

TSN Inter-domain Considerations



[János Farkas, Balázs Varga, and György Miklós](#)

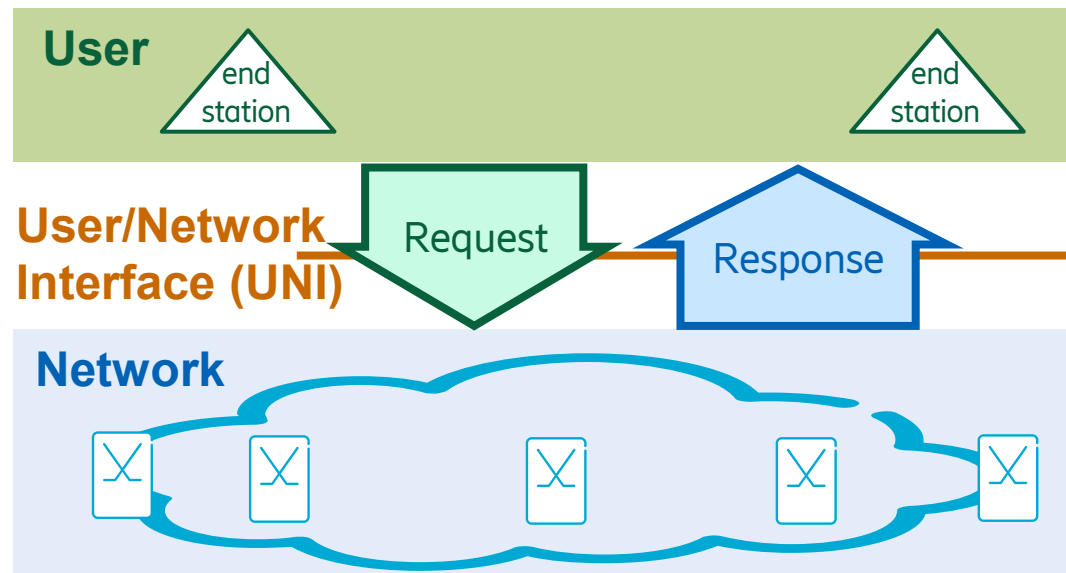
Before we start ...



- This is an individual contribution.
- The intention of this contribution is just to share some considerations as food for thought.
- This contribution is an intentional step back relative to some other contributions in order to take a look at the problem to be solved and some potential high-level directions before diving into solution details.

RECAP: User/Network Configuration Information

IEEE Std 802.1Qcc-2018



46.1.2 Modeling of user/network configuration information

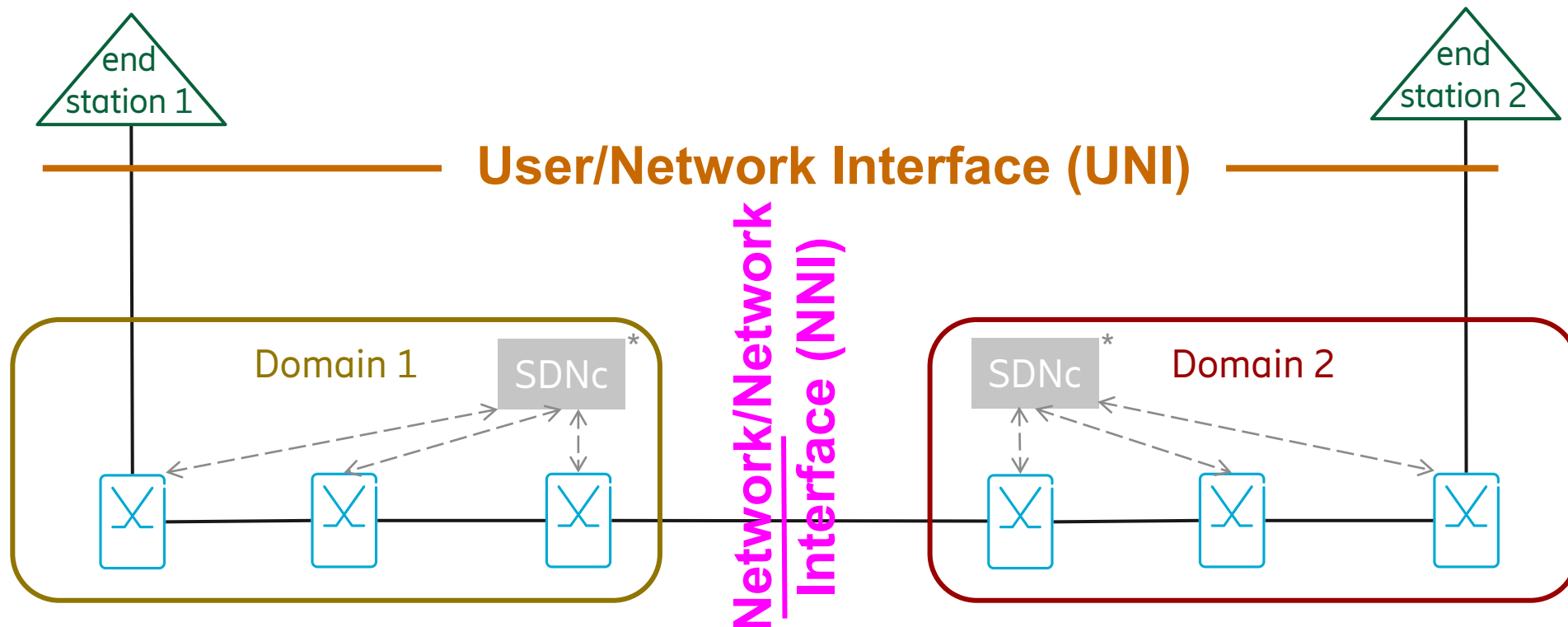
A variety of protocols can be used for the exchange of configuration information over the TSN UNI (e.g., signaling protocols, remote network management protocols). These protocols can exchange the configuration information as text or as binary fields. To enable flexible integration of TSN configuration into a variety of protocols, 46.2 **specifies the TSN user/network configuration information in a manner that is independent of schema, encoding, or protocol.**

