Single-file configuration

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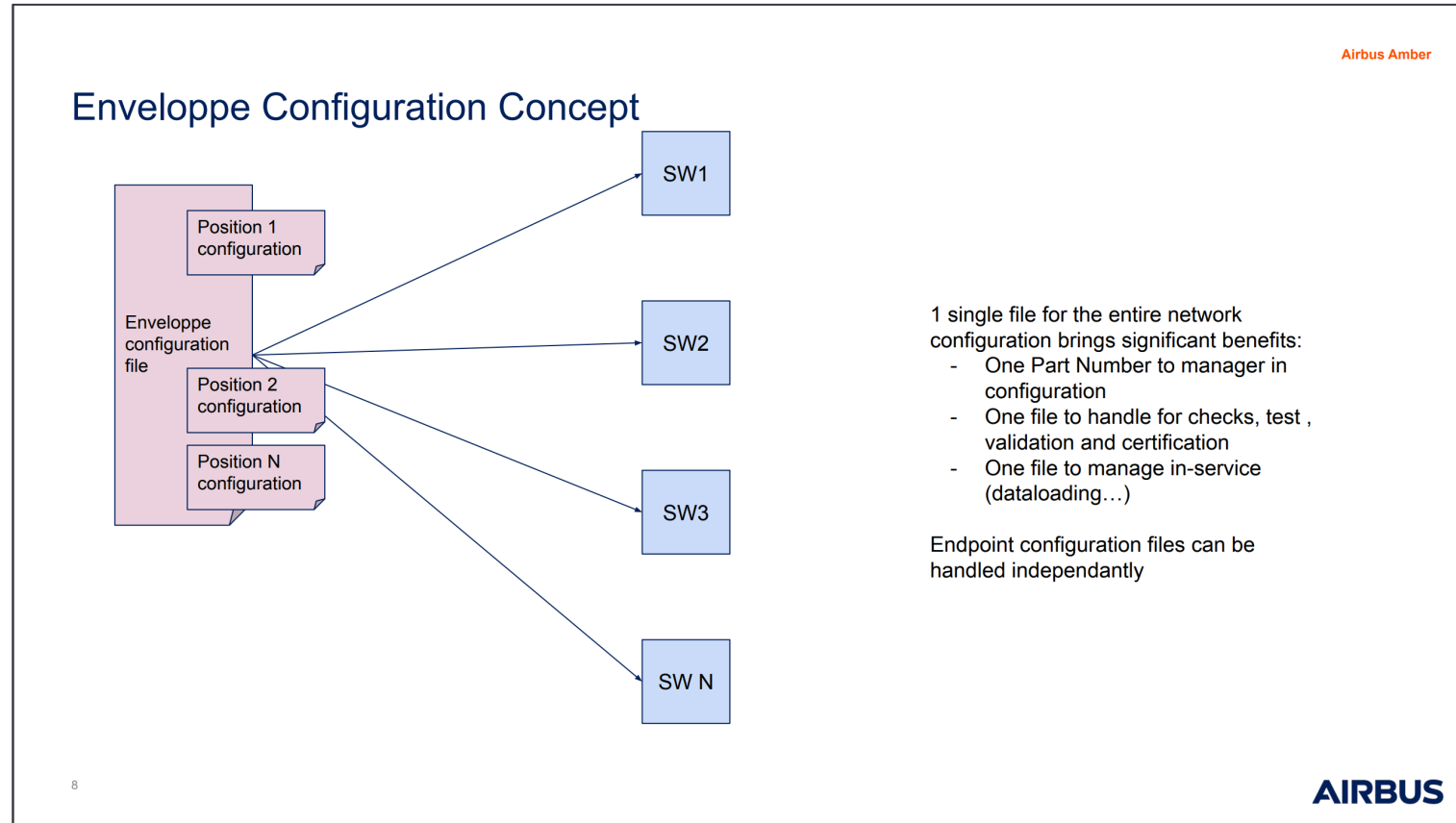Lionel Havet, lionel.havet@realtimeatwork.com

