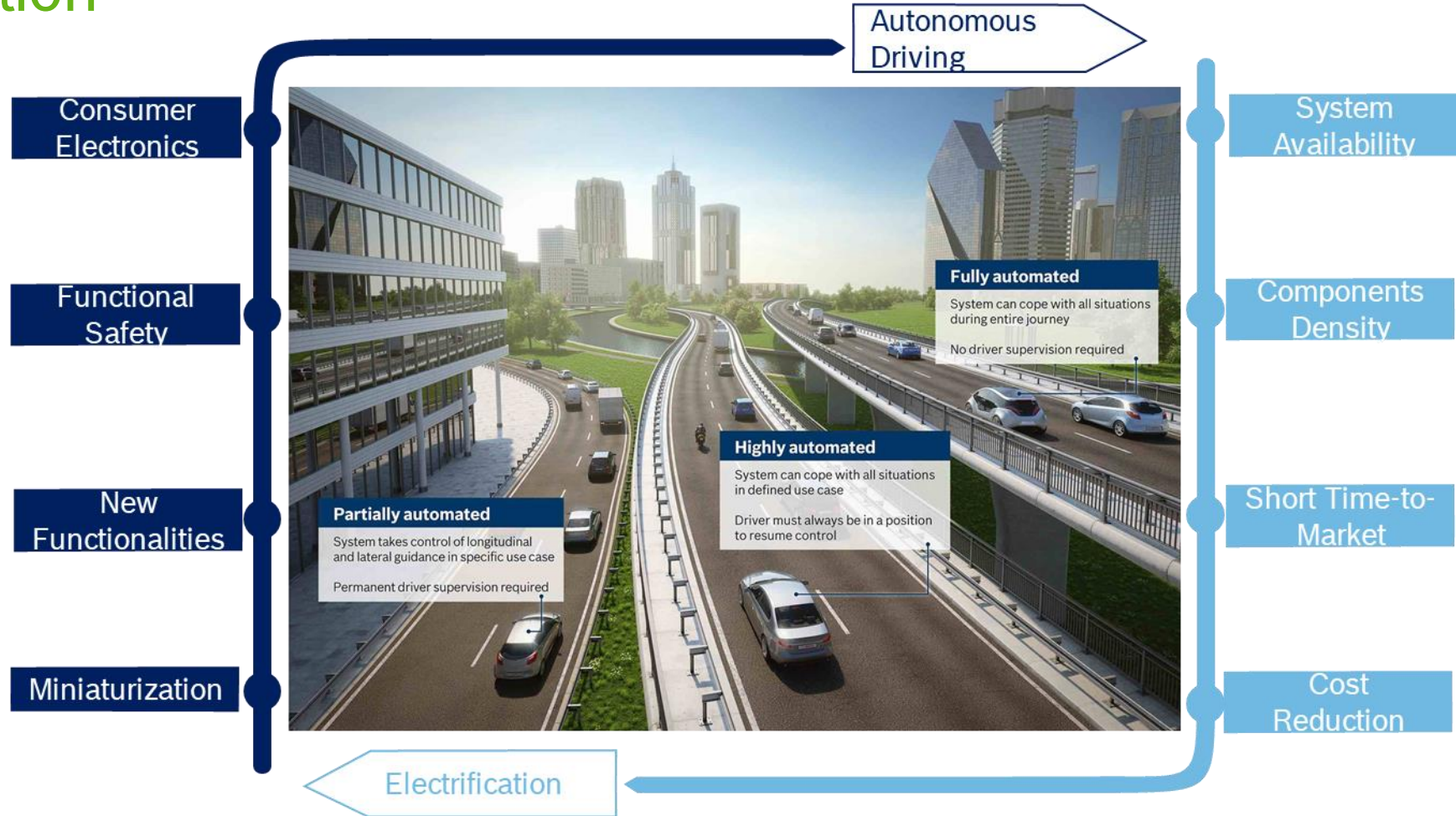


SENSORS AND PACKAGING FOR AUTONOMOUS DRIVING

Przemyslaw Gromala

Sensors and packaging for autonomous driving

Motivation

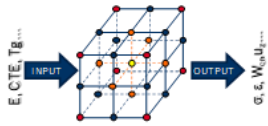


Sensors and packaging for autonomous driving

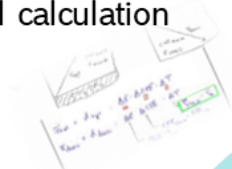
Simulation driven design

Virtual DoE

FEM VDoE – statistically based recommendation for Bill of Materials and/or geometry



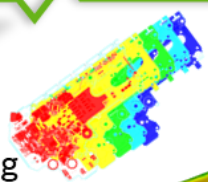
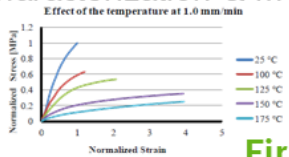
Analytical tools – very first prediction based on analytical calculation



