IEC/IEEE 60802 Traffic Class mapping and Stream Admission

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Overview

- This presentation is going to take a look at the following three potential problems with TC mapping and stream admission in 60802
  - Translation between application/middleware and network provisioning, i.e., mapping between 60802 networks and applications
  - l2vlan interfaces and unique VLAN IDs
  - Stream admission

Mapping of TCs between Network and application

- IEC/IEEE 60802 presents two staged mapping tables in Figure 6
  - One table mapping IEC/IEEE 60802 traffic types to VID and PCP
  - One table mapping application-level traffic types to the IEC/IEEE 60802 traffic types
- The reason for this is to decouple application engineering from network provision, but allowing an easy mapping between the two once an application is rolled out on an installation.

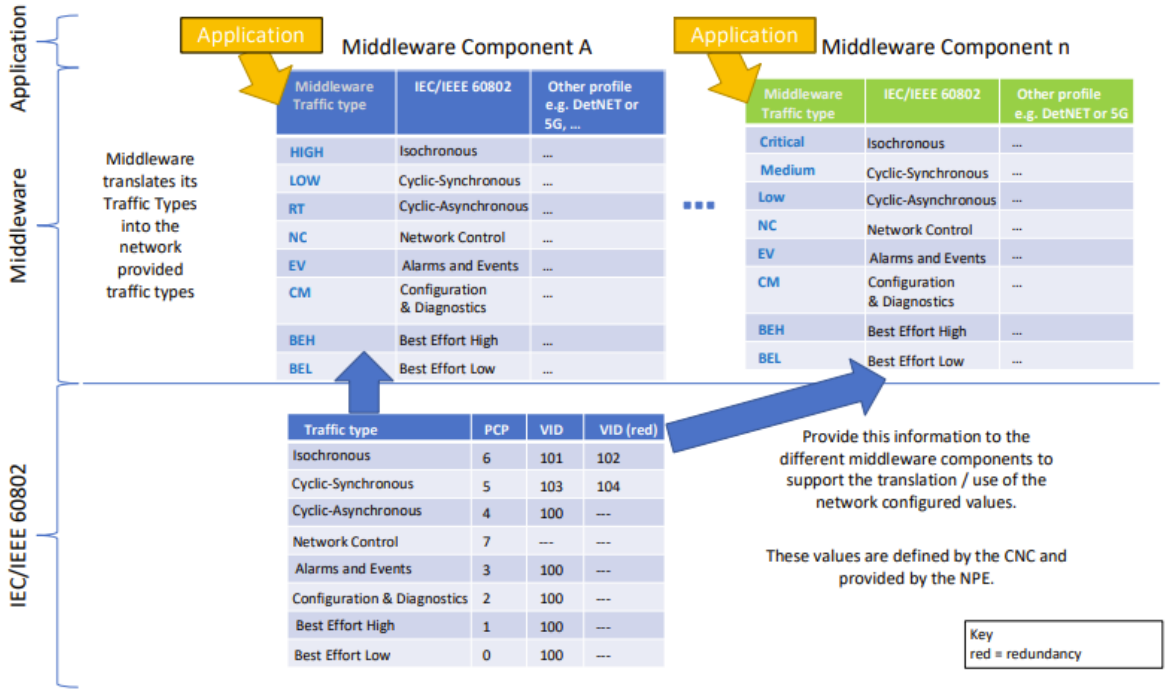


Figure 6 – Traffic type translation example

Problem #1 - part 1: Mapping of TCs

- IEC/IEEE 60802 states the following on how this can be done:

> **4.6 Translation between middleware and network provisioning**
>
> **4.6.1 Interfaces of type l2vlan**
>
> Application engineering can be done without knowledge of the network provisioning. Since the application is not aware of the network provisioning, it cannot directly map to the network configuration, for example, the use of PCP or VID as configured in the network. This problem is solved by providing a translation table, in the form of a YANG module definition, to the middleware. The IA-station's local YANG datastore contains this information.
>
> Figure 6 and Figure 7 show examples of the translation models.
>
> Interfaces of type l2vlan (IETF RFC 7224) can be used to provide the required mapping information to all installed middleware and applications.
>
> The name string of the l2vlan interfaces can provide the vlan-id, the assigned traffic types with their PCP values and redundancy information (see 6.4.2.5).

- This gives the impression that IEC/IEEE 60802 provides two ways to get the information required for this mapping:
  - a YANG module
  - a l2vlan interface naming scheme

- However, while a naming scheme is described, no such YANG module is present in the document.

Problem #1 - part 2: Mapping of TCs

- In the absence of a YANG module, the mapping information is provided by using l2vlan interfaces.
- A specific naming scheme for these interfaces is provided that includes traffic type codes to identify individual traffic types (tables 7 and 19 of IEC/IEEE 60802)

Table 7 – Industrial automation traffic types summary

Traffic type name	Traffic type code	Cyclic	Data delivery requirements	Time-triggered transmission	Traffic-type-category
Isochronous	H	Required	Deadline	Required	IA time-aware-stream
Cyclic-synchronous	G	Required	Frame Latency	Required	IA time-aware-stream
Cyclic-asynchronous	F	Required	Frame Latency	Optional	IA stream
Alarms & Events	E	Optional	Flow Latency	Optional	IA traffic engineered non-stream
Configuration & Diagnostics	D	Optional	Flow Latency	Optional	IA traffic engineered non-stream
Network Control	C	Optional	Flow Latency	Optional	IA traffic engineered non-stream
Best Effort High	B	Optional	No	Optional	IA non-stream
Best Effort Low	A	Optional	No	Optional	IA non-stream

- Issue with this: the letters encode traffic types that are not normative!
- This leads to the problem that currently there is no standardized or specified way that allows the application or middleware to get the traffic type names and characteristics that are associated with the traffic type codes!

