# 802.1Qcc UNI:
# Multi Port End Systems

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# Agenda

- Use cases
  - Show that Qcc (D0.5) can address multi port end systems
- Potential changes to Qcc
  - Including proposal to replace UNI's Interface Capabilities / Configuration with remote management of end system

# Refresh of Qcc UNI (1 of 2)

- User → Network
  - EndStationInterfaces: List of ports (MAC address for each)
  - InterfaceCapabilities (for all ports):
    - VlanTag: Boolean (support add/remove of VLAN tags per port?)
    - 802-1CB: Boolean (support end system requirements?)
    - 802-1CB-StreamIdenTypeList: List of uint32 (0 or more .1CB types)
    - 802-1CB-SequenceTypeList: List of uint32 (0 or more .1CB types)

# Refresh of Qcc UNI (2 of 2)

- Network → User
  - InterfaceConfig: List of 0 or more port configurations;
    Each config is MAC address (ID of port), then 0 or more of:
    - IEEE802-VlanTag: 12-bit VID and 3-bit PCP
    - IEEE802-MacAddresses: Source and Dest MAC addresses
    - IPv4-5tuple: Same encoding as 802.1CB
    - IPv6-5tuple: Same encoding as 802.1CB
    - ScheduledOffset: Uint32 nanosecs; Offset for scheduled talker

# Use Cases for Two Port End System

1. **Independent ports**: No .1CB, No .1AX
2. **Redundant only**: Yes .1CB, No .1AX
3. **Independent plus .1AX**: No .1CB, Yes .1AX
4. **Redundant plus .1AX**: Yes .1CB, Yes .1AX
5. **Bridged**: Bridge is 802.1Q

   Qcc 5.4.1.8 requires remote management;

   Internal end station ports can apply use cases 1-4

# Use Case 1: Independent Ports

- For independent networks, or to optimize bandwidth
  - Historically, user selects the port by traffic (i.e. above 802)
  - For TSN, if user selects port, effectively two end systems
    - Bandwidth optimization requires manual config (e.g. port-based VLAN)
- For TSN, we want network to select the port
  - "I can act as a talker of this stream on either port...
    I want network to tell me which to use"
- Qcc supports network selection of port
  - EndStationInterfaces with two ports (but no .1CB or .1AX)
  - InterfaceCapabilities returns config for only one port
    - Can include a VLAN tag

# Use Case 2: Redundancy Only

- Let's assume that .1CB needs distinct VID per port
- Qcc supports distinct VID per port
  - InterfaceCapabilities: VlanTag TRUE, 802-1CB TRUE
    - No need for optional 802.1CB types (uses MAC/VLAN and CB tag)
  - InterfaceConfig: CNC returns distinct VID per port
- Non-TSN traffic (e.g. best effort) continues to use independent ports

# 802.1AX Background (1 of 2)

- For LAG/DRNI, .1AX selects port for each frame
- .1AX-2014 per-service frame distribution avoids this
  - Assigns specific traffic to one link
  - Optional feature of .1AX-2014 (5.3.1 item g)
    - Aka conversation-sensitive
  - Uses 12-bit Conversation ID
    - For C-tagged, maps 1-1 to the C-VID
    - For S-tagged and B-tagged, mapping table is used
- Ideally, use per-service for TSN traffic,
  and use .1AX distribution for all others (e.g. best effort)

# 802.1AX Background (2 of 2)

- Can Qcc's CNC detect when .1AX is in use on a link?
  - .1AX-2014 doesn't require remote management, but Qcc 5.4.1.8 requires it for bridge (that supports CNC)
    - Remote management not required for end station
  - Successful 'read' of .1AX aAggOperState of 'up' → in use

- Can Qcc's CNC detect when per-service is supported?
  - aAggPortAlgorithm provides the per-service algorithm
    - E.g. "Distribution based on C-VIDs"
  - Successful 'read' of .1AX aAggPortAlgorithm → supported

