

DELPHI

Enabling Travel Information In Vehicles

Connected.



Enabling Travel Information in Vehicles

- Megatrends
- Technology Evolution
- Consumer Market Trends
- The Digital Revolution
- Mass Media to My Media
 - Safety Security Telematics
 - Large Color Displays
 - Dual-View Displays
- Location-based Weather
- Vehicle-to-Infrastructure Integration
- Wrap-up



The Future is Safe, Green and Connected

MEGATRENDS

• People Megatrends

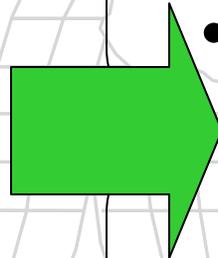
- Natural Growth
- People Live Longer
- Generations X & Y
- Increased Concern About Safety, Security and Privacy
- Health Care
- 8/5 > 12/6 > 24/7

• World Megatrends

- World Turmoil
- Globalization
- Higher Cost of Natural Resources
- Increasing Environmental Awareness/Regulations

• Technological Megatrends

- Information Explosion
- Wireless World



MEGATRENDS

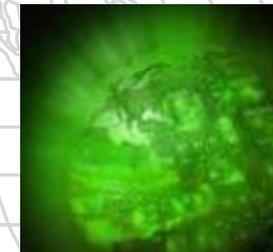
• Safe

- Traffic congestion in major metro areas around the world becomes worse; more accidents; longer commute; higher stress level



• Green

- Fast growing economies: more fuel for mobile platforms
- Demand for electrical energy and related conventional resources far exceeds current capabilities



• Connected

- Global demand for broadband access will continue to grow



DELPHI

DELPHI

CONNECTED

Technology Evolution.

Connected.



In the Last 30 years...

...Audio and communications technology has developed to meet the needs of consumers



Electronically Tuned Radio



Mobile Phone



Navigation



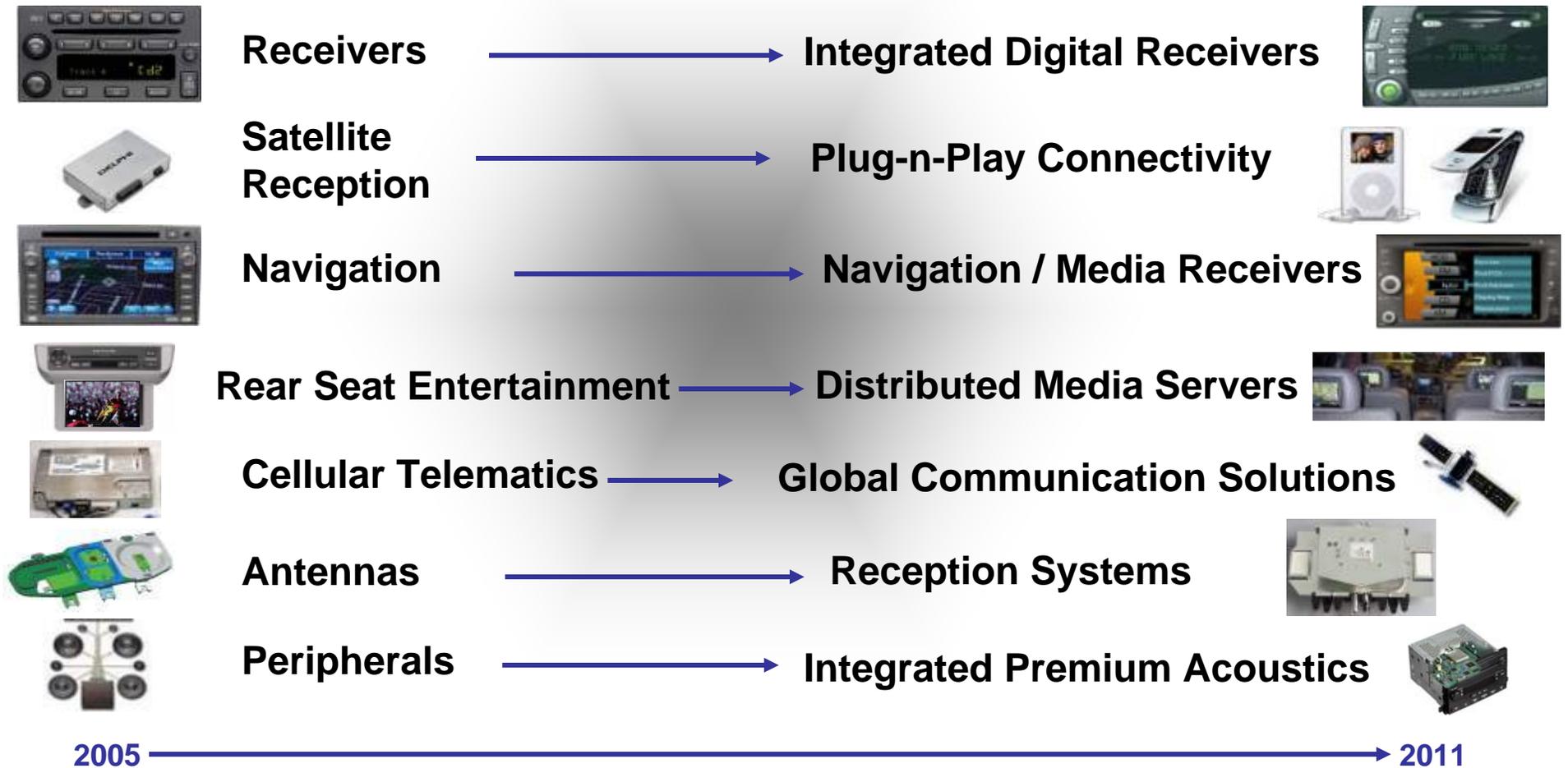
Satellite Radio

Dual-View Display



DELPHI

Technology Evolution



DELPHI

10 Years Ago Delphi's Connectivity Vision Was an...

In-vehicle Digital Living Room



Delphi Connected Vehicle 1997

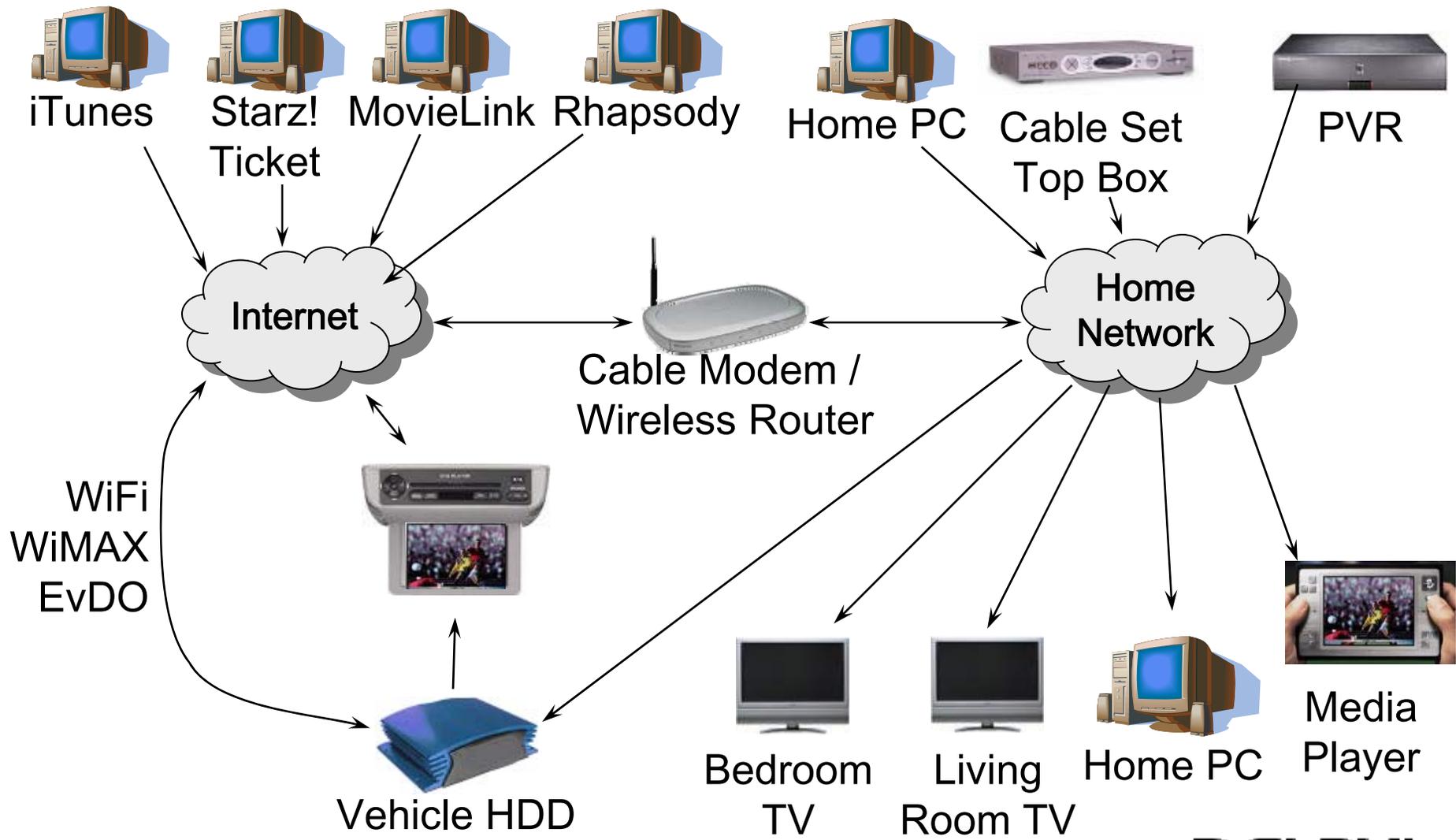
Key Technologies

- Internet Connectivity ✓
- Cell Phone and GPS ✓
- Voice Recognition ✓
- Speech Synthesis ✓
- Java ✓
- Color Head-up Displays ✓
- Satellite Reception ✓
- Passenger Displays ✓
- Available Today ✓

DELPHI

Delphi's Vision Today Is...

