Management Model

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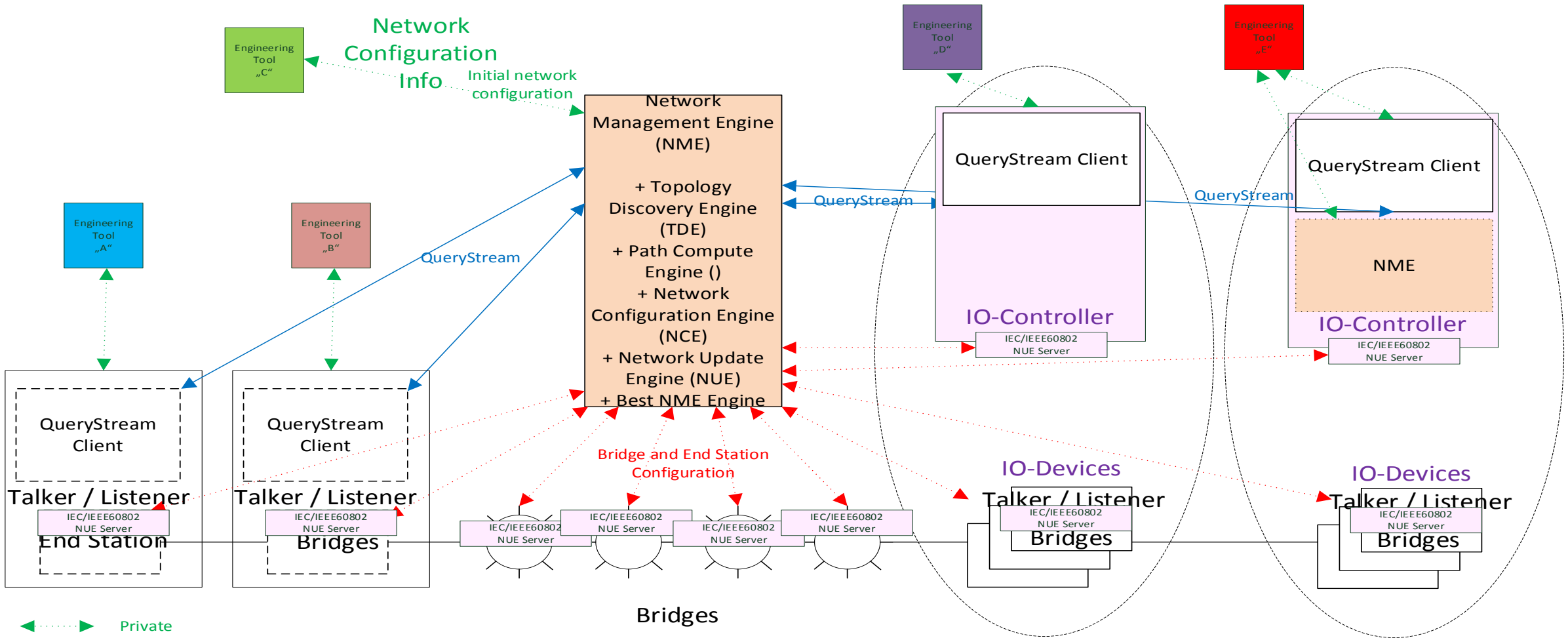
Background

- It is the opinion of this contributor that the success of TSN in the industrial automation market is highly dependent on our ability to minimize the impact to the customer experience w.r.t. commissioning, configuration, deployment and of the industrial network, at least in the short term.
- With that in mind, it falls to the TSN TG and the 60802 Joint Project to provide a management model which enables that transition.
- As part of 60802 comment resolution, the editor agreed to submit a strawman management structure for the profile based upon the following contribution:

  http://www.ieee802.org/1/files/public/docs2019/60802-Steindl-ExampleSelections-0119-v02.pdf

- This contribution is offered as a starting point for discussions

Proposed Management Model



Selected „NME“ - Multiple „QueryStream Clients“

IO-Controller := End-Station or bridged End-Station with the application role „Controller“
IO-Device := End-Station or bridged End-Station with the application role „Remote IO“

Operation

- Industrial automation communications are typically connection-based
- An I/O device understands what information it is capable of producing and the maximum rate at which that information can be provided, it typically does not know where that information needs to go and what update rate is required to close the control loop
- There is a communications master, typically in a PLC, which is responsible for establishing those connections, determining what I/O data is of interest and providing the required update rate.
- The PLC gets this information from an engineering tool.
- There may be multiple PLC in a given TSN domain.

Operation

- For a network with a fixed topology and fixed paths:
  - An engineering tool provides traffic requirements, path information and topology information to the NME.
  - The NME then performs the calculations necessary to meet the specified traffic requirements
  - Query Path delivers the result of the calculation via remote management.
- For a network with a dynamic topology and dynamic paths:
  - An engineering tool provides traffic requirements and path information to the Query Stream Clients.
  - The Query Stream Server, in turn provides those requests to the NME. The Topology Discovery Engine provides topology information to the NME.
  - The NME then performs the calculations necessary to meet the specified traffic requirements
  - Query Path delivers the result of the calculation via remote management.

Observations

- The NME appears to be a superset of the CNC
  - The PCE is indistinguishable from a CNC
    - A CNC gets topology information by an undefined mechanism, in this case, either the TDE or an Engineering tool
    - The CNC gets path traffic requirements from a CUC while the PCE get the information through the Query Stream Server/Client.
- The Query Path Function and Network Configuration Engine (NCE) appear to be closely related to a CUC.
  - A CUC retrieves end station capabilities and user requirements, and configures TSN features in end stations. A CUC exchanges information with a CNC via the UNI in order to configure TSN features on behalf of its end stations.
  - The network configuration engine is responsible for the policy based network configuration using the Network Update Engine (NUE) based on a policy-based network configuration provided by an engineering tool and the discovered topology provided by the Topology discovery engine. The policy-based network configuration is loaded by the vendor specific engineering tool using vendor-specific mechanisms.
  - A Query Path Server retrieves end station capabilities and user requirements from the Query Stream Client. The PCE then performs the calculations necessary to meet the specified traffic requirements and Query Path delivers the result of the calculation via remote management.
- It is unclear to this contributor what role, if any, distributed configuration would play in this model.

Scope of Work

- This contributor believes that a great deal of of Qcc can be leveraged and is consistent w/ this model
  - NME
    - BNME - Define a mechanism for consistently selecting the “Best NME”.
    - PCE – Define in terms of a CNC. Identify gaps and hopefully accommodate as part of the Qcc update.
    - NCE – Define in terms of a CUC, in particular, the interface for the “policy-based network configuration.
    - Query Path Function – Define in terms of a CUC, essentially the “northbound” interface of the CUC to the engineering tool and/or end device.
    - TDE – Not sure anything is required beyond the definition of the topology discovery mechanism. Might be useful to define the format for storing topology data.
  - NUE Client/Server – While helpful to understanding, I’m not sure any standardization work, beyond selection of management protocols and associated data models, is needed.

Thank you