

Technical Area IV: Sensors Data Interface

Moderator

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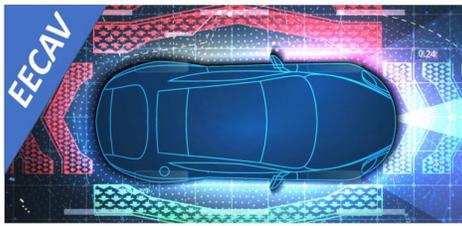
Organizing Team Members

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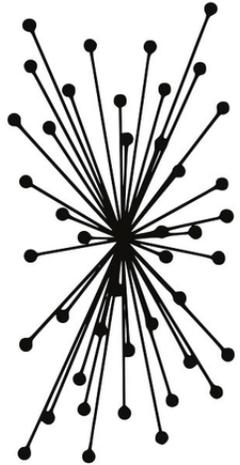
Workshop on Energy Efficient Computing for Automated Vehicles (EECAV)

May 11 - 12, 2021

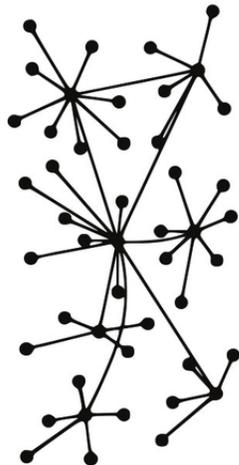




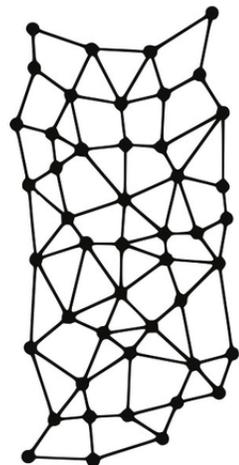
Why this Technical Area?



Centralized



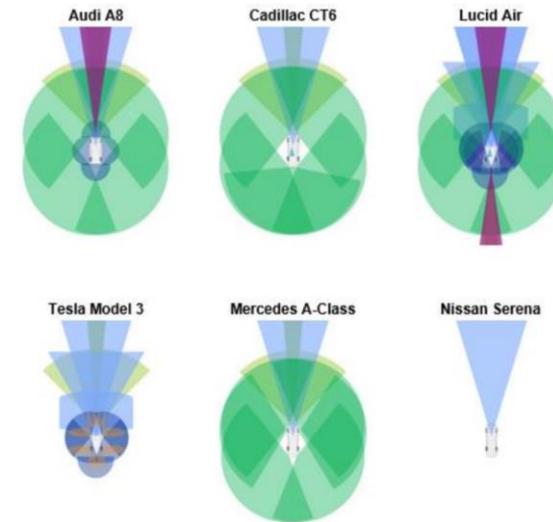
Decentralized



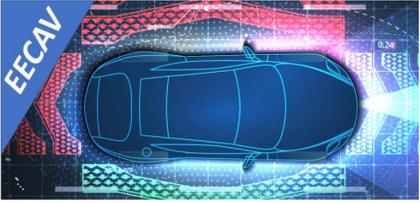
Distributed

The industry lacks methods and tools to **support decision making** about system-level tradeoffs between **smart sensors** and **central processing**, and the **data interconnects** between the them.

Sensors are used in different quantities and combinations to support different levels of autonomy



The 20+ year lifespan of a vehicle requires different generations of sensors, computers, and network technology all interoperate.



Which is More Energy Efficient: Data or Task Migration?

*Data vs. Task Migration –
When should data be moved to the task or vice versa?*



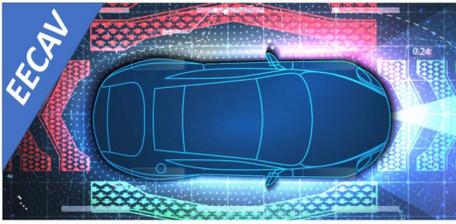
Centralized Perception

- Simple sensor interface.
- Move all the data once.
- All perception logic in one place.



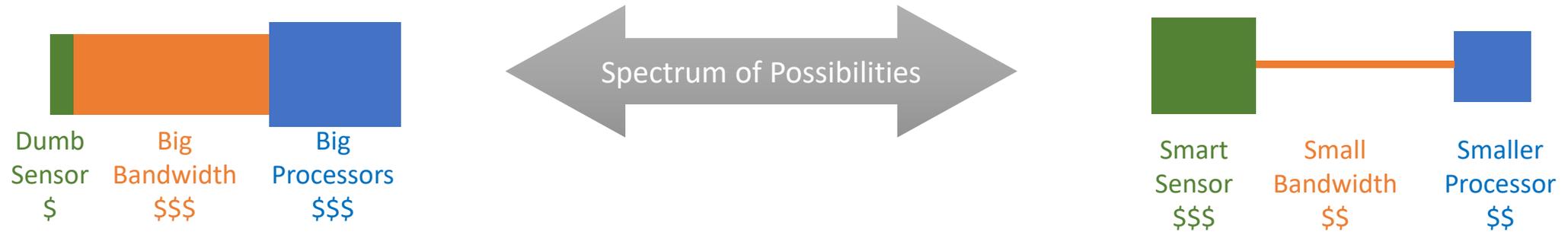
Distributed Perception

- Sensor interfaces vary with capability and network type.
- Move only the data needed.
- Choices about where to run SW.



