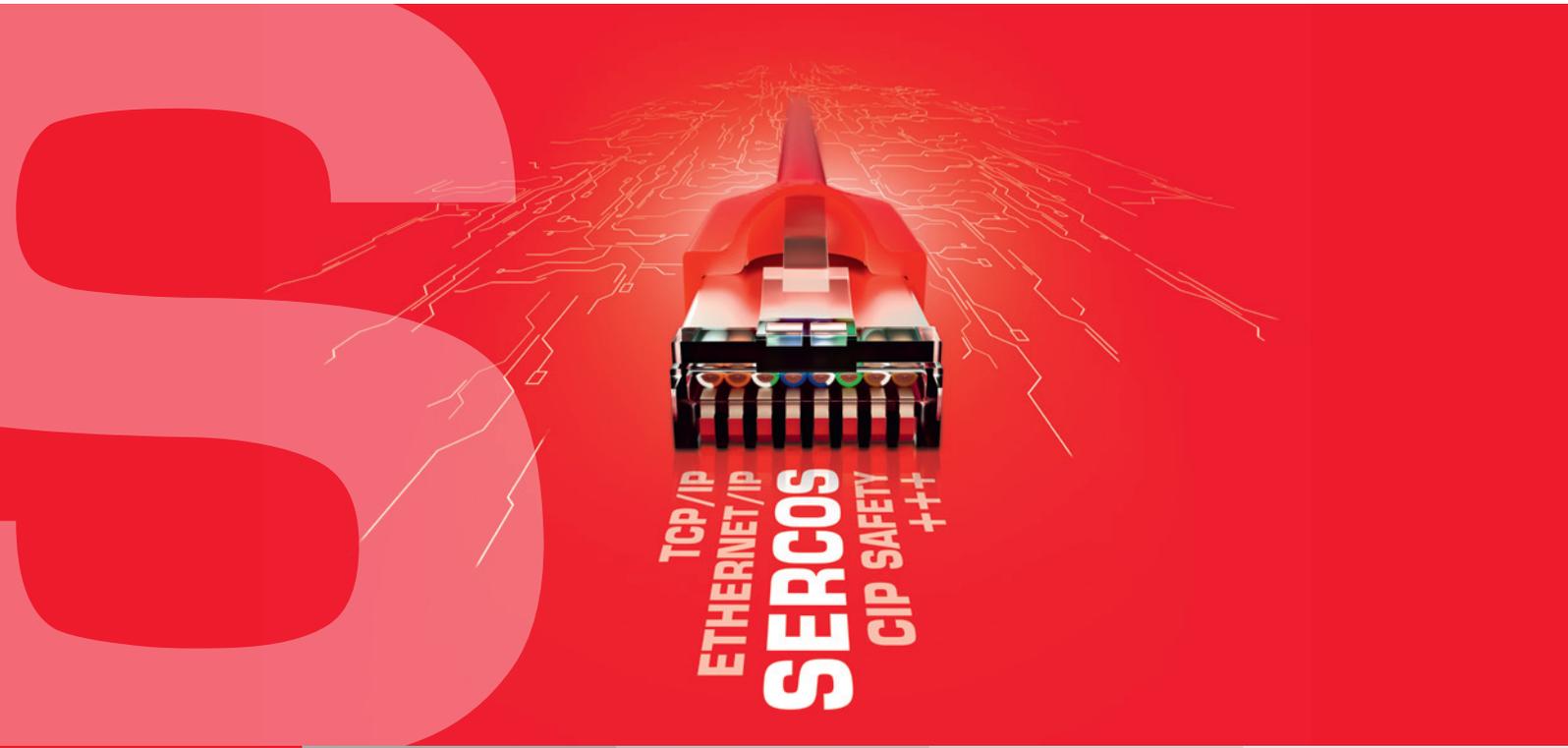


sercos
the automation bus



Sercos over TSN:

The evolution of industrial communication
moves forward

Sercos over TSN: The evolution of industrial communication moves forward

Ethernet Fieldbuses (without Ethernet coexistence)	Real-time Ethernet (with Ethernet coexistence)	Ethernet TSN (with Ethernet coexistence)
<p>Application</p> <p>TCP UDP IP</p> <p>Real-time protocol</p> <p>MAC Ethernet PHY</p>	<p>Application</p> <p>TCP UDP IP</p> <p>Real-time protocol</p> <p>MAC Ethernet PHY</p>	<p>Application</p> <p>TCP UDP IP</p> <p>Real-time protocol</p> <p>MAC Ethernet TSN PHY</p>
Specific hardware required	Specific hardware required	Standard hardware
Mechatrolink III, Ethercat, Varan	Sercos III, Profinet IRT	TSN-based protocols

