



FTF 2016
TECHNOLOGY FORUM

TRENDS AND CHALLENGES IN AUTOMOTIVE INFOTAINMENT

MARK FITZGERALD
STRATEGY ANALYTICS
ASSOCIATE DIRECTOR – AUTOMOTIVE PRACTICE

PUBLIC USE





DAVE CHENEY

GM Infotainment Hardware

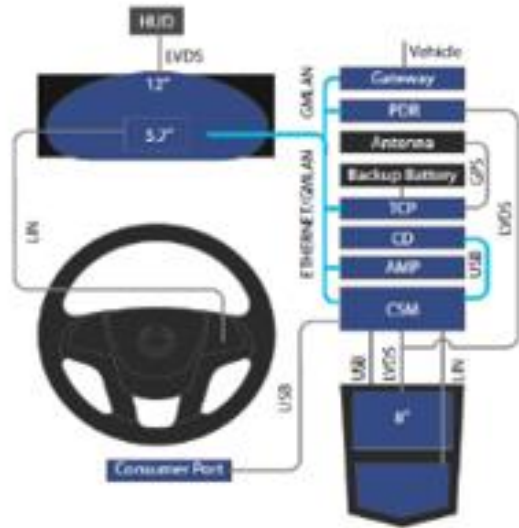
“The automotive industry will change more in the next 5 to 10 years than in the last 50”

- Mary Barra, General Motors CEO

CONNECTIVITY IS A FOUNDATIONAL ENABLER FOR MANY GM INITIATIVES



Solutions delivered by multiple methods



Built-In

+



Brought-In

+



Beamed-in



1 BILLION INTERACTIONS

SINCE FOUNDED 19 YEARS AGO

>99% of customers agree to the terms to have their vehicles connected



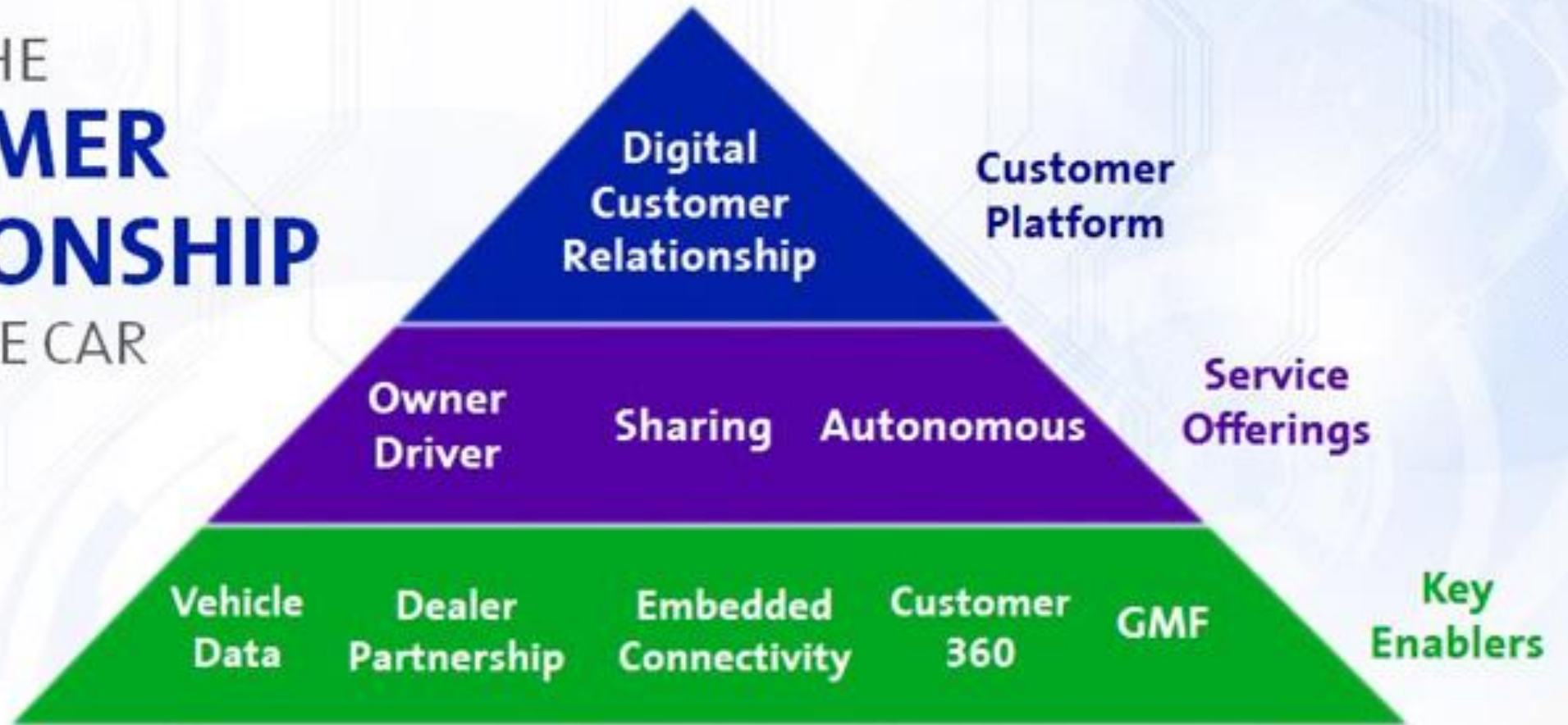
>50 MILLION RemoteLink interactions in first half of 2015



