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The Need for Multi-Gigabit Speeds for In-Vehicle Connectivity

John Michalik
Director, Business Development

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Fabless Semiconductor Company

Smart Connectivity
Across several markets, with superior physical layer (PHY) technology

Leader
ProAV market, with thousands of HDBaseT-enabled products, millions of chips delivered, YoY growth & highly profitable

Innovator
High-speed in-vehicle connectivity
On the road by 2020 with Daimler
Baseline for MIPI Alliance's A-PHY standard for video transmission

2006
established

~100
patent portfolio

~330
employees

IL
HQ in Israel

Presence in
8
countries

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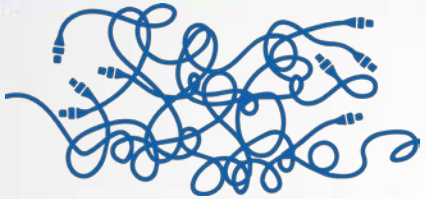
The Pain Points of Wired Connectivity



Too many cables

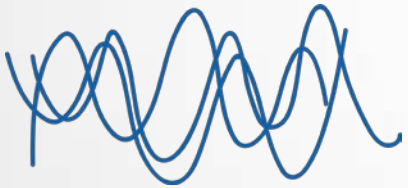
At our homes, offices, plants & vehicles

Distance limitations

Going further without compromising on quality

Installation Complexity

Future-proofing for new interfaces & features



Rough environments

EMC, EMI, temperature changes, cable aging, cable handling

High TCO

Design, development, infrastructure & maintenance costs

Video Resolution

Handling high-throughput, time-sensitive content transmission and latency

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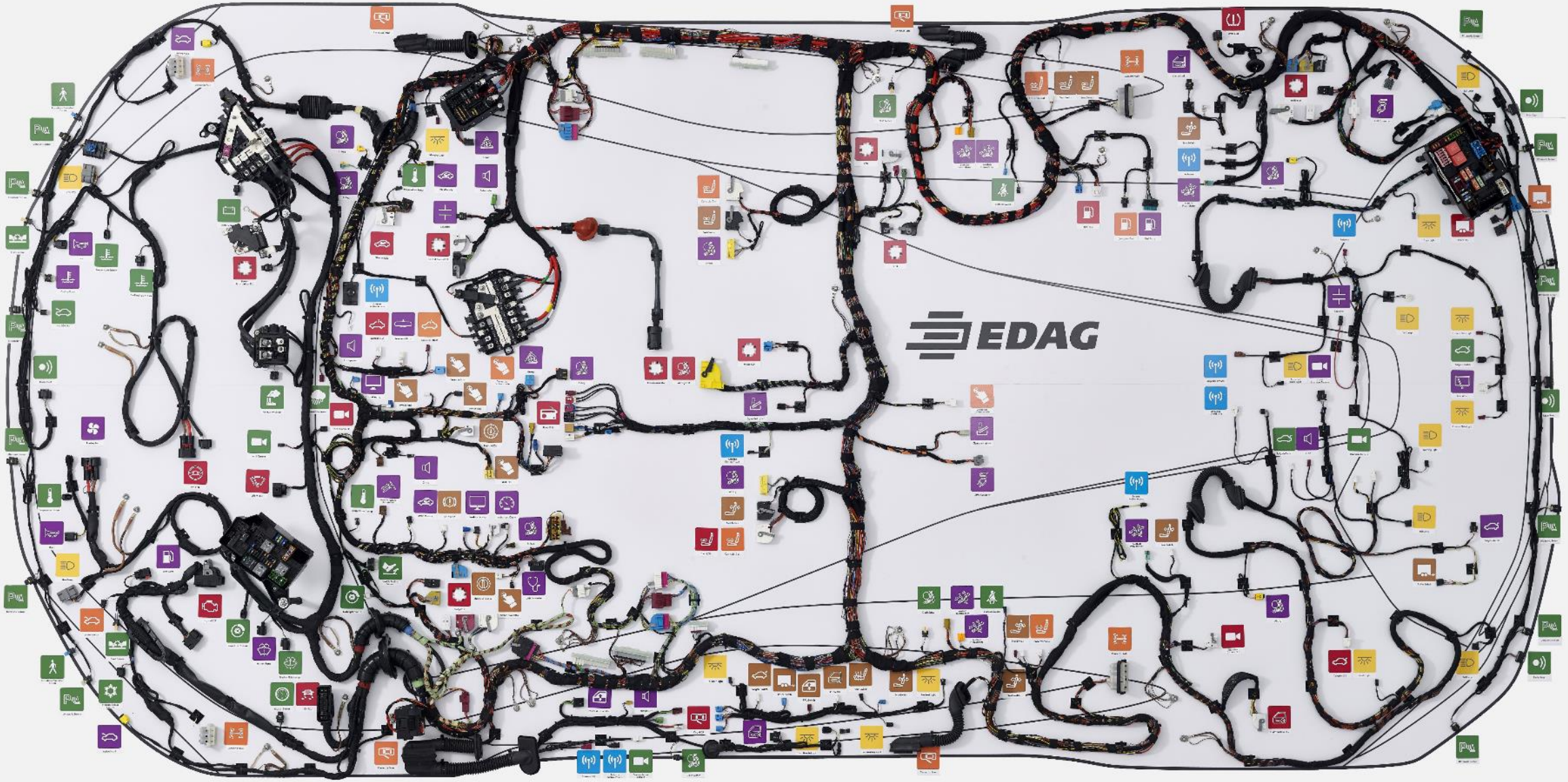
Automotive: Wire Harness Today Weighs Roughly 60kg



Source: EDAG BFFT Electronics

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The Problem Is Real. And Everyone is Talking About It.

