Title: Web-UI for a network configuration tool for real-time traffic

Time Sensitive Networking (TSN) [1] is a collection of standards which enhance Ethernet to become real-time capable (bounded latency, reduction of jitter etc.), allowing new application scenarios for Ethernet in aerospace, automotive, manufacturing, transportation, and utilities.
Technically, TSN establishes *streams* between a sending device and a receiving one (called *Talker* and *Listener*). Packages sent by the Talker are "protected" and cannot be interfered by other traffic (e.g best effort traffic) until they reach their destination (one or multiple Listeners). This protection assures that the packages arrive at their destination within the desired time frame (bounded latency).

However, the mechanisms of TSN increase the network complexity significantly and an extended configuration effort is needed to take networks into operations. Therefore a central controller (called *Centralized Network Configuration (CNC)* in the TSN domain) was established, responsible for the accurate configuration of the network devices, ideally automating the configuration process. This central controller collects Quality of Service (QoS) requirements from applications (Talker) and decides, whether the requirements can be met by the network or not, based on the given network topology and the capabilities of the various network participants. For instance, a requirement could be the "end-to-end latency", which specifies the maximum allowed delay between the transmission of frames by the Talker and the reception of these by the Listener (can be microseconds).
With the given network topology the CNC first determines a path between the Talker and Listener, calculates worst-case network delays along this path and then decides whether the requirements can be met or not. If they can be met, the CNC configures the bridges along the path, according to the requirements. The network is then ready for transmission of real-time traffic and the Talker can start sending data.

The scope of this project is a web-based GUI for the CNC to visualize and manipulate a given network topology and to allow the manual administration of stream requirements (QoS requirements). This includes:

1) visualization and manipulation of the network topology
    a) visualization based on JSON input with a JavaScript graph library (D3.js, cytoscape.js etc.)
    b) CRUD (create, update, delete) edges and nodes manually
2) developing an administrative interface for the stream requirements (QoS requirements) and applying network changes
    a) form with multiple fields for the stream requirements (create)
    b) table for existing streams (update, delete)

Links:
[1] https://en.wikipedia.org/wiki/Time-Sensitive_Networking
[2] https://www.cisco.com/c/dam/en/us/solutions/collateral/industry-solutions/white-paper-c11-738950.pdf
- https://avnu.org/knowledgebase/theory-of-operation/ p. 52ff (free - but name and email necessary for download)

Individual tasks of this project:
- Study the functionality of the CNC
- Study the REST-API endpoints for the network topology and administration of streams
- Implement the Web-UI in HTML/CSS/JavaScript (HTTP-API calls to REST-Server)
- Documentation

Requirements: JavaScript, (REST, Python), English or German.
Group size: 1/2
Project extension towards thesis: No
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