DRIVING AND BEING DRIVEN.

THOUGHTS ON FUTURE MOBILITY AND TECHNOLOGICAL DRIVERS.

MPSoC 2017, Annecy, France I 20170706

BMW GROUP THE NEXT 100 YEARS

Rolls-Royce Motor Cars Limited

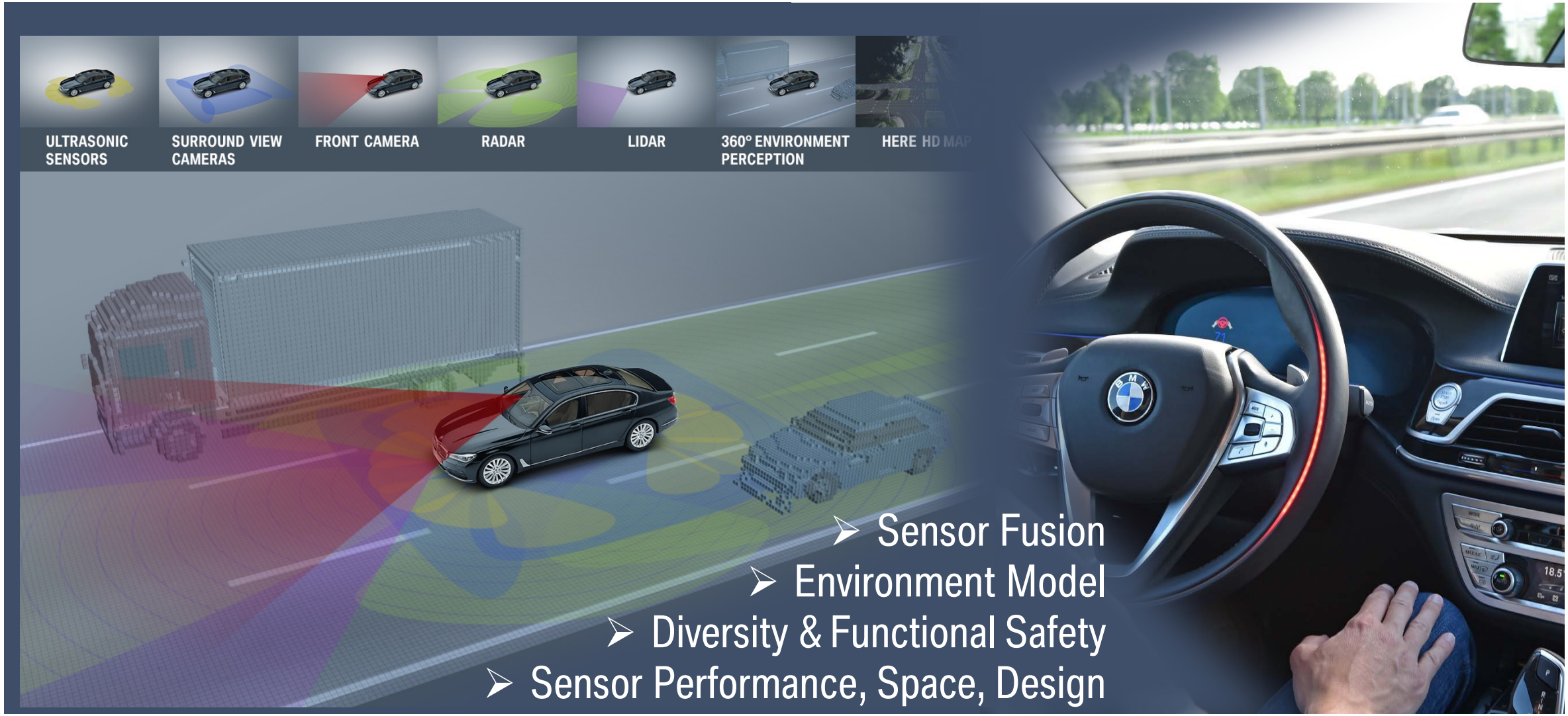
BMW GROUP – GLIMPSE INTO THE FUTURE WITH VISION VEHICLES.

THE NEXT
100 YEARS

ACES – A CORE ELEMENT OF BMW'S STRATEGY NUMBER ONE > NEXT.