→ How are the traffic types that are used specified in a binding way in a final deployment?

Problem #2: Unique VIDs

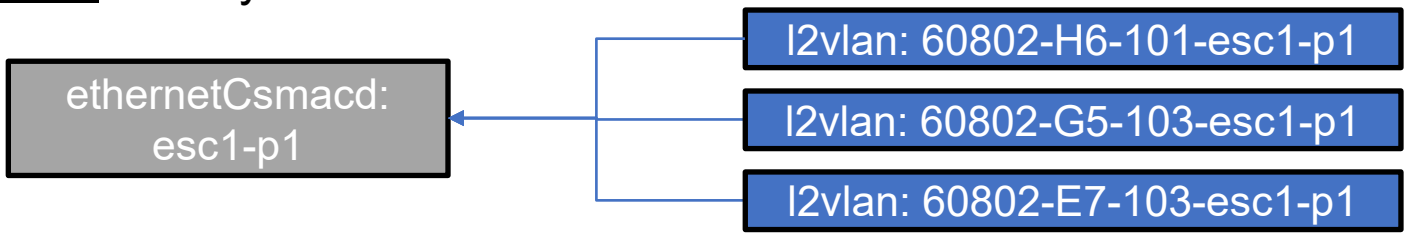
- The l2vlan naming scheme provided by IEC/IEEE 60802 is as follows:

  <VLAN name>-<PortIfName>

  where <VLAN name> is defined as

  60802-[<TrafficTypeCode><PCP>]{1,6}-<VID>[R]

- Using l2vlan interfaces with the encoding scheme provided, ties a traffic type to a VLAN-ID **AND** Priority



- There are 2 issues with this:
  - Information relevant for selecting the forwarding path (VID) is tied to information only relevant for prioritization and application configuration
  - (Some) Unix like systems only allow l2vlan interfaces with unique VIDs per physical interface
- The second point causes problems of how to proceed with mapping interfaces, if the VLAN already exists on the given interface, e.g., esc1-p1.101.

Problem #2: Unique VIDs

- Proposal: use intermediate VLAN interfaces **without** encoding priorities:
  - Use l2vlan interface with the VID only
  - Use generic interfaces tied to the l2vlan interfaces encoding additional information like traffic type encoding and priority and providing it to the application /middleware

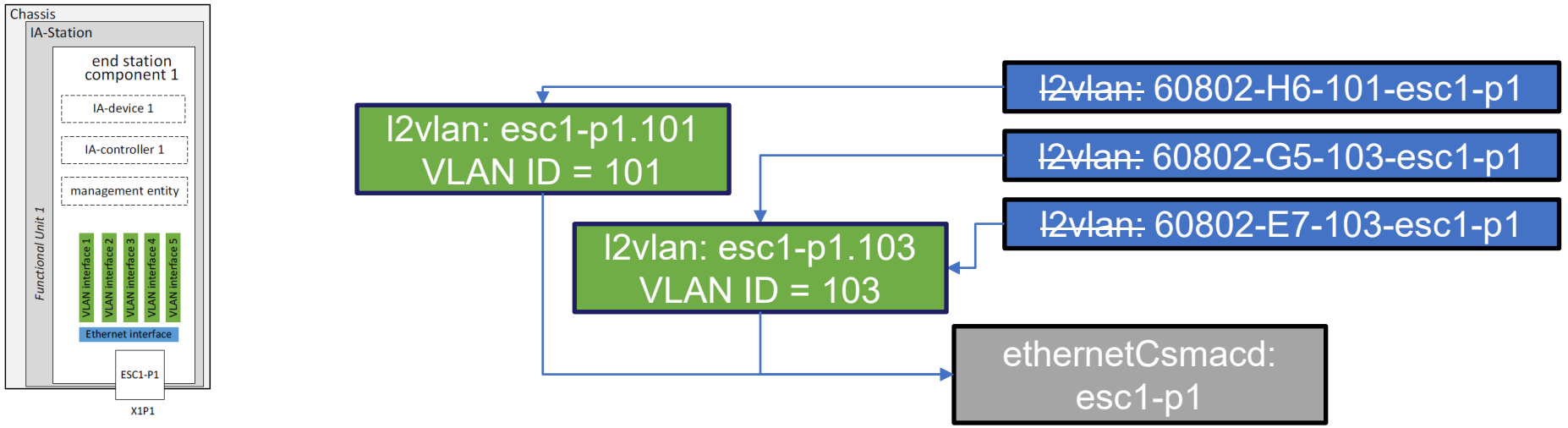


Figure 7 – IETF Interfaces used for Traffic Type Translation

Problem #3: Stream Admission?

- IEC/IEEE 60802 provides 4 traffic type categories:
  - IA time-aware stream, IA stream, IA traffic engineered non-stream, and IA non-stream
  - Tables 3 to 6 describe their respective characteristics
    → informative description only
- Each of the 8 informative traffic classes introduced in IEC/IEEE 60802 has one of the categories assigned (Table 7)
- It is not described which traffic class is required to use stream admission and which is not required to do so
  - Applications need to know if they require an "external" go or if they can just send traffic based on the defined priorities
- Proposal: encode stream admission requirements through the interface naming scheme:

  60802-H6-T-101-esc1-p1

  60802-A1B2-F-101-esc1-p1

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Best Effort High	B	Optional	No	Optional	IA non-stream
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Thank you!

Any questions?