Press release

Highly reliable TTEthernet® controllers from TTTech Aerospace improve Ariane 6 avionics system

- TTTech Aerospace's highly reliable ASICs have been qualified for the use in the Ariane 6 launcher avionics. They are:
    - Connecting all subsystems in the launcher using Time-Triggered Ethernet technology to replace the past MIL-1553 bus.
    - Enabling safety-critical guidance, navigation and control data on the same network as non-critical monitoring or video data – on the same physical media, reducing cable harness.
- Redundant TTEthernet®-based data networks reduce software complexity, enabling faster integration and reducing program risk for customers.

Vienna, Austria, September 6, 2022: **Europe's new flagship launcher [Ariane 6](#) will ensure independent access to space for the European space sector. TTTech Aerospace contributed substantially to the creation of the avionics backbone system in Ariane 6. Its ASICs ("chips") and the related software are integrated into more than 50 subsystems handling functions such as computing, power distribution or thrust-vector actuation, which all connect to a single, redundant TTEthernet® network, the launcher's 'nervous system'.**

The development and qualification of the radiation-hardened TTEthernet® controller chip and the related embedded software started within a research activity co-funded by the French Space Agency (CNES) and then later the European Space Agency (ESA) via its Future Launchers Preparatory Program (FLPP). TTTech Aerospace has developed, manufactured, and qualified this radiation-hardened ASIC in both HiRel and space quality with Ariane 6 being one of its first users.

"We are proud about our partnership with ArianeGroup and to contribute to Europe's Ariane 6 launcher with our second generation TTEthernet® products reliably operating this highly advanced spacecraft. The completion of the development and qualification of the ᵀᵀᴱSwitch and ᵀᵀᴱEnd System Controller HiRel ASICs as core of the avionics connecting all safety-critical units in the data network is a major milestone. We also contributed to Ariane 6 with firmware development and qualification as well as integration support and we are very excited about the final qualification steps and the upcoming first launch," explains Christian Fidi, Senior Vice President, Business Unit Aerospace, TTTech.

Previous generations of large launch vehicles mainly utilized the robust MIL-1553 bus for handling safety-critical command and control data. However, to meet the demands of modular avionics and higher data throughput, the developers of Ariane 6 chose a data network that could provide about ten times more bandwidth and at least the same level of reliability without increasing cost and complexity. Research has found that architectures based on TTEthernet® are an excellent fit and can meet these specifications.

TTEthernet® enables cost savings thanks to modular, scalable system architectures. Safe and secure partition of data, bandwidths scaling up to 1 Gbit/s and precise time distribution ensure that three traffic classes (best-effort, rate-constrained and Time-Triggered Ethernet) for critical control and command data as well as non-critical payload data can be transmitted on the same network. This reduces cabling as well as system complexity, integration, and testing efforts. Fault-tolerant, automated time synchronization and fault containment are implemented in hardware, which increases safety and ensures the system is operational at all times.

Andre Hubert Roussel, CEO of ArianeGroup, explains the benefits of TTEthernet® and TTTech Aerospace's products for the project: "For Ariane 6 we needed an avionics backbone system that could handle current and future requirements, especially higher bandwidth, to integrate additional

data, for example camera streams, on the avionics network. TTEthernet® was the ideal choice, as it is a deterministic network with built-in fault tolerance for maximum reliability and lowers the cost of flight software over the system's lifecycle. It is also interoperable with standard Ethernet used by ground control, which allows us to use the same network for the transmission of all telemetry data. Using TTTech Aerospace's TTEController HiRel ASICs to implement TTEthernet® connectivity allowed us to reduce our recurring cost. These components come in automotive-grade packaging and qualifying both this 'off-the-shelf' solution and the Ethernet-based data network is one of several key innovations in Ariane 6."

In March 2022, the launcher's fully integrated avionics network was qualified at ArianeGroup's development center in Les Mureaux near Paris, France. This is a key milestone ahead of the first launch of Ariane 6 which is expected to take place at the European Space Port in Kourou, French Guiana, in the first quarter of 2023.

Images

Caption: Visit of ArianeGroup in Vienna to discuss the exploitation agreement and R&D partnership with TTTech Aerospace. © TTTech Computertechnik AG
From left to right: Razvan Bija, Project Engineer at TTTech Aerospace, Thierry Fosse, Supplier Manager at ArianeGroup, Matthias Mäke-Kail, Senior Sales & Marketing Manager at TTTech Aerospace, Jean-Francois Dufour, Process and Quality Manager at TTTech Aerospace, Olivier Charre, Head of Electrical Domain at ArianeGroup, Laurent Mazo, Commodity Manager EGSE at ArianeGroup, Ivan Masar, Senior Product Manager Space at TTTech Aerospace, Michael Mastny, Senior Bid Manager at TTTech Aerospace, Alexander Deutschinger, Product Operations Engineer at TTTech Aerospace
Download: https://www.tttech.com/wp-content/uploads/ArianeGroup-Meeting_print-21x15cm_300dpi.jpg

Ariane 6 launch pad
Caption: Ariane 6 launch pad in Kourou, French Guiana © ESA/CNES/Arianespace
Download: https://www.esa.int/ESA_Multimedia/Images/2021/09/Under_the_stars_on_the_Ariane_6_launch_pad

Caption: TTTech Aerospace's ^{TTE}Switch and ^{TTE}End System Controller HiRel ASICs are used to connect more than 50 subsystems to a single, redundant TTEthernet® network, the launcher's "nervous system" (© TTTech Computertechnik AG).
Download: https://www.tttech.com/wp-content/uploads/TTESwitch-TTEEndSystemControllerprint.jpg

About TTTech Aerospace

TTTech Aerospace provides deterministic embedded network and platform solutions for aerospace and space applications. Its products have already completed over 1 billion flight hours in Level A safety-critical applications like fly-by-wire, power systems, avionics, engine controls and environmental control systems. Proven, mature solutions help customers in the aerospace and space industries to develop integrated, modular and scalable deterministic network platforms that increase safety, fault-tolerance and availability. In addition, integrated solutions reduce size, weight, power and cost (SWaP-C), allowing for easier handling of equipment and lowering total lifecycle cost.

TTTech Aerospace is part of TTTech Computertechnik AG, a leading provider of safe networked computing platforms. TTTech is the innovator of Deterministic Ethernet and a driving force behind the IEEE TSN and the SAE AS6802 Time-Triggered Ethernet standards. TTTech Computertechnik AG operates under the umbrella of the TTTech Group, a globally oriented group of high-tech companies, founded and headquartered in Vienna, Austria. TTTech North America Inc, headquartered in Andover, MA, USA is part of TTTech Computertechnik AG.

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