R&D Problems Associated with Data vs. Task Migration

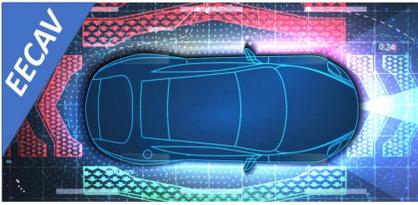
Open Questions about Data vs. Task Migration



R&D Problem Areas We Found:

- How smart should a sensor be? Smart about what?
- What are the long (~20 year) lifespan implications?
- How is work divided among or moved between processors and smart sensors?
- Are dumb sensors and small networks economically viable?
- What are the Fail Operational Redundancy considerations?
- How does a data recorder work? A debugger? HIL/SIL Testing?
- What are the security implications of smart sensors?
- How to perform system-level verification of distributed algorithms

Do you see any high-level R&D areas that we missed?

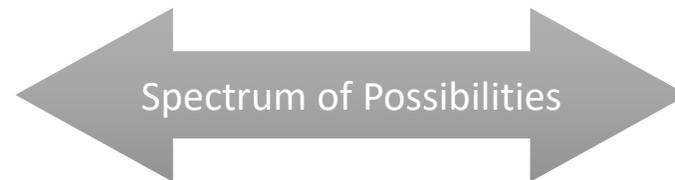


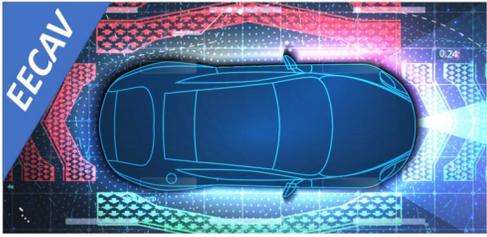
Tech Area IV: Detailed Feedback on Specific R&D Problems

R&D Problem 1:

“How smart should a sensor be? Smart about what?”

- What priority are tradeoffs related to smart sensors?
 - Network energy, bandwidth, and latency
 - Centralized vs. Distributed perception
- How can distributed perception contribute to efficiency of functional safety?
- Have we missed anything specific in this area?



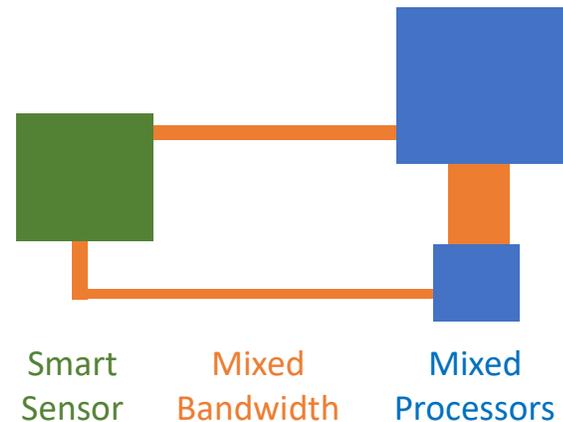


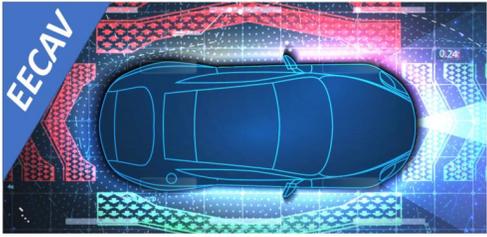
Tech Area IV: Detailed Feedback on Specific R&D Problems

R&D Problem 2:

“R&D on Data vs. Task Migration for Dynamic Power Management”

- How can dynamic task migration be used to minimize total system power?
- Can task migration be used to provide functional safety with less energy than full replication?



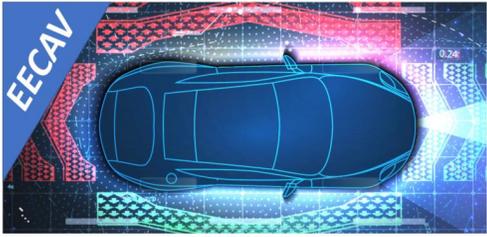


Tech Area IV: Detailed Feedback on Specific R&D Problems

R&D Problem 3:

“Can R&D find ways of exploiting asymmetric bandwidth utilization of networks to improve energy efficiency?”

- Network topologies to minimize power
- Asymmetric low-power modes



Tech Area IV: Detailed Feedback on Specific R&D Problems

R&D Problem 4:

“What R&D is needed to anticipate advancements in sensors and computers over a long (~15 year) vehicle lifespan to maintain forward and backward compatibility?”

- Can we future-proof sensors, computers, and their interconnects?
- Is innovation in sensor-data interface stepwise or incremental?
- Have we missed anything specific in this area?

Thank You for Your Feedback
on Tech Area IV!

