Enhancing in-car user experience with Virtual Device Architecture using non-proprietary and open standards
Executive Summary

- Virtual Device Architecture as a proof-of-concept
- Address the customer pains and needs
- Distribute computing power and create virtual features
- Connect the world of things in a car
#1 Car as my personal device

- Settings and personalization
- Connect work and home environment
- Individualization
#2 Safe environment

- Graceful exit
- One direction control
- Smart firewall
#3 Stay always up-to-date

- Easily follow megatrends
- Stay in touch with modern technology
- Take the best from each other
- Application store out-of-the-box
#4 Internet Radio

- Audio stream from Smart Device
- The same user account used in many places
- Any of service providers
Virtual Device Architecture

Innovative integration in a car
System architecture

Automotive Grade Hardware

Linux based software platform

GENIVI platform

VDA software block

Specific Producer(s) / Consumer(s)

Source Sink

Linux kernel
VDA concept visualization

Main idea is to move processing from in-car device (HU/RSE) which can be soon outdated to smart device with high computing power and other capabilities.

UPnP control point allows to make connection grid between Virtual Devices working on in-car device and virtual Devices working on smart device.
Connected world of things in car

Virtual Device concept ▶ no fixed division of roles
▶ many-to-many architecture ▶ ecosystem
Virtual Device – GPS use-case

<table>
<thead>
<tr>
<th>VirtualDevice #1</th>
<th>VirtualDevice #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;&lt; car &gt;&gt;</td>
<td>&lt;&lt; smart device &gt;&gt;</td>
</tr>
<tr>
<td>Source of GPS data (In-car Head Unit, reliable antenna installation)</td>
<td>GPS data processing (more computing power, running Navit car navigation system)</td>
</tr>
<tr>
<td></td>
<td>Video output (sink) is routed back to VirtualDevice #1 (acting as Head Unit)</td>
</tr>
<tr>
<td></td>
<td>Navigation application is displayed on the screen with routing information</td>
</tr>
</tbody>
</table>
Challenges

- **Hardware**
  - documentation and its quality
  - communication with Silicon Vendor
  - component support ... discontinued (suddenly)
  - automotive development board not specified

- **Software**
  - missing or not supported drivers (e.g. radio tuner, CAN transceiver)
  - operating system maturity
  - a lot of adaptations and little adoptions
Benefits

- Know-how of a new hardware and software platform
  - Pros and cons, potential and weakness
  - understanding HTML5 capabilities, performance and constraints
- Establishing communication channels
  - vendors, developers, project managers and community
- Open sourced way of doing things…
  - understand and start using (in a right manner…)
Feedback

Market
- not well suited for premium or high end segment
- emerging markets possibly with higher potential
- Navigation is still business case for OEMs
- Business model undefined
- Technology is ready. How about OEMs?

The Team
- Questionable TIZEN compatibility with existing components (at that time)
  - Automotive Message Broker component was not a breakthrough
  - deadline slippage due to … other contingencies
  - workarounds instead of software engineering
Thank You.

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