



IEEE P802.1DP Configuration Open Topics | May 2022

P802.1DP Configuration Open Topics

Abdul Jabbar
GE Research

Objective



- ***Review configuration topics that are still open given the past contributions and discussions.***
- ***Get feedback from the larger 802.1 community***
- ***Proposals to address gaps***

References:

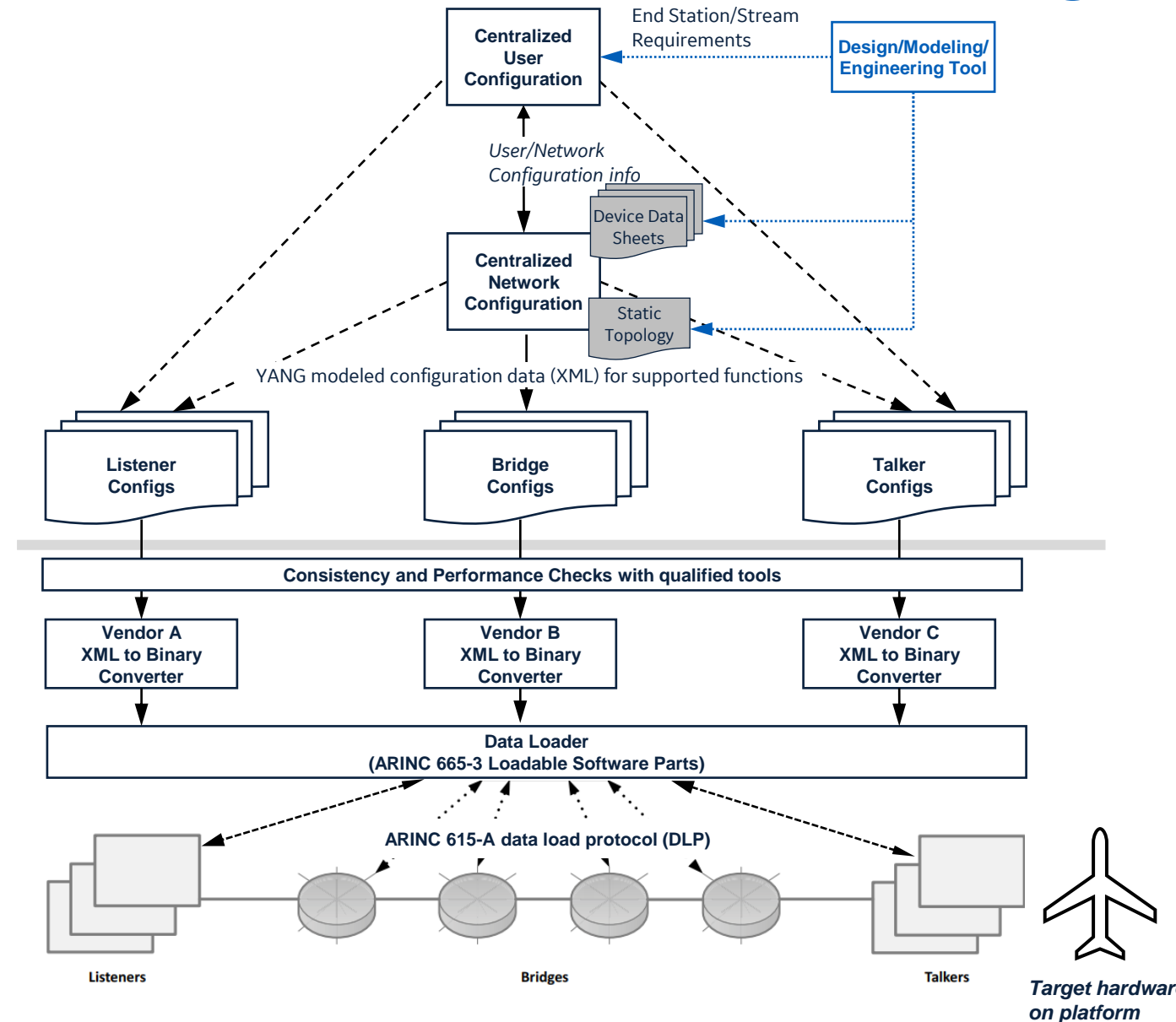
- **Considerations for TSN configuration for avionic network**
<https://www.ieee802.org/1/files/public/docs2022/dp-kretzschmar-considerations-for-configuration-0422-v01.pdf>
- **P802.1DP Configuration Model**
<https://www.ieee802.org/1/files/public/docs2022/dp-jabbar-configuration-0322-v01.pdf>

