Automotive PoE Requirements for RTPGE

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Power over Ethernet for Automotive

- This presentation will explain and differentiate the automotive requirements for power transmission over Ethernet data lines
- There is no requirement that Power over Ethernet is part of RTPGE, but
  - Power transmission over the data line needs to be possible (power over data line capability should not be excluded)
  - The RTPGE channel model needs to comprise respective effects

Classification of ECU & Consumer With Respect to Their Power Consumption

High Power ECU (average)	Mid Power ECU (average)	Low Power ECU (average)	Smart Sensors /Actuators
10 – 60 Watt	4 - 10 Watt	2 - 4 Watt	< 2 Watt
800 – 4500 mA	…	…	< 150 mA / 12 V
Central Domain Controller, Head Units, Amplifier, Engine Management System, …	Gateway, Cluster, Connectivity Unit, …	Mirror heating, Seat adjustment, ...	Cameras, Radar sensor, Roof module, Interior light, …

Use Cases for Power over Data Line in Automotive

- Of interest for smart sensors
  - Often in „satellite“ positions, cable/connector savings significant
  - Changes from car interior to exterior with tight spatial constraints, often very small units, fewer cables use less space
  - Comparably small power consumption
- For all ECU classes it needs to be possible to send power impulses over the data line for wake-up
  - Continuous Power over data line is not necessary for high/mid/low ECUs

Power over Data Line – Saving Potential

- PoDL is only useful if costs can be saved

Use Case example – 1-pair camera based system

Saving potential with PoDL	Additional Costs with PoDL
Terminal 30 filter (at camera)	Coupling inductor
Cabling	
Quiescent current can be 0 when device is activated per PoDL	

PoE Ad Hoc questions

- What line voltage should be used?
  - Today max. 12V
  - 48V will be introduced first of all for ignition and other high voltage ECUs
- What power levels/power classes are required?
  - 2 (3/5/10) Watt
- Will the power system need to support surge loads (motor start)?
  - Yes
- What are the isolation requirements?
  - Human body model
- What action should a PSE take if a power fault is detected?
  - Shut down

PoE Ad Hoc questions

- Is a chassis ground always available?
  - Depends on application (generally yes)
- Will we need to support adding/subtracting nodes to/from a live system (for example, a vehicle trailer or customer---installed equipment)?
  - No hot plug-in/out
- What is the maximum length of a PoE segment? PoE max. segment length
  - 15 m (40m optional)
- Will PoE channels be treated differently (e.g., different wire gauge) than non--PoE channels?
  - No

PoE Ad Hoc questions

- Do we need to support daisy-chain configurations?
  - Ambiguous opinion between different contributors
- What is the estimated ratio of powered to unpowered ports?
  - Question needs to be clarified more
- Is PoE as defined in Clause 33 of the current standard adequate for RTPGE?
  - That depends on the number of wires RTPGE will use
- Will vehicles use a mix of Clause 33 and non--clause 33 connections?
  - Yes, very likely
- Will PSE ports be dedicated to a specific load or do they need to be “universal”?
  - According to power classes