~1 MILLION 4G LTE enabled vehicles



OWNING THE
**CUSTOMER
RELATIONSHIP**
BEYOND THE CAR





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COMPLEXITY YING AND BANG

ALAN NORTON, FORD MOTOR COMPANY
SENIOR TECHNICAL LEADER, AUDIO SYSTEMS



ALAN NORTON

- Joined Ford in 1990
 - Early navigation projects
 - Body & security products
- Visteon 1998 – 2004
 - Multiple J-OEM projects
 - Interior & Electronics lead for Ford C-MAX & Focus
- Joined Ford Of Germany 2004
 - European Upper Body Electronics, Global HMI Lead
 - Global Entertainment Electronics
 - Senior Technical Leader, Audio Systems

COMPLEXITY YING

LOW COMPLEXITY IS EASY, ISN'T IT?

- Design and build a super integrated module that covers all your in vehicle infotainment needs
- Leverage enormous volume to achieve lowest cost
- Provide flexibility by software configurable features



COMPLEXITY BANG!

WHAT EVERY INFOTAINMENT TEAM IS DEALING WITH!

- My program can't afford the overhead, create a version with less memory, channels, tuners...
- Let's put this into three legacy vehicles, make three new bracket variants
- We need supplier competition, key design aspects are supplier IP, rewrite some of the software
- Package in a hot location, add a fan





COMPLEXITY BANG!

WHAT EVERY INFOTAINMENT TEAM IS DEALING WITH!



SEE IT'S EASY!

