You are here

GENIVI’s Location Based Services for Embedded Automotive

Let me get this
out of the way;

I don’t know if HERE will
be coming to GENIVI

Why is GENIVI providing navigation APIs?

Would you let your smartphone *drive* your car?

"While some automakers have delegated navigation features to a connected smartphone, many others still see essential value in proposing in-dash, embedded solutions from the automaker. The latter understand that automobiles are about mobility and navigation, and that these functions are as core to the modern automobile as the engine or the chassis. Moreover, navigation becomes a must-have in an autonomous vehicle. Would you let your smartphone drive your car?"

“To guarantee people’s safety, autonomous vehicles, need a sophisticated ADAS systems along with reliable positioning information with an accuracy below 10 cm., about the size of an orange.

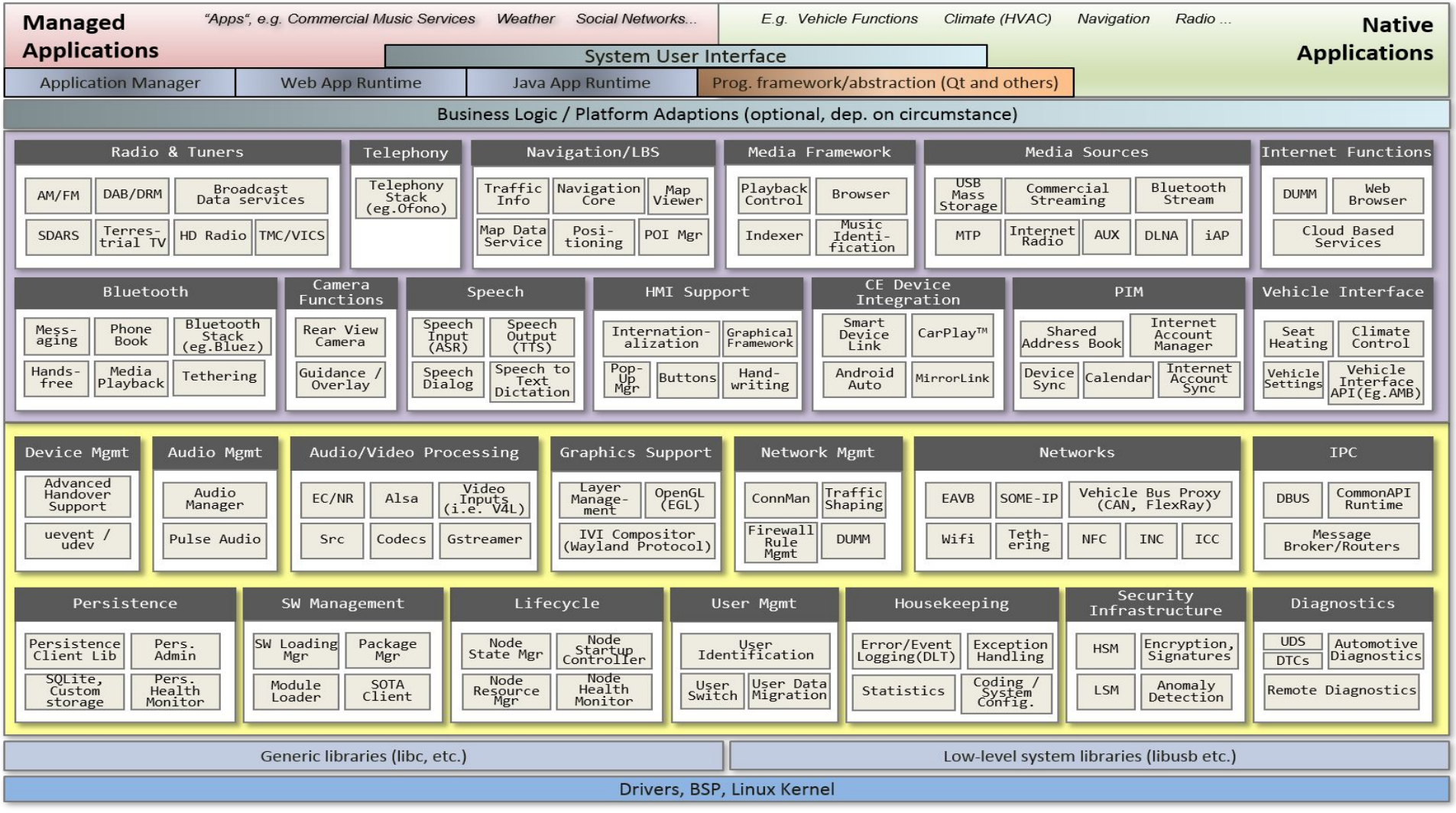
Why car makers want standard APIs

- Time to market
- The possibility to reuse code and to create systems specified independently from hardware
- The “commodity” layer of the vehicle ought to have cost transparency and competition in the ecosystem

Overview of GENIVI APIs

LBS APIs are

- Navigation Core
  - Location Input
  - Route Calculation
  - Route Guidance
    Map Viewer, including Map Rendering and View Control
- POI (Point of Interest) search interface with a content access module to extend searching to external data sources
- Traffic Info, providing a Traffic Incidents Service
- Vehicle Positioning
  - GNSS (Global Navigation Satellite Service)
  - SNS Sensor service, used by Geolocation software for Dead Reckoning
  - Enhanced Position Service


Managed Applications
"Apps", e.g. Commercial Music Services
Weather
Social Networks...
E.g. Vehicle Functions
Climate (HVAC)
Navigation
Radio ...
Native Applications
System User Interface
Application Manager
Web App Runtime
Java App Runtime
Prog. framework/abstraction (Qt and others)
Business Logic / Platform Adaptions (optional, dep. on circumstance)
Radio & Tuners
AM/FM