Any Content, Anytime, Anyplace



DELPHI

DELPHI

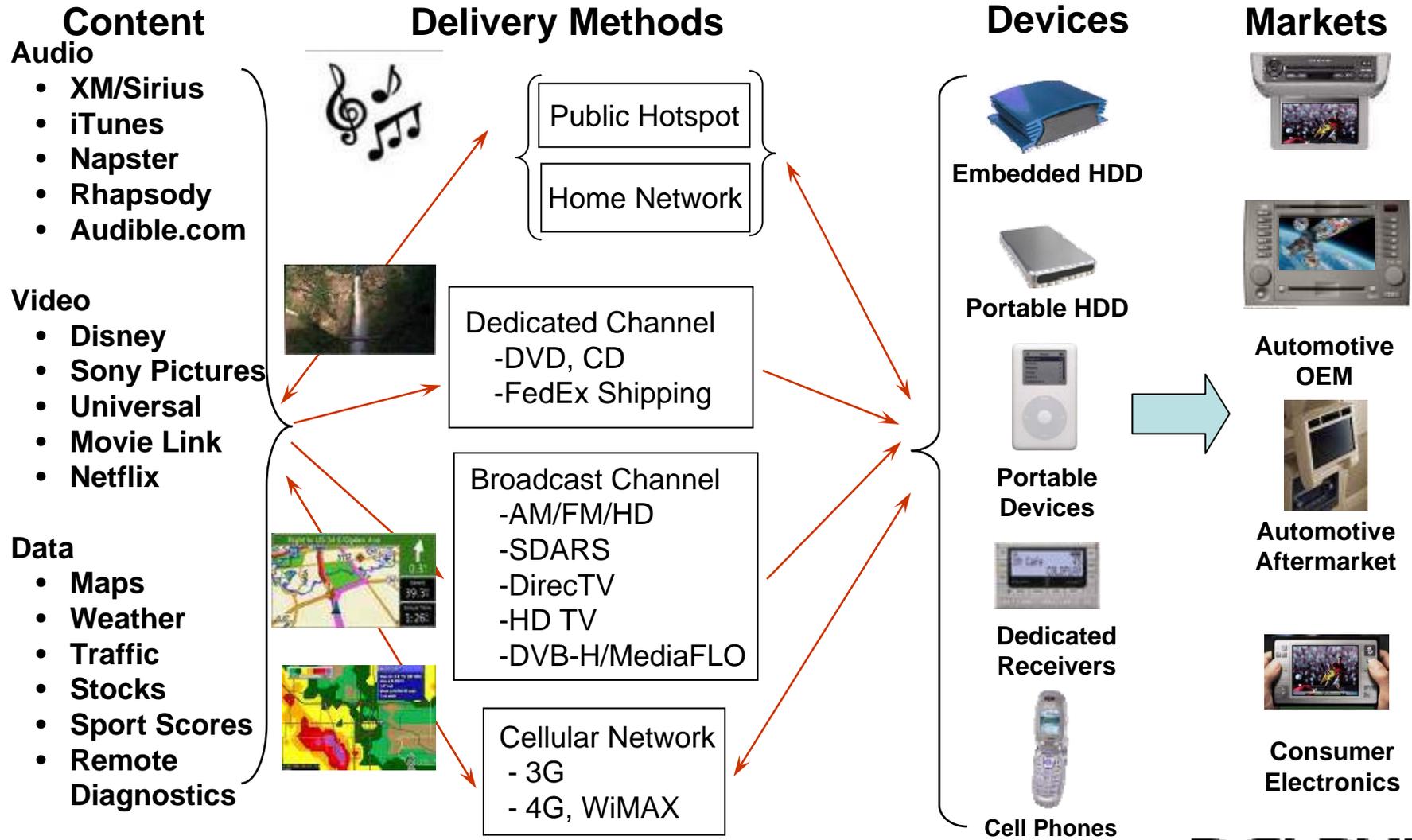
CONNECTED

Market Trends.

Connected.



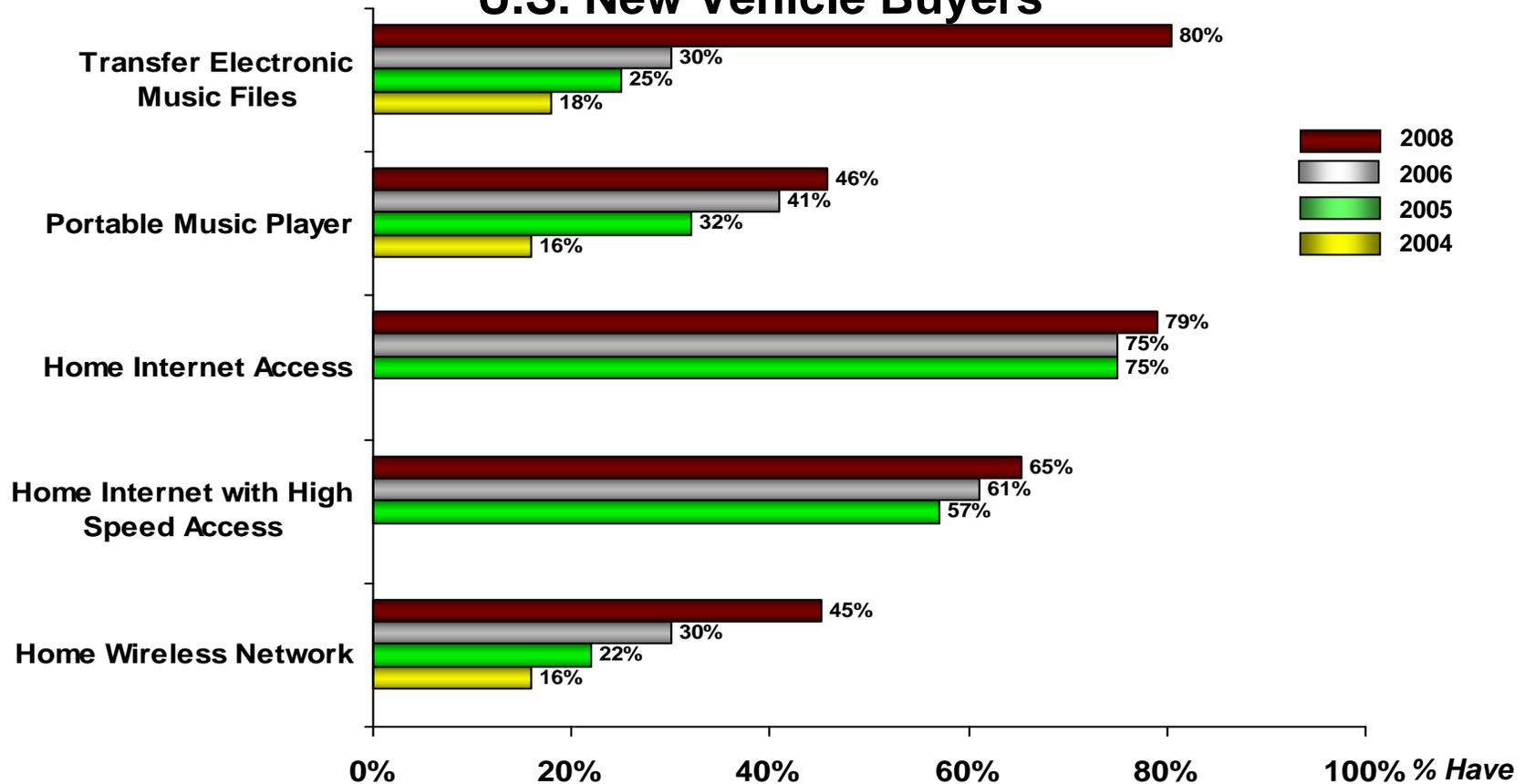
A Simultaneous Explosion of Content, Delivery Methods and Devices



DELPHI

Home Electronics Trends

U.S. New Vehicle Buyers



New Car Buyers Are Connected, So Why Not in the Car?

