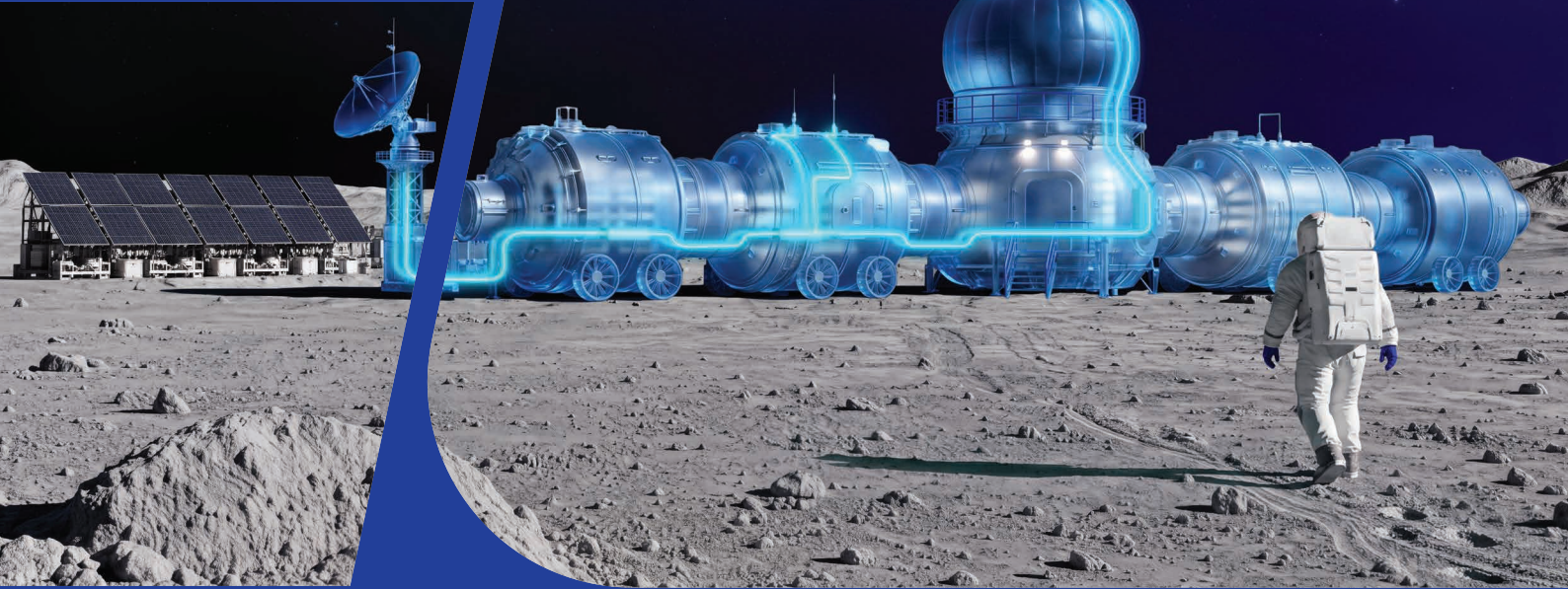


TTTECH—



LUNAR-READY MODULAR AVIONICS

Ultra-reliable avionics platform based on TTEthernet



NASA has recognized the value of a fault-tolerant deterministic data network for large exploration programs. For the “Lunar Gateway”, TTTECH and partner Beyond Gravity Austria have developed and fully qualified an avionics product family for computing, data handling, and networking which is now ready to be used in deep space exploration projects – in particular on the lunar surface.

SPACE EQUIPMENT FOR LONG-TERM USE

Safety and reliability are key in all space programs, but especially in human space flight. TTTECH Aerospace provides reliable networking and computing platforms that connect the systems on board spacecraft, launch vehicles, or satellites.

These platform solutions are based on decades of experience in Ethernet-based distributed avionics archi-

tectures and deep know-how in designing modular, scalable deterministic systems. This enabled us to develop our own chip IP and software, which makes us independent and allows us to continuously improve our products.

We have applied our certification expertise from civil aviation and have achieved space qualification to the highest criticality levels with ESA and NASA.

FULLY QUALIFIED, READY-TO-USE BUILDING BLOCKS AND UNIT-LEVEL SOLUTIONS FOR AVIONICS NETWORKS

TTTECH Aerospace provides Ethernet-based space equipment as a range of ready-to-use building blocks for data networks in space stations, spacecraft, or satellites.

While initially deep space and lunar applications were in focus, the modular design of the equipment allows for their use in other mission profiles.