DAB/DRM
Broadcast Data services
SDARS
Terres-trial TV
HD Radio
TMC/VICS
Telephony
Telephony Stack (eg.Ofono)
Navigation/LBS
Traffic Info
Navigation Core
Map Viewer
Map Data Service
Posi-tioning
POI Mgr
Media Framework
Playback Control
Browser
Indexer
Music Identi-fication
Media Sources
USB Mass Storage
Commercial Streaming
Bluetooth Stream
MTP
Internet Radio
AUX
DLNA
iAP
Internet Functions
DUMM
Web Browser
Cloud Based Services
Bluetooth
Mess-aging
Phone Book
Bluetooth Stack (eg.Bluez)
Hands-free
Media Playback
Tethering
Camera Functions
Rear View Camera
Guidance / Overlay
Speech
Speech Input (ASR)
Speech Output (TTS)
Speech Dialog
Speech to Text Dictation
HMI Support
Internation-alization
Graphical Framework
Pop-Up Mgr
Buttons
Hand-writing
CE Device Integration
Smart Device Link
CarPlay™
Android Auto
MirrorLink
PIM
Shared Address Book
Internet Account Manager
Device Sync
Calendar
Internet Account Sync
Vehicle Interface
Seat Heating
Climate Control
Vehicle Settings
Vehicle Interface API(Eg.AMB)
Device Mgmt
Advanced Handover Support
uevent / udev
Audio Mgmt
Audio Manager
Pulse Audio
Audio/Video Processing
EC/NR
Alsa
Video Inputs (i.e. V4L)
Src
Codecs
Gstreamer
Graphics Support
Layer Manage-ment
OpenGL (EGL)
IVI Compositor (Wayland Protocol)
Network Mgmt
ConnMan
Traffic Shaping
Firewall Rule Mgmt
DUMM
Networks
EAVB
SOME-IP
Vehicle Bus Proxy (CAN, FlexRay)
Wifi
Teth-ering
NFC
INC
ICC
IPC
DBUS
CommonAPI Runtime
Message Broker/Routers
Persistence
Persistence Client Lib
Pers. Admin
SQLite, Custom storage
Pers. Health Monitor
SW Management
SW Loading Mgr
Package Mgr
Module Loader
SOTA Client
Lifecycle
Node State Mgr
Node Startup Controller
Node Resource Mgr
Node Health Monitor
User Mgmt
User Identification
User Switch
User Data Migration
Housekeeping
Error/Event Logging(DLT)
Exception Handling
Statistics
Coding / System Config.
Security Infrastructure
HSM
Encryption, Signatures
LSM
Anomaly Detection
Diagnostics
UDS
DTCs
Automotive Diagnostics
Remote Diagnostics
Generic libraries (libc, etc.)
Low-level system libraries (libusb etc.)
Drivers, BSP, Linux Kernel

