Remote Vehicle Interaction
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RVI Core Enabling Three Macro Use Cases

- Control
- Big Data
- SOTA/FOTA
RVI Core

**Connectivity**
- Utilize a wide array of data links to set up communication to and from vehicle, either with cloud backend or peer-to-peer.
- Provide encryption for secrecy, non-repudiation, replay attacks, MITM, etc.
- Work with OMA, IEEE, W3C, and other organizations for standardization and integration with existing communication standards.

**Authentication**
- Prove the identity of the communicating parties.
- Use best-of-breed open source technologies to drive peer-to-peer reviewed security.

**Authorization**
- Prove to communicating parties the right to discover and to invoke their services.
- Prove to communicating parties the right to publish and advertise services.

**Service Discovery**
- Announce services to communicating parties.

**Service Invocation**
- Invoke services and report the result over data links with changing QoS.
- Support retry and store & forward of service invocations to manage transient transport.
Vehicle Integration
- Utilize GENIVI Networking Expert Group components to integrate with vehicle buses.
- Implement W3C APIs and signal standards to provide access to vehicle information and control vehicle functions.

Service Protocol
- Define vehicle control protocols between vehicle and remote entities such as cloud-based services, mobile devices, home automation gateways, etc.

Web Services
- Utilize W3C-based standards to define web services for remote interaction from web browsers and web runtimes.
RVI Big Data

**Data Collection**
- Integrate with GENIVI components to harvest data infotainment and headunit data.
- Integrate with AUTOSAR components to collect data from ECUs and sensors.
- Utilize dynamically OTA-loadable code agents to securely collect, filter and preprocess data on-board.

**Data Transmission**
- Define, specify, standardize and implement secure transmission protocols for vehicle data to the cloud.

**Data Reporting**
- Specify and implement in-vehicle reporting services.

**Data Analytics**
- Big Data cloud services for data ingestion, storage and access.
- Real-time and batch processing pipelines.
- Based on best-of-breed big data technologies such as Apache Hadoop, Ambari, Spark, NiFi, etc.
RVI SOTA / FOTA

Control
Big Data
SOTA/FOTA

Core

SOTA Client and Software Management
- Specify, define, standardize and implement SOTA client for receiving software update images.
- Specify, define, standardize and implement Software Management (SWM) to manage software updates on the headunit and other ECUs.
- Standardize and implement protocols for notification and transport.

SOTA Server
- Define requirements for server backend supporting large-scale SOTA campaigns to thousands of vehicles.
- Define integration points with enterprise software systems.
- Implement SOTA server with database and user frontend for campaign management and reporting.

Industry Integration and Adoption
- Collaborate with vendors and open source projects to foster adoption.
• **Service Edge**  
  – Manages traffic from and to application.

• **Authentication / Authorization**  
  – Manages certificates that allow applications to discover and invoke services.

• **Service Discovery**  
  – Identifies and locates local and remote services.

• **Service Invocation**  
  – Receives and dispatches local and remote service calls.

• **Scheduler**  
  – Stores and forwards messages for unavailable destinations.

• **Protocol**  
  – Encodes and decodes messages.

• **Data Link**  
  – Controls data transmission to other RVI nodes.
# RVI Service Addressing

![Diagram showing RVI Service Addressing](jaguarlandrover.com/vin/sajwa71b37sh1839/vsi/getVSS)

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organization</td>
<td>Specifies a sub-section hosted by a specific entity</td>
</tr>
<tr>
<td>2</td>
<td>VIN sub-tree</td>
<td>Specifies sub section for all vehicles</td>
</tr>
<tr>
<td>3</td>
<td>VIN</td>
<td>Vehicle Identification Number</td>
</tr>
<tr>
<td>4</td>
<td>Service Domain</td>
<td>Domain of service</td>
</tr>
<tr>
<td>5</td>
<td>Service Command</td>
<td>Service command within the service domain</td>
</tr>
</tbody>
</table>
RVI Security

• TLS-protected Internode Communication
  – Prevent replay attacks.
  – Prevent man-in-the-middle attacks.

• Certificate-based Node Authentication and Service Authorization
  – Certificates, signed by a trusted provisioning system, attest application identity and grant access to services.

• Self-carried application authentication and service authorization
  – A Node presents its certificates to another node to authenticate itself and provide its service authorization. No connection to a server is required.
  – Each certificate carries the node’s public key. Nodes sign all messages with their private key.
RVI Project Progress

• RVI C Library
  – Native RVI communication protocol.
  – Small footprint for embedded devices.

• End-to-End Provisioning
  – Connecting users to keys and credentials.
  – X.509 certificate creation, signing and management.
  – Self-provisioning with identity setup and dynamic assignment of authorizations.

• Security Audit by GENIVI Security Team
  – Thread models and attack vector analysis.
Thank you!

Weekly Networking Expert Group Call
Mondays 0800 PT / 1700 CET
https://genivi.webex.com/genivi/j.php?MTID=mdb9482b92015e5cb7386c1a65e32a887
Meeting number: 579 975 193

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