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MicroTCA developments and history at DESY

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The advances in digitisation, processing power, and sensor technology enable today's new types of scientific machines to achieve significant performance improvements and new capabilities. At the same time, and as a result, the load and impact on controlling such large-scale research facilities have also increased: providing excellent availability, top beam quality and stability, multimodal operation, as well as good maintainability, a short mean-time-to-repair, longevity, and ease of component exchange.

In 2005, significant reliability concerns for the 30 km-long linear TESLA collider prompted a discussion on adopting a more modern electronics standard to address the limitations of 25-year-old VME crate systems. To leverage Telcom's advances, a working group was established between industry and physics laboratories within the non-profit standardisation organisation PICMG (PCI Industrial Computer Manufacturers Group). After only 2 years of intensive work, in 2011, the MicroTCA.4 standard was introduced. MicroTCA.4 combines the specific needs of our physics community, such as widely distributed systems, ample rear panel I/O to accommodate all signals, precise timing, space for analogue pre-processing, with the benefits of the Telcom system, including ultra-high data rates, configurability, remote management, and redundancies.
At the European XFEL, the MicroTCA.4 standard was deployed in 2016, marking its first use in a large-scale research facility. In this presentation, we will discuss the steps taken by DESY to address initial interoperability problems, expand the product range, promote the MicroTCA standard within industry and research, and offer an outlook on the latest developments.

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