Yazaki rethinks wiring for autonomous age

Supplier aims to have vehicles require fewer and lighter harnesses

HANS GREIMEL

TWEET SHARE SHARE EMAIL

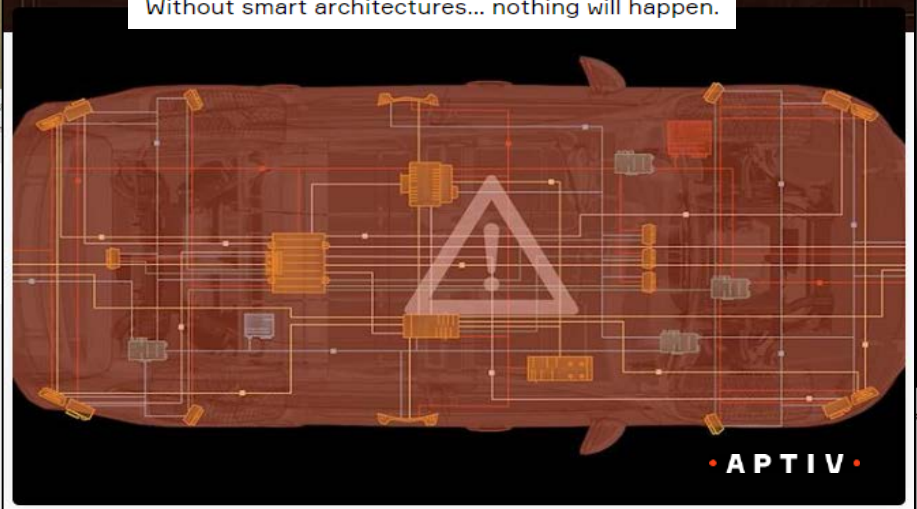
Yazaki r&d chief Noboru Gaeda: To cut weight and bulk, the supplier is turning to aluminum wiring and is considering multiplexing - having one wire car than one signal at a time.

SUSONO, Japan -- These days, a typical luxury car is veined front to rear with miles of electrical cables. Even a compact car can have more than a mile of wire snaking through it. With the advent of connected cars, advanced safety systems and autonomous driving, demand for wiring is set to explode.

CTO Blog: Architecture overload - there's no more room

ARTICLE

May 22, 2018



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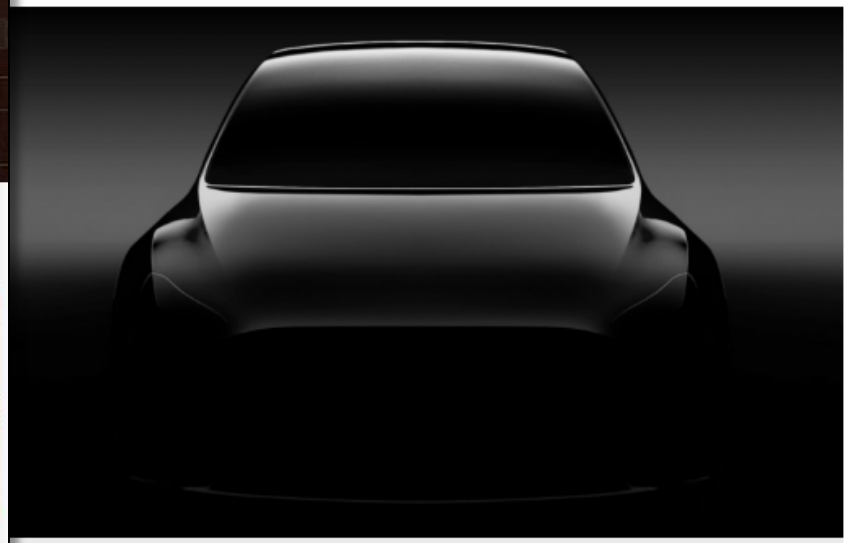
Musk: Tesla will slash wiring on Model Y

LINDSAY CHAPPELL

ust 02, 2017 01:00 AM

TWEET SHARE SHARE EMAIL PRINT



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Requirements for Future In-Vehicle Connectivity

Multi-Gigabit Bandwidth

Connectivity Convergence

Connectivity Convergence

Low Latency

Multi-Gigabit Bandwidth

Cyber Security

EMC/Robustness

EMC/Robustness

Diagnostics

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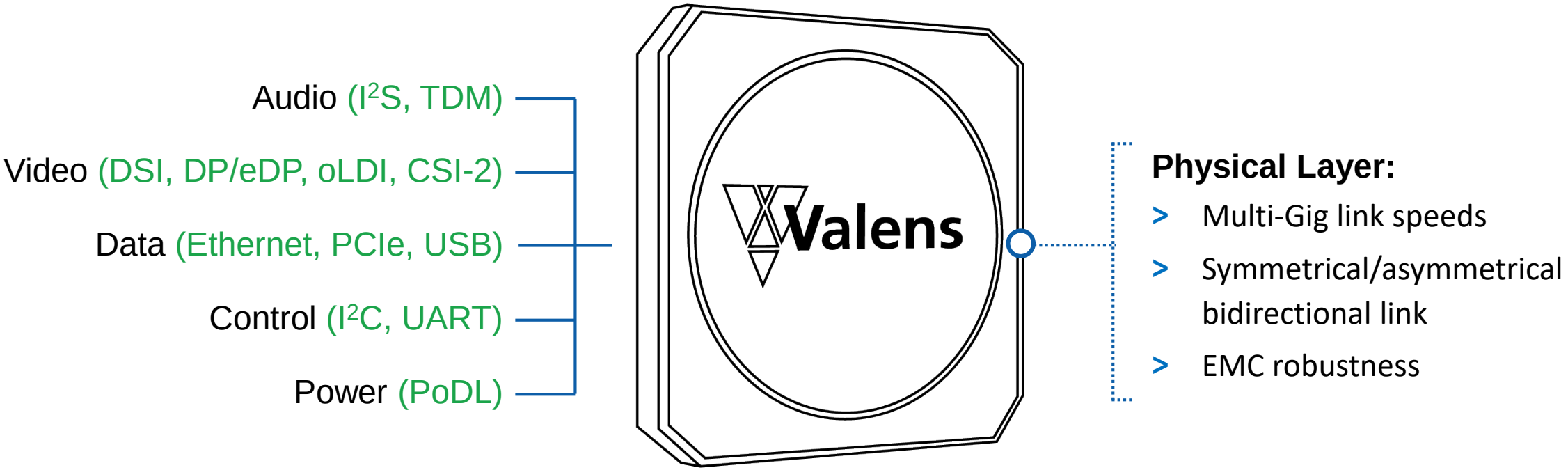
Limitations of Existing Connectivity Solutions

- **Too slow to support advanced architectures** – more bandwidth is needed
- **No common solution** – different use cases require different connectivity technologies
- **No native system convergence** – gateways must be used as data bridges
- **Use costly wiring harnesses** – shielded, expensive wiring is needed to overcome EMC challenges
- **Wiring length is limited** – imposes constraints on system topologies

A CONNECTIVITY REVOLUTION IS REQUIRED.