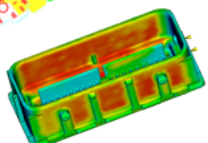
Qualitative reliability prognosis of thermo-mechanical behavior

Material modeling

Material characterization – detailed material characterization & modeling



Homogenization – consideration of the substrate's layout



Fiber reinforced plastics – orientation of the fibers in connectors

First and mandatory step for quantitative prediction

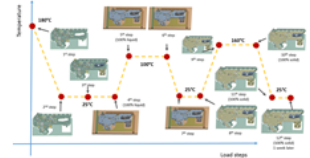
Effective & adaptive methods for specific project's phases

Multi-domain simulation

Multi-scale – from system level to failure in design element



Multi-domain – residual stresses, more accurate prediction

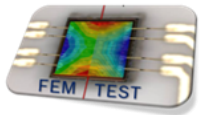


MOR - Fast and precise calculation method, enabling technology for further optimization

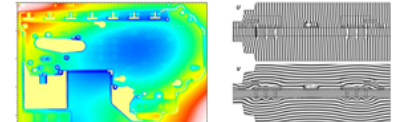
Validation

Reliability prognosis on design element level

Stress / strain – lifetime modeling

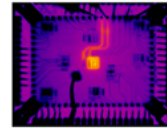


Deformation – CTE mismatch