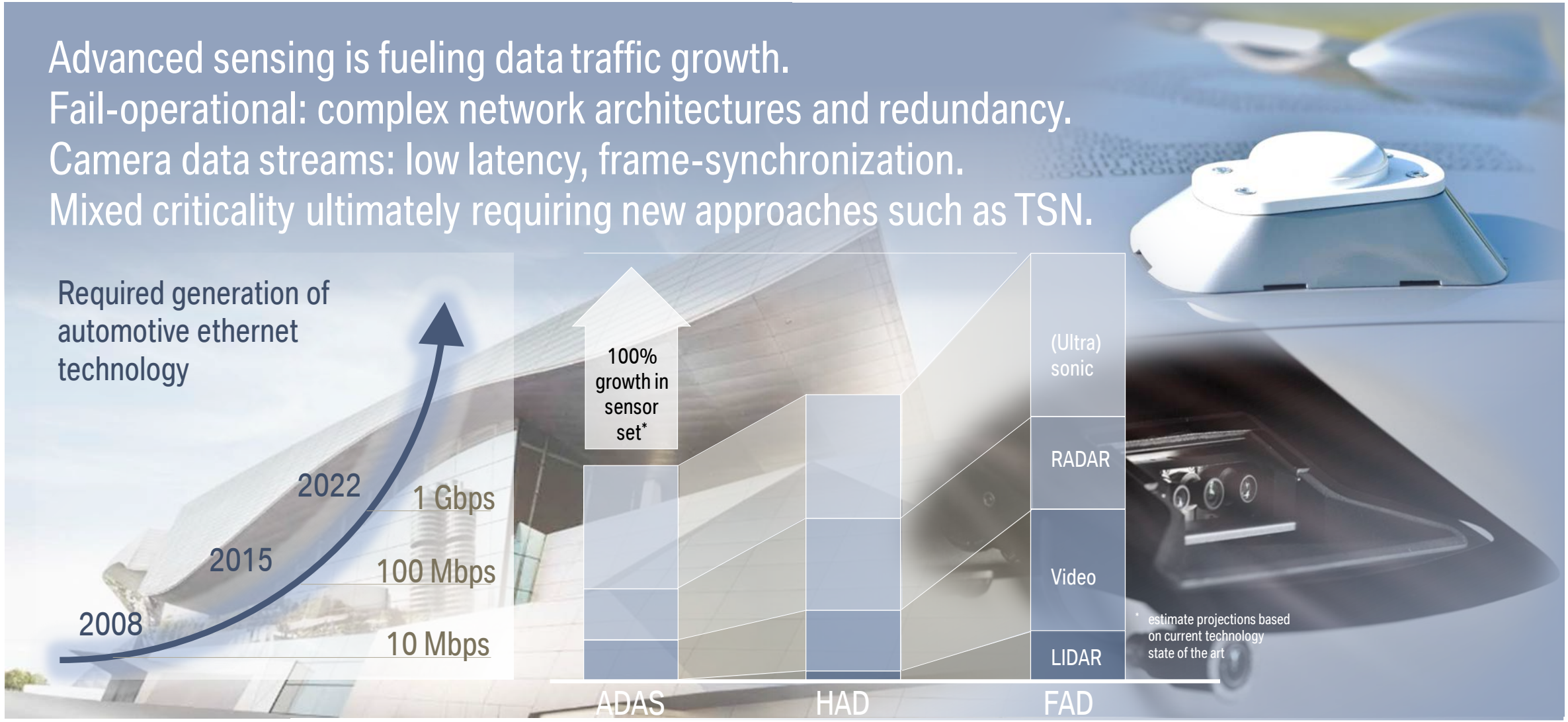
THE NEW BMW 5 SERIES.
COMFORT AND SAFETY AT THE HIGHEST LEVEL.

VEHICULAR PERCEPTION REQUIRES DIVERSE SET OF SENSORS.



ONBOARD DATA TRAFFIC WILL CONTINUE TO GROW.

Advanced sensing is fueling data traffic growth.
Fail-operational: complex network architectures and redundancy.
Camera data streams: low latency, frame-synchronization.
Mixed criticality ultimately requiring new approaches such as TSN.



INTERNET-OF-THINGS.
DIGITAL IMAGES OF THE WORLD IN REAL-TIME.

