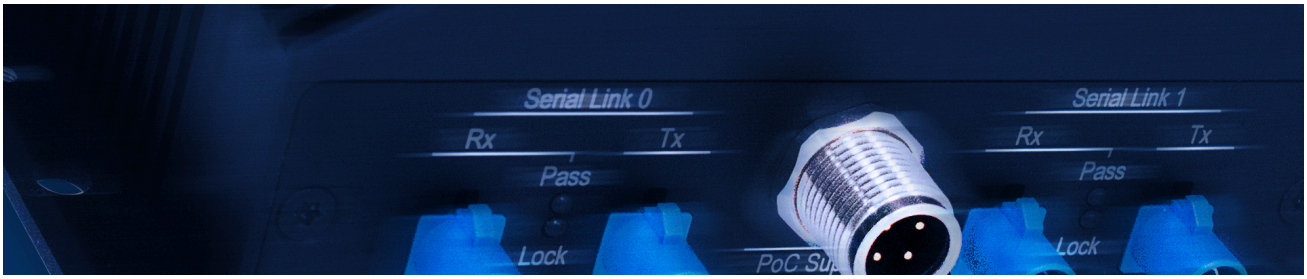

Optimizing Data Distribution in ADAS/AD

finding the suitable hardware components for efficient data handling in validation setups

ADAS (Advanced Driver Assistance Systems) and AD (Autonomous Driving) are highly complex systems that process an immense amount of data from various sources, including cameras, radars, lidars, and other sensors. In order to distribute and process the data efficiently, reliably and with high performance, it is essential to implement powerful measurement data interfaces, data converters and switches.

Key aspects to consider when choosing the right hardware for data distribution?

Data rate and latency: ADAS/AD systems have to process raw sensor data in real time. Therefore, high data rates, as well as a low and well-defined latency are crucial for the loss-free transfer of raw data from the sensors to the further processing systems.

Synchronization: When processing data from multiple sensors, it is important that the data is time synchronized. Accurate time stamping of each data packet is necessary to ensure that the data can be processed consistently and accurately.

Data integrity: The integrity of the data must be guaranteed throughout the entire conversion and transmission process. The data packets must not be touched or altered in any way. Only if this prerequisite is met the data can be reliably used for further processes.

Standardization: The use of standardized protocols and interfaces, such as CAN, FlexRay or (automotive) Ethernet, enables easy integration and interoperability between different components within the setup. By supporting different data formats and standards, the sensors and measurement systems can communicate with each other smoothly.

Robustness and reliability: In automotive applications, systems are exposed to harsh conditions, including temperature changes, vibrations, and electromagnetic interference. Interfaces and converters must be able to withstand these conditions without compromising their performance or reliability.

Compactness: Especially in mobile applications, space and energy are valuable resources. For this reason, efficient and at the same time compact form factor interfaces and converters are of great importance.

Connecting the world of Automotive Ethernet with the world of Standard PC Ethernet

Our Automotive Ethernet Development Tool **NETLion**:

NETLion 1000

- converts 100BASE-T1/1000BASE-T1 to 100BASE-TX/1000BASE-T
- wide range input: 9 V - 48 V
- Dual-Media Converter & TAP
- Cable Tester

NETLion 10G

- converts 2,5/5/10GBASE-T1 to 2,5/5/10GBASE-T
- wide range input 9 V - 32 V
- Dual-Media Converter & TAP

2-in-1 Device

In Media Converter Mode, the device converts up to two BASE-T1 signals to Standard PC Ethernet. In the operating mode Network TAP (Test Access Point), data can be decoupled from both transmission directions and read out separately from each other.

Versatile Use

NETLion offers you flexible solutions for different industries and application areas. In addition to the automotive field, the NETLion can also be used in industrial and agricultural environments, e.g., as a development tool for high-speed ISOBUS. The power supply and temperature range are designed to withstand harsh environments.

Reliable Data

Thanks to Layer 1 technology, the data streams are not being touched or altered during the decoupling process. The NETLion impresses with real-time transmission as well as low and well-defined latency.

