The GENIVI Alliance IVI (In-Vehicle-Infotainment) Software Architecture Report Summary

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This document serves as a Summary Version of the GENIVI IVI Software Architecture Report, which identifies the market's customer needs, competitive environment, next generation system launch, major OS suppliers' SWOTs (strengths, weakness, opportunities & threats), features considered for future versions of IVI products or services and the market's perception of GENIVI.

For those interested in obtaining a complete version of this report, contact: www.mrd.genivi.org

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Companies Interviewed and Contributing Consultants:

Number of Completed Interviews: 72

Number of Companies Interviewed: 60

Contributing Consultants: iSuppli and Frost and Sullivan (both Consultants' reports are included in the complete version of this report)

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Companies Interviewed:

OEM (Vehicle Manufacturers) Interviewed:		
BMW	Chrysler	Fiat
Ford	GM	Nissan
PSA	Renault	Toyota (TIC)

Tier One Suppliers Interviewed:		
Aisin	Alpine	Bosch
Continental	Delphi	Denso
Garmin	Harman (XSe)	Magneti Marelli
Mitsubishi Electric	OnStar	Panasonic
Pioneer	Valeo	Visteon

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Companies Interviewed:

Silicon Suppliers Interviewed:		
Altera	Arm	Freescale
Frontier Silicon	Intel	Marvell
NEC	NetLogic	NXP
Renesas	Rohm	Samsung
ST Microelectronics	Texas Instruments	Xilinx

OSV (Operating Systems Vendors), Middleware and Services Companies Interviewed:			
Advanced Driver Information Technologies	Airbiquity	AllGoSystems	ATX Group
Elektrobit	Google	Hughes Telematics	Inrix
KPIT Cummins	Mentor Graphics	Microsoft	Monta Vista
Navteq	Nokia	QNX	TomTom
Vector Informatik	VoiceBox	Wind River	WiPro
Wireless Car			

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IVI OS Suppliers:

Microsoft

Strengths:	Weaknesses:	Future:
-Established customer base: Ford, Fiat and Kia. -'One Stop Shop'. -Proven Product. - Next generation product 'Motavi' launching with Japanese OEMs.	- High royalty price. (Additional information in full version of report) - Perceived lack of focus on IVI compared to their overall roadmap. - Lack of openness to development community - Slow boot time	- Major IVI supplier through 2015. - Between 2015 and 2017 Open Source (Linux, or more probably GENIVI) will displace MS as No.1 IVI OS supplier

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IVI OS Suppliers:

QNX		
Strengths: -Proven track record in IVI, support and lower price than MS. (Additional information in full version of report)	**Weaknesses:** - Perception of future scalability especially across next generation systems requiring higher level of feature integration. RIM's acquisition of QNX will neither help nor hurt QNX in the IVI market.	**Future:** - Shrinking in IVI - Will be a niche player for the foreseeable future. - Potential exit from the IVI market in the next 5 years due to inability to compete with MS and Open Source (GENIVI or Linux)

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IVI OS Suppliers:

Linux		
Strengths: - Open Source Development Community. - Continued growth in IVI community, with perception of significant cost reductions compared to proprietary OS.	**Weaknesses:** - Perception of IP, indemnification issues, quality & reliability support.	**Future:** - Continued growth in IVI, with GENIVI surpassing Linux and MS in 2017. Japanese Market will be slowest to adopt, due to their risk aversion towards open source.

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IVI OS Suppliers:

GENIVI		
Strengths: -Viewed as Automotive IVI version of Linux. - Same Open Source strengths as Linux. - Consortium momentum and support	**Weaknesses:** - As with Linux: Perception of IP, indemnification issues, quality & reliability support.	**Future:** - Perceived as migration path from Linux. In 2015 most developing Linux solutions will have switched to GENIVI. GENIVI to challenge or surpass MS in 2017 for No. 1 market position in IVI OS. Japanese Market will be slowest to adopt, due to their risk aversion towards open source.

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IVI OS Suppliers:

MicroItron

Strengths:	Weaknesses:	Future:
-Proven track record in Japanese Market. - Will share the Japanese OEM market with MS for the near future.	- Will continue to lose market share in Japan and will not be adopted by other non- Japanese OEMs.	- Shrinking in IVI - Will be a niche player for the foreseeable future, limited to Japanese market. - Potential exit from the IVI market in the next 5 years due to inability to compete with MS and Open Source (GENIVI or Linux)

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IVI OS Suppliers:

Android

Strengths:	Weaknesses:	Future:
- Customer: Roewe, with Continental and Parrot developing OS for future applications. - Growing interest particularly for applications support. - Open source availability for developers' community. - Smart phone adoption	- Too early to tell if the product will be successful in IVI. Perception that Google will do little, if anything to configure the product for IVI in their future roadmap.	- Good potential for growth in IVI, but only as a complimentary OS for supporting apps – especially navigation. Japanese Market will be slowest to adopt, due to their risk aversion towards open source.

