Deterministic network technologies for motion control

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When looking at demanding applications, such as motion control, data needs to be transferred with high accuracy and reliability to meet strict cycle times. Ultimately, to be highly synchronized and truly effective, motion control systems require deterministic network performance.

Up until recently, standard Ethernet did not offer deterministic capabilities per se. Therefore, determinism in industrial automation could only be achieved in two ways. It could be established by controlling all the devices communicating on a network, essentially closing the network to unknown traffic that can impact determinism. It could also be set by selecting a network technology that could guarantee deterministic performance through key protocols and topologies.

Recently, the introduction of Time-Sensitive Networking (TSN) standards has updated the capabilities of industrial Ethernet to make it deterministic, eliminating the need to implement non-standardized strategies. When looking at motion control applications, open network technologies with TSN functions are helping companies reach new heights in a number of ways.

Firstly, an open network technology that incorporates TSN, such as CC-Link IE TSN, is able to support the need for increasingly shorter cycle times, enabling faster operations while ensuring quality and uptime. Secondly, it is helping machine developers and users incorporate an unprecedented number of axes within a system and its motion control network, supporting the development of more advanced setups.

This type of open network solution can also help to enable the digital transformation of business by driving convergence. It can accommodate the coexistence of both deterministic traffic with extreme performance characteristics, such as motion control, and TCP/IP traffic of all kinds for general purpose communications. Therefore, a TSN-based technology offers a solid foundation for smart, interconnected factories that leverage data to generate business intelligence, enhancing flexibility, responsiveness and ultimately improving decision making.

Currently, CC-Link IE TSN is leading the market in driving the adoption of TSN in industry. This is the first solution to leverage gigabit Ethernet, and the key TSN standards for time synchronization and traffic shaping. The network technology is widely used, offering a broad development ecosystem for the creation of compatible industrial automation devices and a multitude of products that can be used to futureproof factory operations.

Image captions:

Image 1: Deterministic network technologies for motion control (iStock-1022892534)

About The CC-Link Partner Association (CLPA)

The CLPA is an international organization founded in 2000, now celebrating its 20th Anniversary. Over the last 20 years, the CLPA has been dedicated to the technical development and promotion of the CC-Link open industrial network family. The CLPA's key technology is CC-Link IE TSN, the world's first open industrial Ethernet to combine gigabit bandwidth with Time-Sensitive Networking (TSN), making it the leading solution for Industry 4.0 applications. Currently the CLPA has over 4,100 corporate members worldwide, and more than 2,000 compatible products available from over 370 manufacturers. Around 38 million devices using CLPA technology are in use worldwide.

Anyone interested in joining the organization can apply here: https://www.cc-link.org/en/clpa/members/index.html

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