Specific TSN-capable products list the user/network protocol that is supported as part of their conformance [e.g., 5.18.3, item c) in 5.29]. Each user/network protocol will specify a specific schema and/or encoding for the configuration information in 46.2. Examples of these protocols are described for each of the TSN configuration models in 46.1.3.

Lookout: Typical UNI & NNI



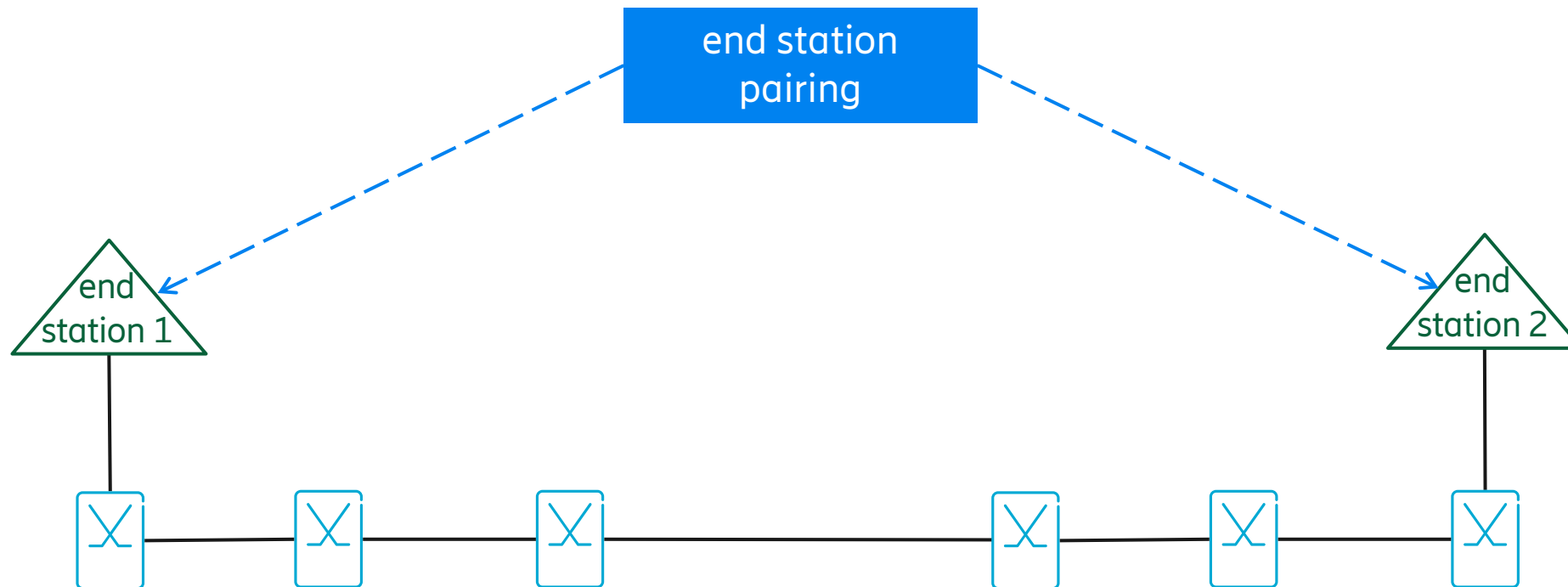
- Typically, user equipment (e.g., end station) is not part of network domain (see, e.g., [MEF](#)).