Valens Chipset:
Smart Connectivity over Simple Wiring Infrastructure



Valens Chipset:
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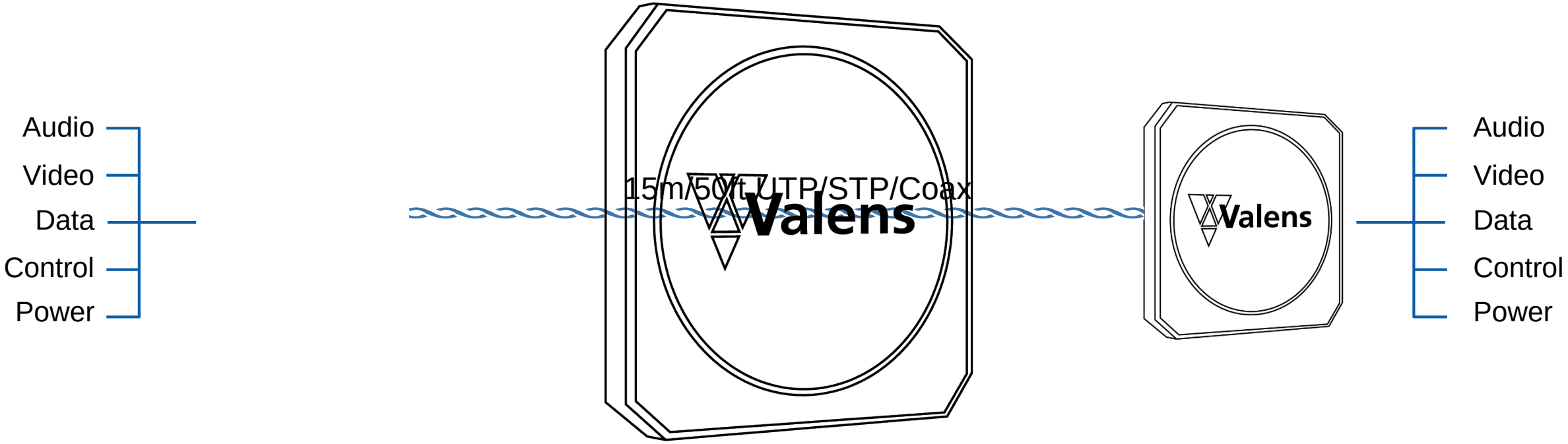
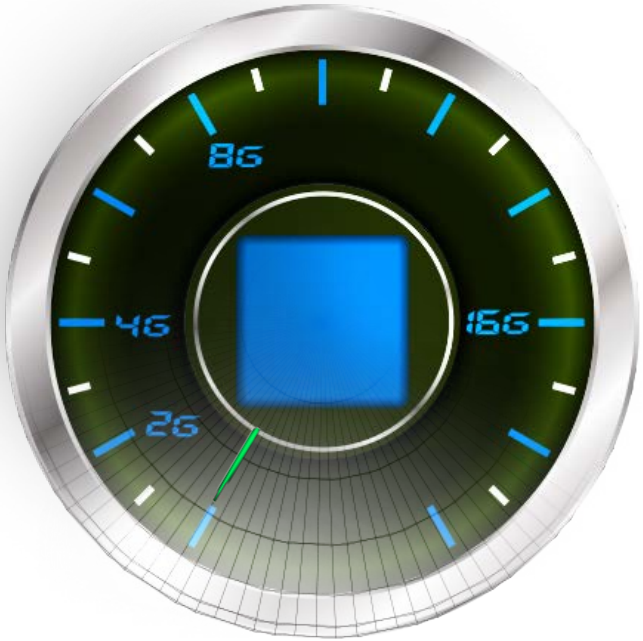


