2ND NEREID WORKSHOP
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AUTOMOTIVE TRENDS

(PUBLIC VERSION)

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Future Mobility

costs hybrid e-motor
eBike power electronics

electrified

plug-in eScooter range
fun-to-drive battery
charging infrastructure

legislation driver assistance
emergency braking autopilot

automated

highway-pilot sensors
redundancy electric steering
valet parking

electronic horizon
smartphone integration

connected

eCall cloud
services fleet management
car2car augmented reality

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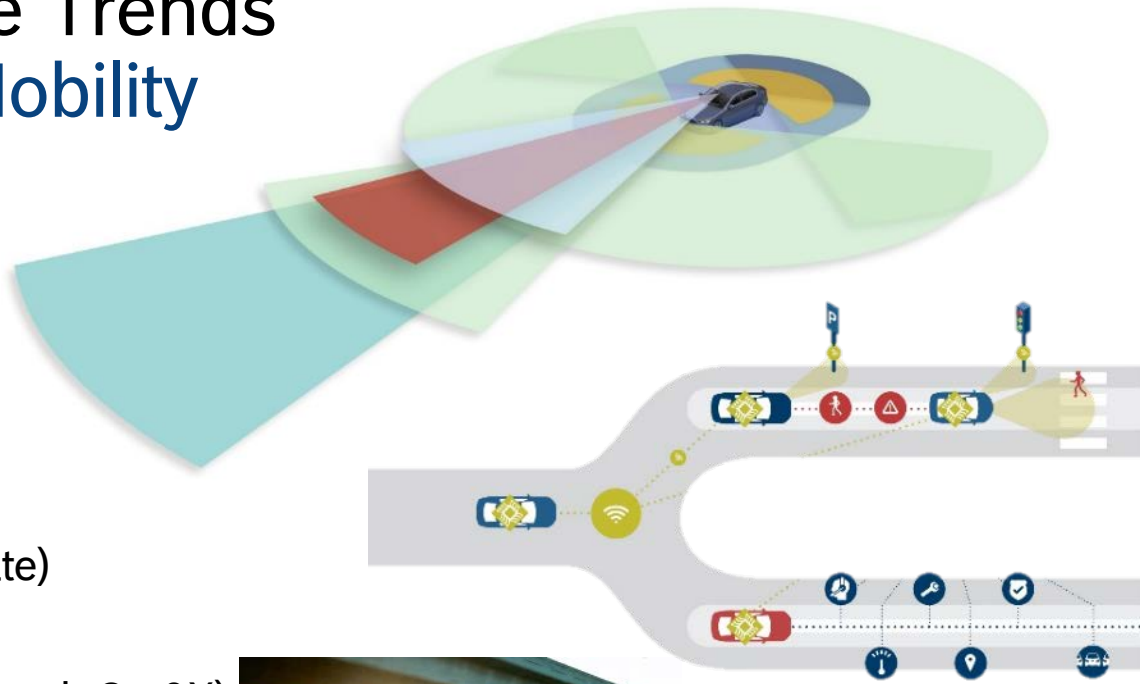
Key selling features for Smart Mobility



- Advanced Driver Assistance Systems
  - complex data processing
  - multi-physics sensing: RADAR, Video and Lidar
  - functional safety
- Comprehensive Vehicle Connectivity
  - onboard communication architecture (high data rate)
  - client connections (ECUs)
  - wireless/mobile network access (Car2Car, Car2Cloud, Car2X)
- Autonomous Driving Vision
  - highest degree of integration (data, sensing, connectivity)
  - highest demand on functional safety

- Features have direct Impact on Driver's Perception, Comfort and Safety

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Market/Customer Expectation and Consequences

- Automobile requires highly integrated solutions with the latest technology, packaging features
- Longer development cycles are not acceptable (even need to be faster)
- “Design-Build-Test-Optimize”-Cycles no more feasible and/or competitive (full sim needed)
- Automotive Reliability to be met, reliability requirements are pushed to even higher levels, redundancy, health monitoring and resilience strategies will be crucial (in hardware & software)
- Functional safety mandatory and increasing
  (partially automated –> fail safe, highly automated/autonomous –> fail operational)
- marketable costs require to “squeeze” the max out of technologies and to use redundancy in a smart way

- The capability for rapid selection & introduction of new technologies is key to be competitive

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Working Mode

- Current automotive market
  - adoption of stabilized technologies
  - deployment of technology platforms
  - known physics of failure and lifetime models
  - standardized design, testing and qualification strategies

established

- New Applications
  - advanced technologies (More-than-Moore, heterogeneous integration)
  - multiple technologies to be combined, tailored solutions
  - multi-domain co-design
  - early adoption (low maturity, early learning curve)

challenge

- New design, testing and qualification strategies required

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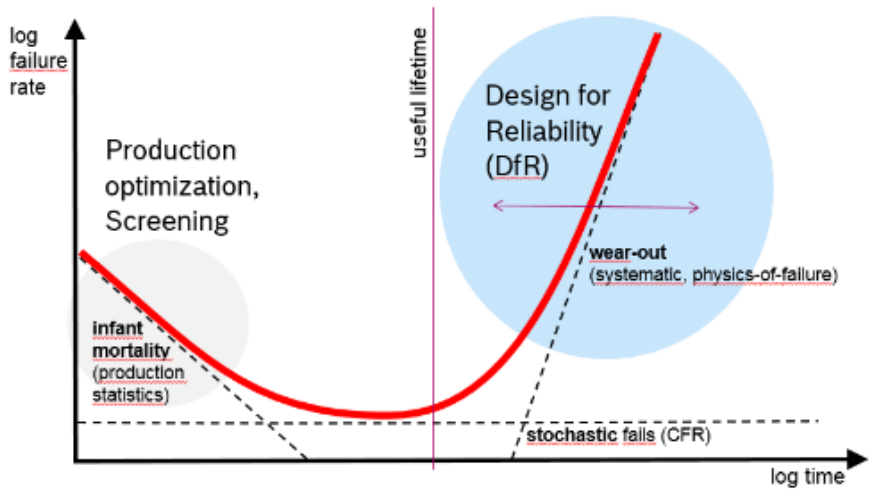
Design Approach

- DfR / Robustness Validation
  - Design for Reliabilty, simulation-driven Design
  - mission profile and physics of failure based validation
  - covers known aging effects systematically, gap for unexpected interactions



- "Future" – Resilient Design?
  - definition of reaction schemes
  - health monitoring based
  - managing deterioration, e.g. drift compensation, remaining lifetime prediction, ...
  - can compensate for stochastic failure modes

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Conclusive Remarks

- Strong push on Automotive Electronics to quickly adopt technologies and packaging features from the Consumer Market
- Semiconductor Industry is about to make a revolutionary change versus heterogeneous system integration (growing component complexity)
- Quality, functional safety & reliability of technologies are a big challenge
- Need for improved simulation-based Design-for-Reliability
- New approaches to overcome limitations needed,
  e.g. the concept of resilient design based on health monitoring
- Success requires system level Co-Design and enhanced collaboration along the value chain (OEM, Tier1, ...)