



nVISION 08

THE WORLD OF VISUAL COMPUTING

Building Immersive User Interfaces

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Software driving automotive innovation

- “... more and more that’s exactly what today’s cars and trucks are: highly sophisticated consumer electronics...
- *Rick Wagoner, General Motors CEO (CES 2008 Keynote)*
- “Many of GM’s products have become reliant on software to the point that they could not be sold, used, or serviced without it.”
- *Dr. Anthony Scott, General Motors* ⁽¹⁾
- “We believe that advanced technology in electronics and software will drive 90 percent of product innovation in the automotive industry for the next 10 years.”
- *Sangkwon Kim, Hyundai Motor Co.* ⁽²⁾
- “40% of a vehicle's cost is determined by electronics and software.” - BMW ⁽³⁾
- Projections are that software alone will soon account for over 12% of the value of a car. - *Matt Volckmann, VDC* ⁽⁴⁾

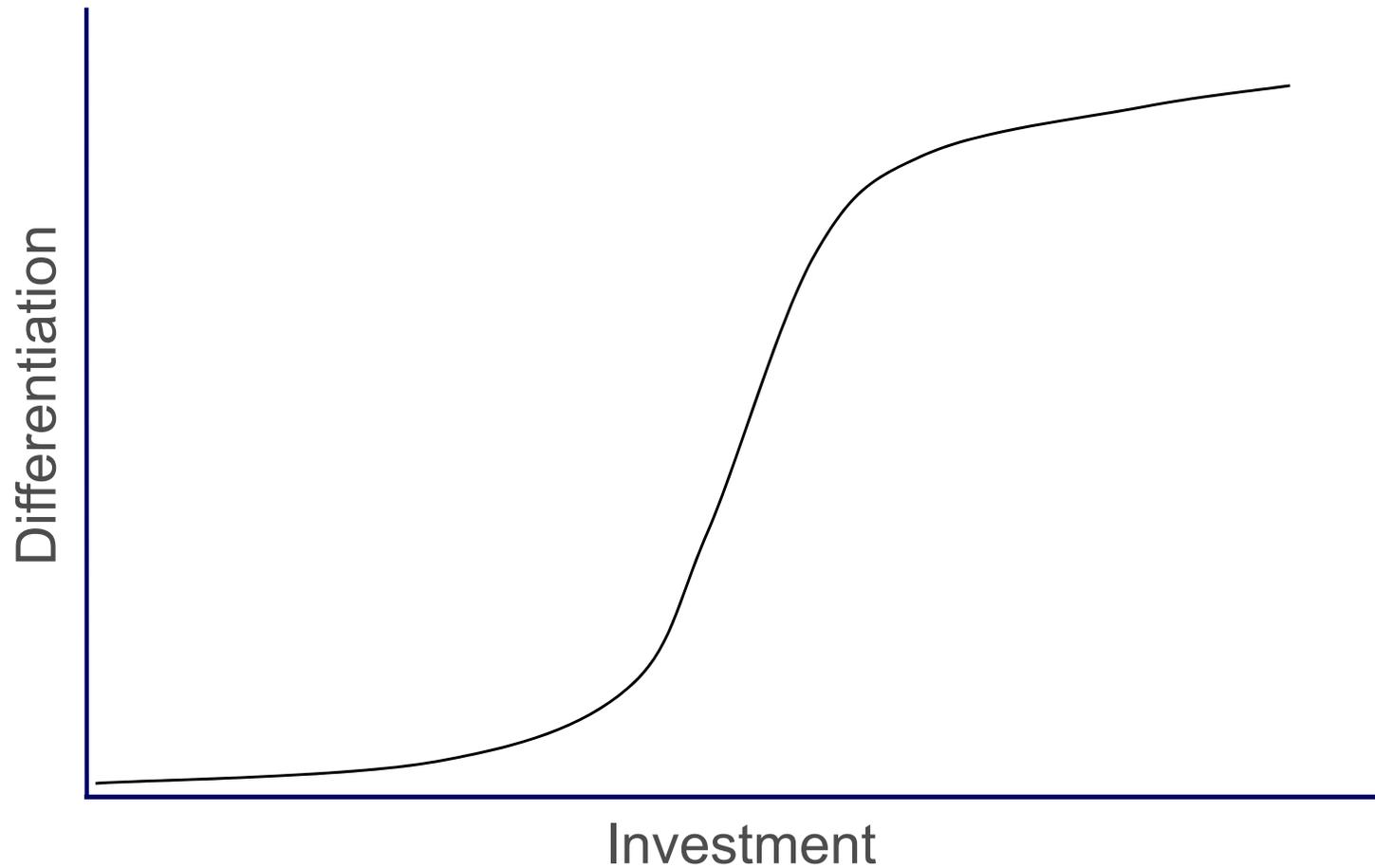
Software driving automotive innovation

- “VW employs more than 700 researchers in Germany, the USA, China and Japan. They are continually striving to network the car more intensively to its environment, to other vehicles and finally - via intuitively operated human-machine interfaces - to the drivers themselves.” (5)

“Our frustrations with machines are not going to be solved with better machines. Most of our technological difficulties come from the way we interact with our machines...” - Dr. Donald Norman (7)

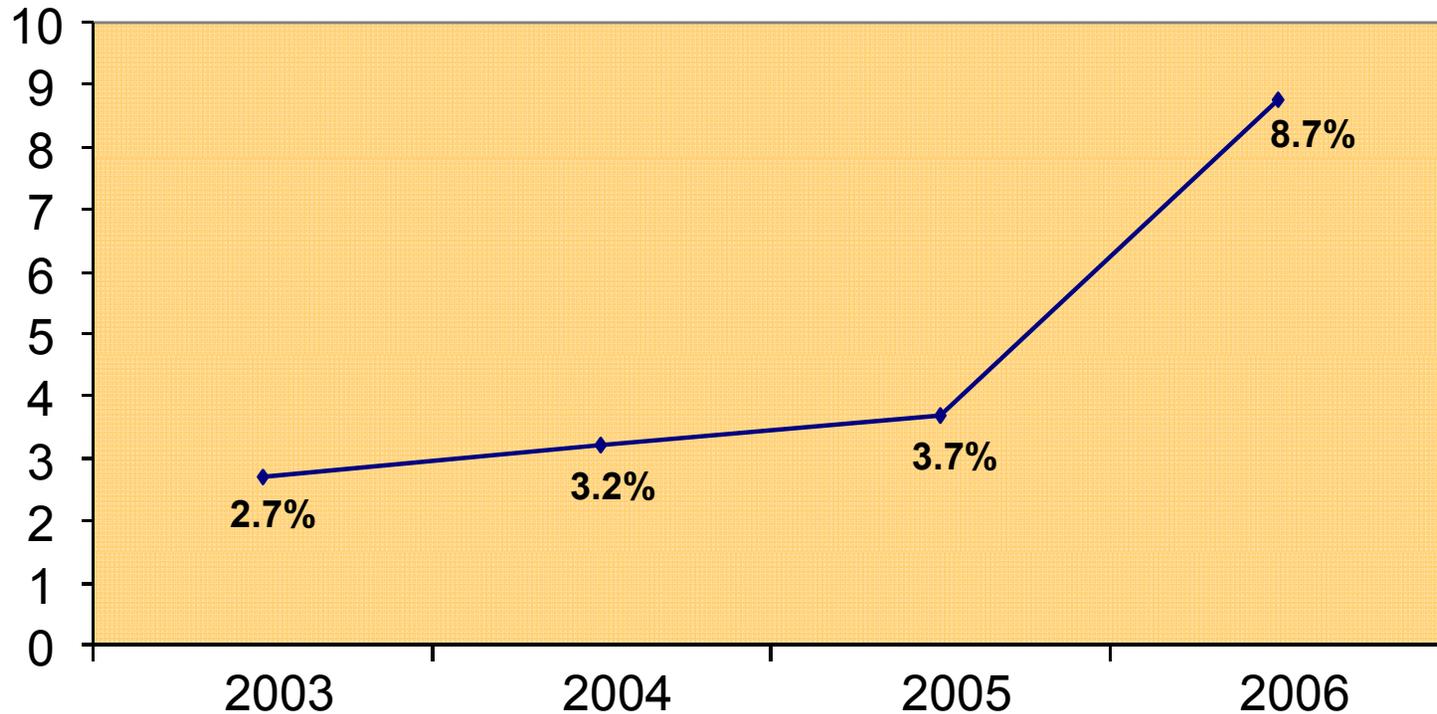


OEM investment versus differentiation



Software impacting quality

Percentage of recalls due to software



Source: National Highway Traffic Safety Administration (NHTSA) (6)