Sensors

- Gyroscope
- ‘wheel ticks’ which measure speed and can help with direction and ‘dead reckoning’. One tick generally is one wheel revolution.
- Global Navigation Satellite System
  - Updated with at least 1Hz frequency
  - Position expressed as WGS 84 altitude, longitude and latitude in tenth of microdegree (degree x 10^-7^)
  - Course speed in meters per second
  - Climb, relative heading to true north expressed in degrees
  - Timestamp and date in UTC

Navigation

GENIVI created a proof of concept that separates out a typical navigation application into a map viewer (realized in QML) and a navigation core (navit)

Location and other input plugins were provided to navit upstream, dbus bindings were created

1. genivi-navigationcore-locationinput.xml
2. genivi-navigationcore-routing.xml
3. genivi-navigationcore-guidance.xml
4. genivi-navigationcore-session.xml
5. genivi-mapviewer-session.xml
6. genivi-mapviewer-mapviewercontrol.xml

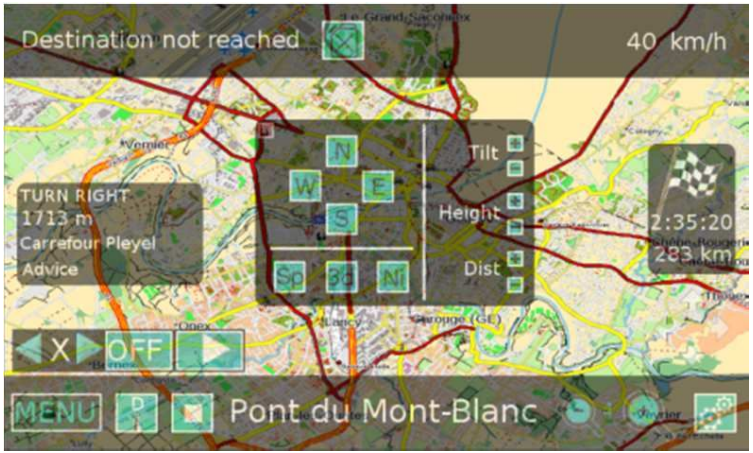
Fuel Stop Advisor

Proof of concept exercising numerous parts of GENIVI subsystems

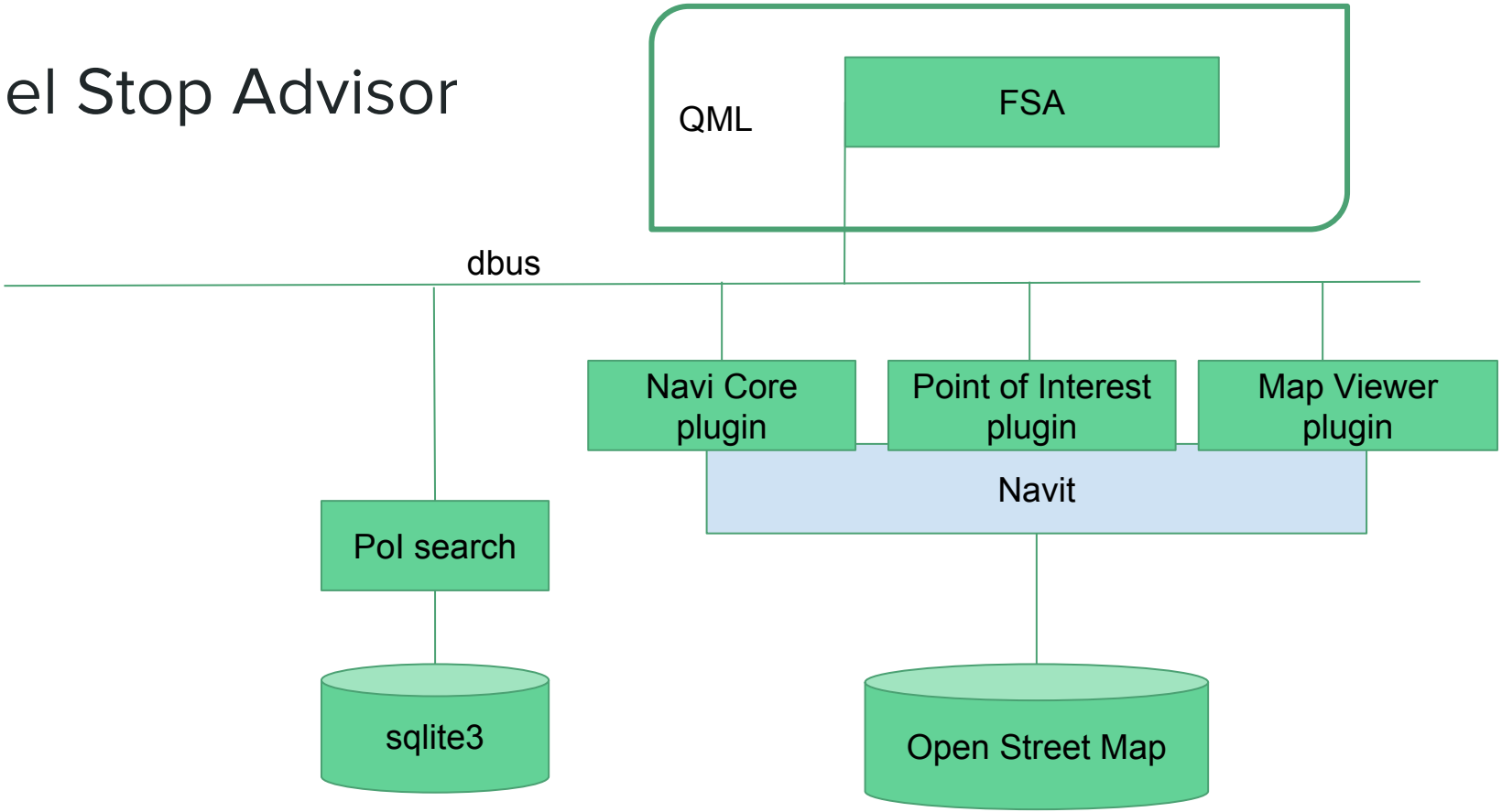
Enhanced tank distance based on the fuel consumption on the route ahead

Warning if destination not reached

Proposal of reroute to a refill station



Fuel Stop Advisor



Map viewer

dbus interface provided;

- org.genivi.mapviewer.MapViewerControl

Entire dbus interface documented and available online; http://git.projects.genivi.org/?p=lbs/navigation.git;a=blob_plain;f=doc/map-viewer/MapViewerAPI.pdf;hb=f0ddb754ad4e16d8f650485a610818c06e0ceac3

