PRESS RELEASE

Time-Sensitive Networking (TSN)

Fraunhofer IPMS has developed a TSN IP Core for the simplified implementation of endpoints in TSN-capable Ethernet networks. Time-Sensitive Networking now allows timed and deterministic transmission of critical real-time messages via standard Ethernet hardware across the network. Fraunhofer IPMS will present its TSN IP Core for the first time at this year’s electronica trade fair and conference in Munich. Visitors can find the Fraunhofer IPMS exhibition in Hall 5, Stand 426 from 13-16 November 2018.

Developed in the seventies, Ethernet technology today is an open standard which has found its way into many automated industrial environments. According to the current standard, however, data packets cannot be consistently transmitted in real time, requiring specific real-time fieldbuses to be still used as before. Because these fieldbuses rely on special hardware support, they are not compliant with the IEEE 802.1 and 802.3 network technology standards, preventing optimal vertical and horizontal integration. In addition, parallel real-time fieldbuses within a network infrastructure often negatively influence each other. Developers at the Fraunhofer Institute are convinced that TSN will make it possible to transmit prioritized and real-time capable data streams throughout the entire network. The joint transmission of real-time and normal Ethernet communication will lead to completely new approaches for the convergence of production and IT networks in the future.

Dr. Deicke, Business Unit Leader Wireless Microsystems, explains, “The synchronization of time is an important TSN element, as deterministic data delivery demands that all devices throughout the network have the same understanding of time as defined in IEEE 802.1AS-rev.” Dr. Deicke adds, “Traffic shaping and scheduling enables the parallel transmission of data streams with both soft and hard real-time requirements, as well as so-called best-effort traffic. IEEE 802.1Qav already defines a credit-based shaper (CBS) that prioritizes time-critical data streams ahead of best-effort traffic. However, in the automotive industry, for example, there are applications that require lower jitter and latency. The IEEE 802.1Qbv sub standard establishes criteria for fixed cyclic transmission windows that allow for the unimpeded transmission along the entire path.”

Fraunhofer IPMS has developed an IP Core TSN_CTRL to facilitate the implementation of TSN-capable endpoints for networks. According to Dr. Deicke, “The IP Core consists of modules for time synchronization, traffic shaping, and Ethernet MAC communication. Packet data is imported and exported via AXI streaming or Avalon ST interfaces with 8-bit data buses.” The IP Core is available in synthesizable RTL source code, or as a targeted FPGA netlist.
A TSN network is fully effective when all infrastructure devices are TSN-enabled. Many manufacturers of industrial devices and switches are currently working to make TSN-enabled products. Technologies are tested for interoperability at so-called plug fairs. In 2018, Fraunhofer IPMS participated at several LNI (Labs Network Industry 4.0) and IIC (Industrial Internet Consortium) plug-in fairs to test the IP Core performance with devices from other manufacturers.

Visitors can view the Fraunhofer IPMS exhibition in Hall 5, Stand 426.