Figure 1: Evolution of real-time Ethernet technologies



Figure 2: "Sercos over TSN" demonstrator at SPS IPC Drives show in November 2016

Ethernet TSN makes time-controlled and deterministic transmission of real-time-critical messages possible for the first time in the 43-year history of unmodified Ethernet. Ethernet TSN uses the principle of time-triggered and time-slot based communication, which Sercos® has already used for more than 25 years for real-time communication for all kind of production machines and high-performance automation, and beyond. The advantages of using Ethernet TSN in an automation system are obvious: instead of special hardware, standard Ethernet components with integrated real-time capabilities can be used (see Figure 1). The cross-industry support (automotive, multimedia, automation) of the TSN technology results not only in low costs, but also the availability of a wide range of manufacturers and products. At the same time, manufacturers and users benefit from the newest technical developments such as higher transmission rates. With TSN, the convergence of production and IT networks can be advanced, i.e. real-time communication and normal Ethernet communication can be transmitted via a uniform network standard. This constitutes an ideal basis for the implementation of Industry 4.0 and IIoT concepts.

Sercos over TSN Demonstrator

At the SPS IPC Drives exhibition in November 2016, Sercos International exhibited a demonstrator for "Sercos over TSN". This demonstrator was a proof of concept to show the interconnectivity of Sercos III devices, Ethernet devices and TSN devices without any impact on the real-time performance (see Figure 2).

The demonstrator involves a TSN-based Sercos III SoftMaster with a Soft CNC which communicates with Sercos III servo drives via Ethernet TSN switches. Through this TSN network infrastructure, video streams from a webcam are transmitted to a remote display in parallel with communication to a servo drive network, without impairing the characteristics and functionality of the Sercos real-time communication.

With such an approach, a Sercos-driven machine can be connected to a TSN network infrastructure (factory network) and is remote-controlled by a TSN-based Sercos master that can be freely positioned in the TSN network ("edge cloud") to control the machine and at the same time interface to the connected IT systems.

Implementation

The aim in designing the demonstrator was to expand a typical setup consisting of a numerical control and drives by adding an interposed, real-time-capable network. A key element here was the integration of the Precision Time Protocol (PTP) according to IEEE 1588 into the TSN-based Sercos III SoftMaster, so that all network participants use a uniform time base. In the analysis of the real-time behavior, it was shown that time synchronization errors were restricted to a two-digit nanosecond range. With this analysis, it was shown that the synchronization, specified in the TSN standard as IEEE 802.1-AS, achieves accuracy that is sufficient for demanding motion applications. Additional analyses on the demonstration system will establish the limits of real-time communication of Sercos via TSN by varying the cycle time and the number of participants.

Advantages

"Sercos over TSN" supports the convergence of traditional real-time Ethernet solutions into a uniform, standardized and consistent network infrastructure. The Sercos technology benefits from TSN in several respects. For one thing, standard Ethernet components with integrated real-time capability can be used and thus flexible network topologies can be realized. Additionally, higher transmission bandwidths are available with Ethernet TSN. Sercos III devices can be integrated unchanged into a TSN network and can communicate with each other via TSN. Here, neither functionality nor real-time characteristics are restricted. In addition, existing tools, such as the Sercos Monitor, a diagnostic and analytical tool, can continue to be fully used.

sercos

the automation bus

About Sercos International

Sercos International is an association of users and manufacturers that is in charge of technical development, standardization, certification and marketing for the Sercos automation bus. Conformance tests guarantee that Sercos implementations are standard-compliant, ensuring that devices from different manufacturers can be combined. Based in Germany, the organization presently has more than 90 member companies located around the world and has national liaison offices in North America and Asia.

Sercos International e.V.

Kueblerstr. 1
73079 Suessen, Germany
☎ : +49 7162 946865
✉ : +49 7162 946866
E-mail: info@sercos.de
www.sercos.org

Sercos North America

405 Loblolly Bay Drive
Santa Rosa Beach, FL 32459, U.S.A.
☎ : 1-800-5-Sercos (1-800-573-7267)
☎ : +1 850 6601293
E-mail: info@sercos.com
www.sercos.com

Sercos Asia

China:
Building No.1 #314,
No.1 Jiao Chang Kou Street,
De Sheng Men Wai,
Xicheng District,
Beijing, 100120, China
☎ : +86 10 82285783
✉ : +86 10 62017873
E-mail: sercos@cameta.org.cn
www.sercos.cn

Japan:

Shin-Yokohama 3-17-15 (8F)
Kohoku-ku
Yokohama, 222-0033, Japan
☎ : +81 45 620 2013
E-mail: info-japan@sercos.com
www.sercos.jp

Visit us at www.sercos.org