Source: Delphi CSAP **DELPHI**

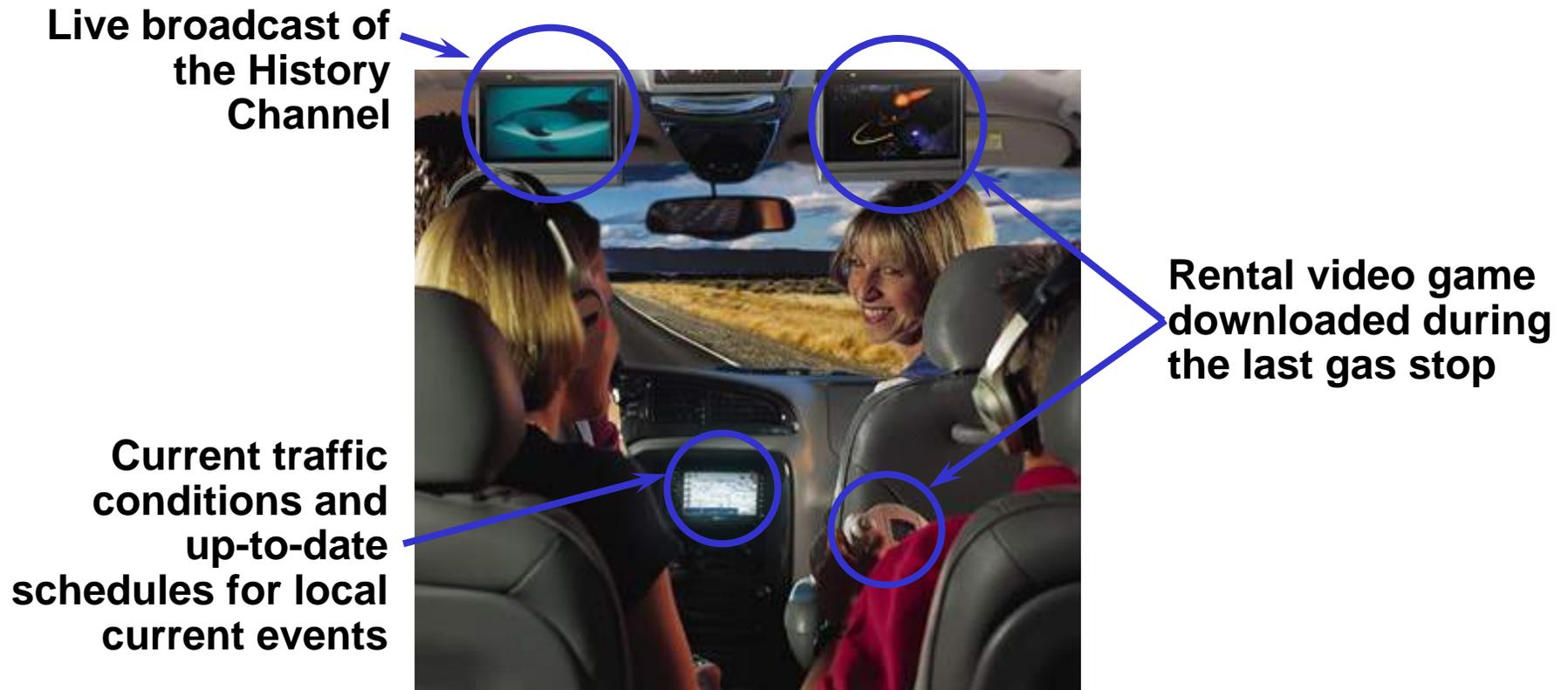
Consumers Want to Be Flexibly, Endlessly Connected



- Consumer research shows that customers demand:
 - Productivity
 - Convenience
 - Entertainment
 - Fresh, timely and non-traditional content
 - Same experience at home and in the car

DELPHI

Consumers Want Connectivity that Is Personalized, Convenient and a Good Value



The Best Seat Isn't Even in the House

DELPHI

DELPHI

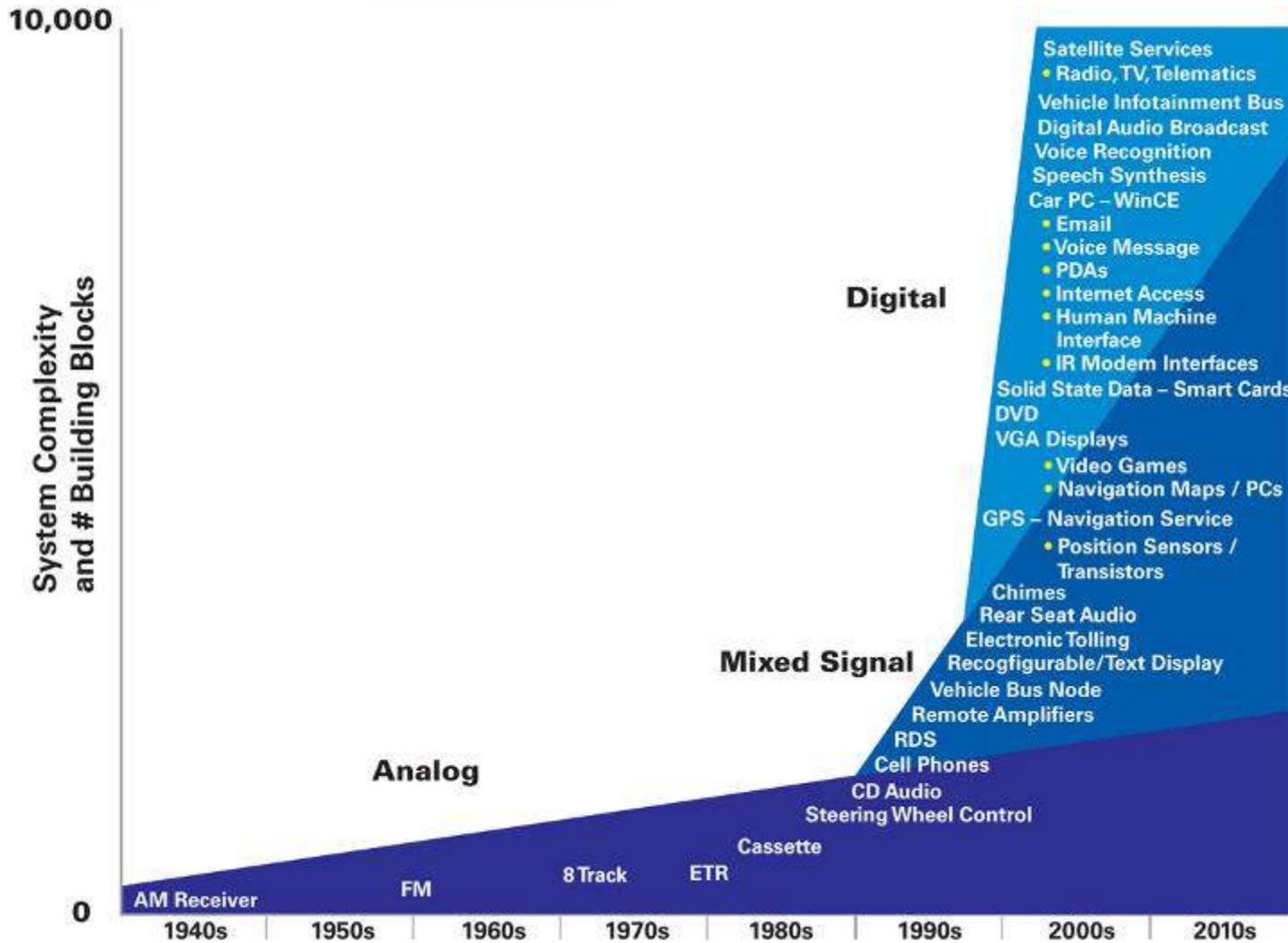
CONNECTED

The Digital Revolution.

Connected.