# Use Case 3: Independent plus .1AX

- As with use case 1, network selects port for TSN
- Qcc supports network selection of port
  - InterfaceCapabilities: VlanTag TRUE, 802-1CB FALSE
  - CNC detects .1AX, including per-service
  - InterfaceConfig: CNC returns config for only one port
    - Includes VID for per-service
    - TSN layers are not aware of .1AX... talker just adds the tag
    - .1AX config of per-service VID uses its mechanisms (e.g. LACP)

# Use Case 4: Redundant plus .1AX

- Similar to use case 2: Distinct VID per port
- Qcc supports distinct VID per port
  - InterfaceCapabilities: VlanTag TRUE, 802-1CB TRUE
  - CNC detects .1AX, including per-service
  - InterfaceConfig: CNC returns distinct VID per port
    - Used for both: .1AX per-service, and .1CB

# Potential Changes to Qcc

# Management of End Stations in .1Q

- Remote mgmt of end stations not specified in .1Q
  - Intro text for clause 12 refers to Bridge only
  - PICS entry for Bridge only, not End Station (Annex B)

**A.5 Major capabilities**

| | | | | |
|---|---|---|---|---|
| RMGT | Is a remote management protocol supported? | MGT:O<br>PBBTE OR<br>TPMR: M | 5, A.15 | Yes [ ] No [ ] |

    - PICS RMGT A.15 lists protocols (e.g. SNMP, RESTCONF) and encodings (e.g. MIBs, YANGs)
- NETCONF and RESTCONF introductions
  - "configuration of network devices"
  - End station (host) is not a network device (bridge/router)

# Qcc IntfCap/Conf in Remote Mgmt

- Summary of equivalents in managed objects

| IntfCap/Conf Element | In managed object? | Mgmt protocol failure? |
|---|---|---|
| Cap: VlanTag | N | N |
| Cap: 802-1CB | N | Y (successful .1CB read) |
| Cap: .1CB Types | N | Y (successful .1CB write) |
| Conf: VlanTag | N in .1Q, Y in .1CB | - |
| Conf: Stream MacAddr | Y (.1CB) | - |
| Conf: Stream IP tuple | Y (.1CB) | - |
| Conf: Stream Scheduled Offset | N | - |

- Only the .1CB elements can be managed remotely

# How Does Qcc Reference CB Mgmt?

- YANG snippet from InterfaceConfiguration:

```
leaf-list CB-StreamIdenTypeList {
      type uint32;
      description
            "This provides a list of the optional
            Stream Identification Types as specified in
            IEEE Std 802.1CB.

            Each stream identification type is provided
            as a 32-bit unsigned integer. The upper
            three octets contain the OUI, and
            the lowest octet contains the
            Type Number.
```

  - Reference by formal name in 802.1CB, with brief summary
    - Avoids duplication of 802.1CB text

# Add End Station Remote Mgmt?

- "Todo" list if we do it in 802.1Q
  - Add to conformance (clause 5, annex B, etc)
    - Require for TSN remote management feature
    - Question: Not specific to Qcc… is it in scope?
  - Add concept of managed config of Streams
    - Currently 'Idle' in Annex Z due to many open issues
    - Specify managed objects for Stream's VLAN tag
    - Specify managed objects for Talker's ScheduledOffset

- Editor's preference: No (new idea)
  - If desired, address in a future 802.1Q PAR

# Remove Interface Cap/Config?

- Some verbal comments have implied that we should remove Interface Capabilities/Config from Qcc, and replace it with remote mgmt of end station
  - Breaks MSRP
    - Even MSRPv0 does interface config (e.g. VID)
  - Prevents integration of TLVs into non-mgmt protocols
    - 802.1: LLDP, LACP, …
    - 1722.1
    - Other automotive protocols
    - Other industrial protocols
- Editor's preference: No

# Other Potential Qcc Changes

- Add an Annex (informative) to describe uses cases 1-5
  - Can help to clarify .1AX usage
- Add text to IntfConfig to clarify use case 1
  - Not only configuration, but "here is the port to use"
- Add text to IntfCap to clarify that when 802-1CB is FALSE, VlanTag TRUE means the capability to apply a distinct VID per port

- Editor proposes to submit comments to Qcc D0.6

# Thank you