Aerospace Configuration Model - Proposed

User-specific interface



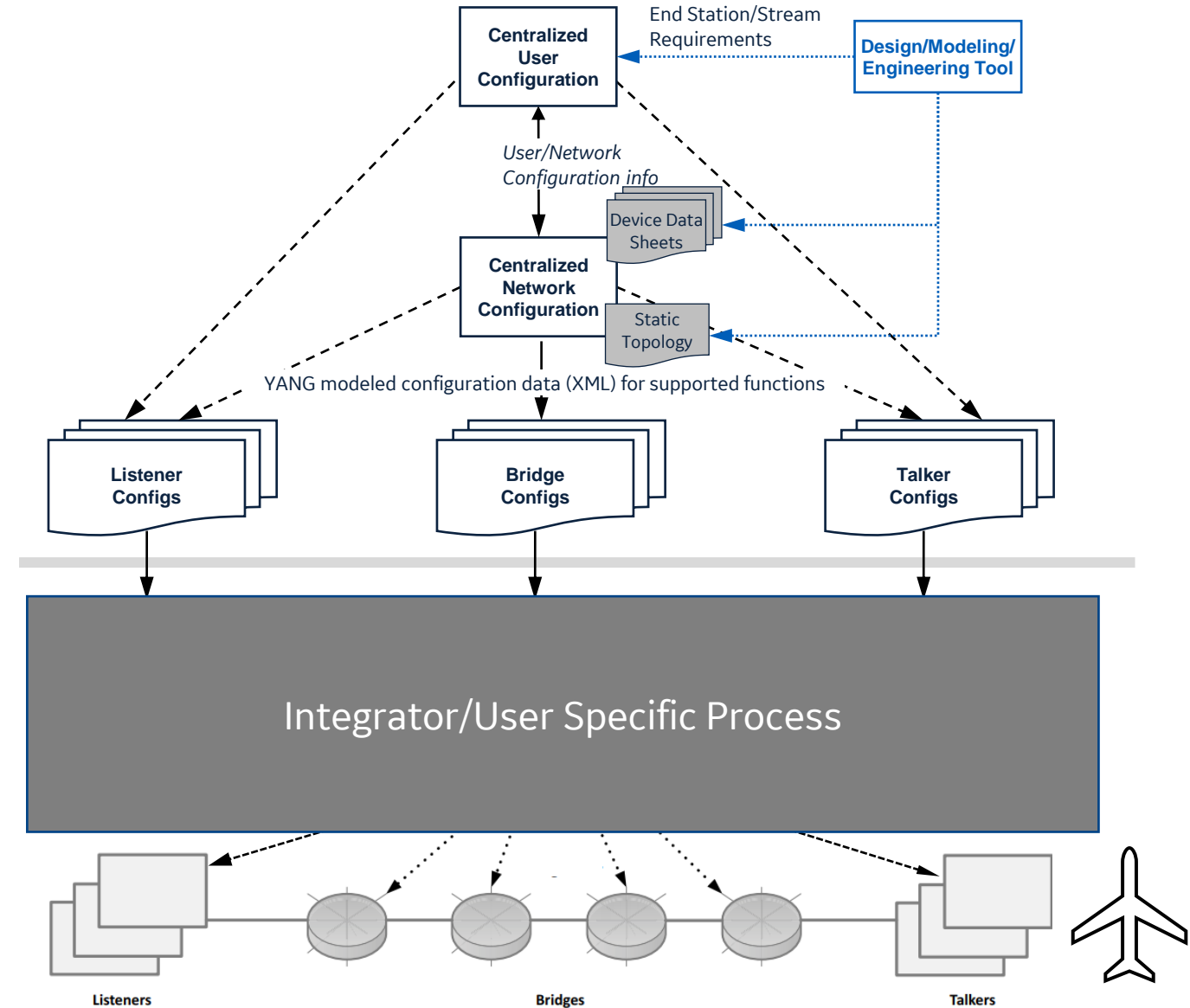
1. Fully centralized configuration model
2. Engineered network with static topology
3. No direct comms between ES/Bridges and CUC/CNC
4. Design/Engineering tool generates all input to CUC/CNC
5. File based configuration for all end stations and bridges
6. Integration, interoperability, and configuration across multiple TSN device vendors for an aerospace vehicle to be driven by YANG modeled configuration data...potentially in XML or (JSON)?