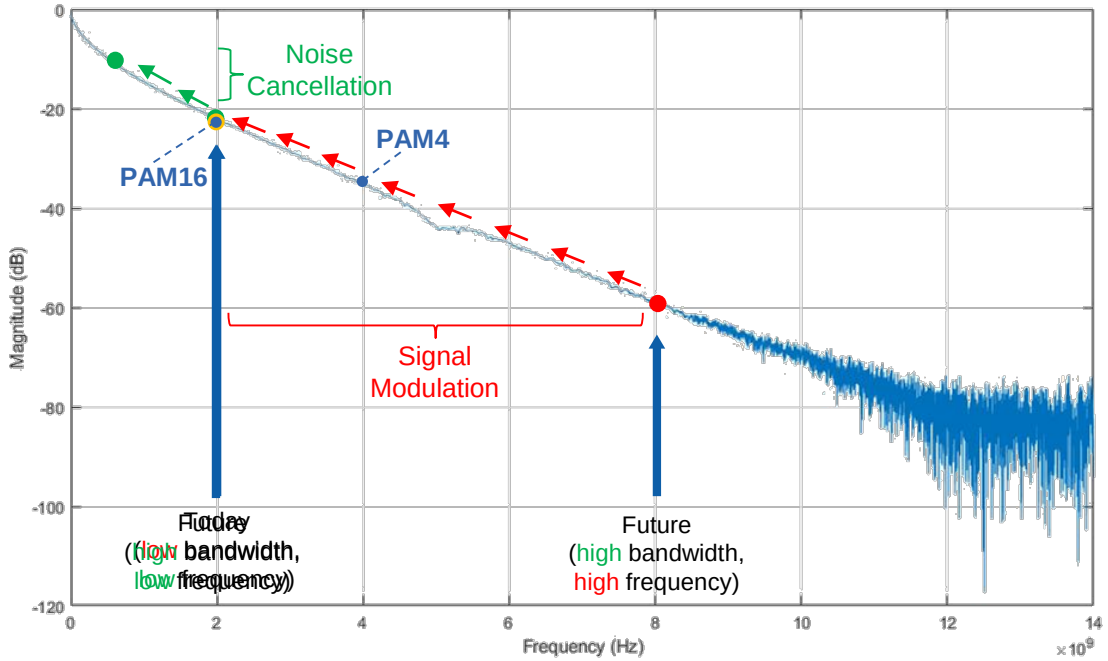
Unprecedented Bandwidth



Tunneling of multi-Gigabit, bi-directional, simultaneous streams of high-definition video & audio, data, USB, and power over a single wire; scalability over multiple wires

Link Bandwidth Limitations: Communication Channel

Insertion loss measurement for typical automotive wire assembly showing degradation of channel with frequency increase



- Signal modulation reduces frequency, enabling higher bandwidth
- Adaptive noise cancellation further improves link capacity

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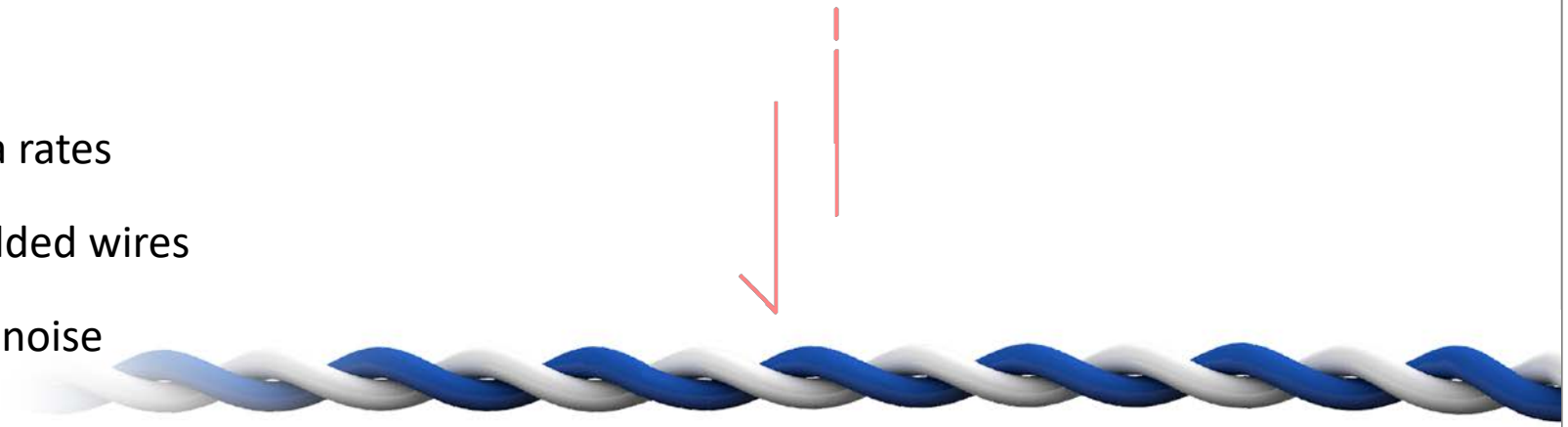
EMC Robustness by Design

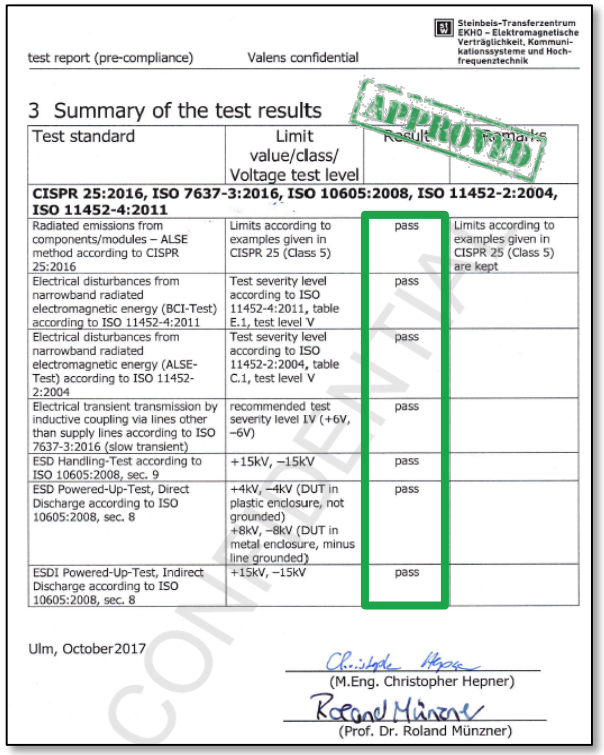
- Other technologies avoid noise as much as possible
  - Fewer levels of coding
  - Transmitting at a lower data rates
  - Use heavier, expensive shielded wires
- Valens' technology "welcomes" noise
  - Sampling the noise
  - Learning where it exists
  - Learning how it behaves



The only technology that meets the harsh EMC requirements while transmitting multi-Gigabit data over UTP

Proven EMC Performance

> Ongoing testing with leading OEMs and Tier-1s worldwide yielding positive results



test report (pre-compliance) Valens confidential

Steinbeis-Transferzentrum EKHO – Elektromagnetische Verträglichkeit, Kommunikationssysteme und Hochfrequenztechnik

