturing both normal and erroneous behavior)
           e.g. passingFrameCount, notPassingSDUCount, redFramesCount

IEEE/IETF Managed Objects

- Grouped with features and functions

- Are optional (see PICS)

- Only check is for full module (See PICS)

12.31 Managed objects for per-stream classification and metering

The Bridge enhancements for support of per-stream classification and metering are defined in 8.6.5.2, 8.6.5.3, 8.6.5.4, 8.6.5.5, and 8.6.5.6. The associated state machines are defined in 8.6.10 and 8.6.11.

This managed resource comprises the following objects:

a)   The Stream Parameter Table (12.31.1)
b)   The Stream Filter Instance Table (12.31.2)
c)   The Stream Gate Instance Table (12.31.3)
d)   The Flow Meter Instance Table (12.31.4)
e)   The Scheduler Instance Table (12.31.5)
f)   The Scheduler Group Instance Table (12.31.6)
g)   The Scheduler Port Parameter Table (12.31.7)
h)   The Scheduler Timing Characteristics Table (12.31.8)

A.46 Per-Stream Filtering and Policing

Item	Feature	Status	References	Support
	If neither Per-Stream Filtering and Policing (PSFP in A.5) nor cyclic queuing and forwarding (CQF in A.5) are supported, mark N/A and ignore the remainder of this table.		5.4.1.9, 5.13.1.2, 8.6.5.2, 8.6.10, 12.31, 17.7.24	N/A[ ]
PSFP1	Does the implementation support the state machines and associated definitions as specified in 8.6.10?	PSFP OR CQF:M	5.4.1.9 item b), 5.13.1.2 item b), 8.6.5, 8.6.10	Yes [ ] N/A [ ]
PSFP2	Does the implementation support the management entities defined in 12.31?	PSFP OR CQF:M	5.4.1.9 item e), 5.13.1.2 item e), 8.6.5.2, 8.6.10, 12.31	Yes [ ] N/A [ ]
PSFP3	Is the IEEE8021-PSFP-MIB module fully supported (per its MODULE-COMPLIANCE)?	MIB AND (PSFP OR CQF):O	5.4.1.9 item e), 5.13.1.2 item e), 12.31, 17.7.24	Yes [ ] N/A [ ] No [ ]

IEEE/IETF Managed Objects for Aerospace
Proposed approach

- Identify the objects related to operational state (category #3 on slide 7)
  Rationale: Other categories are not necessary and, in some cases, should not be exposed

- Identify the subset of those that are required for aerospace use and certification
  Rationale: Reduce the burden (resources) on a compliant devices...especially given per-port and per-stream monitoring requirements. Too many counters otherwise

- Make them mandatory in DP

- Other objects can remain optional