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IVI Commercial Considerations, relative to Open Source:

Development Costs for IVI System	Projected development cost savings through Open Source
- Respondents explained total IVI development costs ranges from$20 Million to $100 Million (Additional information in full version of report) - Software represents approximately half of the total development costs, rising in the near future to 60% of total costs. - Average human resource necessary for development of a new IVI system is 200 man years (discussed in full version of report).	- Respondents indicated savings realized through use of Open Source (GENIVI or Linux) would be 50% of software cost or 25 to 30% of overall total development cost. - Costs saving projections assumed a mature/stable Open Source implementation. The first implementation could cost as much if not more than a proprietary solution.

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IVI Differentiating Features: [*Respondents indicated HMI would be the true differentiating domain in IVI and ranked the HMI features as follows:]

HMI Feature	Comments	Respondents Ranking
1). Voice Recognition	Contextual & grammatical recognition is focus for improvement. No. 1 differentiating feature under development across all global regions.	70%
2). Touch Screen	Although any regional focus is unclear, several respondents indicated that Europe would see more future touch screen application compared to other regions.	27%
3). 3D Graphics	-	20%
4). HUD	Projected virtual image is focus, compared to windshield projection for safety reasons.	12%

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IVI Differentiating Features: [*Respondents indicated HMI would be the true differentiating domain in IVI and ranked the HMI features as follows:]

HMI Feature	Comments	Respondents Ranking
5). Gesture Recognition	Several tier one suppliers mentioned active development programs they were engaged in for this technology. Omni Swipe for smart phone application was mentioned as a potential model to be followed.	12%
6). Steering Wheel Controls	-	8%
7). Text to Speech	higher end vehicle standard feature	8%

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IVI Connectivity Technologies : [*Respondents explained the most important connectivity technologies as market drivers and major considerations for IVI software support.]

Connectivity	Comments	Future
SD Cards	SD Card Interfaces will remain for the foreseeable future with no identified technology as a potential replacement. Japanese OEMs are the major proponents of SD Cards for safety reasons.	Standard
USB	All respondents indicated that USB will remain the standard wired connection for IVI in the foreseeable future	Potential replacement with wireless technology after 2015
Bluetooth	100% of respondents saw Bluetooth as a mainstay for the short term, 47% of respondents felt Bluetooth will be replaced with an alternative wireless technology beginning in the 2015 to 2017 timeframe.	2017 potential replacement by WiFi

IVI Connectivity Technologies : [*Respondents explained the most important connectivity technologies as market drivers and major considerations for IVI software support.]

Connectivity	Comments	Future
WiFi – Connect to Hot Spot	70% of the respondents felt that this application will shrink in the future, while 30% felt it will grow. United States was the region most felt it had the best chance for growth	Decline
WiFi – V2V, V2R	Driven by safety and mobility efficiency initiatives, 90% of respondents felt this application will grow in the future, while 10% felt its growth is questionable.	Growth. Timing: ?
WiFi – Vehicle as a Hot Spot	90% of respondents indicated this application will grow in the future, while 10% felt it would not. Those feeling it will not grow cited non-supportive cellular business models as the detractor.	Growth

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IVI Connectivity Technologies : [*Respondents explained the most important connectivity technologies as market drivers and major considerations for IVI software support.]

Connectivity	Comments	Future
WiFi – for connectivity between smart phone and head unit	Significant industry response indicating this technology has the potential of becoming the standard connectivity protocol for this application. While the current version of Wi-Fi does not support use cases provided by Bluetooth, Wi-Fi & Wi-Fi direct are being evaluated for development in this application.	Potential growth. Under evaluation
Mobile Broadband: LTE vs. WiMax	93% of all respondents indicated that LTE will dominate and potentially completely displace WiMax in the future.	Long term growth for LTE. WiMax: Decline

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IVI Connectivity Technologies : [*Respondents explained the most important connectivity technologies as market drivers and major considerations for IVI software support.]

Connectivity	Comments	Future
Terminal Mode	83% of respondents felt it will be a viable solution in the future. Out of these respondents, one tier one supplier mentioned it is being developed by and will be launched in to production by some of their customers.	Potential Growth
Serial Communications	CAN, LIN, MOST, FlexRay and Ethernet will be required protocols for future IVI systems. FlexRay is questionable for IVI unless supporting a safety critical application (Powertrain, ADAS, etc.)	Growth for CAN, LIN, MOST & Ethernet. FlexRay: ?

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IVI Non-Connectivity Market Drivers: [*Respondents explained the most important non-connectivity technologies as market drivers and major considerations for IVI software support.]

Technology	Comments	Future
Protection from harmful apps.	100% of respondents: OEM certification of apps store was necessary. 23% of respondents: physical silicon partitioning, meaning separate IC as gateway would be best approach for foreseeable future (example: Ford SYNC). 53% of respondents: software partitioning or virtualization with or without multi-core processor would be most cost effective future strategy.	Long Term: Software Partitioning

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GENIVI IVI Software Architecture Report Summary

Above slides represent an abridged version of the complete GENIVI IVI Software Architecture Report. Also included in the complete version are iSuppli's 'Automotive OS Overview' and Frost & Sullivan's 'Outlook for the Global Infotainment, Navigation and Telematics Market. For inquiries regarding a complete copy of the report contact GENIVI at mrd.genivi.org

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