



ETHERNOVIA

TRANSFORMING HOW CARS OF THE FUTURE ARE BUILT

IEEE802.1DG – CONFIGURATION PROTOCOLS

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IEEE contribution

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Starting Points

- Boundary Diagram:
<https://www.ieee802.org/1/files/public/docs2021/dg-Lawlis-BndryDiag-0421-v01.pdf>
- SDN input:
<https://www.ieee802.org/1/files/public/docs2021/dg-Nomura-JASPAR-Use-Cases-0321-v04.pdf>
- Profile Format
<https://www.ieee802.org/1/files/public/docs2020/dg-potts-ProfileOutlineUpdated-0820-v01.pdf>
- Outline proposal:
<http://www.ieee802.org/1/files/public/docs2019/dg-finn-auto-prof-outline-0119-v02.pdf>

De/Centralized Configuration

Preamble

- IEEE 802.1DG is aimed at “privately owned, potentially partially automated vehicles”, meaning:
 - The vehicle is started and shut-down multiple times a day
 - Start-Up time must be around 2 seconds (FMVSS-111)
 - As the vehicle is parked for about 95% of it’s lifetime, it needs to shut-down fast to save energy
 - Stand-by modes are difficult to realize
 - Power consumption during “parking” must be minimized
 - This is independent from ICE (preserve starter battery) or EV (conversion efficiency) propulsion
 - A failed start-up requiring maintenance is devastating to the user
- Goal: Allow for a parallel start-up of systems (ECUs, links, ...)

Preable – Part 2

- If IEEE 802.1DG was aimed at “fleet owned, fully automated robo-taxi vehicles”, meaning:
 - The vehicle is started and shut-down once a day
 - Start-Up and shut-down times are almost irrelevant
 - The vehicle is operated for 40-50% of it’s lifetime
 - Stand-by modes can bridge usage gaps
 - While “parked” the vehicle is charging
 - ICE propulsion is not a use-case
 - A failed start-up is resolved by dispatching a different vehicle, maintenance is readily available (central parking)

Configuration Protocols

Stream Reservation Protocol (SRP)

- IEEE 802.1Q-2018, chapter 35
- The SRP works using the
 - Multiple MAC Registration Protocol (MMRP), the
 - Multiple VLAN Registration Protocol (MVRP), and the
 - Multiple Stream Registration Protocol (MSRP)
- All based on the Multiple Registration Protocol (MRP)
 - Layer 2
 - Link-based Multicast 01:80:C2:00:00:2#
 - Different Ethertypes (22EA, 88F6, 88F5, 22E2)
- Use-case
 - Bandwidth reservation?
 - Path definition (multicast forwarding)?

Link Layer Discovery Protocol (LLDP)

- IEEE 802.1AB, P802.1ABdh, IEEE 802.3, IEEE 802.1CS
- Layer 2 (see below for switch to IP)
- Link-based Multicast 01:80:C2:00:00:0#
- Ethertype 0x88CC
- Define exact TLVs supported?
- Relation to: LRP, ECP
- Allows data transport over TCP
- extended LLDP in definition

Spanning Tree Protocols (xSTP)

- IEEE 802.1Q-2018, chapter 13
- Link-based Multicast 01:80:C2:00:00:00
- The IEEE STP/RSTP/MSTP uses LLC encapsulation (DSAP=SSAP=0x42), not Ethernet-II Frames (no Ethertype)
- For the Error-Case (link failure) only?
- Alternatives exist: Media Redundancy Protocol (MRP) IEC 62439-2.

Internet-Standard Management Framework (SNMP)

- IETF RFC 3410
- TCP/IP based over UDP
- Older versions allow broadcast discovery
- Securing messages with USM or TSM

Resource Allocation Protocol (RAP)

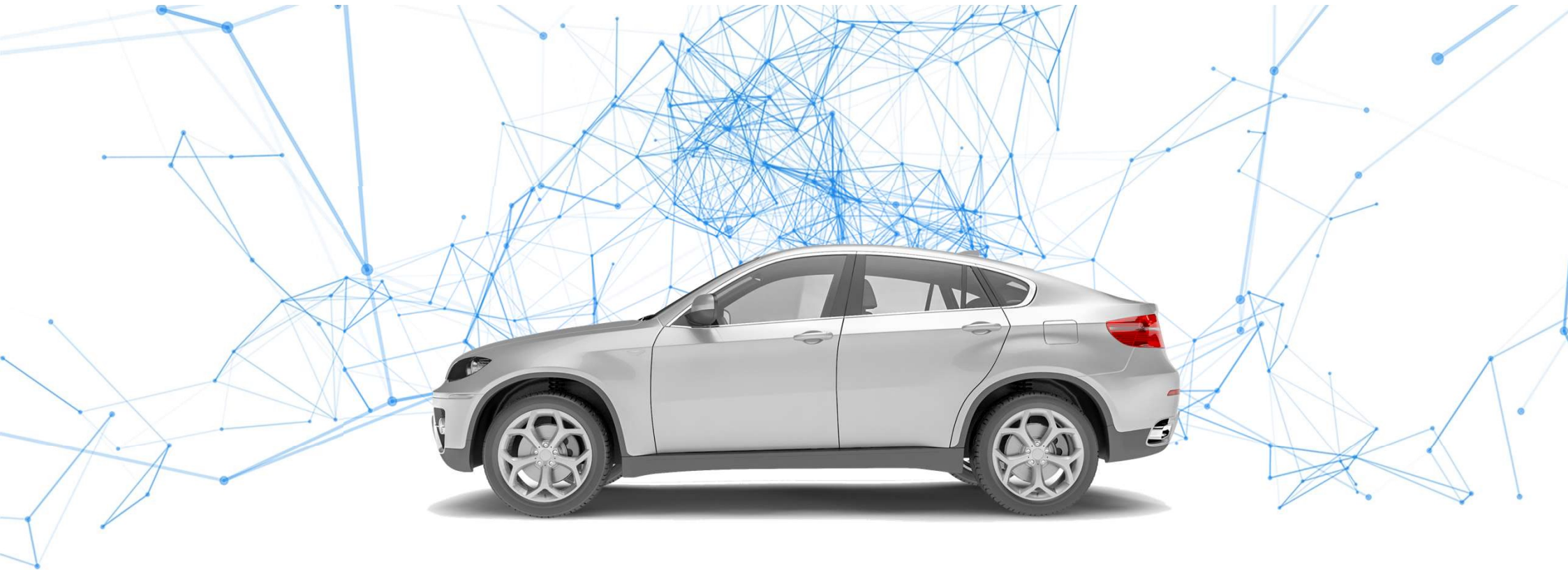
- IEEE 802.1Qdd
- Which protocols would be replaced by RAP?
 - LLDP Discovery Mode, so LLDP stays?
- We will spend a whole .1DG session on RAP: May 18th
 - Thanks to Feng Chen!

AUTOSAR and OPEN Alliance

- Internet Protocol (IPv4)
- DHCP
- ICMP
- ARP
- TCP
- UDP
- SOME/IP, SOME/IP-SD, SOME/IP-TP
- DoIP, UDS
- SecOC
- E2E profiles

Goal: Reduce number of choices!

- Make the implementation testable to a “minimum” set of features
- If we make elements “optional” we need to at least reduce the variance with these elements
 - The effort (detail) to specify an optional feature is almost identical to a mandatory one
- Should we strive to replace solutions which have a specification, are used in the automotive ecosystem, and already have test cases and tools/stubs?
- Should we focus on things the current automotive TCP/IP stack does not support already?



THANK YOU

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