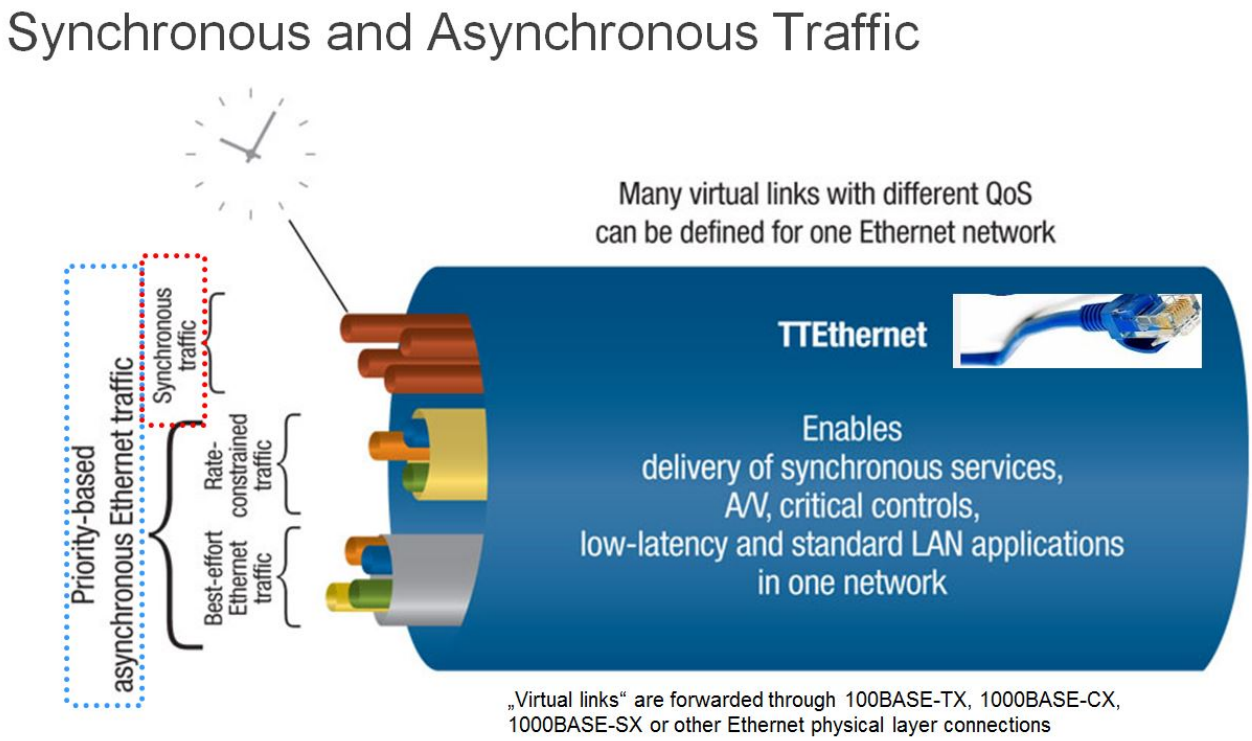
Radiation tolerant deterministic Ethernet ASIC or related chip IP cores

Ref-Nr:



Technology abstract

An Austrian corporation has developed chip IP over the course of 2010-2016 which can be licensed. This chip IP is now used to develop a radiation tolerant Ethernet controller chip. This allows to build level 2 Ethernet switches with 24 ports and deterministic behaviour or three-channel network interfaces to connect end nodes (computers,

sensors) to a regular or deterministic Ethernet network. Usage outside space and aeronautics is offered.

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Technology Description

The Internet of Things relies on Ethernet networks and related IEEE standards which enable near real-time connectivity for control processes. TTP solutions have been developed and deployed in applications ranging from industrial control and the automotive sector to helicopters and aircraft.
After several years of research funded by the French space agency (CNES) and afterwards by the European Space Agency (ESA), architectures based on TTEthernet are considered also a great fit for launch vehicles. For the new European launch vehicle Ariane 6, the company has adapted proven chip IP to develop a radiation tolerant Ethernet controller. For this the 65nm process of French back-end manufacturing partner STMicroelectronics is used together with their space libraries. An estimated total dose of 300 kRad as well as SEU immunity up to 60 MeV are tolerated by the devices, available in plastic package (BGA 400) suitable to various industries.
Deterministic Ethernet offers guarantees for bandwidth utilization and timely message delivery, i.e. fixed latencies and minimized jitter. The solution at hand is the version of deterministic Ethernet which has highest potential in the space, aeronautics and adjacent markets. It offers ARINC 664 p. 7 (also known as AFDX®) and SAE AS6802 compliant traffic classes in addition to regular Ethernet (see attached graphic). Fault-tolerant switches guarantee continuous synchronization and freedom from interference. Faulty

end nodes can thus not flood the (deterministic) Ethernet network.

Innovations & Advantages

TTEthernet solutions combine strictly deterministic Time-Triggered Ethernet with regular IEEE 802.3 “best effort” Ethernet and a third, rate-constrained traffic class, which can be used for video (camera) data. The bandwidth is at least 100 times higher compared to MIL-1553, i.e. 100 Mbit/s, while scalable to 1 Gbit/s where needed.
As all data is safely and securely partitioned, a single network can be used for both control and telemetry data. In addition, increased cable lengths are possible without the need for repeaters.
Manufacturing utilizes European state of the art 65 nm wafer manufacturing process with newly qualified libraries for radiation tolerance by STMicroelectronics.
The device tolerates an estimated total dose of 300 kRad as well as SEU immunity up to 60 MeV; Up to 125 degrees operating temperature.
All this simplifies the required software and related integration and testing efforts to a large extent. The familiarity of the engineering community with Ethernet and the usage of moderately priced, off-the-shelf Ethernet test and monitoring equipment are added benefits. Recurring component cost is minimized by using automotive-like packaging and qualification instead of a full-blown space grade approach and by standardizing on a single interface to the network. Finally, built-in fault tolerance and safety features allow for superior reliability and availability needed in launchers and other spacecaft.

Current and Potential Domains of Application

Launch vehicles
Space exploration
Satellites

Helicopters

UAV/UGV/UUV

Applications for health

Nuclear power

Science

- Synchronous and Asynchronous Traffic