Acceleration and Impact of the Digital Revolution



DELPHI

Technology Has Changed Consumer Expectations



CD

Album

80's & 90's



CD MP3

Favorite Tunes

2002



iPod

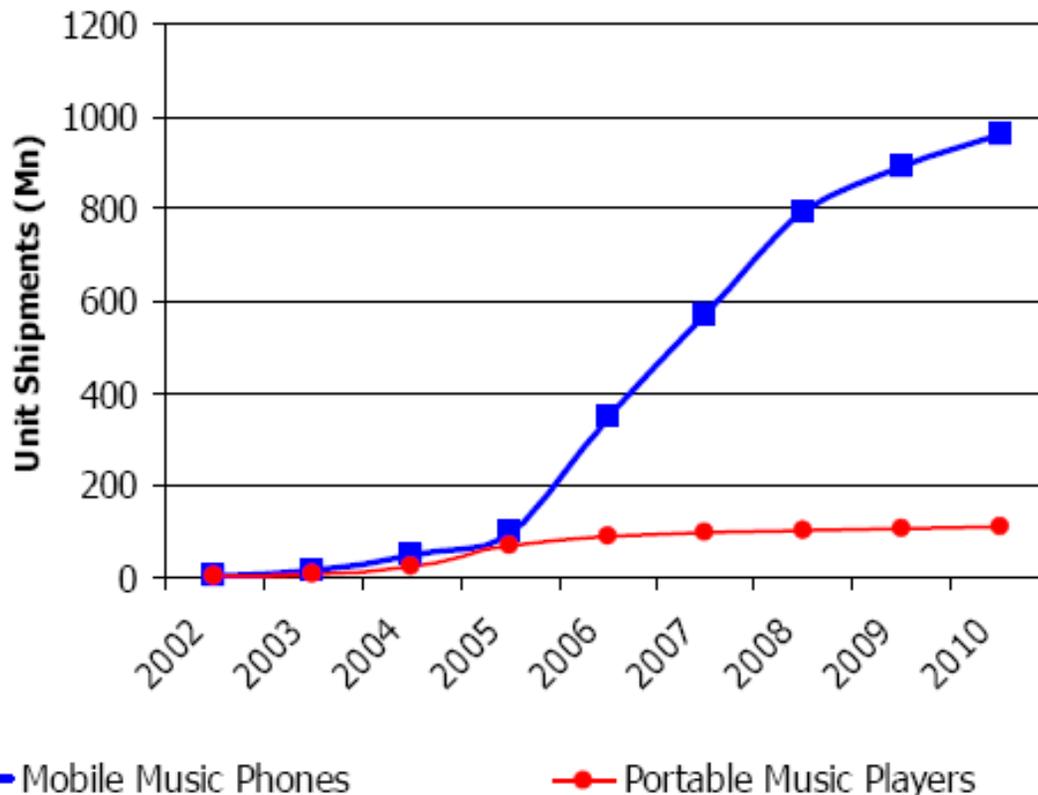
Complete Library

2003

Consumers Like Choice

DELPHI

Worldwide Portable Digital Media Player Shipments



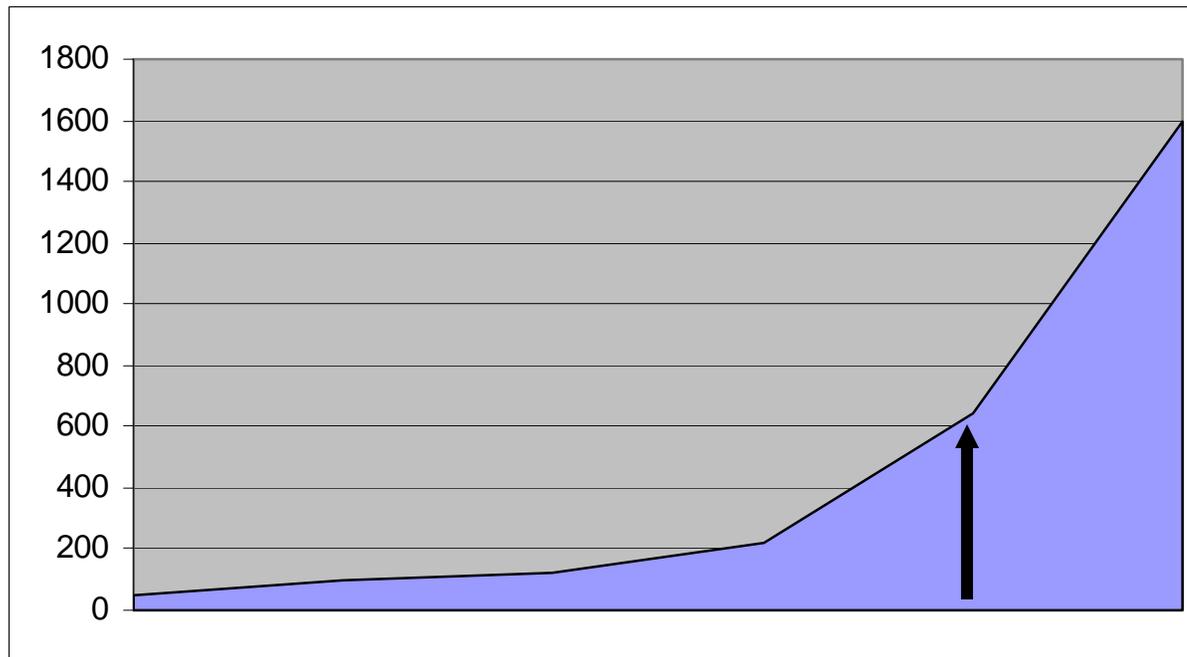
Source: Strategy Analytics

Consumers Are Just Beginning to Use Music Phones

DELPHI

iPod Initial Sales Acceleration After iTunes

2.8M iPods Sold as of 1st Quarter 2004
Over 22M iPods Sold in 2005



iPod Intro Jan 01 iTunes Availability April 03
Result: iPod Sales Acceleration

Data Source: Multiple Press Releases

DELPHI

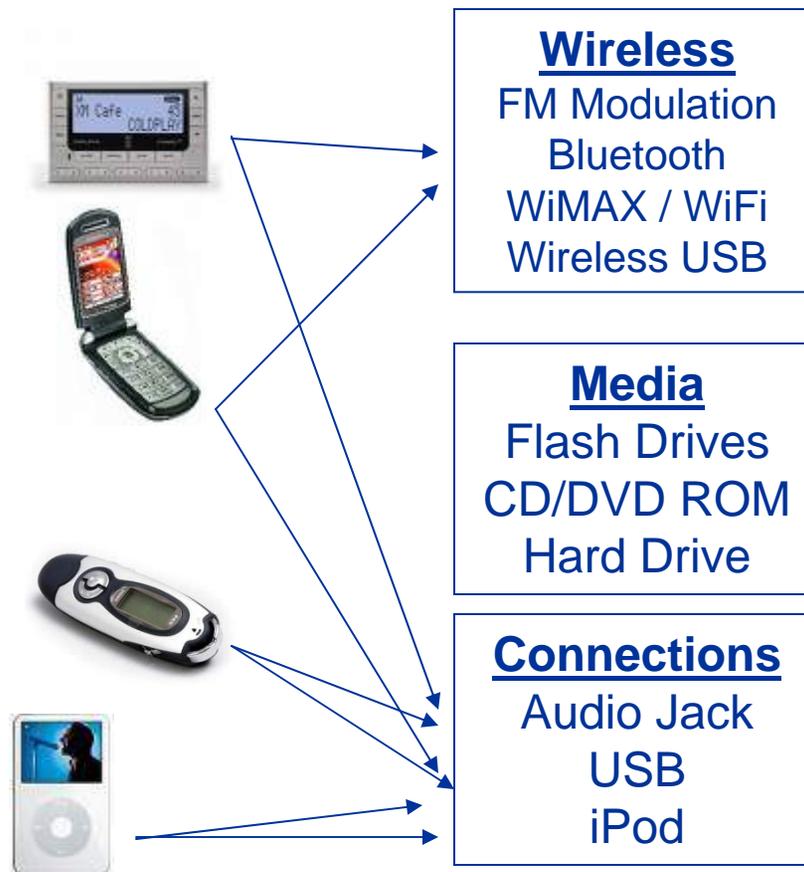
Digital Media Distribution Presents Multiple Connectivity Options

- **Wireless**
 - Satellite Radio
 - 3G Handsets
 - WiMAX
 - Bluetooth
 - WiFi
 - Wireless USB
- **Media**
 - SD Card
 - USB Drive
 - CD ROM
 - HDD
- **Connections**
 - Audio Jack
 - USB
 - iPod



DELPHI

Digital Media Connectivity



Vehicles require multiple connections. There is no single solution.

DELPHI

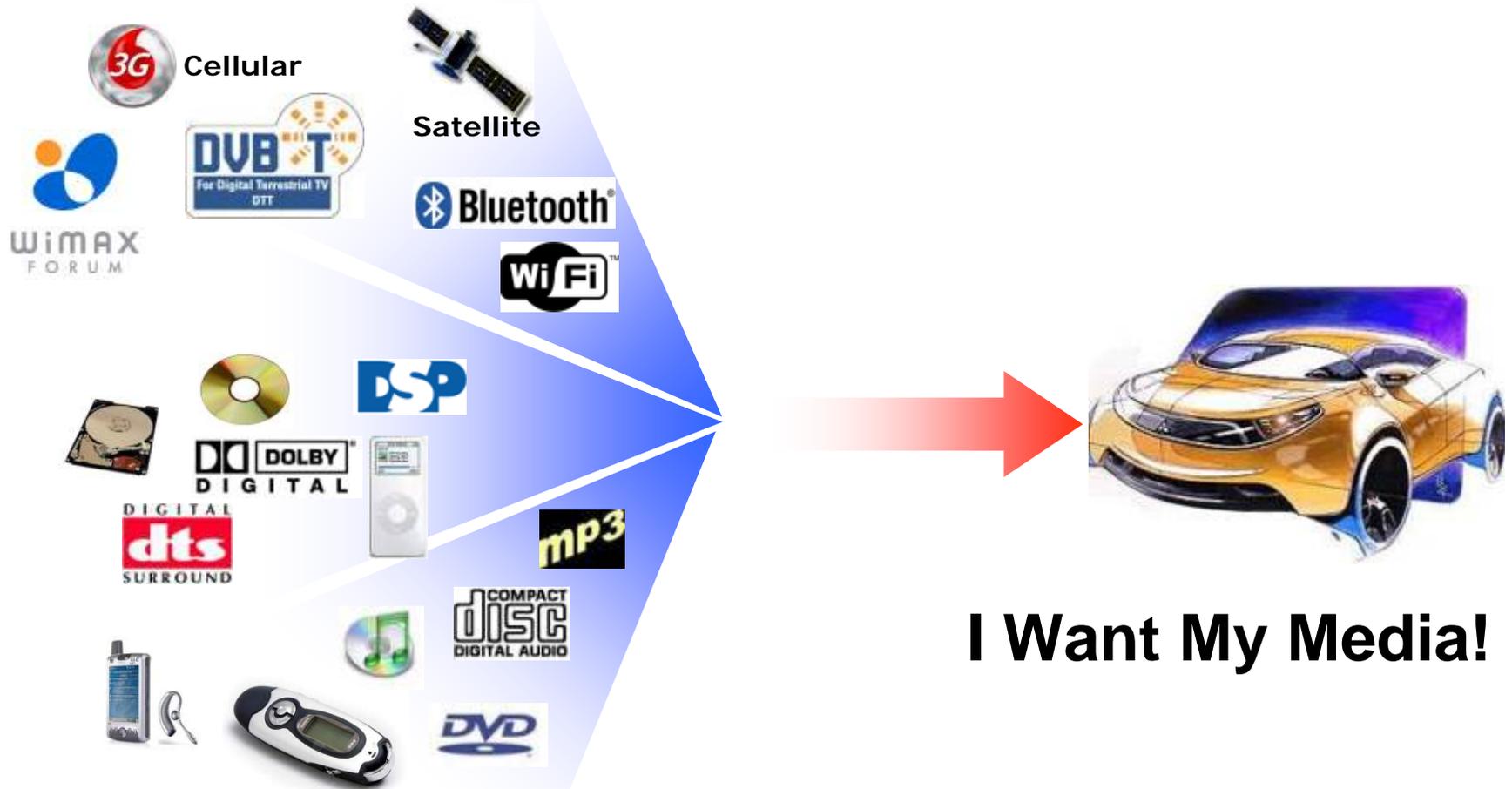
DELPHI

Mass Media to My Media.