Aerospace Configuration Model - Proposed

1. Fully centralized configuration model
2. Engineered network with static topology
3. No direct comms between ES/Bridges and CUC/CNC
4. Design/Engineering tool generates all input to CUC/CNC
5. File based configuration for all end stations and bridges
6. Integration, interoperability, and configuration across multiple TSN device vendors for an aerospace vehicle to be driven by YANG modeled configuration data...potentially in XML or (JSON)?



Status of YANG Data Models



Functions	Yang Data Model	Bridge and/or ES	Status/Remarks/Questions
Time Synchronization (AS)	P802.1ASdn	Bridge and ES	D0.1 <i>Confirm that it applies to both Bridge and ES configuration?</i>
Time Aware Shaper (Qbv)	P802.1Qcw (scheduled Traffic)	Bridge and ES	D1.3
<i>Credit Based Shaper (Qav)</i>	<i>None</i>	<i>Bridge and ES</i>	<i>Consider a new PAR?</i>
Per Stream Filtering & Policing (Qci)	P802.1Qcw (PSFP)	Bridge only	D1.3
Frame Replication and Elimination for Reliability (CB)	802.1CBcv-2021	<i>Bridge and ES</i>	Released. <i>Does not produce valid XML file Recommendations to address this?</i>
Stream Identification (Bridge)	802.1CBcv-2021 802.1CBdb-2021	Bridge only	Released
<i>End Station Configuration (Interface and stream configuration)</i>	<i>Configuration Block in UNI or 802.1CBcv</i>	<i>ES only</i>	<i>Can DP develop and adopt YANG model for ES config?</i>
<i>Explicit/Static Forwarding</i>	<i>802.1 Qcp?</i>	<i>Bridge only</i>	<i>Released? Does Qcp support static FDB entries</i>
<i>Device Data Sheets (capabilities, value ranges)</i>	<i>None</i>	<i>Bridge and ES</i>	<i>60802 has similar requirement...clause 6.7.9 Can DP develop a model? Use by other profiles?</i>
<i>Static Topology Description</i>	<i>None</i>	<i>Bridge only</i>	<i>Use IETF model? Can DP adopt develop or adopt a model? Other profiles?</i>

CB Configuration using CBcv



[SAMPLE XML Configuration file with CBcv YANG model]

```
<frer:frer xmlns:frer="urn:ieee:std:802.1Q:yang:ieee802-dot1cb-frer">
  <frer:sequence-identification>
    <frer:port>swp0</frer:port>
    <frer:direction-out-facing>false</frer:direction-out-facing>
    <frer:stream>1</frer:stream>
    ...
  </frer:sequence-identification-list>
  ...
</frer:frer>

<if:interfaces xmlns:if="urn:ietf:params:xml:ns:yang:ietf-interfaces">
  <if:interface>
    <if:name>swp0</if:name>
    ...
  </if:interface>
  ...
</if:interfaces>

<sid:stream-identity xmlns:sid="urn:ieee:std:802.1Q:yang:ieee802-dot1cb-
stream-identification">
  <sid:index>1</sid:index>
  <sid:handle>1</sid:handle>
  <sid:out-facing>
    <sid:input-port>swp0</sid:input-port>
  </sid:out-facing>
  ...
</sid:stream-identity-list>
```