More insights on NETLion

Conversions to 10 Gbit Ethernet and decoupling of raw sensor data streams

Our Measurement Data Interface **MDILink**:

MDILink GMSL2 TAP

- 2x GMSL2 Link in
- 2x GMSL2 Link out
- 2x 10 GbE download ports

MDILink FPD-Link III

- 2x FPD-Link III in
- 2x FPD-Link III out
- 2x 10 GbE download ports

MDILink CSI-2

- 2x CSI-2 in
- 2x CSI-2 out
- 2x 10 GbE download ports

In the ADAS/AD area, measurement data converters are always used when you want to decouple raw data from sensors, such as cameras, radars or lidars. With our MDI technology, we specialize in decentralized measurement data acquisition, the conversion and exact time stamping of data from synchronized clocks, and the subsequent transfer via Ethernet standard to the data recorder. The MDILink offers a conversion to 10 Gbit Ethernet as well as transparent decoupling of the raw data stream in TAP mode.

Customization made possible

GMSL, CSI-2 and FPD-Link are not the right fit for you? Thanks to the modular concept, we can easily adapt to various interfaces and data formats. But also, data compression, conversion and encryption can be adapted to individual requirements. In addition, b-plus will gladly perform the physical adaptation to the selected sensor chip.

Learn more about Measurement Data Interfaces

Distributing data in the vehicle

Our Managed Ethernet Switch with or without PTP Functionality **EDSwitch 10G**:

12 Port
with or without PoE

- 8 ports 1G (RJ45)
- 4 ports 10G (SFP+ slot)

20 Port
with or without PoE

- 12 ports 1G (RJ45)
- 4 ports 1G (SFP slot)
- 4 ports 10G (SFP+ slot)

20 Port
with or without PoE

- 16 ports 1G (RJ45)
- 4 ports 10G (SFP+ slot)

The highly flexible EDSwitch 10G series offers multiple different versions to match your specific needs. Whether in a 12 or 20 port version - with or without PoE - this device offers 4 x 1/10 Gbit Ethernet SFP+ uplinks, making it a cost-effective and reliable industrial solution that focuses on high data throughput and reliability. EDSwitch 10G is designed to withstand the harshest surroundings and the most demanding EMC environments. Its fanless and EMC optimized design ensures reliable operations within -40 Â°C to +70 Â°C.

Learn more about the EDSwitch 10G

Distributing large amounts of data in the test vehicle

Our High-Performance Managed Ethernet Switch for Big Data **MDSwitch**:

MDSwitch SN2010

- 4x 100 Gbit/s ports
- 18x 10/25 Gbit/s ports
- Up to 1,7 Tb/s data throughput
- 300 ns latency (port to port)
- XTSS Time Synchronization

MDSwitch SN2100

- 16x 100 Gbit/s ports
- Up to 3,2 Tb/s data throughput
- 300 ns latency (port to port)
- XTSS Time Synchronization

With the MDSwitch we offer the highest Ethernet switching capacity and transmission bandwidths for use in high-end ADAS/AD validation setups. It ensures a seamless and reliable communication between the various components in your application. With port speeds of up to 100 Gbit/s combined with optimized latency behavior, the MDSwitch is able to deliver enormous data throughput. The ruggedized system is optimally suited for in-vehicle use.

Learn how to level up time accurancy

Ensuring precise time synchronization within the setup

Our Time Synchronization Service **XTSS**:

Forming the base for reliable sensor data fusion:

Modern ADAS and AD environments combine data from multiple sensors such as LiDARs, radars, cameras, and more. For effective sensor fusion, data from all these sensors need to be time-aligned to ensure that the combined data accurately represents the state of the environment at a specific point in time. Consistent time-stamping across sensors and modules ensures reliable data for further decision-making.

Time Synchronization Service XTSS

With XTSS, b-plus offers a highly accurate, widely configurable, as well as plug and play capable time synchronization solution.

XTSS uses two time domains in the AVETO Toolbox.There is **no phase or rate correction** between the two domains

Working Clock Domain

- provides the time base for measurement and synchronization tasks
- makes optimal use of hardware structures
- synchronized via gPTP (IEEE 802.1AS) over Ethernet based network connections
- integrates into domain 1, defined in the IEEE 802.1AS-2020 standard
- clock runs interference free from global influences, such as a GPS synchronization

TAI Clock Domain

- is considered as an external reference to events in the extended system network
- synchronized via gPTP (IEEE802.1AS) or optionally via PTP (IEEE1588v2-Industrial Profile)
- temporal assignment of acquired measurement data is possible
- domain 0 is used for a global temporal correlation of measurement data

Learn how to level up time accurancy