FG-VM use cases and requirements

Overview

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Use Cases
Interactive and personalised multimedia services
- Custom Infotainment system
- Intelligent voice interaction
- High precision navigation (maps)
Platform considerations

Multimedia service provider approach

Service platform → Convergence gateway → CDN → Broadcasting network → Broadcasting link → Vehicle → Mobile communication link → Mobile communication network → Mobile terminals
Platform considerations

**OEM/ integrated approach**

- **B2B services, Emergency**
- **Content providers**

**Core platform** (oem or public, telematic, )

**Vehicle gateway**

- **Other Domains/Subsystems** (i.e. ADAS)
- **Vehicle Multimedia System**
- **App1**
- **App2**
- **OEM App**

**Personalisation**

- **High**
- **Customised HMI at each seat tailored to each User**
- **Hybrid, temporal customization**
- **General content, non identifiable notification**

**Control**
- **Configure**
- **Customize**
Connectivity within the vehicle

**Brought-in**
- Vehicle has no own connectivity
- User will connect through his brought-in mobile device
- Mobile device will connect through Bluetooth, USB or other to VMS
- Content will be made visible on VMS using e.g. MirrorLink, Apple CarPlay, Android Auto
- All apps and mobile services are accessible through VMS (mobile phone can stay in the bag)

**Built-in**
- Vehicle is fully equipped to connect internet and other connected services to the vehicle
- All apps and services are accessible through VMS

**Hybrid Connectivity**
- Mix of brought-in and built-in connectivity
- Vehicle has own connectivity
- Some mobile services/ apps are only accessible through mobile device brought into the vehicle
- Mobile device connects to vehicle VMS through Bluetooth, USB or other
- User accesses all vehicle connected services and apps through VMS

Vehicle Connectivity (with credit to Tesla, GM)
Use cases versus data privacy legislation

US Department of Transport
• Vehicle shall not be tracked
• Personally Identifiable information shall not be collected and shared

Europe GDPR
• Protection of personal information
• Obligations on service provider
• Right to be forgotten
• Etc…

China:
• Vehicle are equipped with an RFID chips
• Vehicle tracking is required
Use cases vs autonomous driving levels

SAE J3016 Definition of Driving Levels

<table>
<thead>
<tr>
<th>Use Case</th>
<th>SAE LEVEL 0</th>
<th>SAE LEVEL 1</th>
<th>SAE LEVEL 2</th>
<th>SAE LEVEL 3</th>
<th>SAE LEVEL 4</th>
<th>SAE LEVEL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listen to audio services</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Use video, TV and gaming services</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Use mobile devices</td>
<td>✔</td>
<td>✔</td>
<td>✔ (☆)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Use mobile devices through VMS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Phone conferencing (handsfree)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Video conferencing</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Reading in vehicle (books, mails, news, etc.)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Getting read content (text-to-speech)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Working in vehicle (office applications)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

✔ = Allowed
(☆) = Partly Allowed (in autonomous driving mode)

Matching of Generic multimedia use cases with SAE Driving Levels
App and service integration

- Sharing:
  - Network connectivity,
  - Sensor data
- Integrated HMI
  - Synchronization
  - Interactive functions

Vehicle domain dynamic map service
Requirements
Connectivity and Content delivery requirements

<table>
<thead>
<tr>
<th>Connectivity</th>
<th>Content delivery and protection</th>
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<tbody>
<tr>
<td>● Connect simultaneously and provide seamless handoffs between communication networks</td>
<td>● Deliver different channels, to different user/screen</td>
</tr>
<tr>
<td>● inclusive of bi-directional and broadcast communication networks</td>
<td>● Content sharing within the vehicle (e.g. from phone)</td>
</tr>
<tr>
<td>● transmission and reception functions shall be agnostic to the underlying physical layer transmission standards and transparent to the upper layer applications</td>
<td>● Conditional Access and DRM</td>
</tr>
<tr>
<td>● shall require none or minimum modifications to the existing broadcasting and mobile communication infrastructures and shall be compatible with major media streaming and broadcasting protocols</td>
<td>● Parental control</td>
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<tr>
<td></td>
<td>● User controlled, upload and download of user viewing history.</td>
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<tr>
<td></td>
<td>● Content subscription link to user, to the vehicle, to device</td>
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<tr>
<td></td>
<td>● Content right and privilege management system</td>
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</tbody>
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### Personalisation, Integration requirements

<table>
<thead>
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<th>Personalisation</th>
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<tbody>
<tr>
<td>● Complete customization of the HMI based on User ID (password, biometrics, etc).</td>
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<tr>
<td>● Portability of personalized HMI in different vehicles</td>
</tr>
<tr>
<td>● Seamless integration of applications in the multimedia system (broadcast app, calendar, wallet, maps, etc)</td>
</tr>
<tr>
<td>● Preloaded content/dedicated content link to the vehicle</td>
</tr>
<tr>
<td>● ID management and Account management</td>
</tr>
<tr>
<td>● Driver/passenger differentiated customization</td>
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<thead>
<tr>
<th>Integration</th>
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<tbody>
<tr>
<td>● Voice command, speech recognition, speech to text</td>
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<tr>
<td>● Gaze sensor/command</td>
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<tr>
<td>● Sensor input and command in and outside the vehicle</td>
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<tr>
<td>● Various projection/screen types</td>
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<tr>
<td>● UI and sensory integration of various systems (IVI, Maps, HVAC, Apps, ADAS)</td>
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<tr>
<td>● Modular architecture</td>
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</table>
Privacy and safety/security requirements

**Privacy**
- Design should allow for different privacy regulations
- Opt-in/ opt-out
- Secure log-in/log out via phone, screens
- Network-layer identifiers shall not be used as PII
- Protect private conversation when voice recognition is used (particularly cloud base)

**Safety/ Security**
- End-to-end data protection, including data protection at rest in local terminals, during transmission over different channels and when processed at the cloud platform.
- Protect any permanent hardware identifiers and only allow access for authentication purposes
- Isolated from other vehicular control systems
- Modular architecture → hypervisor
- Trusted apps, data wipe?
- On hold for emergency