Configuration files

At least one configuration file per device

Taken from:

https://www.ieee802.org/1/files/public/docs2022/dp-jabbar-configuration-open-topics-0522-v01.pdf
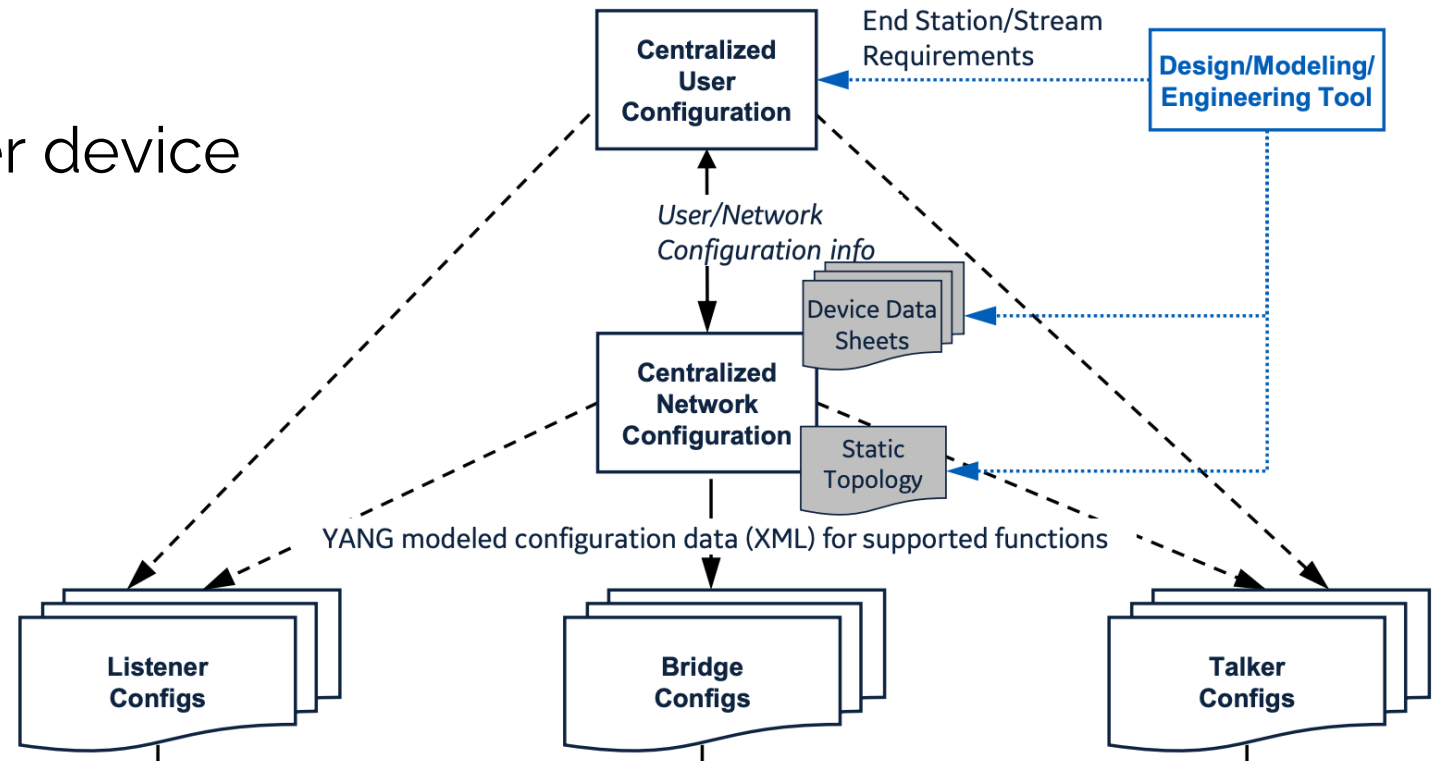
Why a single file?

Taken from:

https://www.ieee802.org/1/files/public/docs2022/dp-kretzschmar-considerations-for-configuration-0422-v01.pdf

Context

RTaW:
- develops model-based network simulation and configuration tools.
- addresses the aerospace and automotive domains.