Automotive trends and software challenges

– Personalization

- My devices
- My media
- My look and feel
- My services
- My content
- My location

– Challenges

- Complexity
- Quality
- Ease of use
- Driver distraction
- Connectivity
- Updates



HMI design challenges

- **Increasing pressure for market differentiation**
 - HMI is now one of the biggest single differentiators
- **Increasingly sophisticated customer expectation**
 - Rich, multi-modal, dynamic HMIs
 - Consistency, ease of use and familiarity
 - Location aware interface / content
- **Integration with external consumer electronics and services**
 - e.g. cellular phones, MP3 players
 - Synchronization, communication, and control
 - System and component software upgradeability to keep up with the consumer electronics market
 - Off board services / internet
- **Digital media integration**
 - Formats, codecs, filesystems and DRM
- **Driver distraction**

HMI design challenges

- Reduce cost of development
 - HMI can consume over 50% of a project resources
- Shortened design cycles
- Leverage latest consumer and desktop technologies with:
 - Lower-cost CPU
 - Smaller flash and RAM footprint
 - Much faster startup times
 - Automotive grade reliability
 - Predictable response times
 - Smoother animations / transitions



All without compromising traditional real-time tasks!

HMI concepts – example

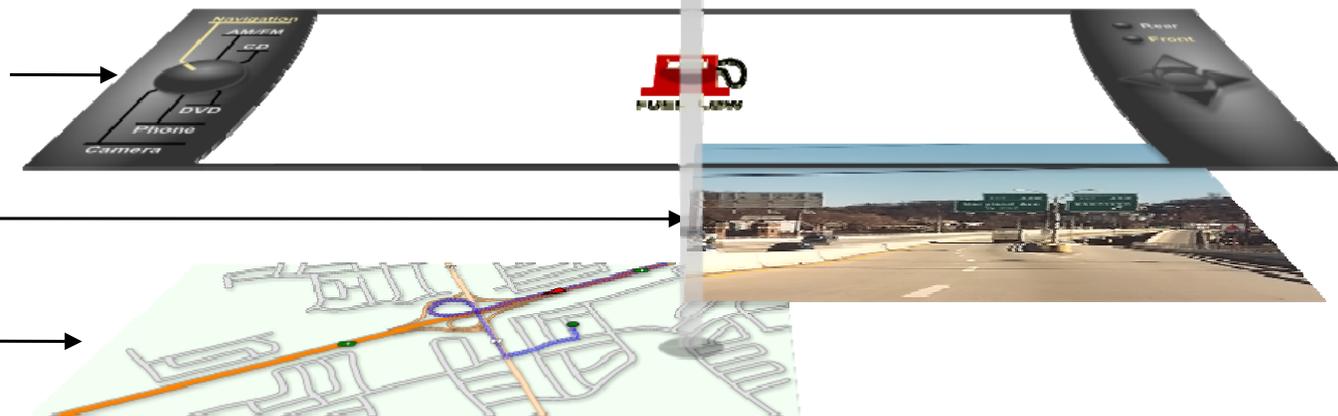


HMI

User Control

Video

Navigation



The OS dimension

- The operating system plays a key role in the user experience and must:
 - Be highly customizable and support fast-booting
 - Provide real-time priorities and scheduling for each HMI subsystem (layer) and OS service
 - Offer open and lightweight communications between HMI subsystems and OS services
 - Support on-the-fly partitioning of OS-level resources (CPU, memory, etc.) between the HMI and other sub-systems
 - Provide automotive grade reliability
 - Modularity to implement component level repair / upgrade / update

QNX Neutrino provides all these capabilities

QNX Aviage



Aviage HMI player



Rapidly build rich Flash-based user interfaces with video effects and animations



Aviage Multimedia Suite



Discover, play, sync and organize media



Aviage Acoustic Processing

Before



After



High-quality, hands-free communication without costly dedicated speech processors

Adobe Flash for your HMI

- Quickly jump from prototype to product
- High-level tools, millions of developers and designers
- Mountains of Flash content: components, movies (YouTube), source code, etc.
- Consistent look-and-feel for all flash content on all players
- Adobe has been targeting embedded systems for several years
 - Almost all phones support Flash Lite 2
 - Targeted for an embedded environment (footprint, cpu usage, etc.)