APPROVED

3 Summary of the test results

Test standard	Limit value/class/ Voltage test level	Result	Remarks
CISPR 25:2016, ISO 7637-3:2016, ISO 10605:2008, ISO 11452-2:2004, ISO 11452-4:2011			
Radiated emissions from components/modules – ALSE method according to CISPR 25:2016	Limits according to examples given in CISPR 25 (Class 5)	pass	Limits according to examples given in CISPR 25 (Class 5) are kept
Electrical disturbances from narrowband radiated electromagnetic energy (BCI-Test) according to ISO 11452-4:2011	Test severity level according to ISO 11452-4:2011, table E.1, test level V	pass	
Electrical disturbances from narrowband radiated electromagnetic energy (ALSE-Test) according to ISO 11452-2:2004	Test severity level according to ISO 11452-2:2004, table C.1, test level V	pass	
Electrical transient transmission by inductive coupling via lines other than supply lines according to ISO 7637-3:2016 (slow transient)	recommended test severity level IV (+6V, –6V)	pass	
ESD Handling-Test according to ISO 10605:2008, sec. 9	+15kV, –15kV	pass	
ESD Powered-Up-Test, Direct Discharge according to ISO 10605:2008, sec. 8	+4kV, –4kV (DUT in plastic enclosure, not grounded) +8kV, –8kV (DUT in metal enclosure, minus line grounded)	pass	
ESDI Powered-Up-Test, Indirect Discharge according to ISO 10605:2008, sec. 8	+15kV, –15kV	pass	

Ulm, October 2017

(M.Eng. Christopher Hepner)

(Prof. Dr. Roland Münzner)

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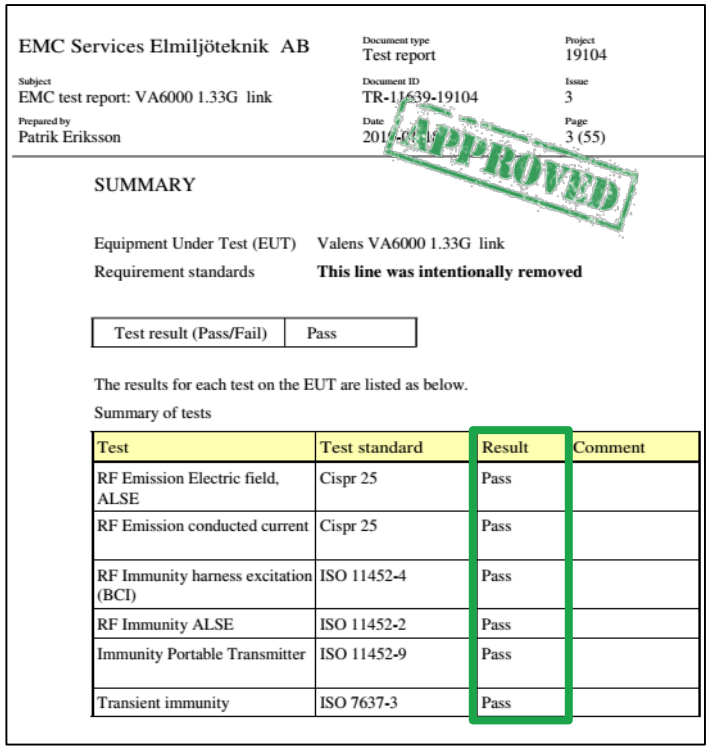
@ Steinbeis Transferzentren GmbH an der Hochschule Ulm, Ulm



EMC Services Elmiljöteknik AB

Document type: Test report

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Subject: EMC test report: VA6000 1.33G link

Document ID: TR-11639-19104

Issue: 3

Prepared by: Patrik Eriksson

Date: 2019-[illegible]

Page: 3 (55)

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SUMMARY

Equipment Under Test (EUT) Valens VA6000 1.33G link

Requirement standards **This line was intentionally removed**

Test result (Pass/Fail)	Pass

The results for each test on the EUT are listed as below.

Summary of tests

Test	Test standard	Result	Comment
RF Emission Electric field, ALSE	Cispr 25	Pass	
RF Emission conducted current	Cispr 25	Pass	
RF Immunity harness excitation (BCI)	ISO 11452-4	Pass	
RF Immunity ALSE	ISO 11452-2	Pass	
Immunity Portable Transmitter	ISO 11452-9	Pass	
Transient immunity	ISO 7637-3	Pass	

EMC Services Elmiljöteknik AB, Sweden

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Delivering Smart Connectivity

- A single technology solution to address all use cases
  - Asymmetric or symmetric links
  - Various multi-gig link speeds
- Convergence of multiple native data interfaces on one link
- Highly robust EMC performance enables 15m/50ft reach over a single wire (UTP/STP/Coax) with up to 4 inline connectors
- Suitable for point-to-point and networking topologies with near-zero latency

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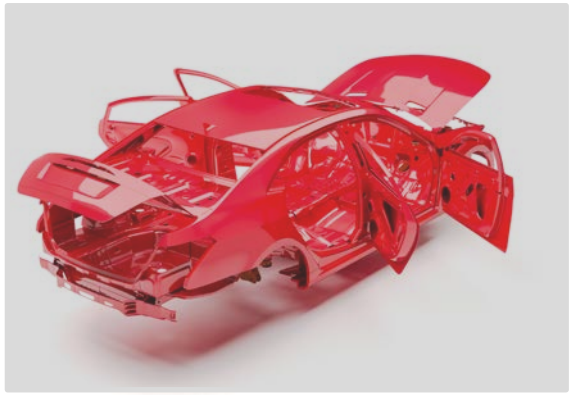
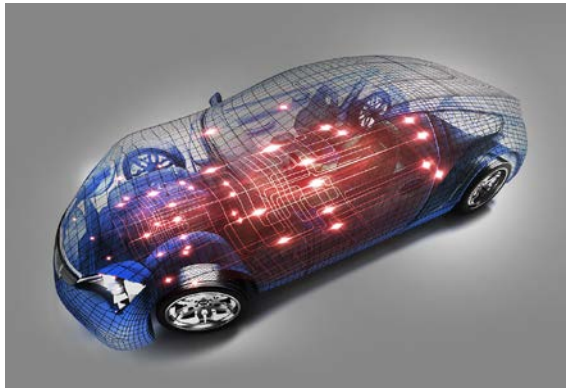
Use Cases

