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Challenges & Advantages Of Using Time-Sensitive Networking (TSN) For Developing Converged Ethernet

Over the past three and half decades, the popularity and usage of Ethernet has increased continuously in wired local area network standard. Ethernet has been successful in providing low operating cost, high bandwidth, robustness, architecture openness and a flexible network service. These advantages of Ethernet and the boom in IOT application has attracted attention from automotive and numerous manufacturing industries. Thus, it is becoming essential to develop converged Ethernet that can support both time-critical services and conventional communication services on a unified network infrastructure.

In this essay, we will go through challenges and advantages of using Time-Sensitive Networking (TSN) for developing converged Ethernet. The greatest challenge in developing a converged network is providing low and deterministic latency for time-critical packets and provide sufficient bandwidth for data and infotainment applications. In order to address these challenges the IEEE launched a time sensitive networking task group. Time-Sensitive Networking (IEEE 802. 2 standard) makes it possible to carry data traffic of time-critical applications over a bridged Ethernet network shared by various kinds of applications having different service requirements.

TSN provides guaranteed data transport with bounded low latency, low delay variation, and extremely low data loss for time critical traffic. The TSN achieves low data loss and low delay variation by reserving resources for critical traffic, and applying various queuing techniques, TSN achieves zero

congestion loss for critical data traffic. TSN also provides ultra-reliability for data traffic via a data packet level reliability mechanism as well as protection against bandwidth violation, malfunctioning and malicious attacks. TSN includes reliable time synchronization, which provides the basis for many other TSN functions. Therefore, TSN is one of the viable technique for developing converged real-time Ethernet. TSN will be crucial in increasing robustness of network as both time critical data and infotainment data share same infrastructure.

It will also boost applications in industrial automation networks, in mobile networks for 5G, in networks for critical machine-to-machine communication, for new networking approaches in vehicles including support for autonomous driving, and provide new insights in different verticals. It has a key role to provide in converged networks for IOT (Industry 4. 0), where the convergence of operation and information technology is a necessity. It is possible to modify existing TSN techniques or develop new TSN techniques for specific application. TSN is still in an early phase, thus as new techniques are developed and implemented application area of TSN will largely increase.