Smartphone-based Connectivity on AGL

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Agenda

• About RealVNC & VNC Automotive
• Why connect the smartphone to the car?
• Smartphone-based connectivity review
• Connected Car with MirrorLink
• Integration on AGL
VNC Automotive is a pioneer in delivering connected car solutions…


VNC & RFB invented in Olivetti / AT&T Labs Research Project

RealVNC founded by inventors

RFB3.8 published as an open internet standard, RFC 6143

VNC Automotive launched

VNC MirrorLink released

VNC MirrorLink Available to License

RealVNC achieves Core Member Status of CCC

RealVNC delivers world’s first MirrorLink 1.1 server certification

First MirrorLink 1.1 in production

VNC available for Raspberry Pi

VNC Connect launched

Corporate Rebranding


VNC Automotive, 2017

15 Auto OEMs

50+ Vehicle Models

10+ Million Cars

100+ Million Phones

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Collaborating with Volkswagen to deliver a market-defining user experience to MirrorLink connected cars

RealVNC work very closely with Volkswagen and all major mobile phone OEMs providing a mature, high-performance MirrorLink implementation. This close cooperation has brought many new major mobile phone vendors to the ecosystem. Using our VNC Automotive™ MirrorLink Certified™ solution in their handsets provides fast time-to-market and guaranteed MirrorLink Certification.

As part of our continuous improvement process, we are pleased to declare our commitment to Volkswagen to refine and perfect the overall end-to-end user experience for MirrorLink enabled devices.

Using our unique position in the industry as a vendor of full MirrorLink software stack technology, for both ends of the connection (in the car and mobile devices), RealVNC are able to realise a highly optimised MirrorLink solution where both ends are designed and guaranteed to work well together. Thus ensuring fast response times and a smooth driver experience. As the industry strives to ensure a high level of interoperability and consistent user experience, knowing the mobile devices have the same underlying software stack is a significant assurance to Volkswagen.
Why connecting the smartphone to the car makes sense
Advantages of having Smartphone connectivity

For driver
Familiar / Consistent user-experience
Continue using favourite Apps
Large app ecosystem
No need to sync content

For IVI Developer (Car OEM, Tier 1/2)
Simplify development
Easy to extend and update
Increased security, sandboxing
Reduced hardware / software cost
Smartphone-based connectivity review
Smartphone-based connectivity solutions are emerging

**Mobile Centric**
- Mobile ecosystem
- Mobile brand

**Open Standard**
- Community driven
- Brand neutral

**OEM Centric**
- Preserve the traditional OEM ecosystem
- OEM brand
Multiple connectivity standards but no clear winner

It is very likely that the trend to support multiple standards in one HU will grow.

<table>
<thead>
<tr>
<th>Mobile Centric</th>
<th>Open Standard</th>
<th>OEM Centric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Works with Apple CarPlay</td>
<td>Works with Baidu CarLife</td>
<td>Works with V2</td>
</tr>
<tr>
<td>- Closed standard</td>
<td>- Open standard</td>
<td>- Open or closed standard</td>
</tr>
<tr>
<td>- Limited Apps controlled by Apple</td>
<td>- Driven by Auto OEMs &amp; Handset Vendors</td>
<td>- Auto OEM in full control</td>
</tr>
<tr>
<td>- Siri voice mandated</td>
<td>- Open to any App developer</td>
<td>- Auto OEMs in full control</td>
</tr>
<tr>
<td>- OEM liability concerns*</td>
<td>- Capabilities limited by templates</td>
<td>- Car OEM need to create Mobile App</td>
</tr>
<tr>
<td>- Pre-installed on iOS devices</td>
<td>- Works well in China</td>
<td></td>
</tr>
<tr>
<td>- Most modern Android devices supported</td>
<td>- Supports iOS and Android</td>
<td></td>
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</tbody>
</table>

* Auto OEMs have expressed serious liability concerns as both Apple and Google accept no liability, e.g. Driver distraction, yet provide no way for the OEMs to influence what is displayed.
Apple CarPlay

- Apple-centric Ecosystem, iPhone 5+
- Proprietary Protocol
- 3rd party Apps as services (media, text)
- OEM Apps supported
- Driver Distraction Policy: Templates
- Siri for voice control
- Projected Virtual Display

Application Library

- Media and Messaging Only
- No Maps, No Parking

Podcasts  Audiobooks  iHeartRadio  At Bat+
Spotify  Stitcher  CBS Radio  Overcast
Audiobooks.com  Audible  Pandora  Slacker Radio
VOX  NPR One  Clammr  Downcast