“As a feature and in conflict with the XML definition, `yanglint(1)` (and libyang) is able to read XML files with multiple top-level elements. Such documents are not well-formed according to the XML spec, but it fits to how the YANG interconnects data trees (defined as top-level elements of a single schema or by multiple schemas)” - **Source:** [README](#), Libyang

Discussion Points:

- Invalid (not-well formed) XML
- Unable to use XML parsers and other tools
 - Potential interoperability issues
- Aerospace model does not use standard NETCONF/YANG toolchain.
 - Should we use 3 separate xml files? Requires some additional knowledge of the order in which to process the files.
 - Going in the wrong direction, num files wise.
- How do standard NETCONF servers handle this XML?

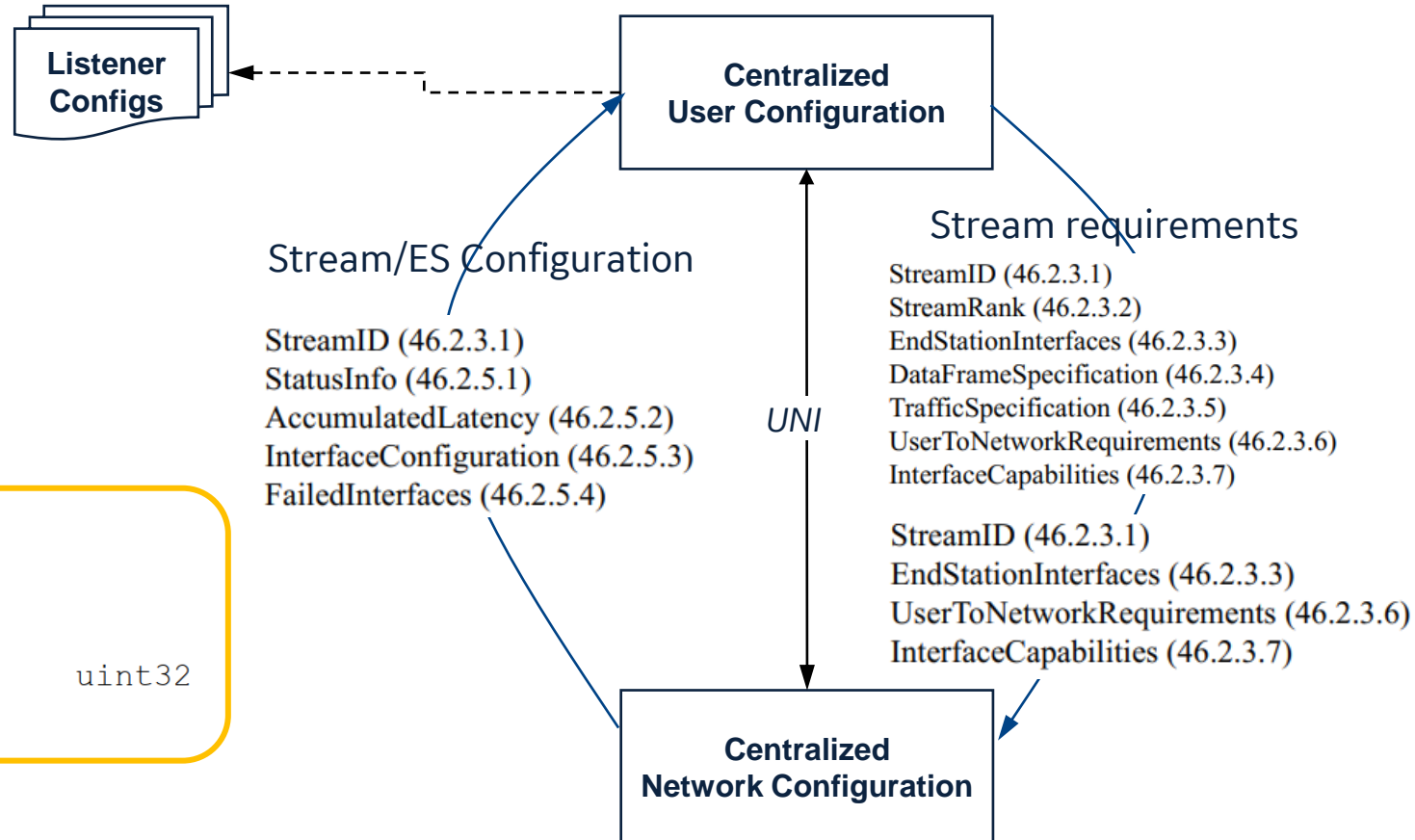
End Station Configuration of Streams and Interfaces