YANG exporter:
- developed in collaboration with the EDEN project.
- EDEN is a project of IRT Saint Exupery:

    https://www.irt-saintexupery.com/wp-content/uploads/2021/07/EDEN-Project.pdf

YANG models (1/2)

Mechanism	YANG model	comment
Explicit/Static forwarding	ieee802-dot1q-bridge.yang	contains bridge and bridge-port
Scheduled Traffic	ieee802-dot1q-sched.yang ieee802-dot1q-sched-bridge.yang	augments bridge-port
Per-Stream Filtering and Policing	ieee802-dot1q-stream-filters.yang ieee802-dot1q-stream-filters-bridge.yang ieee802-dot1q-psfp.yang ieee802-dot1q-psfp-bridge.yang	augments bridge component
Credit Based Shaper	*(created from MIB export by RTaW and EDEN)*	no IEEE model available expected to augment bridge-port

Complete list taken from:

https://www.ieee802.org/1/files/public/docs2022/dp-jabbar-configuration-open-topics-0522-v01.pdf

Single-file Configuration: How? (1/3)

Bridge model:

- contains a list of bridges

- augments IETF interfaces to define bridge-port

```
1  module: ieee802-dot1q-bridge
2    +--rw bridges
3      +--rw bridge* [name] ⚬⚬
165
166   augment /if:interfaces/if:interface:
167     +--rw bridge-port⚬⚬
266  |
```

IETF interfaces:

- contains a list of interfaces

```
1  module: ietf-interfaces
2    +--rw interfaces
3    |  +--rw interface* [name]
```

Single-file Configuration: How? (2/3)

"bridge" XML:

```xml
 1  <?xml version="1.0" encoding="UTF-8"?>
 2  <bridges xmlns="urn:ieee:std:802.1Q:yang:ieee802-dot1q-bridge">
 3    <bridge>
 4      <name>SWITCH_1</name>
 5      <bridge-type>customer-vlan-bridge</bridge-type>
 6      <component>
 7        <name>SWITCH_1</name>
 8        <type>c-vlan-component</type>
 9        <filtering-database> •••                         ONE BRIDGE
59        </filtering-database>
60        <bridge-vlan> •••
69        </bridge-vlan>
70      </component>
71    </bridge>
72    <bridge> •••
140    </bridge>
141    <bridge> •••
209    </bridge>
210    <bridge> •••
278    </bridge>
```

Single-file Configuration: How? (2/3)

"bridge" XML:

```xml
 1  <?xml version="1.0" encoding="UTF-8"?>
 2  <bridges xmlns="urn:ieee:std:802.1Q:yang:ieee802-dot1q-bridge">
 3    <bridge>
 4      <name>SWITCH_1</name>
 5      <bridge-type>customer-vlan-bridge</bridge-type>
 6      <component>
 7        <name>SWITCH_1</name>
 8        <type>c-vlan-component</type>
 9        <filtering-database> …
59        </filtering-database>
60        <bridge-vlan> …
69        </bridge-vlan>
70      </component>
71    </bridge>
72    <bridge> …
140   </bridge>
141   <bridge> …
209   </bridge>
210   <bridge> …
278   </bridge>
```

OTHER BRIDGES

Single-file Configuration: How? (3/3)

"interfaces" XML:

```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <interfaces xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces" xmlns:ianaift="
   urn:ietf:params:xml:ns:yang:iana-if-type">
3    <interface>                                    ONE BRIDGE-PORT
4      <name>EthernetPort_1</name>
5      <enabled>true</enabled>
6      <type>ianaift:ethernetCsmacd</type>
7      <bridge-port xmlns="urn:ieee:std:802.1Q:yang:ieee802-dot1q-bridge">
8        <gate-parameter-table xmlns="urn:ieee:std:802.1Q:yang:ieee802-dot1q-sched">…
193      </gate-parameter-table>
194      <frame-preemption-parameters xmlns="urn:ieee:std:802.1Q:yang:ieee802-dot1q-preemption">…
227      </frame-preemption-parameters>
228    </bridge-port>
229  </interface>
230  <interface>…
1452 </interface>
1453 <interface>…
1751 </interface>
1752 <interface>…
2242 </interface>
```

Single-file Configuration: How? (3/3)

"interfaces" XML:

```xml
1   <?xml version="1.0" encoding="UTF-8"?>
2   <interfaces xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces" xmlns:ianaift="
    urn:ietf:params:xml:ns:yang:iana-if-type">
3     <interface>
4       <name>EthernetPort_1</name>
5       <enabled>true</enabled>
6       <type>ianaift:ethernetCsmacd</type>
7       <bridge-port xmlns="urn:ieee:std:802.1Q:yang:ieee802-dot1q-bridge">
8         <gate-parameter-table xmlns="urn:ieee:std:802.1Q:yang:ieee802-dot1q-sched">⋯
193       </gate-parameter-table>
194       <frame-preemption-parameters xmlns="urn:ieee:std:802.1Q:yang:ieee802-dot1q-preemption">⋯
227       </frame-preemption-parameters>
228     </bridge-port>
229   </interface>
230   <interface>⋯
1452  </interface>
1453  <interface>⋯
1751  </interface>
1752  <interface>⋯
2242  </interface>
```

