

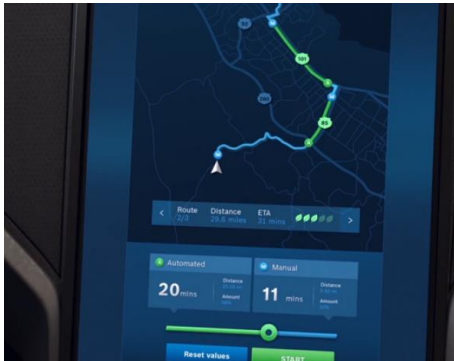
***Novel PHM concept
for future use in
safety relevant
electronics for harsh
environment***

Trends in automotive electronics

Electrification

Connectivity

Autonomous driving



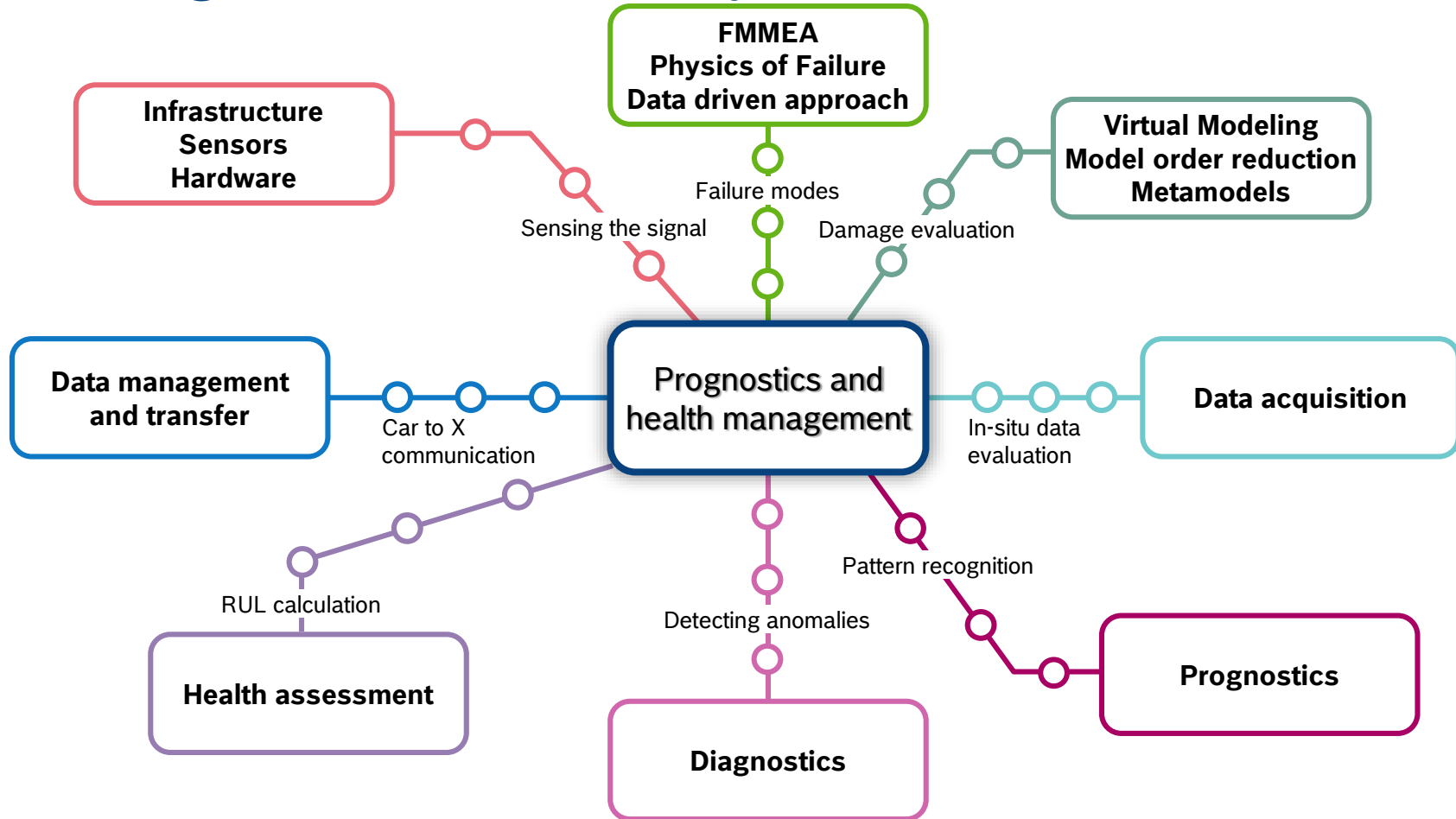
Reliability is a key issue!

Operating Conditions

- ▶ Extremely harsh and demanding environment (TCU)
 - Extreme ambient temperatures (-40 °C to +60°C ...+140°C under normal operating conditions)
 - Abrupt temperature changes
 - Exposure to fluids (oil, fuel, water, salt water)
 - Effects of moisture
 - Mechanical stresses (e.g. engine or transmission vibration)
- ▶ Other ECUs
 - Exposure to sunlight (UV)
 - High currents (self-heating)



Next generation reliability



Summary:

- ▶ Requirements for electronic systems for harsh environment increases.
- ▶ Reduction of reliability and qualification time of the new products.
- ▶ Significant increase of the computational power → New cooling concept is crucial.
- ▶ This can be achieved by:
 - Development of the novel products supported by numerical modeling and optimization → Simulation Driven Design;
 - Better understanding of the field and operating conditions that the electronic systems are exposed to.

In order to reach this specific challenges next generation reliability approach is required.

Hybrid prognostics and health management, and direct, damage relevant quantity measurements is a potential solution to fulfill specific requirements.