Compact View of UNI Yang model

```

module: ieee802-dot1q-tsn-config-uni
+--rw tsn-uni
  +--rw stream-list* [stream-id]
    +--rw stream-id      tsn:stream-id-type
    +--rw request
      | +--rw talker
      | | +---u tsn:group-talker
      | +--rw listener-list* [index]
      |   +--rw index          uint32
      |   +---u tsn:group-listener
      +--ro configuration!
        +---u tsn:group-status-stream
        +--ro talker
          | +---u tsn:group-status-talker-listener
        +--ro listener-list* [index]
          +--ro index          uint32
          +---u tsn:group-status-talker-listener
    
```



References: 801.Qcc and P801.Qdj

End Station Configuration YANG Model – Proposal



```
container es-configuration {
  description "This is the root node that holds all
information for this device, either as talker or listener";

  list talker-config {
    key "talker-config-index";
    leaf talker-config-index {
      type uint32;
    }
    uses dot1q-tsn-types:group-status-talker-listener;
  }

  list listener-config {
    key "listener-config-index";
    leaf listener-config-index {
      type uint32;
    }
    uses dot1q-tsn-types:group-status-talker-listener;
  }
}
```

Simple model:

- Take the configuration data from CNC to CUC (north bound interface) and put it in a container
- Single file for each end station

“In the fully distributed model and the centralized network/distributed user model, this group is delivered to each Talker end station and Listener end station of the Stream”- IEEE 802.1Qcc, Clause 46.2.5]

Some Complexity:

- Add additional parameters available in CUC that make it a complete config. For example, time-aware offset needs to be augmented with duration and interval to be a complete stream configuration.
- There are other parameters...perhaps idleSlope for Qav streams

Device Datasheets



- **Electronic/digital device datasheet provides the capabilities/features, parameters/attributes, and performance indicators**
- ***Required at the CNC to generate a valid configuration***
- Required for fully centralized static configuration
- Enables modeling, simulation, and configuration
- Can be compiled in a catalogue/database – might be too ambitious
- Industrial automation started discussion in 2018. 60802 Draft 1.3 has Clause 6.7.9 on the use of data sheets in IA and potentially using YANG to model the datasheet. Current status?
- Should the datasheets be common across profiles, or should it be a profile specific datasheet?

<https://www.ieee802.org/1/files/public/docs2019/60802-Hantel-Data-Sheet-Model-0119-v00.pdf>

<https://www.ieee802.org/1/files/public/docs2019/60802-Zuponcic-Data-Sheet-Discussion-0719-v00.pdf>

<https://www.ieee802.org/1/files/public/docs2019/60802-ademaj-DatasheetParameters-0119-v02.pdf>

<https://www.ieee802.org/1/files/public/docs2020/60802-enzinger-switch-timing-parameters-for-datsheets-0620-v01.pdf>

<https://www.ieee802.org/1/files/public/docs2022/60802-Stamenic-Digital-Data-Sheet-0322-v03.pdf>

<https://www.ieee802.org/1/files/public/docs2022/60802-Steindl-DigitalDataSheet-0522-v02.pdf>

Static Topology Description



- **Annotated network connectivity graph – describes ES, Bridges, and connectivity between them.**
- ***Required at the CNC to generate a valid configuration in Aerospace networks***
 - fully centralized static configuration
 - *no way to know the network connectivity otherwise*
- Enables modeling, simulation, and configuration
- While this can be implementation specific, there is a desire in the industry to have a standardized model
- Have other profiles considered YANG modeling of static topology for TSN configuration?
- Can/Should DP develop and adopt a static topology description model?