OTHER BRIDGE-PORTS
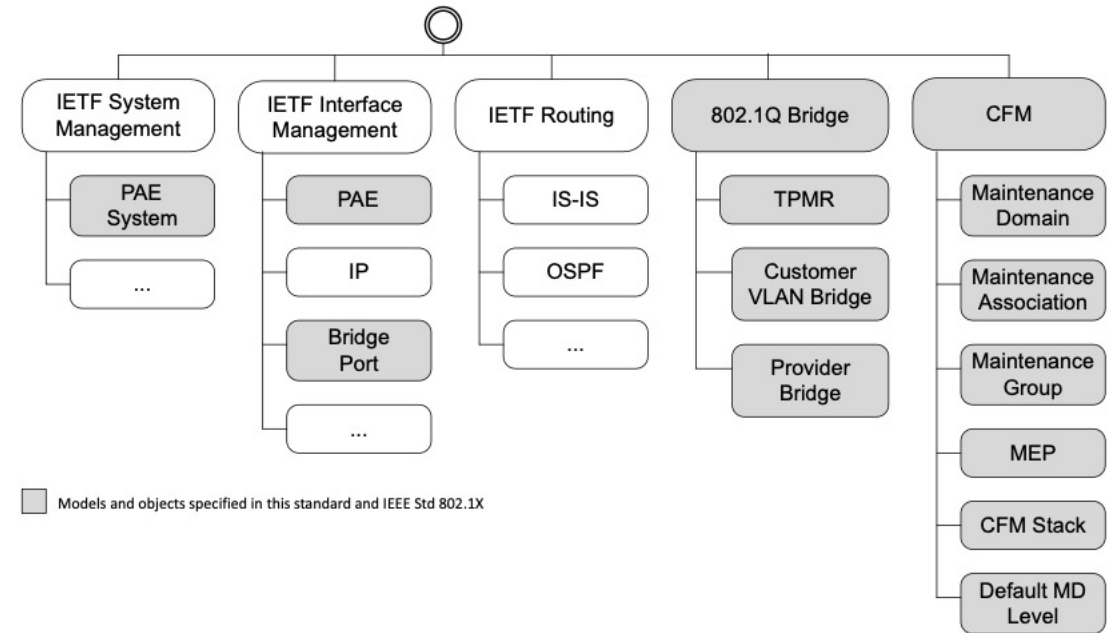
Remarks

- 2 configuration files (bridge and interfaces)

→ also in a per-device configuration

Figure 48-2—YANG root hierarchy with IEEE 802.1Q YANG modules

Figure taken from:

https://www.ieee802.org/1/files/private/q-rev-drafts/d1/802-1Q-rev-d1-2.pdf

Remarks

- 2 configuration files (bridge and interfaces)

    → also in a per-device configuration

- each bridge in the network should have a unique name

- each interface in the network should have a unique name

- the position of elements (interfaces or bridges) in their respective XML file is not defined / standardized / depends on the user or tool

- Is this a proper use of YANG models?

YANG models (2/2)

Mechanism	YANG model	comment
Static topology description	ietf-network.yang	not a network configuration element
AS	ieee802-dot1as-ptp.yang	
Stream Identification	ieee802-dot1cb-stream-indentification.yang	
Frame Replication and Elimination for Reliability	ieee802-dot1cb-frer.yang	

Complete list taken from:

https://www.ieee802.org/1/files/public/docs2022/dp-jabbar-configuration-open-topics-0522-v01.pdf

Non-Q YANG models

Same strategy as with the TSN models in Q:

- ieee-802-dot1q-<mechanism>.yang → base model
- ieee-802-dot1q-<mechanism>-bridge.yang → "anchor" to the bridge model

Conclusions

- A single-file configuration cannot be achieved with the current structure of the YANG models.

- Two-file configuration (bridge and interfaces) can be achieved for 802.1Q YANG models.

- Non-Q YANG models will generate additional configuration files
    - possible solution: "anchor" them to bridge model?