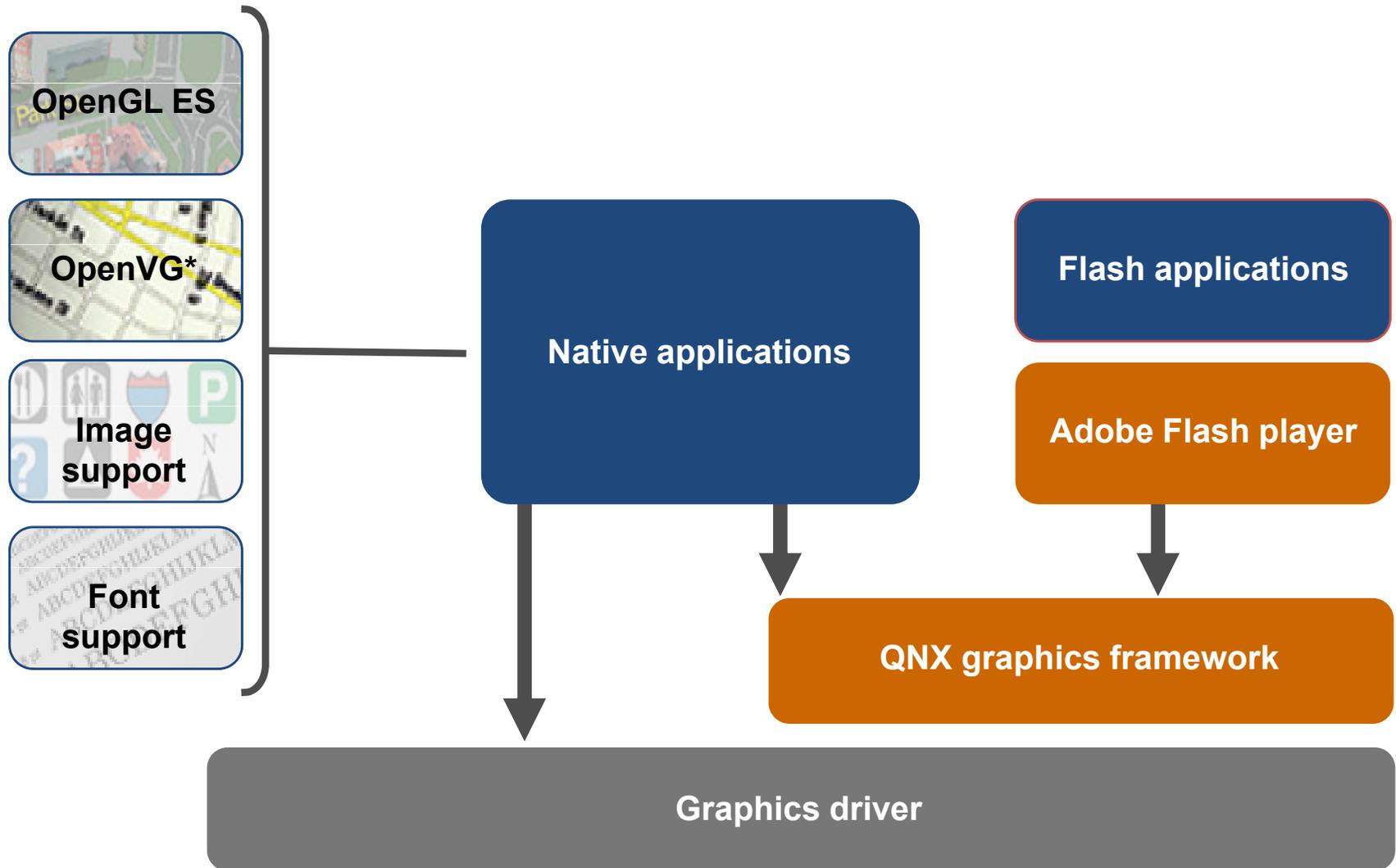


QNX and Adobe Flash

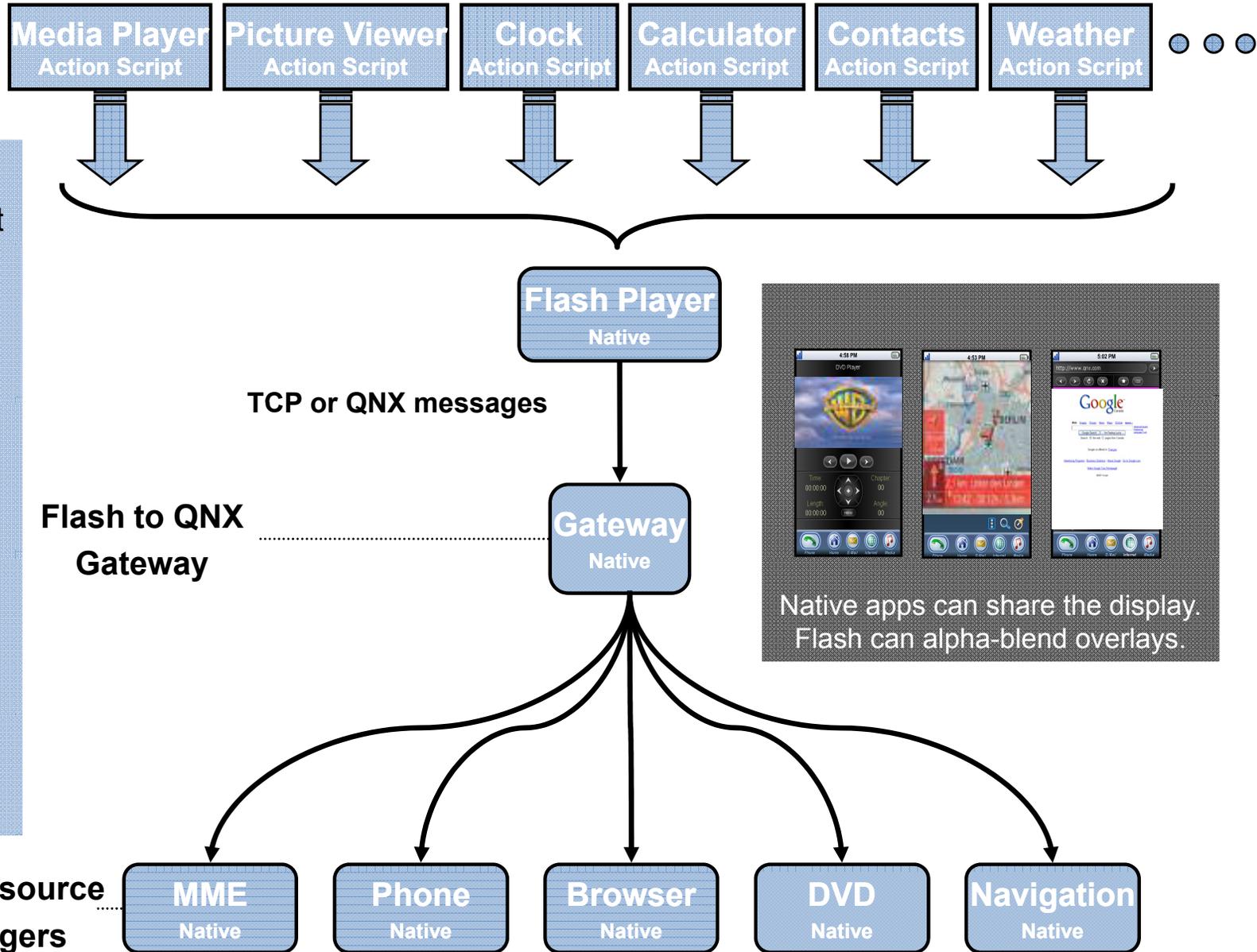
- QNX Aviage Flash HMI Player
 - Incorporates Flash into QNX application frameworks
 - Launch and control Flash content
 - Enable Flash content to coexist with other graphics and OS services
 - Adds QNX embedded values to Adobe Flash player and its environment
 - Reliability
 - Performance
 - Scalability
 - Adobe Certified



QNX Aviage graphics suite



Robust, “Connected”, Automotive HMI



Action Script

- OS independent
- CPU independent
- Safe execution environment
- Trained workforce
- Most advanced HMI builder in the world

Audi Q5



Audi Cross Cabriolet Concept



Contact Information

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Thank You!!

