Vehicular Networks and Telematic Applications: Challenges and Opportunities

by

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- Global Market vs US Market in Vehicular Telematics
Transportation and Communications

3500BC

2000BC

1769

1885

2000

2020

Internet
Vehicular Information Infrastructure

- Backbone Network
- Traffic Operations Center (TOC)
- Enterprise Network Operations Center (ENOC)
- On Board Equipment (OBE)
- Road Side Equipment (RSE)
- Network-based Differential GPS (DGPS)
- Backhaul Network
- Global Positioning Service (GPS)
- Service Delivery Node (SDN)
- Dedicated Short Range Communication (DSRC)
- Traffic Operations Center (TOC)
- Network-based Differential GPS (DGPS)
Connected-Vehicle Model is Rapidly Morphing

Car & Electronic Component Life Cycles diverging
- Automobiles
  - Median life is 9.2 yrs
  - Design cycle is 3.5 yrs
- Components
  - Median life 2.0 yrs
  - Development cycle 0.5 yrs

Closed electronic components & software under assault
- Open architectures (Android, iPhone 3G, Intel’s MID)
- Carried-in devices (PNDs, cell phones, PDAs, mp3 players)

After-market devices for cars proliferate
- Mushroooming growth
- Advanced capabilities
- Have crossed “impulse” purchase thresholds
Major Concerns and Key Objectives

- Safety
- Traffic Congestion & Environment (i.e. Energy)
- Mobility Applications
- Privacy-Preserving Secured Communication
Telcom and Automotive Convergence
This is all about

.NET  .CAR  .ROAD

人  車  路
A Ubiquitous Communications Node

- **Proactive Maintenance and Self-Diagnosis**
- **Tire Pressure Sensor**
- **Lane Change / Merge Collision Avoidance**
- **Driver/Passenger Productivity**
- **Interior Sensors**
- **Information and Entertainment**
- **Rear-end Collision Avoidance**
- **Lane or Road Departure Warnings**
- **GIS-based Services & Situational Awareness:**
  - Local Facilities
  - Roadway Conditions
  - Traffic Information
  - Weather Information
  - Car/Driver Health
- **Emergency Response**
- **Voice Recognition and Communications**
- **Seat-Back Display**

To R. Hsing – 8
.ROAD
Ubiquitous Awareness for Transportation

- Real-Time Road Traffic and Condition Reporting to Reduce Congestion and Accidents
- Parking Information
- Road-Side System
- GIS-Based Services
- Ramp Metering for Electronic Toll Collection
- Lane-Line RFID for Location Tracking
- Lane/Road Sensors for Departure Warnings and Collision Avoidance
- Distance Marker
- EXPECT ICY ROADS USE CAUTION
- Smart Signs
- Internet
.NET Essential Infrastructure is Well Under Way

- 3G / 4G poised to deliver unprecedented:
  - Coverage
  - Bandwidth
  - Latency
  - Reliability

- Future wireless technologies to deliver explosive range & depth of services
  - Personalization
  - Immediacy
  - Anticipation
Wireless communications and Mobile Ad Hoc Networking are Enablers for

Dramatically Improved

- Safety
- Security
- Efficiency
- Convenience
- Information
- Entertainment

Based on

- Software and Applications
- Protocols
- Intelligence and Autonomy
- Computing
- Ad Hoc Networking
- Storage
- Communications Technologies and Interfaces
USDOT IntelliDrive Program

- “Advancing connectivity among vehicles and roadway infrastructure to significantly improve the safety and mobility of the U.S. transportation system”

- Future vision:
  - Vehicles and infrastructure are connected to enable cashless vehicles
  - Access to real-time data on status of vehicles & roadway transforms transportation system management and operations
Vehicular Networks & Telematics App.

- Safety/Auto Services
  - Driver Safety and Security
  - Vehicle Maintenance

- Navigation & Mobility
  - Traffic, ETA, POI, Localized Searches
  - Tolls and Parking

- Infotainment & E-Commerce
  - Digital Content
  - Social Networking

Connected Vehicle Services

Enabling Trends

- Smartphone Platforms
  - App Store Business Model
  - Tethering for OBU

- OBU and Passenger Entertainment Systems
  - Embedded wireless and sensors
  - Smartphone integration with improved HMI

- Infrastructure
  - Vehicle Infrastructure Integration (Future)
  - Cloud based delivery
Example Vehicle Applications

- Cooperative collision avoidance
- Lane-change assistance
- Road condition warning
- Intersection collision warning

- Need reliable reception of messages
- Need quick dissemination of information
Why Telematics Standards Are Important?

- **Common incident data** from various sources for easy, rapid access and sharing

- **Consistent user interfaces** and **technology-neutral protocols** can enable providers to offer telematics services with economies of scale

- **Standards Committees** (such as TIA TR-48) work with other TIA committees, national and international standards organizations, and other relevant entities to ensure work items are necessary and not duplicative.

EMS: Emergency Medical Services
OBE: Onboard Equipment
PSAP: Public Safety Answering Point
RSAP: Roadside Assistance Provider
TSP: Telematics Service Provider
Telematics Opportunities

.NET
Connectivity & Services

.CAR
Communications Node & In-Car Network

.ROAD
Critical Data & Situational Awareness

Ubiquitous Telematics Services
Telematics Challenges

- Technologies

- Standards

- Government Policy

- Business Model
Global Telematics -- Revenue (retail)
(Note: from iSuppli, 9/2008)
USA Telematics -- Revenues (retail)

Note: (from iSuppli, 9/2008)
Thank You!
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