Use Cases

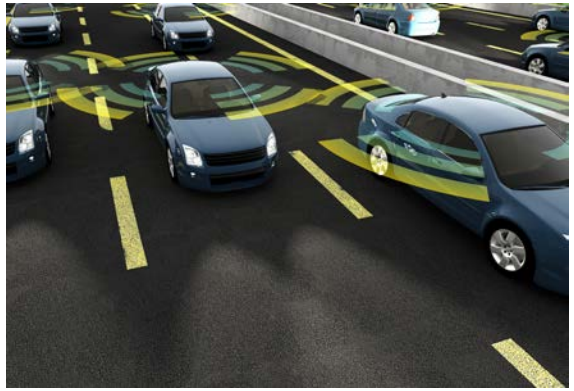


Body/Chassis
Connectivity

Infotainment/
Telematics



High-Performance
Computing



Autonomous

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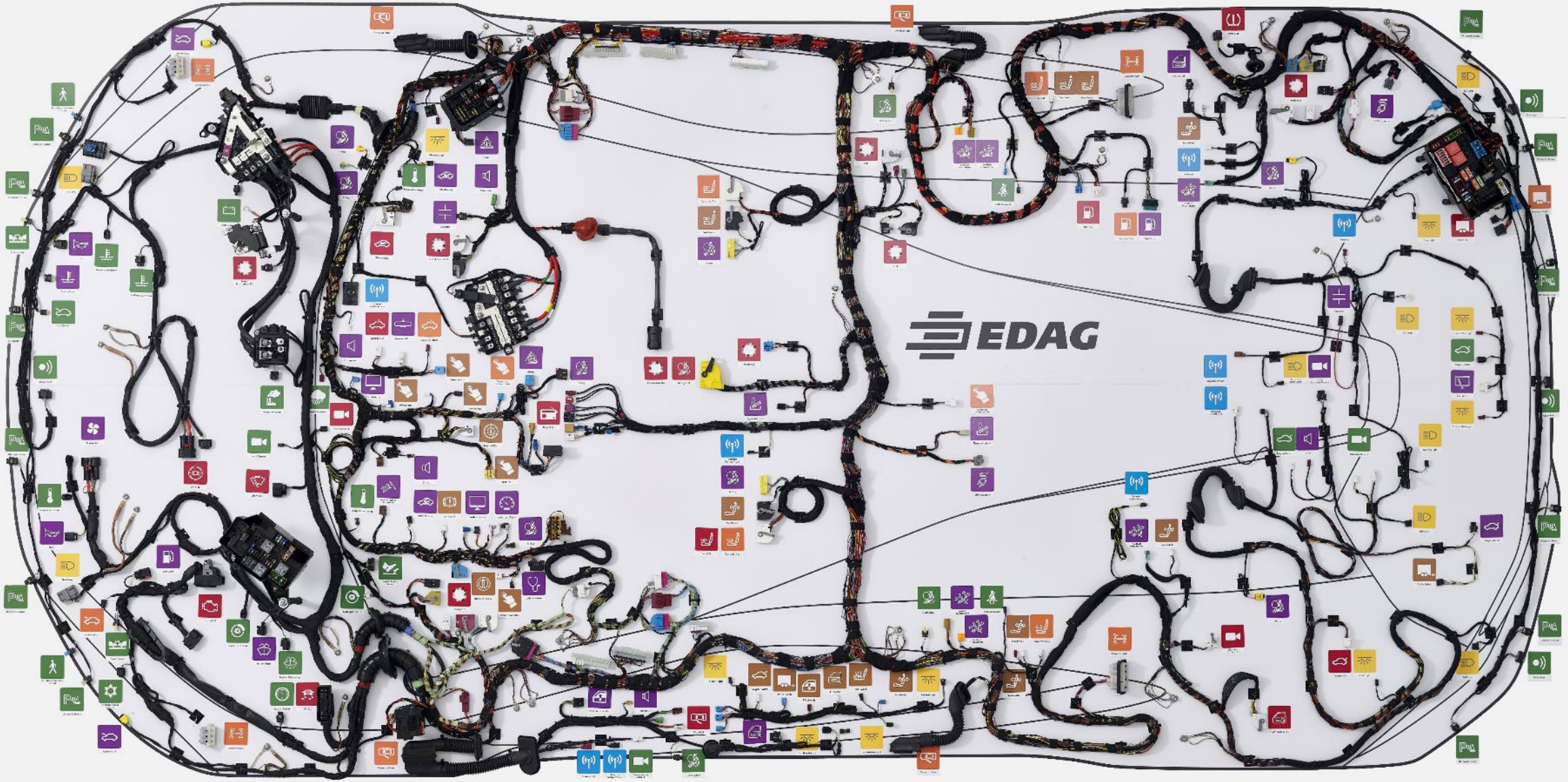
Automotive: Wire Harness Today Weighs Roughly 60kg