Note



- It has been pointed out multiple times that in industrial automation it is decided at high-level which end stations communicate to each other (which end stations are “paired”).



TSN Domain



- **Definition is work in progress in P802.1Qdj**
- Current status captured in <https://www.ieee802.org/1/files/private/dj-drafts/d0/802-1Qdj-d0-1-dis-v01.pdf>

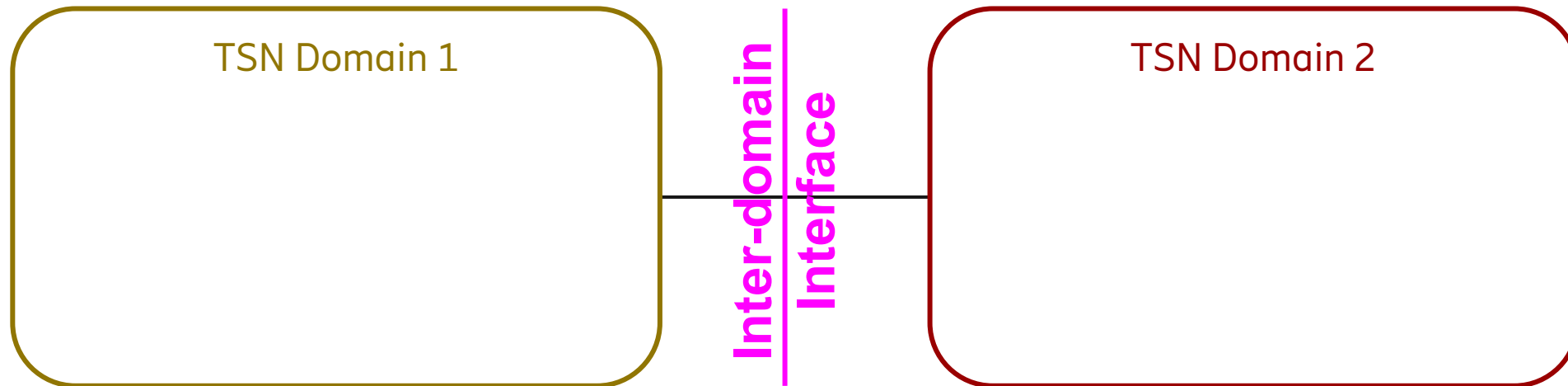
“**TSN Domain**: set of stations (end stations and/or Bridges), their ports, and the attached LAN’s that transmit and/or receive time-sensitive streams using TSN standards.

NOTE - The TSN standards include transmission selection algorithms, enhancements for scheduled traffic, preemption, time synchronization, or frame replication and elimination for reliability, and that share a common management mechanism.”

Inter-domain Interface – High Level



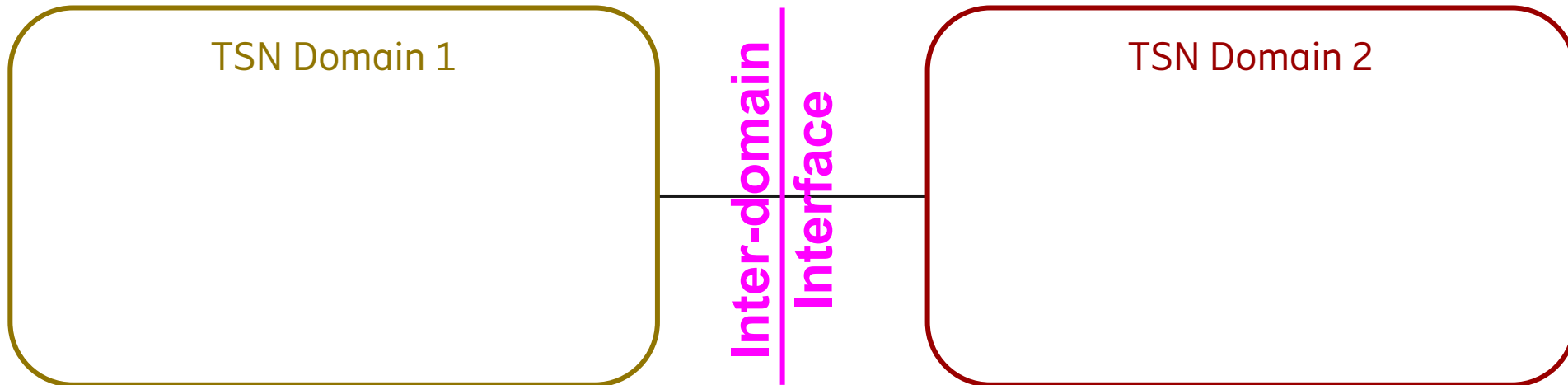
- Ideally, configuration information exchanged between TSN domains should be “specified independent of schema, encoding, or protocol”, like the TSN user/network configuration information in 46.2 in IEEE Std 802.1Qcc-2018