Connected.



Multiple Enablers for Content Delivery



I Want My Media!

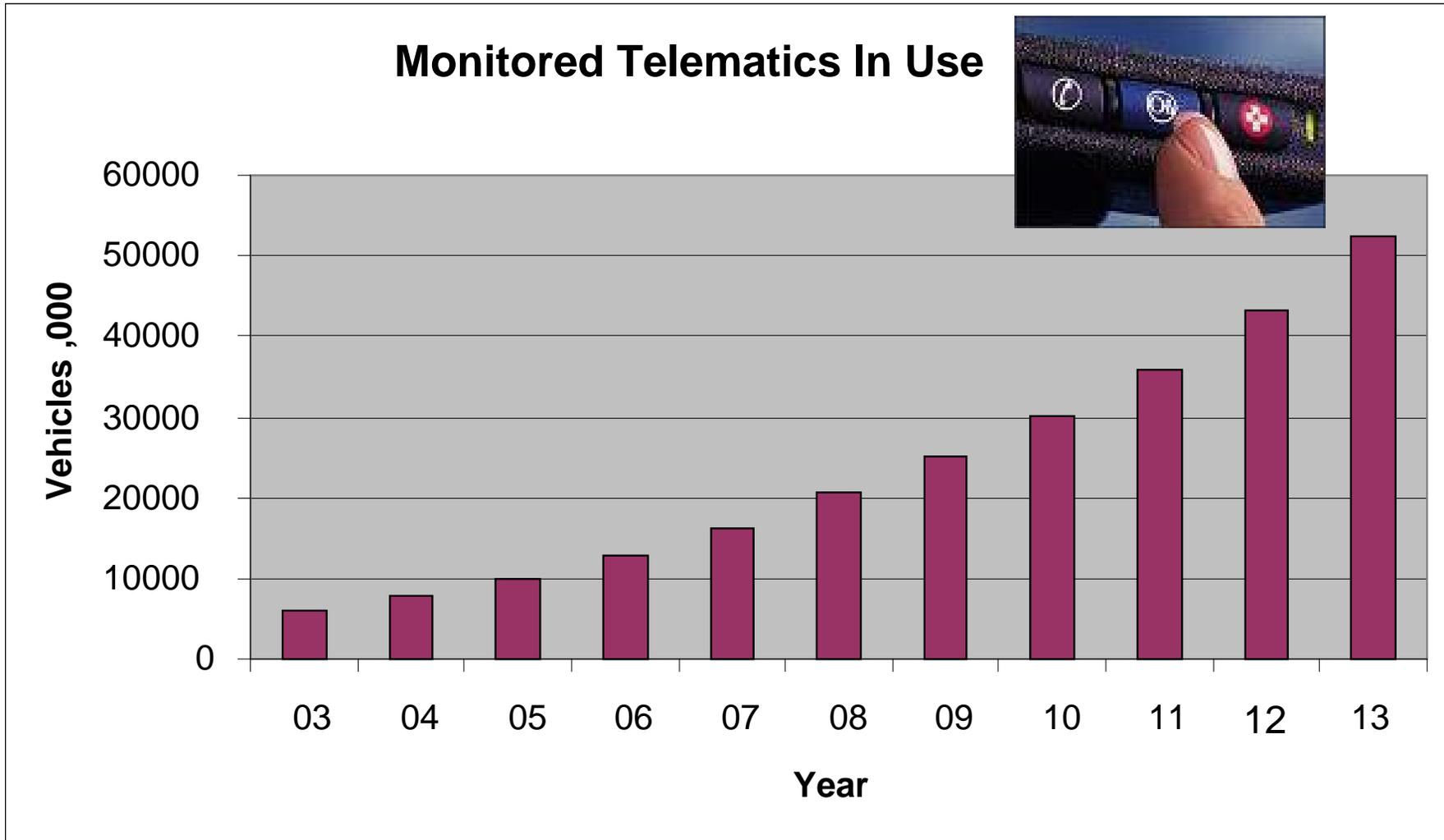
DELPHI

Technologies Enabling My Media



| <u>Connectivity</u> | <u>Digitalization</u> | <u>Automotive HMI</u> |
|---------------------|-------------------------------|-------------------------------|
| L/S/Ku Satellite | CD ROM Drive | Reconfigurable Color Displays |
| 3G Cellular | SD Cards for Low-cost Memory | Larger Displays |
| SDARS | Low-cost DSP | Touch Screens |
| DAB/DVB | Affordable Wireless Broadband | Color Head-up display |
| WiMAX/WiFi | Low-cost Flash Memory | Voice Recognition |
| Bluetooth | Portable Hard Drives | Speech Synthesis |
| HD Radio | Universal Interface USB | 3D Acoustics |
| DVB-H/FLO | Wireless USB | Dual-view Displays |

Safety Security Telematics Enabler for Wireless Communication to Vehicles

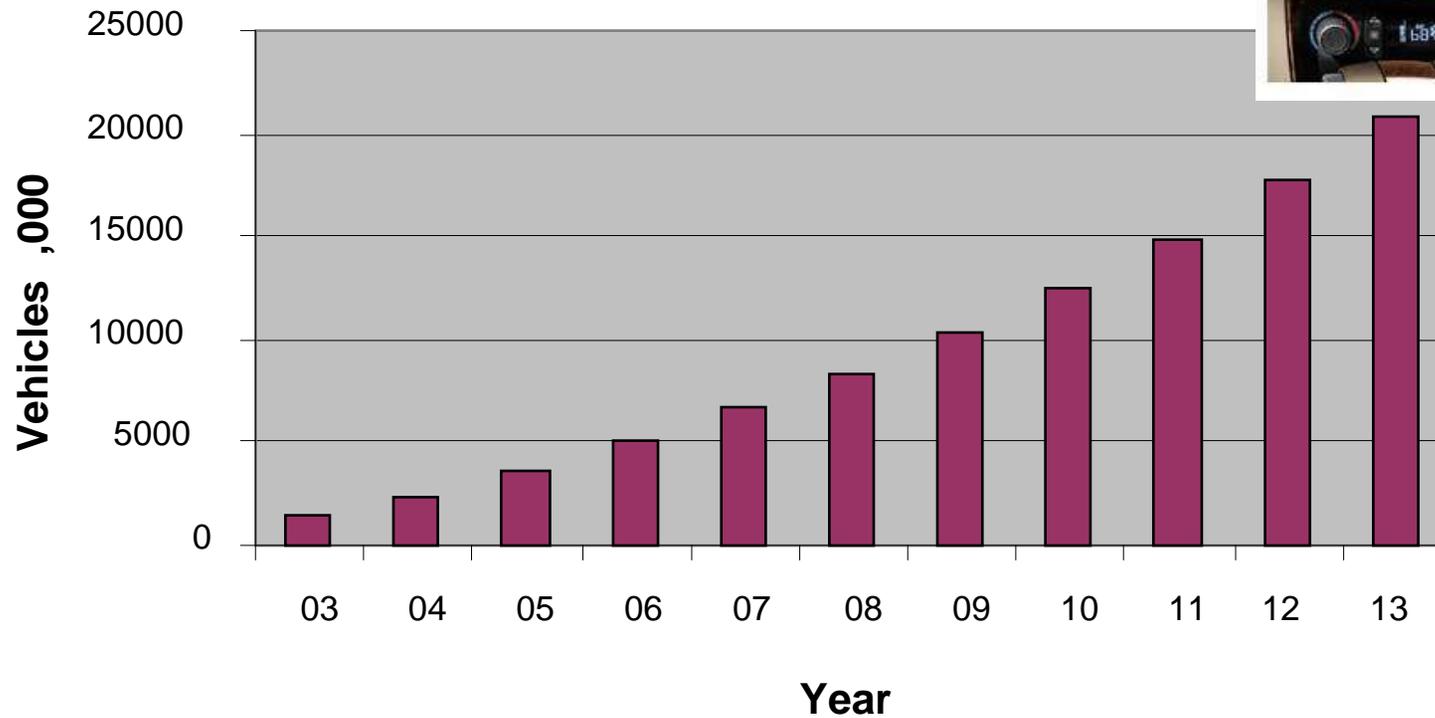


Source: Telematics Research Group April 29, 2008

DELPHI

Large Color Displays Enablers for In-vehicle Signing

Navigation Systems In Use



Source: Telematics Research Group April 29, 2008

DELPHI

Integrated Dual-view Display

- Allows drivers to view a full-featured navigation system while the front seat passenger views video content on the same display