Thank You





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MARK FOSMOEN
VISTEON N. AMERICA ENGINEERING DIRECTOR



Visteon at a Glance



\$3.25B 2015 ANNUAL SALES – Electronics Only

11,000 EMPLOYEES

19 COUNTRIES

22 MANUFACTURING LOCATIONS

9 GLOBAL TECH CENTERS

14 REGIONAL TECH CENTERS

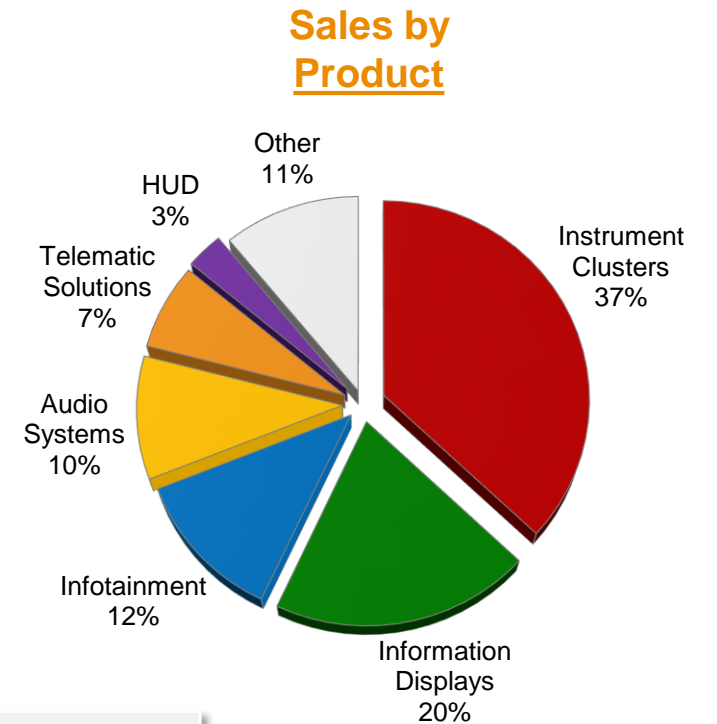
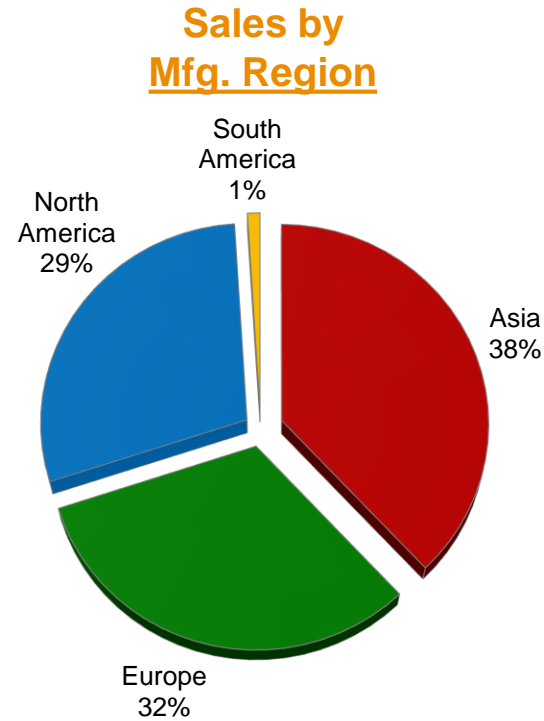
**Van Buren Township,
Michigan, United States** COMPANY HEADQUARTERS

Leading Portfolio and Expertise, Global Footprint, Strong Balance Sheet



Visteon at a Glance: Product/Technical Landscape

R&D more than
30% of global
workforce



1,600 R&D employees develop
Software

2 of 3 R&D employees work in
Low-Cost Regions

R&D workforce augmented through technical partners and contractors:
660 people

Abstract Interest: Summary

Interest Scope: We see growing demand for aggressive implementation timing and content

- Most notably are the increases in:
 - Display resolution, luminance, processor demands (due to UI requirements and data handling) and inter-module communication
 - These needs have caused integration challenges
- Potential Growth in Domain Integration.
 - Integration of Cluster, ADAS and Infotainment for cost and inter-module communication optimization
 - Results in complexity management concerns for entry systems
- Challenge Areas:
 - X-OEM customer Re-use of core assets
 - Thermal management
 - EMC management
 - Distributed system architectures: Well defined inter-module (network) communication.

Abstract Interest: Challenge Areas (expanded):

- X-OEM customer Re-use of core assets:
 - Tier 1's need to develop re-usable assets x-customer and across HW platforms
 - One solution model is to partition the SW and HW “stable” assets on a low overhead uP/OS that has maximum HW abstraction and SW that tends to be only configured by OEM (not fully custom)
 - For multiple Micro based solutions:
 - Network, Diagnostics, Core functions like Tuner controls (audio), Cluster core Application code (DI) and power state handling to be done on ViP. Preferable in an AutoSar environment to help configure/abstract from the HW.
 - The GP (graphics processor) to be used for “Unstable” functions such as UI, Connectivity, high bandwidth network interfaces such as MOST150 and Ethernet
- Thermal management:
 - Display sizes/brightness:
 - 1000nits is not an uncommon requirement (to the user) for displays that are not shrouded
 - We are targeting illumination sources that can supply 1.5X the visible targets
 - SoC thermal management:
 - Most of our SoCs need DIRECT passive or active thermal management by Tier1
 - These are adding cost, weight, size and EMC noise that we need to manage in design

Abstract Interest: Challenge Areas (expanded):

- EMC management:
 - Growth in the SoC, Memory, and content within the constrained package we are delivered, resulting in most Tier1's having to move to higher PWB layer counts as well as creative ways to shield their module (RE and RI)
 - Chassis or Die Cast housing serving dual purposes for Thermal and EMC management (heatsink + Faraday cage)
- Distributed system architectures:
 - As several OEMs move to greater distribution of functions, another challenge is data management between modules via MOST150, Ethernet, or lower bandwidth interfaces without pre-defined messaging
 - Non-standard use cases and inter-module handling of these fringe use cases are normally weak areas of timing specs
 - Tends to take system level testing to resolve late in programs due to need for module maturation