CONNECTED.
ECOSYSTEMS AND INTELLIGENT SERVICES FROM THE CLOUD.

BEING DRIVEN: CAR AS A LIVING SPACE.

Electric drivetrain architecture will make possible entirely new interior concepts.

Advanced functions of occupant monitoring demanding new sensors and compute power.

Smart interaction (voice, gesture, gaze…) for every passenger / seat: affective computing and artificial intelligence.

FUTURE INTERIORS.
MORE SPACE, NEW CHALLENGES.

Mixed-Criticality applications on one shared screen.

Emphasis on intelligent interaction via voice, gesture, gaze, …

Reliable intent detection.

COGNITIVE CAR.
NATURAL INTERACTION AND INTELLIGENT PERSONAL ASSISTANCE.

Vision for a fully immersive user interface

Boost and Ease:

- Drive (with all help you want) or Be Driven (at ease)

Augmented Reality

Natural and intuitive multi-modal interaction

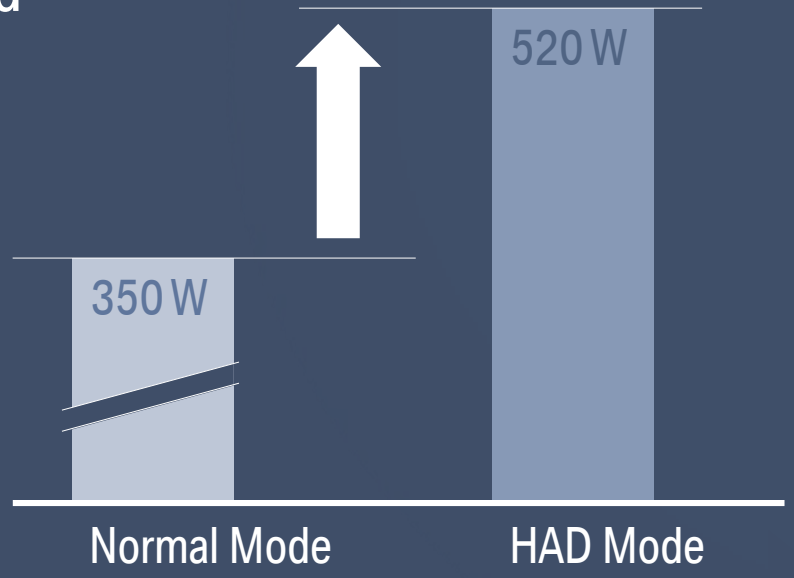
Affective Computing

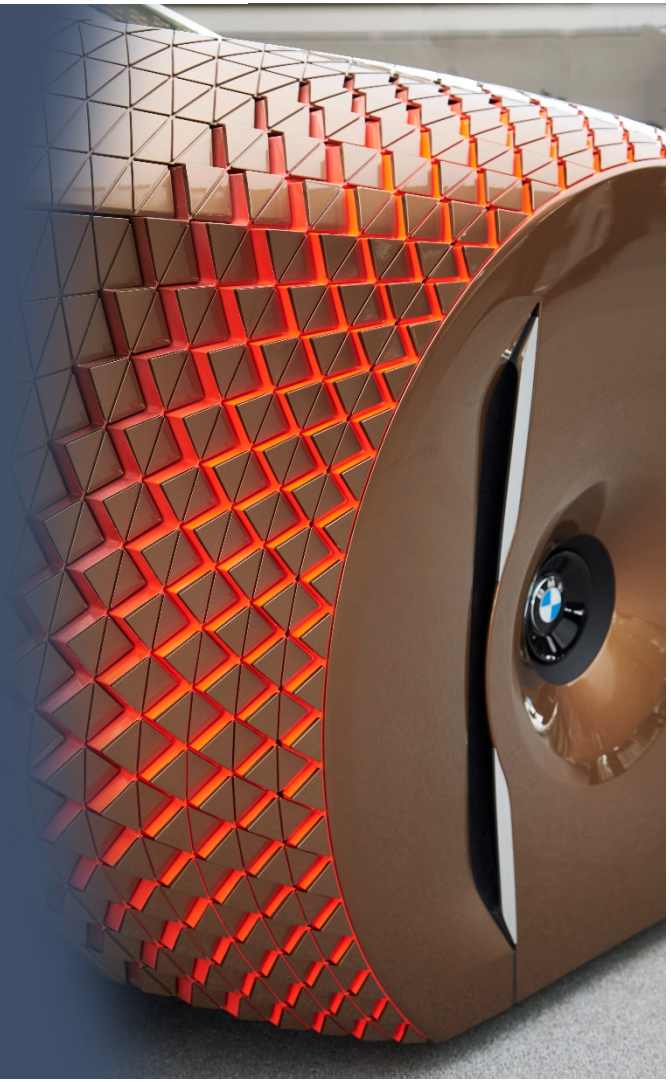
Intelligent Personal Assistant: context-aware, learning, proactive