DELPHI

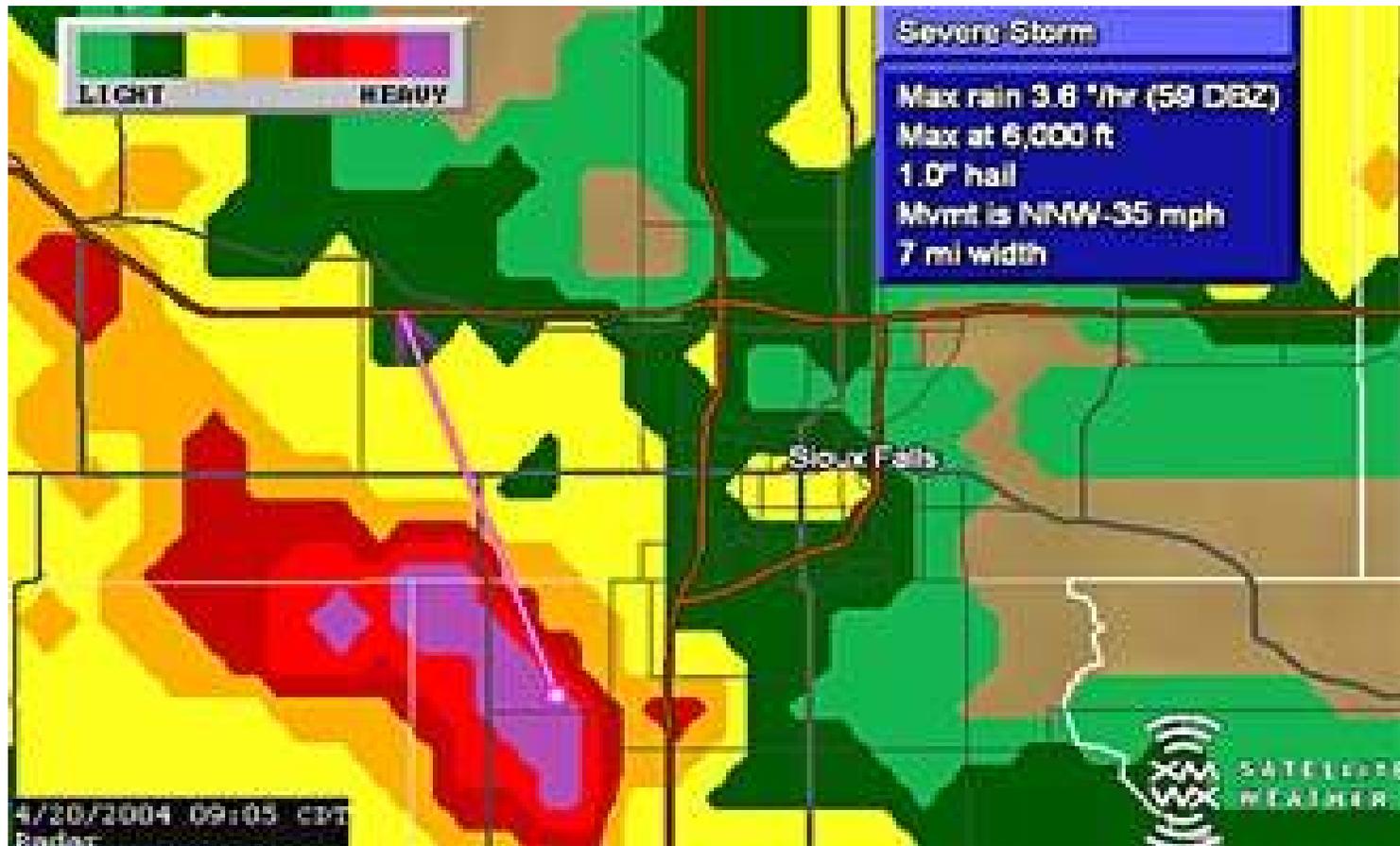
DELPHI

Location-based Service

Connected.



Lets Talk About the Weather



DELPHI

Automotive Weather Information Dissemination

- Weather Radios



- Equipped with NOAA 7- Channel National Weather Radio (NWR)
- 2 X 16 Dot Matrix Display

DELPHI

Automotive Weather Information Dissemination

- Visual: Weather Map
 - Essential information concerning road and atmospheric conditions
 - Notifies the driver audibly and visually using the navigation system
 - Challenge: fewer than 20% of OEM vehicles will have navigation by 2010/11 (Source:TRG)
 - Growing interest with vehicle OEMs to display weather information in navigation systems
- Weather Threat Matrix – Delphi Demonstration 2006
 - Weather threats are delivered by XM satellite provider to vehicle



DELPHI

Future Mobile Electronics Interest in Cars

| FUTURE INTEREST IN MOBILE ELECTRONICS IN CARS CEA April 2006 | | |
|--|-----------|--|
| | % | |
| Highest Interest | 80 | Get updates on traffic |
| | 76 | Watch/Listen to weather |
| | 73 | Watch/Listen to news |
| | 53 | Listen to satellite radio |
| | 51 | Listen to books on tape |
| Moderate Interest | 44 | Watch/Listen to sports events |
| | 43 | Receive U.S national security updates |
| | 39 | Use digital camera |
| | 39 | Watch movies |
| | 36 | Instant messenger |
| | 35 | Access to the Internet |
| | 34 | Access to PC in car |
| | 31 | Download music |
| | 31 | Text message |
| | 27 | Watch TV |
| | 26 | Audio conference |
| Low Interest | 25 | Access files from home or work PC |
| | 24 | Watch listen to podcasts |
| | 20 | Use camcorder |
| | 19 | Play video, computer games |
| | 18 | Access digital photos from home or work PC or Internet |
| | 11 | Video conference |

High and Moderate Interest in Weather and Security Updates

DELPHI

High Interest In All Hazard Public Alert and Weather Radar in Vehicles

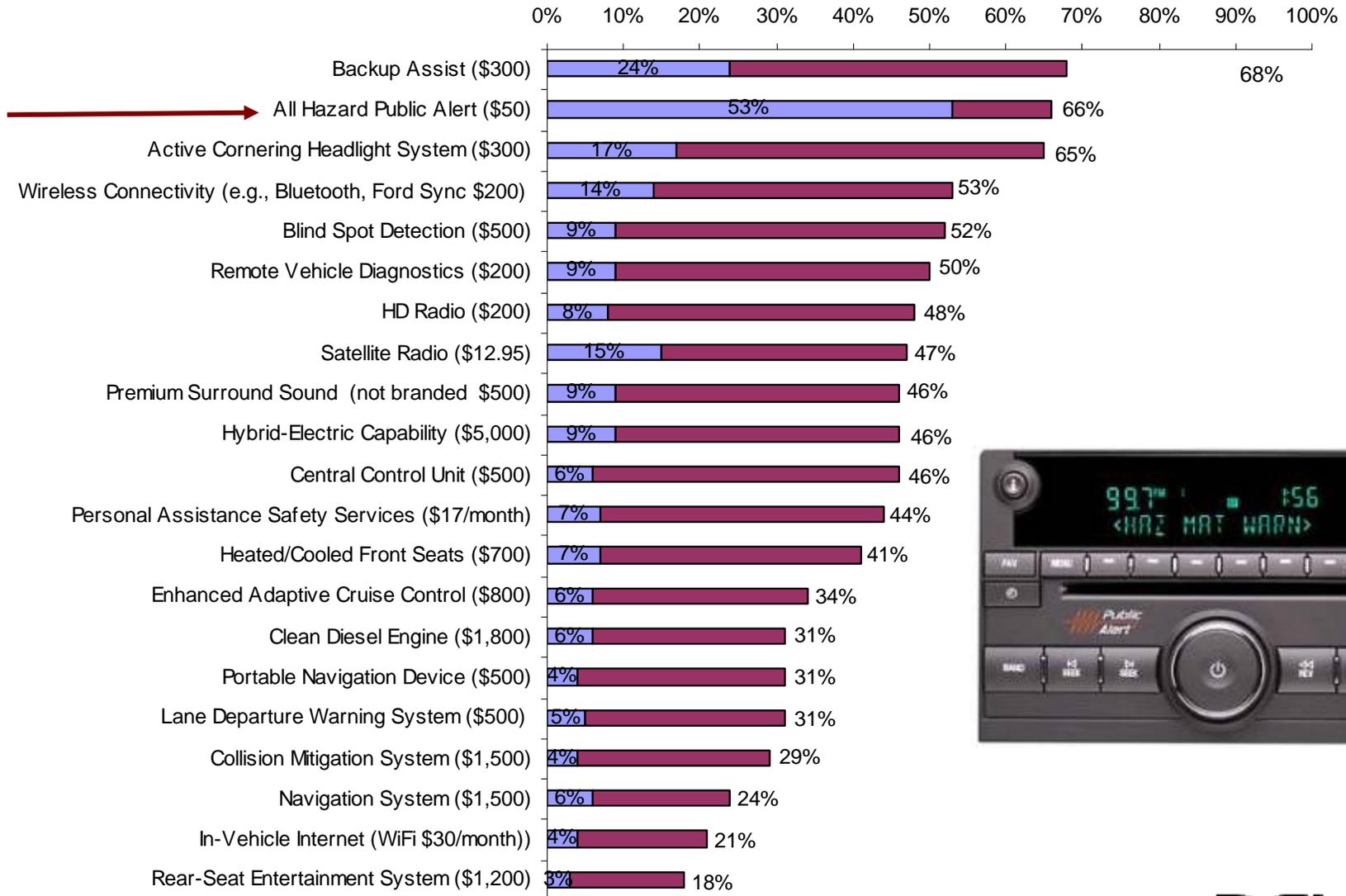
| |
|--|
| High Interest |
| 1. Receive audible All-Hazard Public Alerts* |
| 2. Watch weather radar |
| 3 |
| Moderate Interest |
| 4 |
| 5 |
| Low Interest |
| 6 |
| 7 |
| 8 |