Backup

- Sources:
 - 1 - Measuring and Sustaining the New Economy, Software, Growth and the Future of the US Economy: Report of a Symposium (2006),
http://books.nap.edu/openbook.php?record_id=11587&page=48
; Quote from Dr. Anthony Scott, the Chief Information Technology Officer of GM
 - 2 - Sangkwon Kim, Senior Executive Vice President of Hyundai Motor Co.'s Research and Development Division - 2002
 - 3 - "Automotive Software—The Silent Revolution," Frischkorn, H-G., Keynote, Automotive Software Workshop, San Diego, Feb. 2004
 - 4 - Matt Volckmann, senior analyst at VDC 2006
 - 5
www.volkswagenag.com/vwag/vwcorp/info_center/en/themes/2008/06/research_roadmap_2008.html
 - 6 - <http://www-odi.nhtsa.dot.gov/cars/problems/recalls/>
 - 7 - Dr. Donald Norman via New York Times - Dec 18th 2007

QNX Strengths

- Standards-based OS
 - POSIX compliant (application portability)
 - Linux and Unix knowledge base and developers without IP risks
 - OpenGL ES, Open VG, etc.
- Standards-based tools
 - QNX Momentics Tools are based on Eclipse industry standard
 - www.eclipse.org : hundreds of third-party tools
- Reliability
 - QNX microkernel architecture and MMU permits reliable, self-healing design
- Scalable and realtime
 - Components based
 - Scalability without affecting realtime response
 - Multi-core - Symmetric, Asymmetric and Bound Multi-processing support
- Clean IP
 - No viral GPL or other licensing restrictions
- Automotive and Consumer Middleware
 - Multimedia Suite
 - Advanced 2D and 3D Graphics (OpenGL ES)
 - Adobe Flash for rich immersive HMI
 - Acoustic Pre-Processing
- Rich automotive ecosystem

Extensive Automotive Experience

Silicon relationships



Suppliers



Middleware



Auto OEMs



QNX is in over 180 Vehicle Models



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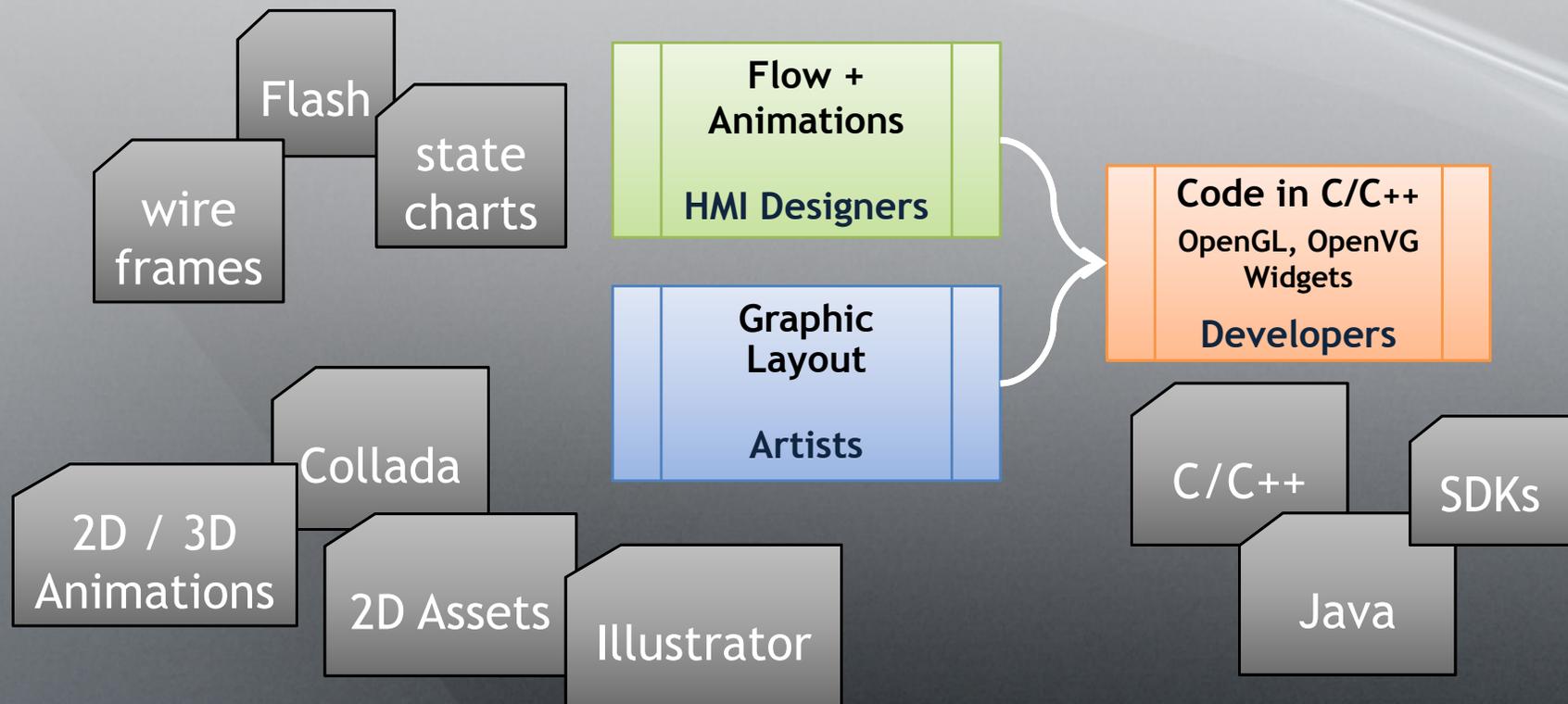
VW Electronics Research Lab