W3C positioning PoC

The PositionWebService is a simple proof of concept (PoC) showing how positioning information provided over D-Bus by the GENIVI EnhancedPositionService can be accessed within a web browser.

This PoC was developed to investigate how to match the already defined positioning dbus interface with the Web API being defined by the W3C

The translation D-Bus <-> JavaScript is realized using a FireBreath NPAPI plugin.

How do I get the software?

GENIVI DEMO PLATFORM

GENIVI DEMO PLATFORM

Yocto or Baserock based image built as both a virtual image or for target hardware.

Supported targets: Renesas Porter and Koelsch boards, Nvidia Jetson, Intel Minnowboard, and others in development

Uses LTSI kernel, systemd, and includes a complete suite of automotive specific software including lifecycle, layer management, diagnostic log and trace

GDP

- Fully FOSS, all source code available
- Build yourself: http://wiki.projects.genivi.org/index.php/GENIVI_Demo_Platform
- Available hardware: http://www.digikey.com/product-search/en?keywords=Y-RCAR-M2-Porter-A
  http://wiki.minnowboard.org/Where_to_buy
- Working towards a continuous integration and testing system as well as pre-built images

Challenges

What we're working on

- HMI SDK specific to navigation
- Overall ADK being built
- Continuous Integration
- Automated testing

Nice to have

- Navigation engine (navit doesn't look it is maintained)
- Complete framework bindings into HMI, i.e. GTK+ and Qt bindings

Future scenarios