Take Away: Recognition of the Timing, Weight and Cost impacts of Technology Growth
Management need to be planned for in the Development Cycle





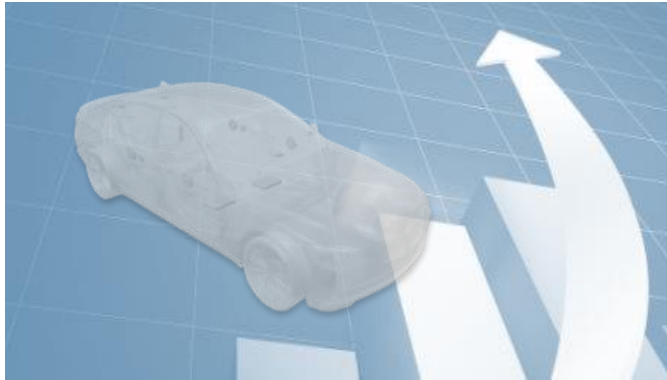
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IVAN DZOMBAK
CHIEF ENGINEER, INFOTAINMENT SYSTEMS, HARMAN



ABOUT HARMAN



- **\$6.2 Billion revenues***

**Last 12 Months as June 30, 2015.*

MARKET LEADER



- **27,000** Professionals worldwide
- **12,600** Engineers
- **25+** Countries: Americas, Europe and Asia
- **16+** Legendary brands

GLOBALLY DIVERSE



- **5,700** Patents and patents pending
- **51** Design awards in 2014
- **3** GRAMMY® Awards-AKG, JBL, Lexicon
- **2** Academy Awards

INNOVATION LEADER



ABOUT HARMAN

CONNECTED CAR



Navigation, Multimedia, Connectivity, Telematics, Safety & Security Solutions

LIFESTYLE AUDIO



Premium Branded Audio products for use at home, in the car and on the go

PROFESSIONAL SOLUTIONS



Audio, Lighting, Video Switching and Enterprise Automation for Entertainment and Enterprises

CONNECTED SERVICES



Cloud, Mobility and Analytics Software Solutions along with OTA update technologies for Automotive, Mobile and Enterprises



Automotive Infotainment Trends and Challenges

Trend / Market Demand	Challenges
Compressed schedules	<ul style="list-style-type: none">• Getting the product defined quickly enough• Meeting quality goals for software and hardware
More features	<ul style="list-style-type: none">• Drives software and testing complexity• May confuse users if not presented intuitively• Usually increases hardware requirements, packaging density, and power dissipation
Robust security	<ul style="list-style-type: none">• Conflicts with trend toward more connectivity and keeping the software “fresh”• Complicates development, manufacturing, and testing
Function consolidation, including safety functions	<ul style="list-style-type: none">• Adds complexity to reach the desired level of safety• Physical I/O and connector space limitations
Higher-resolution displays and more of them	<ul style="list-style-type: none">• Dramatic increase in memory bandwidth• Automotive digital video interfaces are lagging consumer interfaces• Thermal management

Automotive Infotainment Trends and Challenges

Trend / Market Demand	Challenges
Digital camera interfaces and more of them	<ul style="list-style-type: none">• Physical I/O limitations• Memory bandwidth• Image signal processing (ISP) requirements
Latest wireless consumer interfaces	<ul style="list-style-type: none">• MIMO → more antennae• Packaging constraints → antenna locations?• Host processor I/O loading
Latest wired consumer interfaces (Especially USB Type C)	<ul style="list-style-type: none">• Cable lengths that vary by vehicle• Signal integrity / standards compliance issues• IR drop for high-current charging modes• Protection for data lines conflicts with signal integrity
Projection mode support (CarPlay, Android Auto, Baidu CarLife)	<ul style="list-style-type: none">• Need to support USB device mode and role switching• Increased hub complexity
State-of-the-art processing, graphics, and memory	<ul style="list-style-type: none">• Reduced Tj(max) for state-of-the-art SOCs• More difficult memory interface and power distribution network design



SECURE CONNECTIONS
FOR A SMARTER WORLD