Source: EDAG BFFT Electronics

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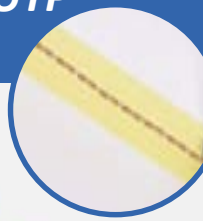
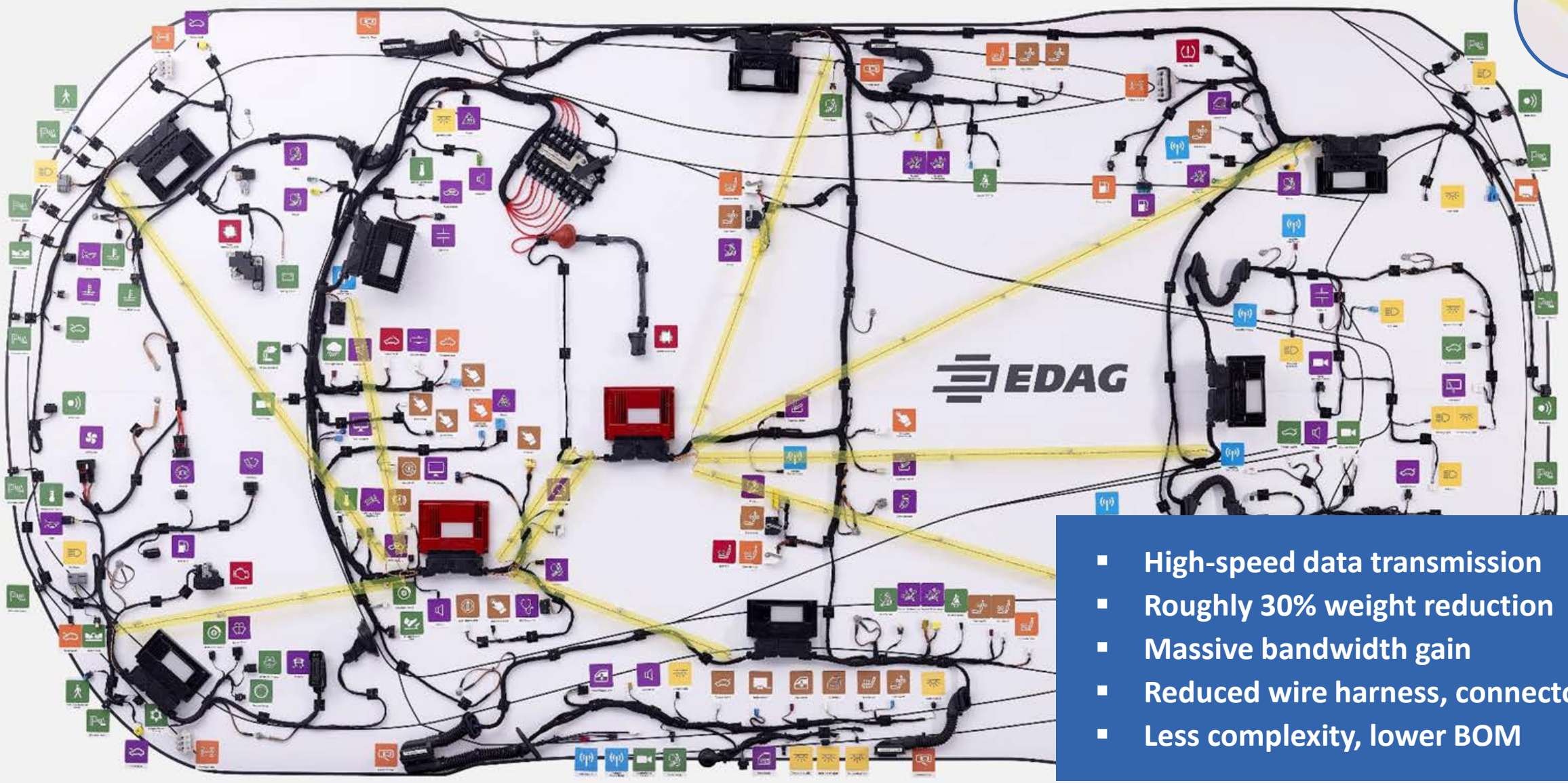
The Industry is Heading to Zonal Architecture

