Seamless Integration of Heterogeneous Automotive Busses into Linux
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From Steel to Silicon

1908: Ford Model T

1980: ABS

1990: ESP/ESC

2000: OBD

Autonomous vehicles

ADAS

Electric vehicles
Vehicles Turning into Super-Computers

Percentage of total vehicle cost made up by electronics

Source: Statista
<table>
<thead>
<tr>
<th>Bus Type</th>
<th>Purpose</th>
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<tbody>
<tr>
<td><strong>LIN</strong></td>
<td>• Body control</td>
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</table>
| **CAN / CAN-FD / FlexRay** | • Body control applications  
                     • Safety critical functions |
| **MOST®**        | • Infotainment  
                     • Control / Audio / Video / IEEE 802.3 |
| **Ethernet**     | • Information backbone, ADAS, Diagnostic  
                     • TCP/IP, UDP |
Applications
Infotainment A/V
Applications
Active Noise Cancelling
Network Capabilities Example with MOST®

- Many nodes
- Multiple types of data (video, audio, IP, control)
- All data types have their own channels
Requirements for a Seamless Integration

- Providing support for the bus
  - Low-level driver for networking IC

- Enabling easy handling of the network
  - Network & connections management software

- Enabling standard and secure applications
  - OS integration providing standard interfaces
  - Integration into an application framework
Former situation with Classical MOST®

- **MOST®-specific app**
  - System Management Module (MSMM)
  - NetServices (MNS)
- **(Proprietary)** System Integration
- **Physical Layer**
**Linux® & AGL Integration with UNICENS**

- **MOST® specific apps**
  - Classical mode of operation
  - Decentralised
  - NetServices (MNS)

- **Standard AGL apps**
  - New alternative mode of operation
  - Centralised
  - (ex. slim nodes and others)

- **Linux® Driver**
- **Physical Layer**

- **Linux Driver**
- **Physical Layer**
Unified Centralized Network Stack (UNICENS)

- Centralized intelligence in root node ⇒ Easy maintenance
- From design stage to running in “a day” ⇒ Shorten development cycle
Specific Technology Standard OS Interfaces

Character device (cdev)

Ethernet card

ALSA device

V4L2 device
Technology-Independent Applications

Non MOST® specific applications / standard programs and libs

- open
- read
- write
- close
- TCP/IP
- UDP
- SOME/IP
  etc.
- ALSA mixer
  std libs &
  programs
- ffmpeg
  gstreamer
  etc.

- cdev
- meth0
- ALSA
- V4L2

MOST specific domain abstracted by Linux Driver

- control
  channel
- Ethernet
  packet channel
- synchronous
  channel
- isochronous
  channel

Physical Layer
Seamless Integration Achievement with MOST®

- Providing support for the bus
  - Low-level driver for networking IC

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- Linux® driver
- UNICENS
- Linux driver UNICENS
- AGL App Framework
● Linux® Driver
  ● Released under GPL v2
  ● Source code published on GitHub
    • https://github.com/microchip-ais/linux/tree/mld-1.5.0/mld
  ● Mainline since kernel 4.3

● UNICENS
  ● Released under BSD-3
  ● Source code published on GitHub
    • UNICENS: https://github.com/MicrochipTech/unicens
  ● Working with AGL app framework
    • UNICENS AGL Binder: https://github.com/iotbzh/unicens2-binding
Corporate Overview

● **Leading semiconductor provider:**
  - High-performance *microcontrollers*, digital signal controllers and microprocessors
  - Mixed-signal, analog, *interface and security* solutions
  - Clock and timing solutions
  - Flash IP solutions
  - Non-volatile EEPROM and Flash memory solutions
  - Wireless and wired *connectivity* solutions
  - #8 in WW automotive supplier ranking

● ~ **$3.5 billion revenue run rate**

● ~ **13,000 employees**

● Headquartered near Phoenix in **Chandler, AZ**
In-Vehicle Networking Leadership

Infotainment Network

MOST®

IEEE 802.3 Ethernet

SUPERSPEED CERTIFIED USB

CAN FD lin
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