ELECTRICAL POWER CONSUMPTION ON THE RISE.

New compute-heavy functions driving energy consumption of the onboard network.

Highly automated driving mode expected with up to 50% higher power load* compared to normal mode.





* estimate projections based on current technology state of the art

SECURITY AND PRIVACY BY DESIGN.

Security for the onboard network
Security for the cloud
Privacy: customer expectations and legal requirements

Example BMW Car Data: give more control to customers.

INTERNET-OF-THINGS.
FUELING SERVICES FOR THE NOW-ECONOMY.

POWER AND DATA: NETWORKS MERGE.

Functional Safety:

Highly or Fully Automated Driving requires redundancy also for energy.

New requirements for fail-operational energy distribution, fault-protecting control of energy flows, and diagnostic coverag of energy storage.

Mixed criticality flows also on the energy network.

Future power and data networks have to engineered in a more wholistic approach.

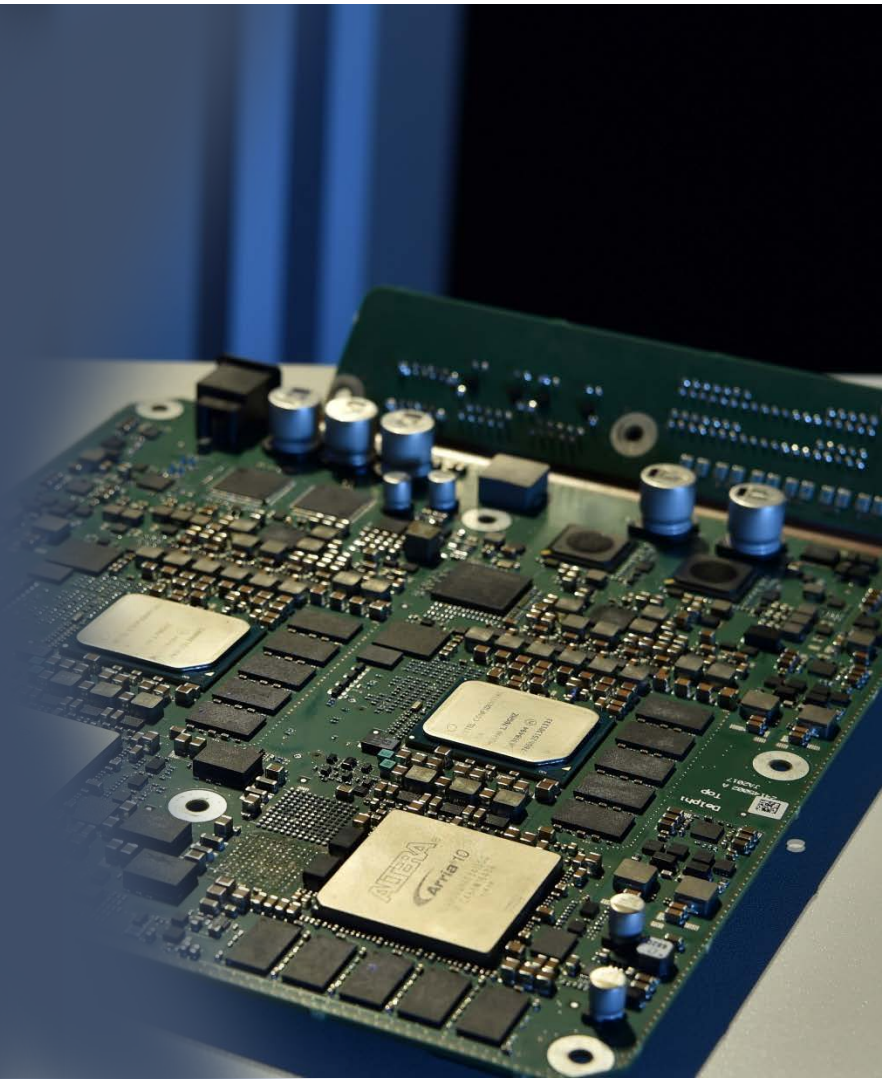
New synergies may arise.