Inter-domain TSN Configuration



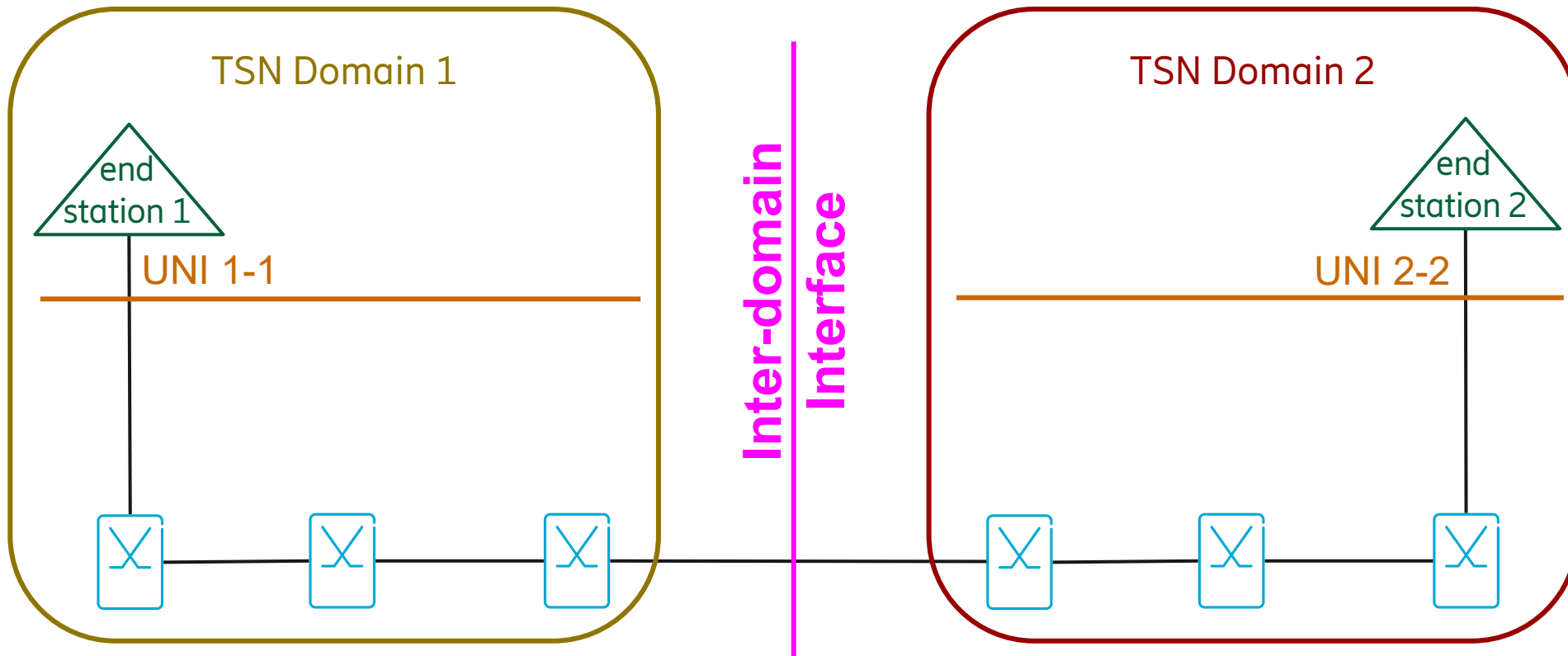
- Inter-domain could follow the TSN configuration concept laid down by 802.1Qcc:
 - “TSN configuration can be viewed conceptually as a request/response exchange:
 - — Request: End station or CUC transmits a protocol message that contains a Talker or Listener group.
 - — Response: Bridge or CNC transmits a protocol message that contains a Status group.”
 - Protocol can be, e.g., Netconf/Restconf or signaling