*Voiced concerns with repeated, false and alarms not pertaining to location
 Source: Delphi Market Study Vehicle Infotainment Features March 2007



DELPHI

JD Power 2008 U.S. Automotive Emerging Technologies Study Interest In Features at Market Price



Definitely Probably

DELPHI

Chrysler UConnect Web System In Vehicle Internet



DELPHI

INRIX Connected Services To The Vehicle

Aggregate Content

Analyze & Process

Deliver Solutions

Deliver customized connected and broadcast solutions



Real-time, Historical & Predictive Traffic



Traffic-Influenced Routing



Information



Search/POI's

Applications & Alerts

GPS

RDS

HD Radio

HTTP

CDMA

Cellular

WiFi



In-Vehicle Platform



Portable Navigation



Wireless Phone/PDA



Work/Home PC

DELPHI

DELPHI

CONNECTED

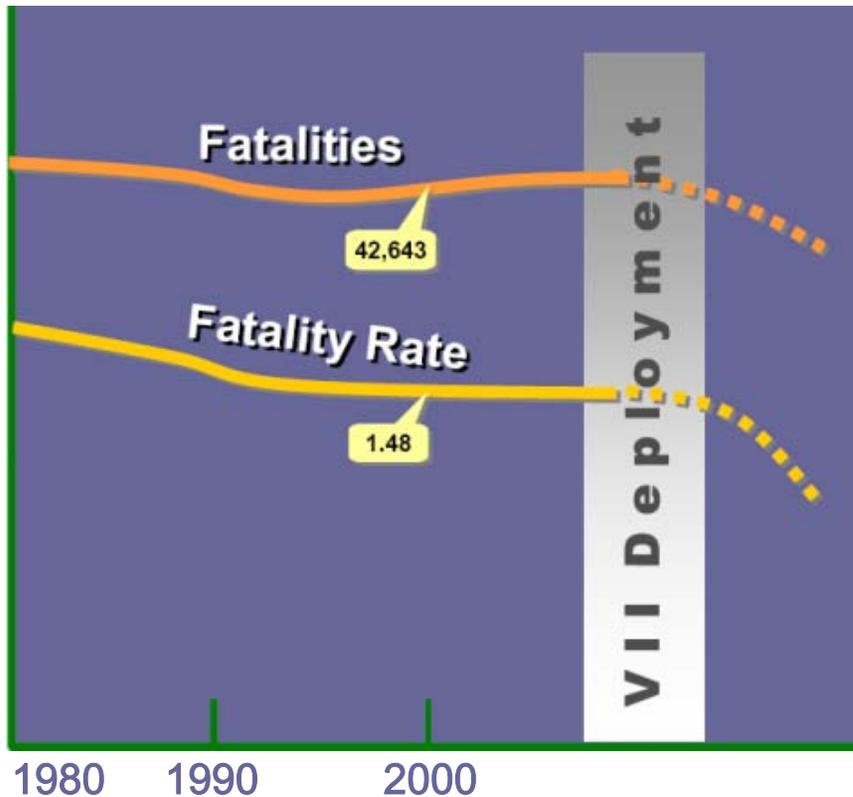
Vehicle to Infrastructure Integration.

Connected.

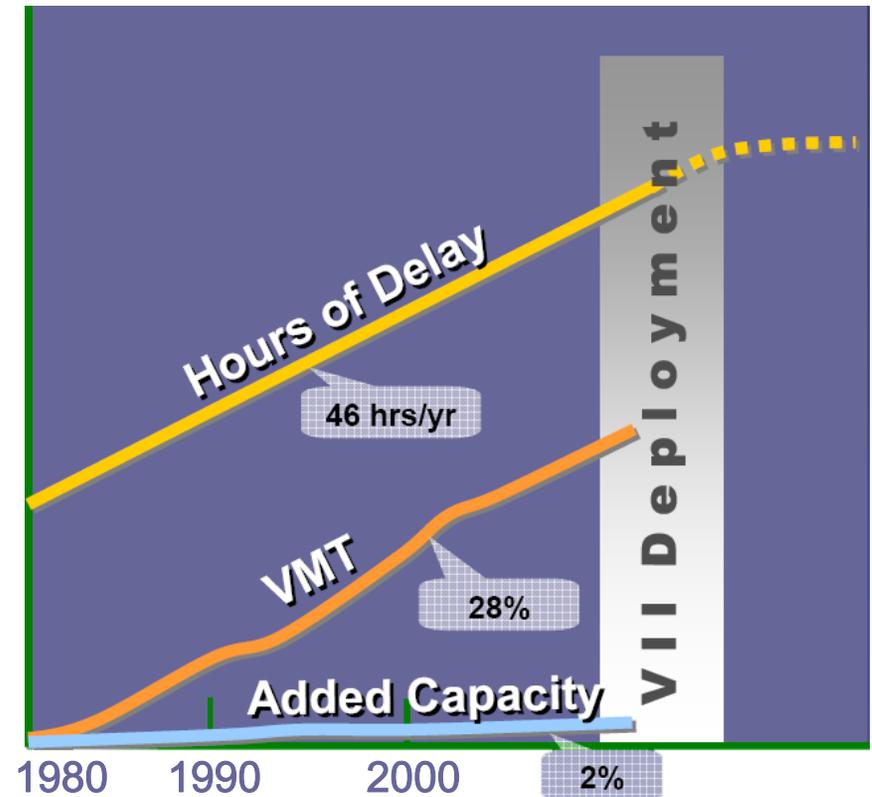


Why VII? Vehicle Safety and Mobility

Safety



Mobility



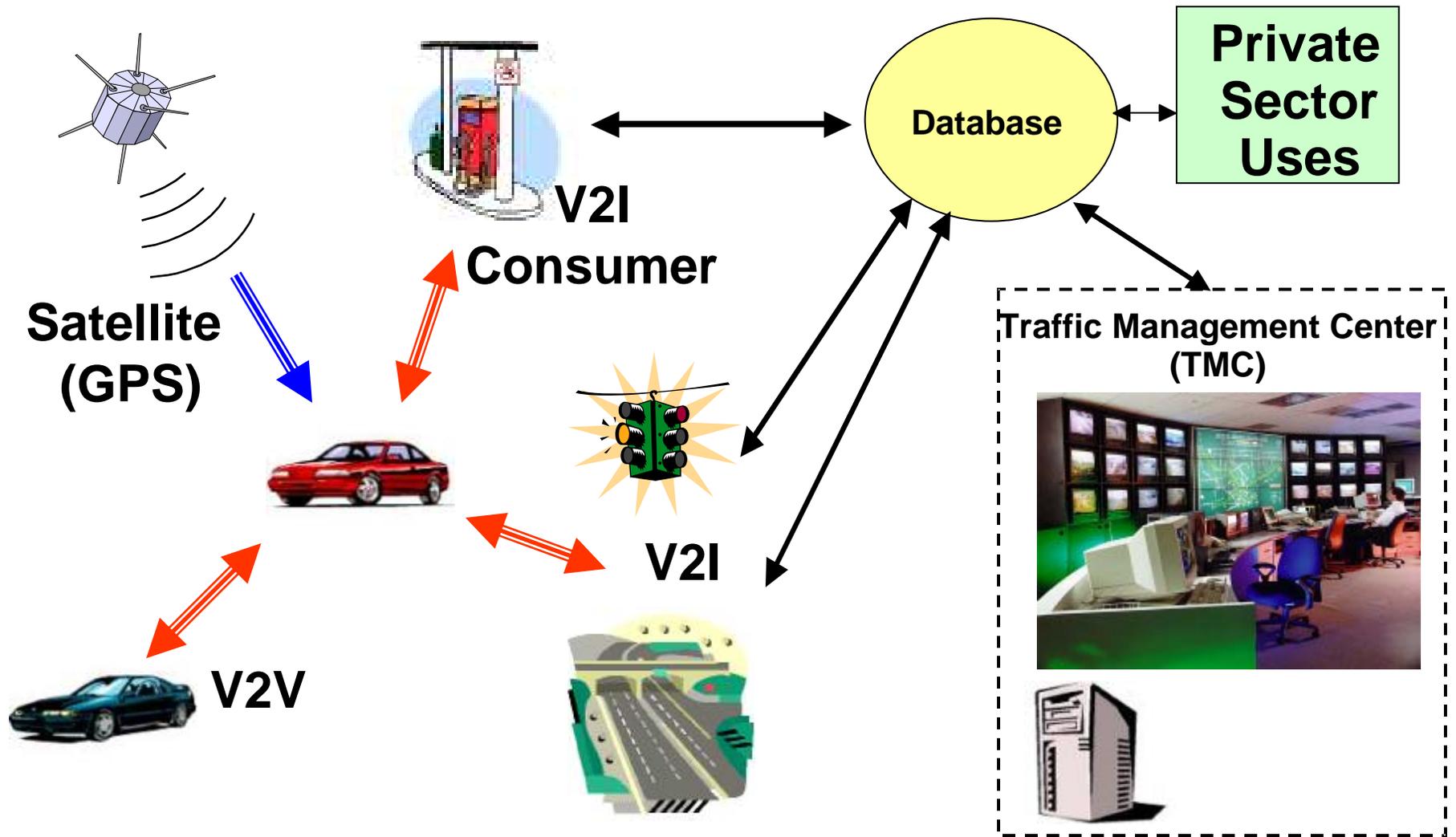
Source: ITS Joint Program Office, US Department of Transportation
VMT Vehicle Miles Traveled