Long-reach UTP



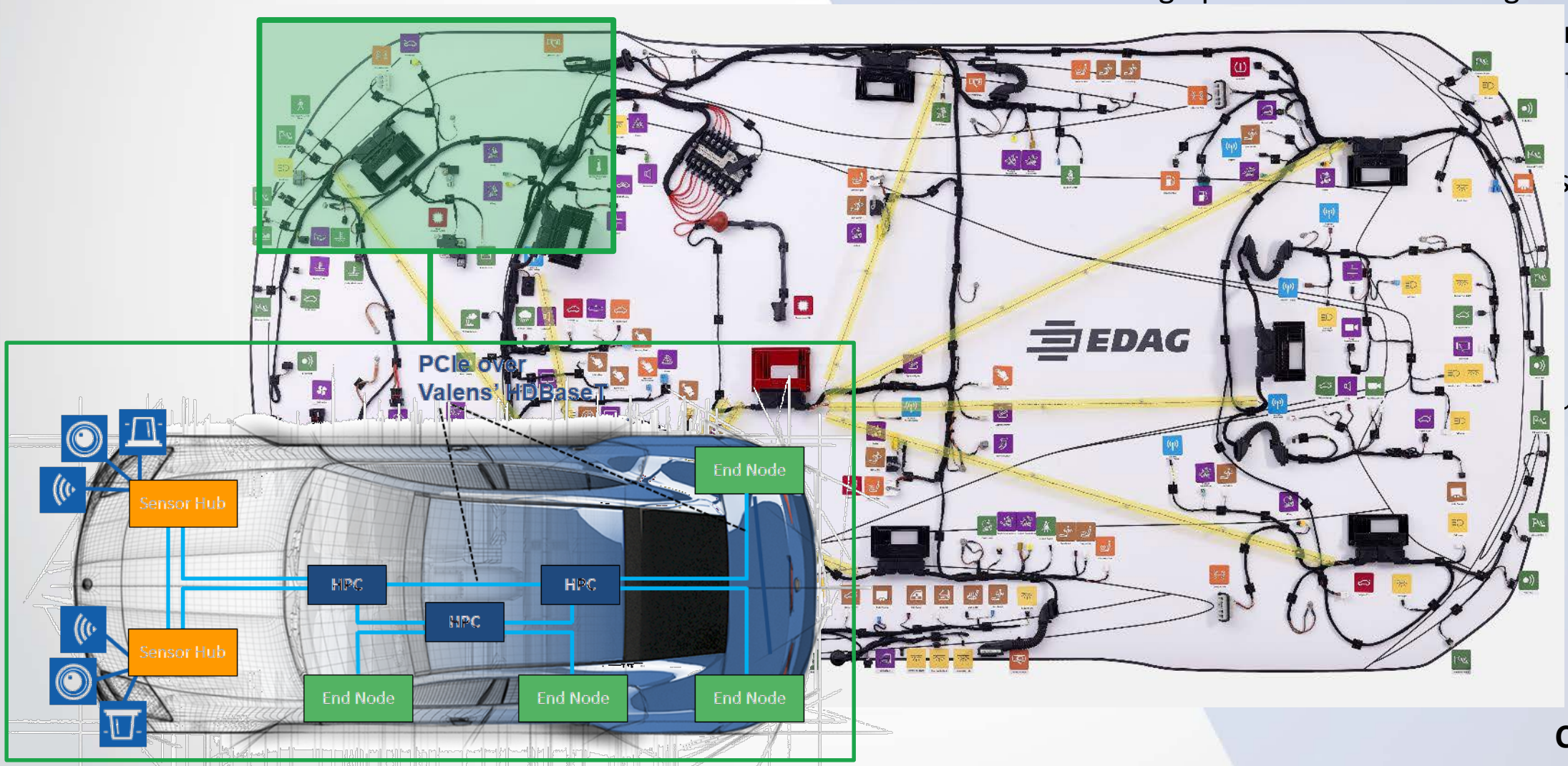


- High-speed data transmission
- Roughly 30% weight reduction
- Massive bandwidth gain
- Reduced wire harness, connectors
- Less complexity, lower BOM

Source: EDAG BFFT Electronics

Example: Valens' Innovative Approach for Zonal Architecture

- High performance with long-range
- nd
- faces
- speeds
- urce



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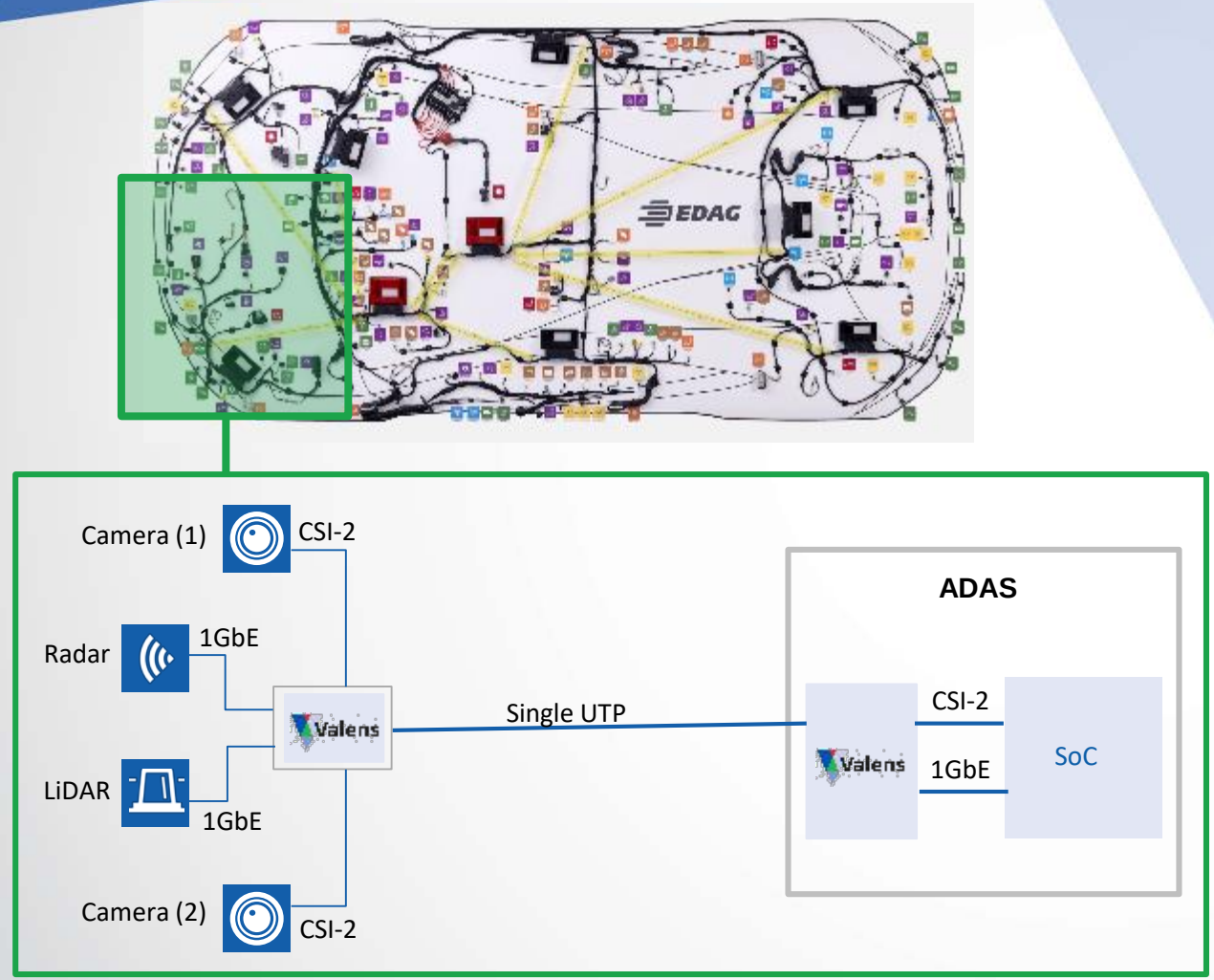
Example: Optimized Sensor Fusion



- Asymmetric multi-gigabit link speeds
- Baseline technology of MIPI Alliance's A-PHY standard
- Near-zero latency
- Point-to-point, sensor fusion and network topologies
- Clock synchronization
- Low power consumption

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HDBaseT & Automotive Ethernet: No Need to Choose

- Co-existence of numerous technologies to address different applications and technological requirements
  - Symmetric vs. asymmetric
  - PCIe more suitable for direct memory access
- Valens is already an enabler for high-speed Ethernet within vehicles
  - VA6000 with 1Gbps Ethernet in production for smart antenna connectivity in Daimler vehicles
  - 2.5Gbps Ethernet over UTP – a first in the market
  - No need to relax channel requirements

Thank You

john.michalik@valens.com

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