FROM ECU TO COMPUTE PLATFORMS.

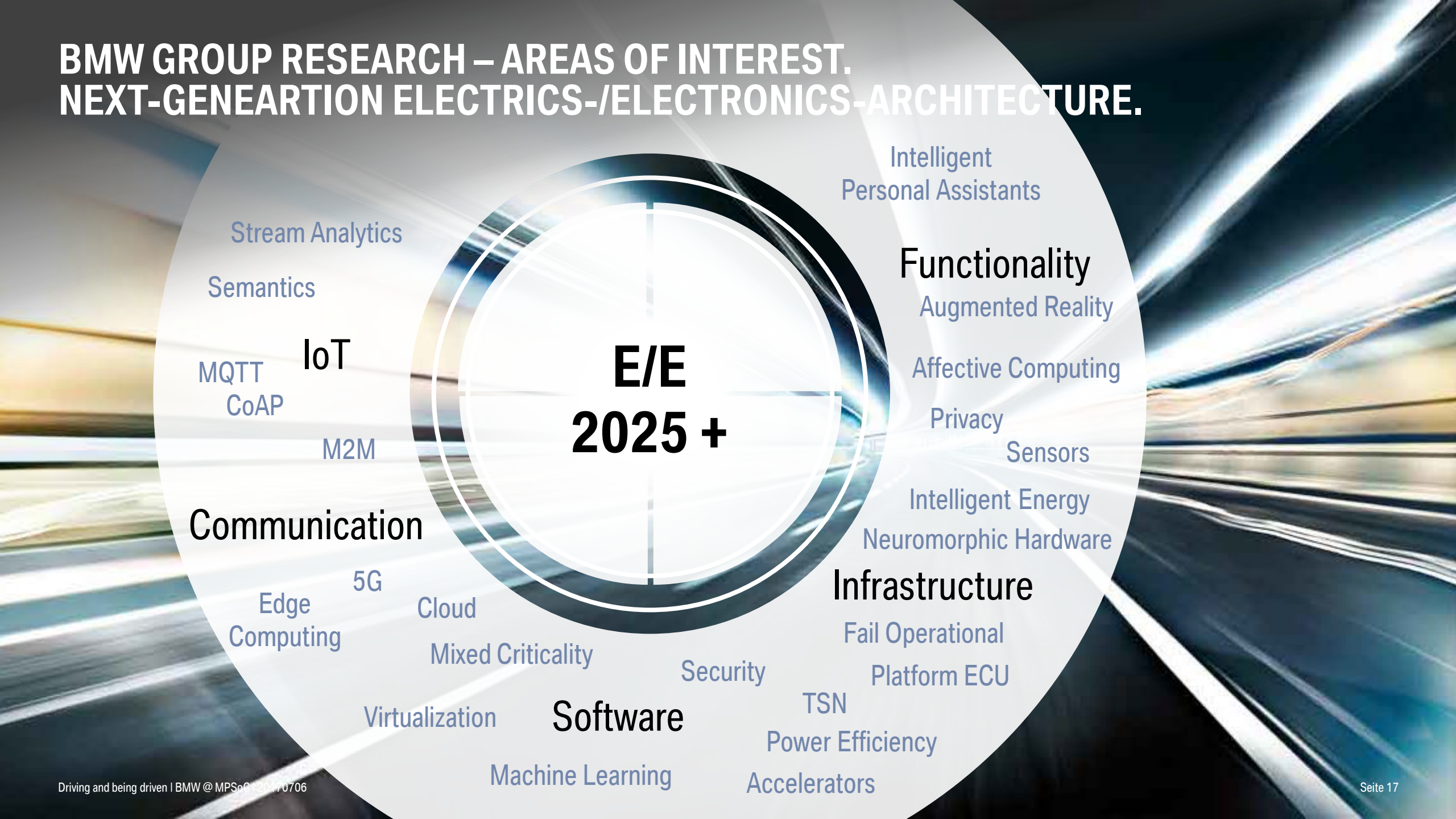
Cars become a mobile datacenter:
backbone networks, compute platforms, analytics, cloud integration …

