Proposal for Nendica Study Item: Converged Elastic Ethernet Network

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Background

- Regarding Elastic Ethernet, several presentations were discussed:
  - Elastic Ethernet based on Converged Switch (presented to Nendica, 2022-05-26 & 2022-06-02)
    - ✓ Converged switch
    - On 2022-06-02, possible relationship to IEEE Project P2971 and proposed P2972 were raised, and Study Item initiation proposal was deferred one week.
  - Industrial Network based on Convergent & Elastic Ethernet (presented to 60802 Task Group, 2022-05-16)
    - ✓ Weak determinism
    - ✓ Centralized management
    - ✓ Extreme low latency / jitter
  - Convergent & Elastic Ethernet Networking for Industry (presented to 60802 Task Group, 2022-05-06)
    - ✓ Convergent industrial network based on Ethernet
  - Elastic Ethernet Networking for Industry (presented to Nendica, 2022-04-07)
    - ✓ Elastic Ethernet framework
  - Low Latency Discussion for Ethernet Networking (presented to Nendica, 2021-11-18)
    - ✓ Extreme low latency / jitter analysis
- This presentation shows that P2971/P2972 are very different and proposes to proceed with initiation of the Study Item.

Difference between P2971 / P2972 and Elastic Ethernet

IEEE PAR P2971 (“Standard for the Test Requirements of a Gateway Supporting a Time Sensitive Networking in the Field of Industrial Internet”) [authorized 2020-12-03]
https://standards.ieee.org/ieee/2971/10467/

See also: “Introduction of IEEE P2971 and P2972”
https://www.ieee802.org/1/files/private/liaisons/liaison-IEEE_P2971+P2972_introduction-0121.pdf .

NO.	Category	P2971 / P2972 (based on Gateway)	Elastic Ethernet (based on Converged Switch)
1	Network site	● The gateway is deployed between industrial networks.	● The converged switch is deployed internally within industrial network.
2	Main functionality	● The functionality operates at Layers 4-7. ● The gateway implements information exchange and conversion among multiple industrial networks. ● The focus is on protocol conversion among applications. ● The communication endpoints are devices from different industrial networks.	● The functionality to be studied is at Layer 2. ● The converged switch supports forwarding among a mix of different industrial network datagrams. ● The converged switch does not alter fields at the application layer. ● Both communication endpoints are devices in a common industrial network.
3	Network scope	● Including network bus (non-Ethernet based), industrial Ethernet, industrial wireless	● Including industrial Ethernet only

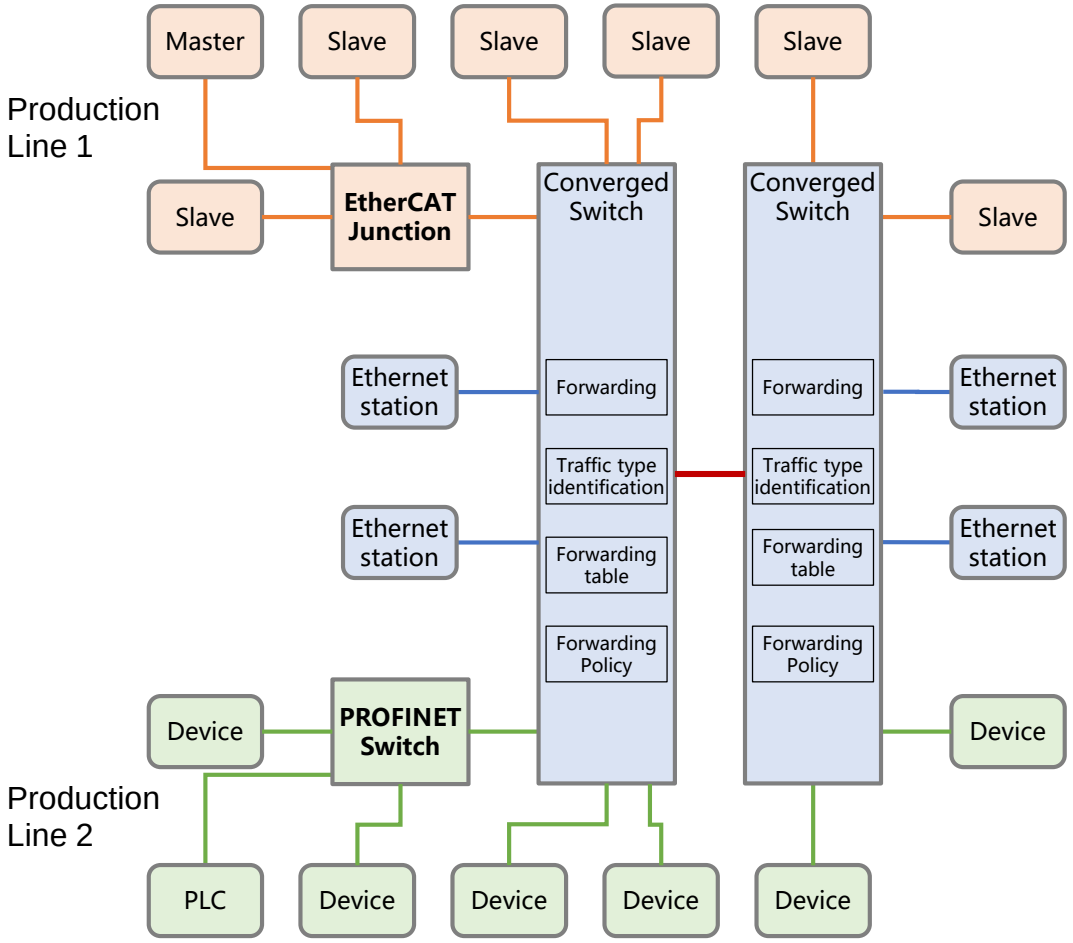
Proposal for Nendica Study Item

- For Nendica to initiate a study item on **Converged Elastic Ethernet Network**

To be studied	• Industrial requirements for elastic topology / forwarding and converged switch. • Feasibility of assuring QoS for all devices connected by the converged switch. • Feasibility of scheduling. • Feasibility of centralized & effective management / scheduling. • Other related aspects (high available, security, etc.) requested by industrial scenarios.
Deliverable	An informal report documenting • Summary requirements of industrial scenarios unsatisfied by current industrial networks • Potential benefits from Converged Elastic Ethernet Network • Impact & optimization of evolving technologies • Possible standardization needs • Possible recommendation to initiate a work item
Leader	• Huajie Bao (Huawei), or other volunteers
Timeline	• Start in June 2022, finish in Nov 2022 • Draft version Aug 2022 • Call for comments Sept 2022 • Complete Study Item Report Nov 2022
Work schema	• Weekly meeting or on-demand meeting • Encourage all contributions

Thank you.

Converged Switch in Mixed Networks



- The converged switch may need to support mixed networks.
- Each access port (to a station) only carries a single frame type for a specific network according the station connected.
- The (red) inter-switch link between the converged switches carries a mix of frame types.
- The appropriate forwarding method is determined not only by the port; the frame type should be considered to select the forwarding rule.
- The inter-switch link is a shared resource, and the Converged Switch may need to allocate the resource to assure the QoS for each network.
- *Future end stations may need to support mixed networks; e.g. Ethernet control messaging to an EtherCAT slave.*