DELPHI

Three Categories of VII Applications

- **Highway Safety – Reduce Fatalities**
 - Cooperative vehicle-roadway effort to mitigate death, injury and property damage
 - Primary approach
 - » Intersection cooperation
 - » Lane / road departure
 - » Vehicle-vehicle cooperation
- **Vehicle Mobility – Improved Traffic Flow**
 - Cooperative information sharing to improve traffic flow and enhance driving experience
 - » Aggregate real-time probe data into map database
 - » Driver advisories, incident detection, optimized signal phasing
 - City, counties and states can track service trucks and emergency vehicles
- **Consumer and Commercial Services**
 - Media downloads
 - Traveler Information
 - Fast food payments or advertising

How Does VII Work?



Vehicle to Vehicle V2V
V2I Vehicle to Infrastructure

DELPHI

VII-Consortium (VII-C)

- VII-C is a group of OEMs working together to coordinate proof-of-concept test activity
- Work with federal, state and local government and suppliers
 - Select vehicle hardware – “off the shelf” Parvus OBE
 - Select roadside hardware – “off the shelf” TechnoCom RSE
 - Build “proof-of-concept” test environment in the Detroit, MI area
 - Develop applications, vehicle and infrastructure to verify the system performance
- VII-C Current Membership
 - Ford
 - Nissan
 - Chrysler
 - BMW
 - Honda
 - VW
 - Toyota
 - GM
 - Mercedes



Current Status

- Phase One – Proof of Concept
 - System is up and running with some challenges
 - Fleet of vehicles is in the process of running tests
 - A number of issues/concerns are being addressed
 - Completion expected by **end of Sept 2008**
- Viability Decision Based on Performance Expected in 2009
- Decision to Deploy Expected in 2010
- VII Demonstrations – ITS World Congress Nov 2008

Sample Applications

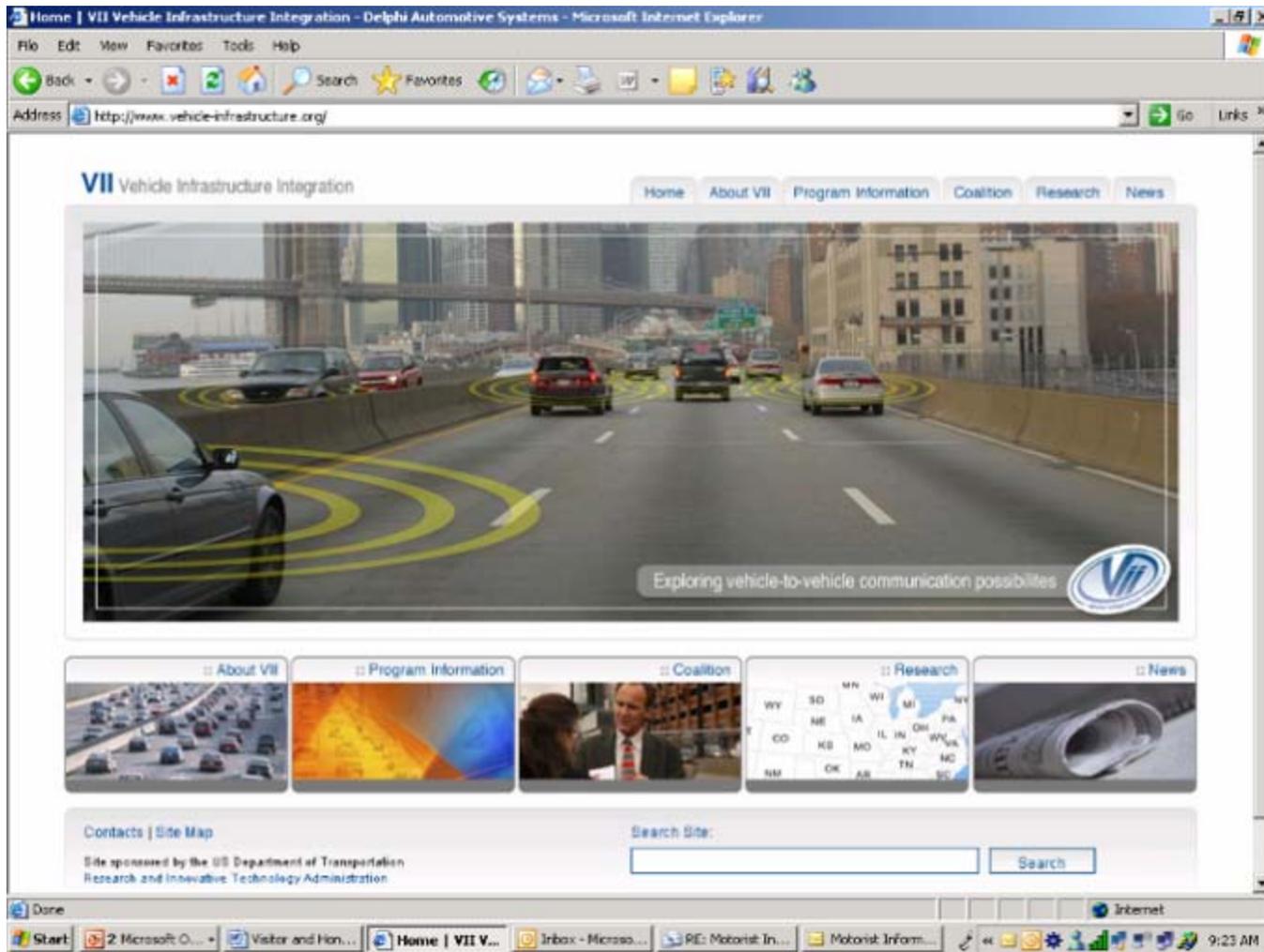
| # | Name | Lead |
|----|---|------|
| 1 | Emergency Brake Warning | CAMP |
| 2 | Traffic Signal Violation Warning | CAMP |
| 3 | Stop Sign Violation Warning | CAMP |
| 4 | Curve Speed Warning | VIIC |
| 5 | Display Local Signage | VIIC |
| 6 | Present OEM Off-Board Navigation | VIIC |
| 7 | Present OEM Reroute Information | VIIC |
| 8 | Present Spontaneous Traffic Information | VIIC |
| 9 | Electronic Payments: Parking / General | VIIC |
| 10 | Electronic Payments: Gasoline | VIIC |

| # | Name | Lead |
|----|--|-------|
| 11 | Electronic Payment: Toll Roads | USDOT |
| 12 | Traveler Information | USDOT |
| 13 | Ramp Metering | USDOT |
| 14 | Signal Timing Optimization | USDOT |
| 15 | Pothole Detection | USDOT |
| 16 | Winter Maintenance | USDOT |
| 17 | Corridor Management Planning Assistance | USDOT |
| 18 | Corridor Management Load Balancing | USDOT |
| 19 | Weather Information Traveler Notification | USDOT |
| 20 | Weather Information Improved Weather Observing | USDOT |

CAMP = Collision Avoidance Metrics Partnership
 VIIC Vehicle Infrastructure Integration Consortium



http://www.vehicle-infrastructure.org/



DELPHI

<http://www.vehicle-infrastructure.org/>

<http://www.vehicle-infrastructure.org/>

Program Information

Valerie Briggs
U.S. Department of Transportation
valerie.briggs@dot.gov

Jim Wright
American Association of State Highway
and Transportation Officials
jwright@aaashto.org

David Henry
Vehicle Infrastructure Integration Consortium
(representing automobile manufacturers)
ddh51@chrysler.com

Mike Schagrin
U.S. Department of Transportation
Mike.Schagrin@dot.gov



DELPHI

DELPHI

CONNECTED

Wrap-up.

Connected.



Wrap-up

- Three Megatrends – Safe, Green and Connected – are driving the future
- Technology is enabling the Digital In-vehicle Living Room
- New vehicle buyers are Connected at home and work – why not In Their Vehicle
- The Digital Revolution presents multiple connectivity options
- New products and technology to watch
 - Dual-view Display
 - All Hazard Public Alert Radio
 - VII