Inter-domain Interface



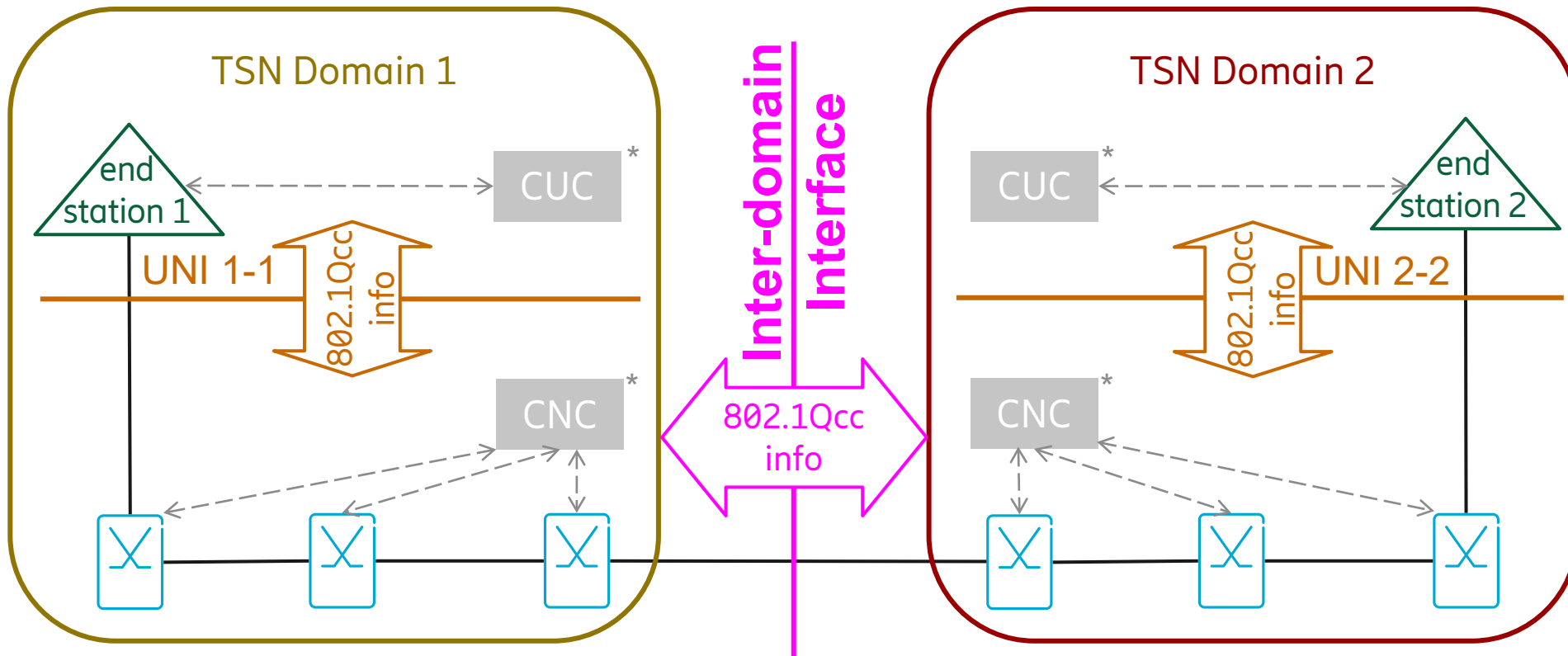
- In-line with current TSN Domain definition in P802.1Qdj



Configuration Information



- Ideally, configuration information is “specified independent of schema, encoding, or protocol” (along TSN user/network configuration information specified in 46.2 in IEEE Std 802.1Qcc-2018)



Summary



- IEEE 802.1Qcc specifies TSN configuration for the interface at an edge of the network (i.e., UNI) in a manner that is independent of schema, encoding, or protocol.
 - That is, if one chooses a particular TSN configuration model (e.g., fully centralized, centralized network / distributed user, or fully distributed), then not mandated to implement features of another TSN configuration model.
- Ideally, inter-domain TSN configuration could be specified following the same principles
 - That is, if one chooses a particular TSN configuration model for intra-domain, then not mandated to implement features of another TSN configuration model for inter-domain.