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Google Android Auto

- Google-centric Ecosystem, Lollipop+
- Proprietary Protocol
- 3rd party Apps as services (media, text)
- OEM Apps supported
- Driver Distraction Policy: Templates
- Google Now
- Projected Virtual Display

Application Library

- Media and Messaging Only
- No Maps, No Parking
Baidu CarLife

- Baidu-centric Ecosystem
- Proprietary Protocol
- 3rd party Apps as services, China focus.
- Baidu Services in the Car
- Projected Baidu Application Display
- Supports both iOS and Android devices
SmartDeviceLink

- OEM-centric Ecosystem
- Open Protocol
- Open-source Application Developer SDK
- Driver Distraction Policy: Whitelist
- Template based remote rendering

Application Library

- GLYPSE
- Spotify
- Pandora
- SCOUT
- Life360
- InCarAuto
- AccuWeather
Connected Car with MirrorLink
MirrorLink

• Open Ecosystem, controlled by consortium of car OEMs and smartphone OEMs
• Open Protocol
• Driver Distraction Policy: Certification program
• Projected Application Display
Car Connectivity Consortium

• Global consortium to develop connected-car solutions, including smartphone based connectivity
  − Membership open to any interested company
  − Solutions are not owned or governed by a single corporation
  − OS agnostic - No platform limitations
  − Assure device and application interoperability
  − Future proof – not reliant on a single vendor

• Bringing car, mobile and head-unit industries together
  − Established in February, 2011. Now 100 member companies
  − Automotive, Smartphone, Tier 1 and Ecosystem-enablers

Some of CCC Members are:
MirrorLink is the only cross-industry collaboration in developing an open standard for car-smartphone connectivity.
Extensive support in cars, smartphones and Apps
30+ Million cars MirrorLink enabled, 250+ Million phones
History of MirrorLink

• v1.0
  • Initial release
  • a.k.a. Terminal Mode

• v1.1
  • In production since 2014
  • Provided foundation for 3rd party Apps

• v1.2
  • expanded technology portfolio with wireless MirrorLink (WFD)
  • In production since 2016

• v1.3
  • being published to members
  • Adds H.264 encoding for the RFB protocol, supporting HD resolutions
  • More features for App developers
  • Will be published as an ETSI (European Telecommunications Standards Institute) standard
Wireless MirrorLink is already available

Volkswagen + Samsung Showcase at CES 2016

Skoda + Samsung PR in 2016
MIRRORLINK USER EXPERIENCE
Leveraging vehicle’s accessible Display and Controls

No obstruction from dash or window mounted device

No holding
No touching
No looking
No glancing

Car optimized Audio
Input & Output

Car optimized
Display & Input Control

Source: Car Connectivity Consortium
MIRRORLINK® EXPERIENCE
Make it easy to develop for MirrorLink

No SDK 😊
MirrorLink API
Connectivity

Source: Car Connectivity Consortium
Certification program

- Certification program built to help offset risk
- Device certification
  - Conformance with specification
  - Interoperability with reference devices
- Application certification
  - Driver Distraction testing
  - Region-based following local regulations
- Conducted by approved Test Labs
MirrorLink Architecture

Shell
- VC
- Call
- Messaging
- Productivity
- Search
- Nav
- Music

MirrorLink Common API (Platform Specific)
- Device & App Discovery and Control
- Screen Replication
- Secure Device Attestation
- Application Certificates
- Phone/Media Audio & Voice Control
- Access to Car Data

Connectivity
- CDC/NCM
- HSML
- IP
- TCP/UDP
- DHCP

MirrorLink™ uses VNC (RFB 3.8) for remote control

Source: Car Connectivity Consortium

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Integration on AGL
AGL Architecture:

VNC Viewer Services

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AGL ‘Smartphone Link’ Service

5.2.8 Smartphone Link

This section describes regarding Smartphone link. Smartphone Link is the technology which realizes that video and audio streaming play which data from smartphone. And touch operation is possible to share between IVI and smartphone. MirrorLink, Miracast, SmartDeviceLink and AirPlay are technologies that realize Smartphone Link. By this technology, it is possible to use smartphone content (map, music, browser...) by IVI.

Figure 8-30 shows the system structure of the Smartphone Link.
VNC Mobile: supports MirrorLink, Apple CarPlay, Android Auto and Baidu CarLife on any combination of OS and CPU platform

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<td>VNC Enhanced</td>
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- **OPERATING SYSTEMS**
  Multiple versions supported.

- **SILICON**
  Multiple variants supported.

- **PLATFORMS AND CONSORTIA**
  Building an extensive automotive ecosystem.
Please visit our website for more information

https://www.realvnc.com/

https://automotive.realvnc.com/