

TSN Configuration

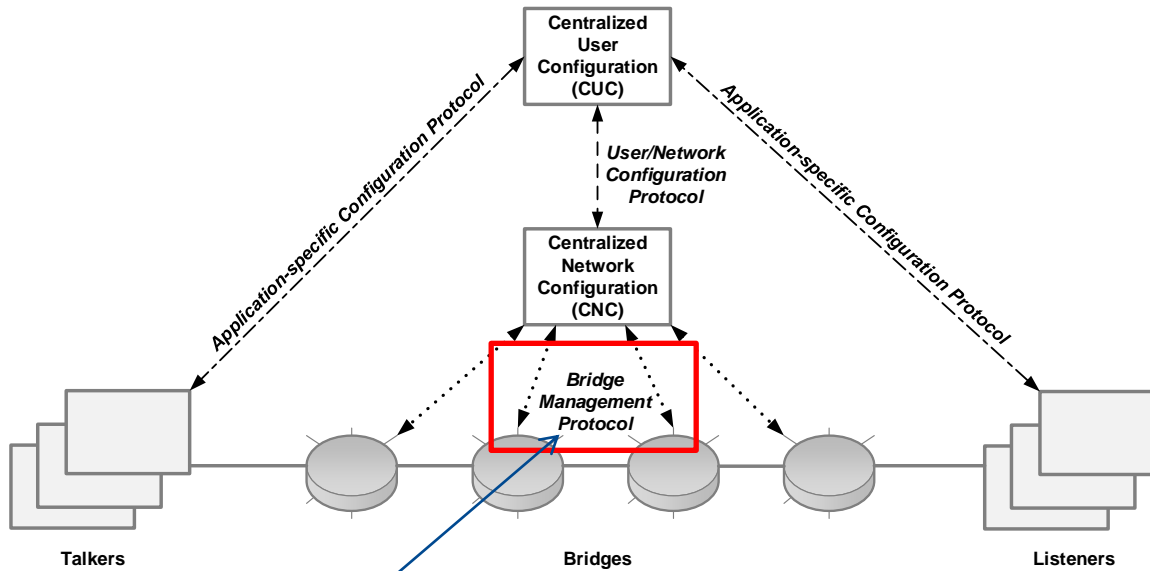
Focusing on Network Management Protocols



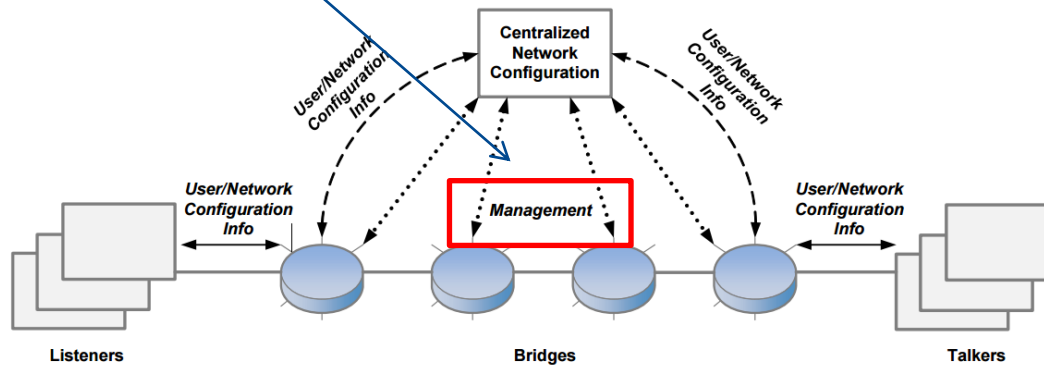
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TSN Configuration Models



i.e. NETCONF, RESTCONF, SNMP



Status Quo

YANG, NETCONF/RESTCONF	MIB, SNMP
Support constrained and non-constrained bridge implementations	Support constrained and non-constrained bridge implementations
Support non-volatile configuration	Support non-volatile configuration
Support automated configuration ¹	Support automated configuration
Recommended by IETF and embraced by IEEE for future standards, but: <ul style="list-style-type: none"> • Bridge model still in development (<i>IEEE 802.1Qcp</i> in WG Ballot) • Currently no YANG specification for <i>802.1AS(-Rev)</i>, <i>.1Qbv</i>, <i>.1AB</i>, <i>.1CB</i>, <i>.1Qci</i>, <i>.1Qbu</i>, <i>.1Qch</i>, <i>.1Qcr</i>, and <i>1588</i> <ul style="list-style-type: none"> • <i>802.1Qcp</i> must be finished first 	Standard bridge management protocol in current network deployments: <ul style="list-style-type: none"> • Support for <i>IEEE 802.1Q</i>, <i>.1AS(-Rev)</i>, <i>.1Qbv</i>, <i>.1AB</i>, <i>.1Qci</i>, <i>.1Qbu</i>, <i>.1Qch</i> In development: <ul style="list-style-type: none"> • <i>IEEE 1588</i> However, currently no support for: <ul style="list-style-type: none"> • <i>IEEE 802.1CB</i>, <i>.1Qcr</i>
Security (password- or PK-based)	Security (password-based or PK-based)
Monitoring (similar capabilities)	Monitoring (similar capabilities)

¹ transactions and multiple data-store enable high degree of automation with NETCONF, automation capabilities of RESTCONF similar to those of SNMP

Observations and Discussion Points

- Markets use different management protocols
 - IT and data center: SNMP for monitoring, NET/RESTCONF for config
 - Industrial
 - Greenfield: Introduction of NETCONF and RESTCONF possible once the necessary standards are published
 - Brownfield: Increasing use of SNMP for centralized network management
- SNMP support indispensable now (timeline) and remains indispensable for some time to cater to Brownfield scenarios

Way Forward

- Assumption
 - YANG-based protocols will become more and more ubiquitous
- **Possible Solution:** Allow for MIB- and YANG-based protocols
 - Ensure contribution of MIBs for current¹ and planned² TSN projects
 - Try to make MIB and YANG diverge as little as possible, but “backwards compatibility” should **not** hamper better designs with YANG
 - **Slowly** phase out MIB-based management (i.e. support in standards) as YANG-based protocols become more broadly accepted in the industrial market

¹ e.g. MIB for IEEE 802.1CB when defining YANG modules

² e.g. for IEEE 802.1Qcr

Thank you

Thank you!