Classical single-purpose ECUs complemented (and replaced) by embedded high-performance compute servers

- Mixed criticality
- High-Performance, high protection
- Fail-operational system-level redundancy
- Energy efficiency
- Integrate protected Ethernet



BMW GROUP RESEARCH – AREAS OF INTEREST.
NEXT-GENEARTION ELECTRICS-/ELECTRONICS-ARCHITECTURE.



SUMMARY.

Autonomous, Connected, Electrified, Sharing/Services.

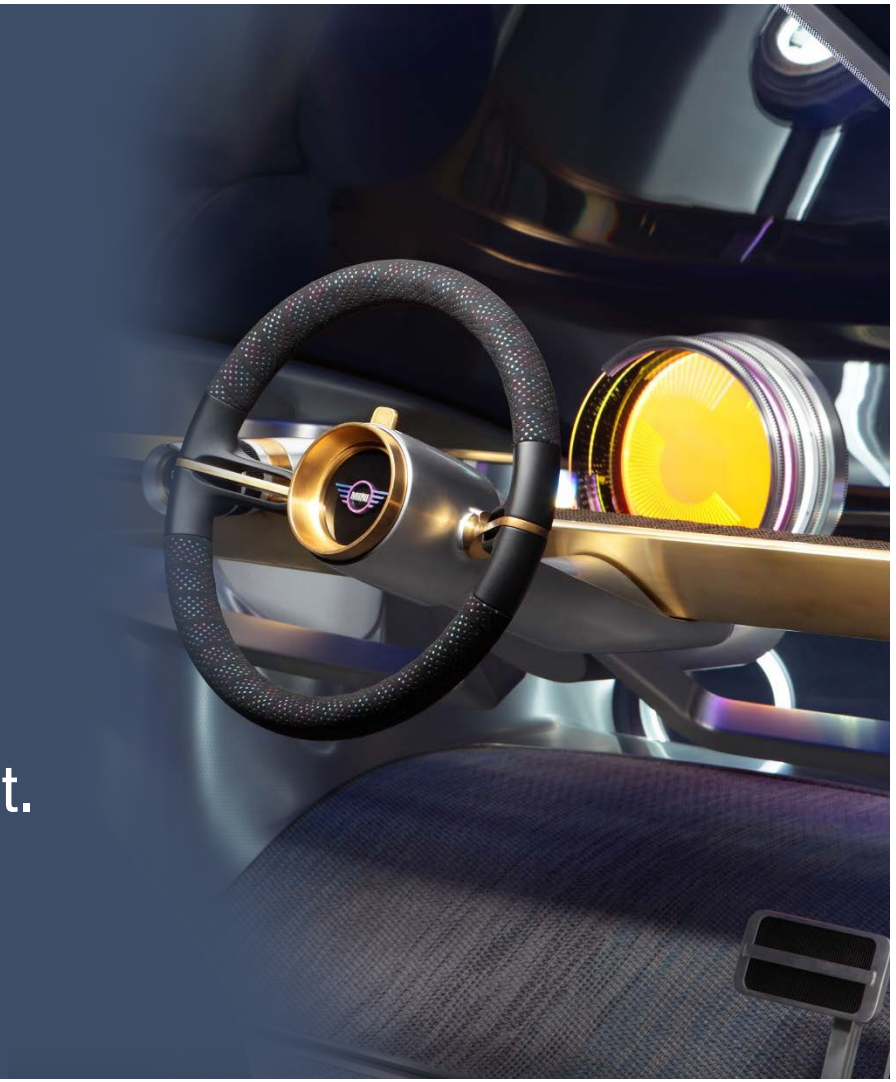
Cars become a mobile datacenter:
backbone networks, compute platforms, analytics, cloud integration …

The Internet-of-Things is at their heart.

Sensors and artifical intelligence are among the future key technologies for highly automated driving.

Energy: put the power into mileage instead of dissipating it.

Functional Safety puts fail-operational requirements on many additional components.



THANK YOU.

THE NEXT
100 YEARS