- The ERL Vision
 - Expand VW Group technology road map with cutting edge technologies
- Research Areas
 - Connected Vehicle
 - Multimedia Integration
 - Human Machine Interface
 - Driver Information and Assistance
 - Testing Concepts and Validation



Prototyping User Interfaces

- Automotive HMI development cycle:
Designer -> Implementer -> Supplier -> Developer



Prototyping User Interfaces

- Iterative prototyping provides opportunity for enriching and improving brand identity
- A common tool chain for design and implementation of HMI speeds this process



Potential Product Impact

- Dynamic design over 3-5 year product cycle
- Vehicle specific user interface design



Cross Cabrio Quattro Concept

- Los Angeles Auto Show November 2007
- Infotainment features developed by ERL and Audi Design Center -California
- Design study developed at ERL with help from partner companies



Cross Cabrio Quattro Features

Media features

- Internet streaming radio concept
- Destination entry with geo-encoded imagery



Cross Cabrio Quattro Features

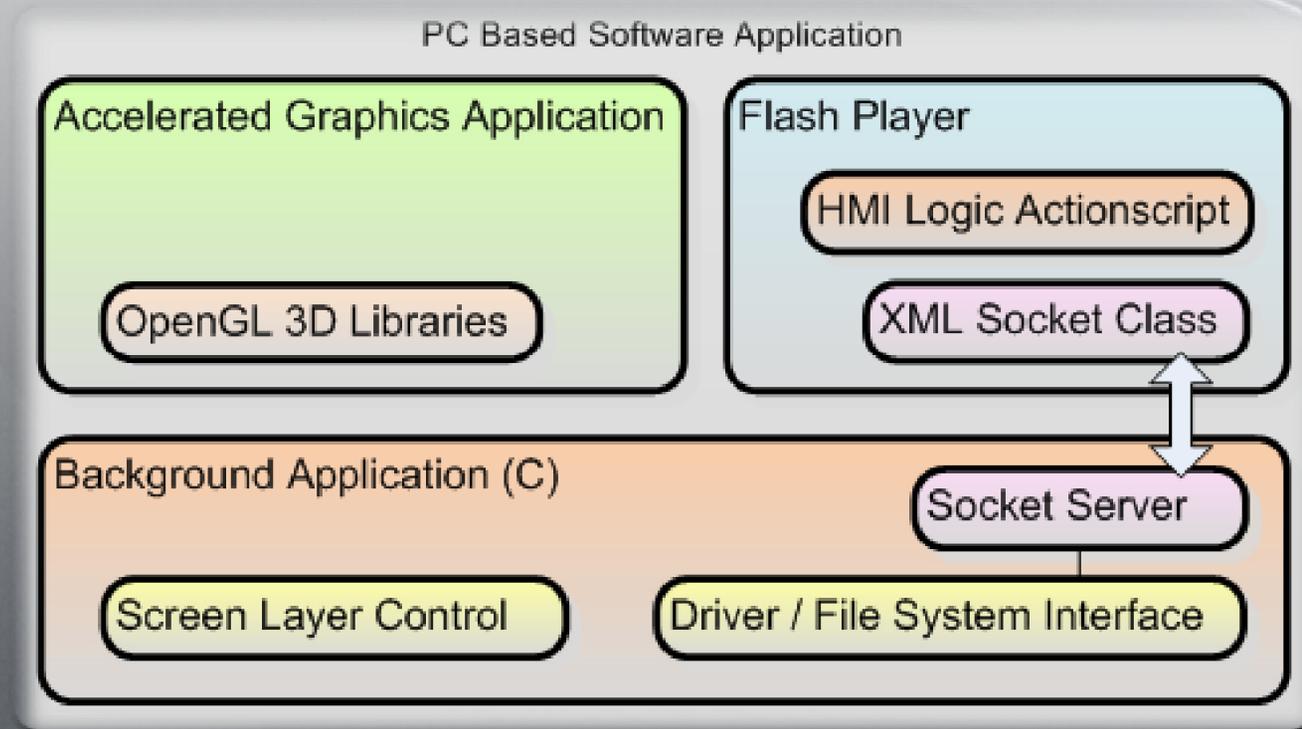
Navigation Features

- Online point of interest searching
- 3D navigation satellite imagery concept



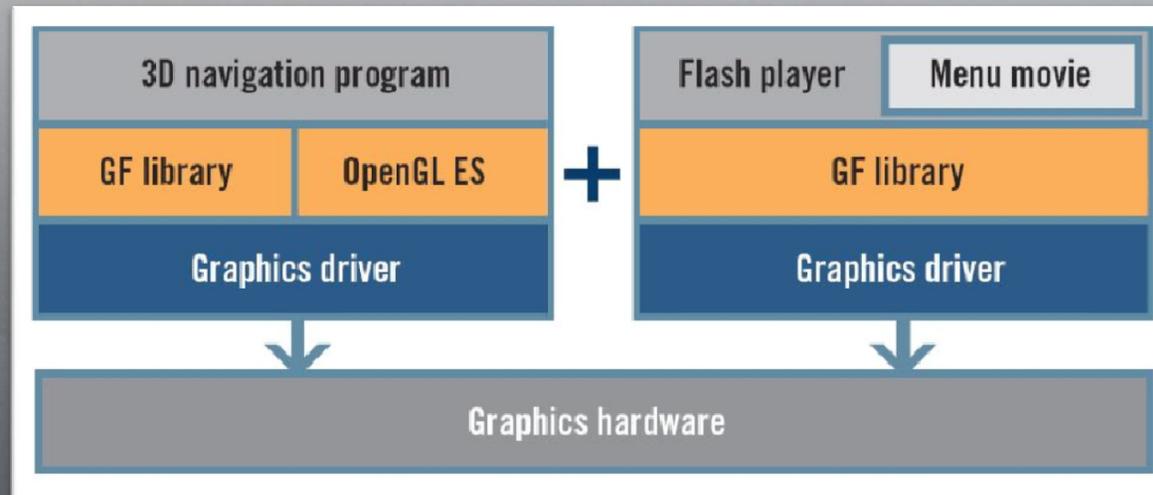
Cross Cabrio Quattro Features

- PC application structure
Flash, 3D graphics application, framework



Embedded Flash Ecosystem

- Flash composited with native applications
- HMI server provides device interfaces
- C/C++ local code extensibility from Flash



Handbook Application Study



Home Screen



Design goals:

- Intuitive structure for digital user manual
- Utilize Flash XML data class functionality
- Focus on graphics and information density

Handbook Application Study

- Flash Lite 3.0 Software structure
 - Actionscript HMI Description
 - XML Data Structure
 - FLA Graphics library

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