Validation and verification improves understanding of the system behavior

Temperature – thermal performance

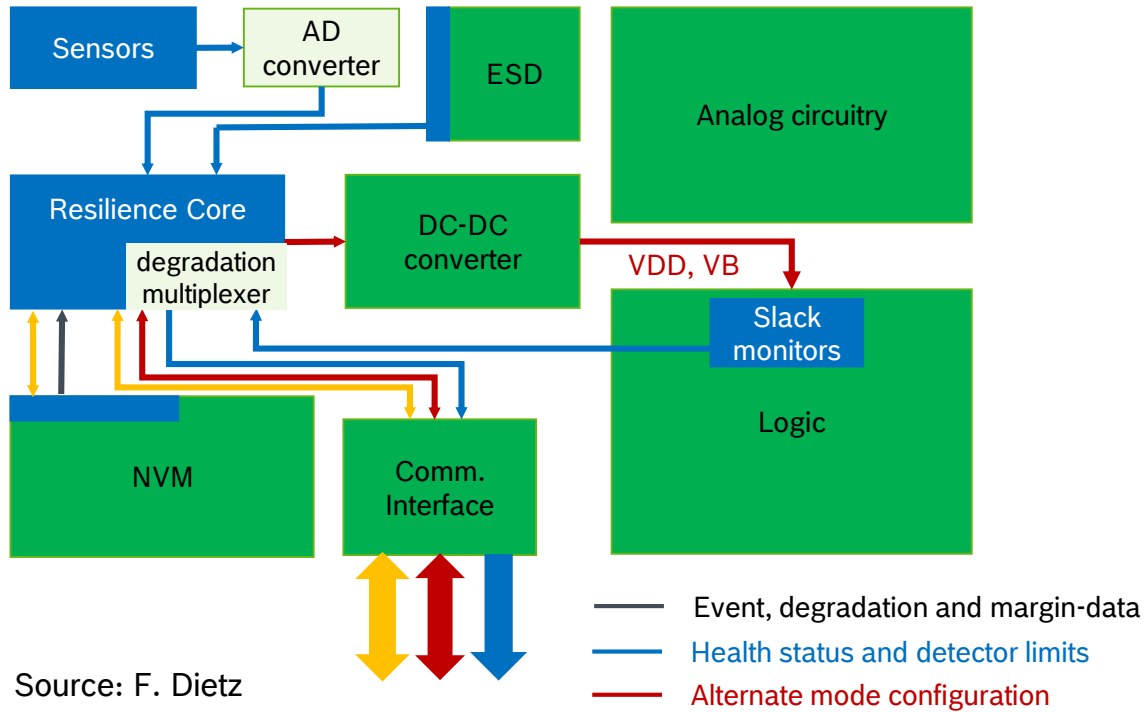


Virtual pre-qualification as a design method

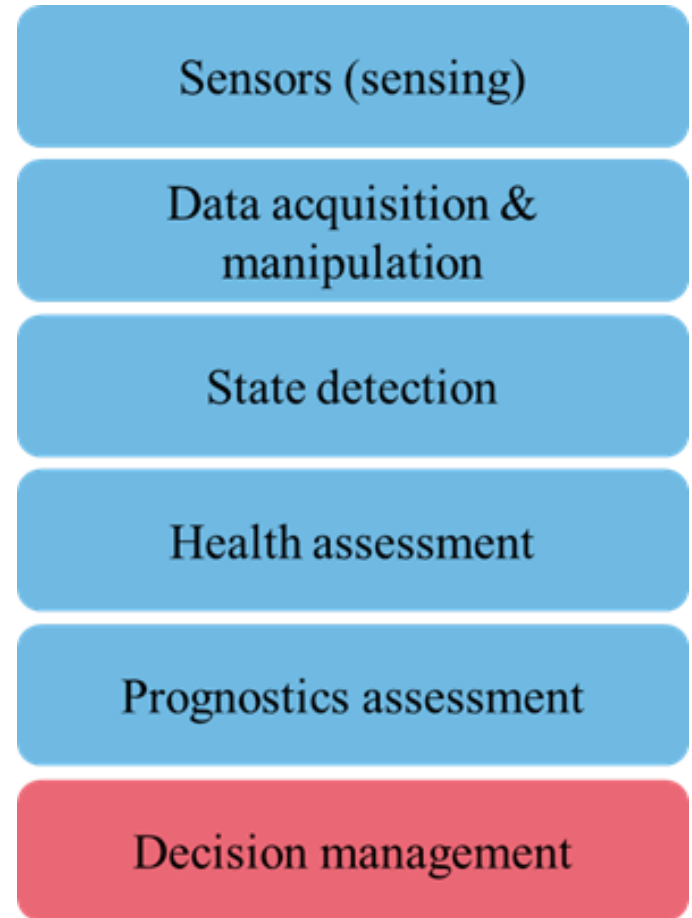
3rd Generation of Reliability for Electronic Smart Systems

PHM and resilience

1. Sensors and detectors
2. Resilience core and communication interface



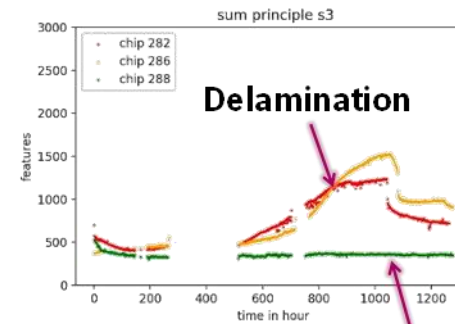
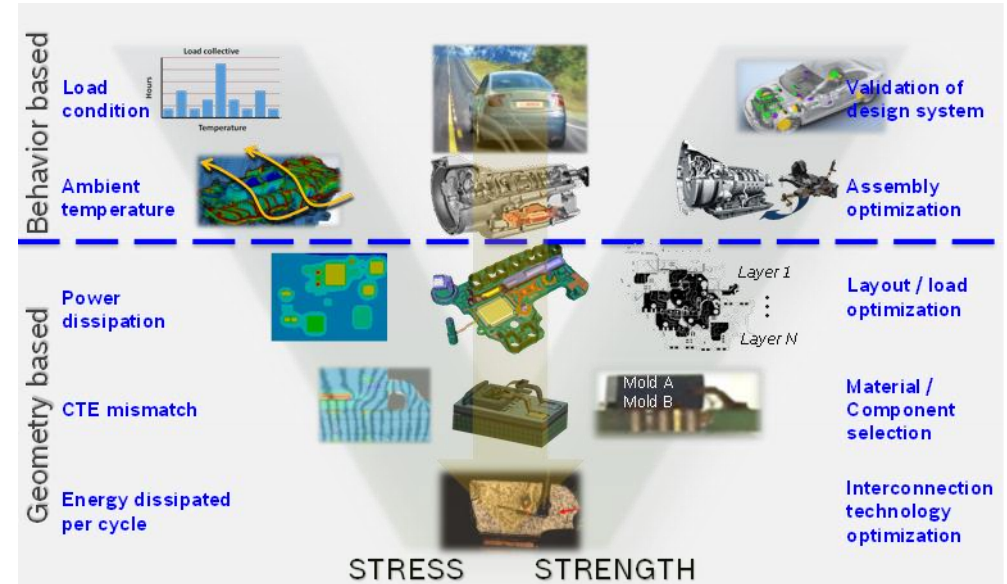
Source: F. Dietz



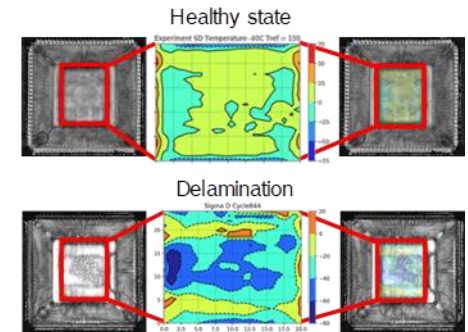
Sensors and packaging for autonomous driving

The top 3 items to be accomplished in the next 5 years

- ▶ Chip / board / module / system interaction → standard definition for tool chain and data exchange
- ▶ Variability and uncertainty → multi-objective optimization, stochastic methods, I4.0
- ▶ Artificial intelligence and machine learning → usability in daily engineering tasks, predictive maintenance



Healthy



Source: A. Prisacaru