Our deterministic Ethernet-based space equipment can be easily integrated into spacecraft data network and

flight applications, either as single-function building blocks or integrated with additional modules in an avionic hosting unit, thanks to certifiable embedded software supporting industry real-time operating systems and hypervisors (e.g. VxWorks, PikeOS, RTEMS) and also NASA's cFS.

Our space products are compliant with the International Avionics System Interoperability Standards (IASIS) and the ECSS-E-ST-50-16C (European engineering standard for space applications) and optimized for mass, power, and functionality.

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We partner with leading space equipment manufacturers in developing products for different development stages, enabling fast and cost-effective prototyping and a seamless migration path to flight-grade hardware. Our qualified solutions ensure reduced lead times, allowing customers to bring their solutions to orbit faster.

MARIO GARTNER,
Director Product Management, TTTECH Aerospace

AT A GLANCE

CUSTOMERS / PROJECTS

Northrop Grumman – Habitation and Logistics Module
MDA – Robotic arm
Thales Alenia Space – Habitats

CHALLENGE

Providing durable interoperable equipment and software, both qualified to the highest safety standards to be used in human and robotic exploration.

SOLUTION

TTTECH Aerospace's modular, Ethernet-based avionics product platform includes unit-level solutions and board-level solutions in standard form factors. To allow software development to begin right away, cost-efficient off-the-shelf engineering development units are a key part of the portfolio.

TTEthernet:

TTEthernet® solutions uniquely integrate three standards, i.e. regular Ethernet (IEEE 802.3), ARINC 664 part 7 with bandwidth guarantees and SAE AS6802 (Time-Triggered Ethernet). In the space sector. A TTEthernet-based digital backbone can be combined with TSN for non-critical functions.

Flight-grade solutions:
TTE Switching Unit (FLIGHT)/
TTE Avionics Core Unit (FLIGHT), both based on the same hosting unit

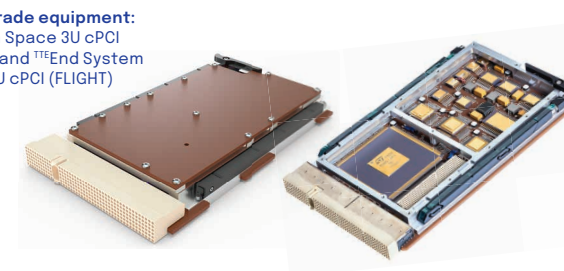


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Lab-grade equipment:
TTE Switch Space 3U cPCI (EDU) and TTE End System Space 3U cPCI (EDU)



Flight-grade equipment:
TTE Switch Space 3U cPCI (FLIGHT) and TTE End System Space 3U cPCI (FLIGHT)



MODULAR, SCALABLE EQUIPMENT FOR THE COMPLETE PRODUCT LIFECYCLE

Modularity and scalability are achieved by combining hosting units which provide power and connectivity with different arrangements of pre-qualified network interface and switch cards, as well as 3U single board computers.

Engineering development units (EDUs) enable customers working on NASA Artemis or other lunar programs to build fully representative systems on the ground. EDUs are thus ideal for flight software development, and functional verification of avionics, as they are functionally equivalent to the flight product variants.

EDUs are assembled in mid-sized batches using cost-efficient, industrial-grade components, and are typically available for shipping at short notice.

PROTO units are equivalent to the FLIGHT variant both functionally and on a component level. The only difference is the level of qualification testing which means that PROTO units can be delivered faster and can be used to build proto-flight systems that remain on the ground.



ABOUT TTTECH AEROSPACE

TTTECH Aerospace supplies and develops highly dependable networking and embedded computing platform solutions for time-, mission- and safety-critical applications. Its products are based on open data networking standards (Ethernet, ARINC 664 part 7, TSN), time-triggered technology, and deep know-how in safety certification. Its network switches and network interface solutions are used by global champions and technology leaders such as Collins Aerospace, Honeywell, or Thales, and can be found, for example, in the Airbus A-220, Boeing 787 and Embraer C-390 aircraft, NASA's Orion spacecraft, the Ariane 6 launch vehicle and in critical infrastructure.

TTTECH Aerospace is a business entity of the TTTECH Group, a globally operating group of high-tech companies, founded and headquartered in Vienna, Austria. TTTECH is the innovator of Deterministic Ethernet and a driving force behind the IEEE TSN and the SAE AS6802 Time-Triggered Ethernet standards.

TTTECH NORTH AMERICA INC serves the US market with offices in Andover, MA, and Houston, TX.

HEADQUARTERS

TTTech Computertechnik AG
Schönbrunner Strasse 7
1040 Vienna/Austria

P +43 1 585 34 34-0
E products@tttech.com

