IEEE Embedded System Workshop

Advances in Vehicle Networks and Diagnostics

John A. McNelis

DG Technologies

(248) 802-4214

Jmcnelis@dgtech.com

DG is Vehicle Networks!

-Nearly 25 Years of Expertise in Vehicle Networks

-Automotive, Truck & Bus/Heavy Duty, Military Vehicle Networks

-Tools and solutions built around Vehicle Network Systems

-Network Solution Agenda:
- Standards
- Education & Training
- ECM/ECU
- Network Analysis Tools
- Consulting & Custom Solutions
- Reprogramming/Flash

Standards Participation

Guide Vehicle Standards, DG on SAE's Board of Directors

DG classes on leading edge tech of in-vehicle networking

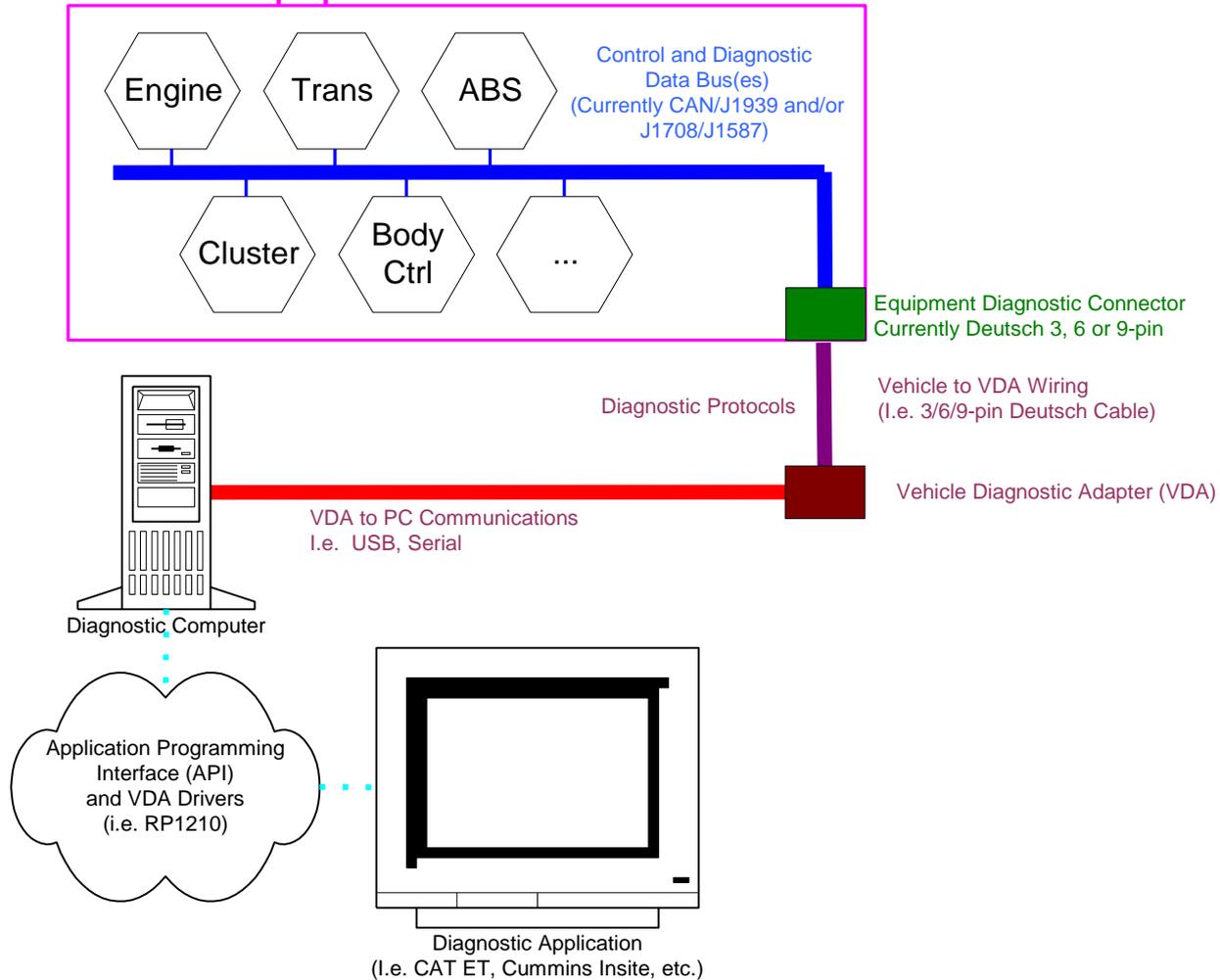Maintain high level of industry knowledge of standards through direct participation

Allows you to develop solutions for customer needs and better understand the industry

Vehicle Networks

Vehicle/Equipment

Engine Trans ABS

Control and Diagnostic
Data Bus(es)
(Currently CAN/J1939 and/or
J1708/J1587)

Cluster Body Ctrl ...

Equipment Diagnostic Connector
Currently Deutsch 3, 6 or 9-pin

Diagnostic Protocols

Vehicle to VDA Wiring
(I.e. 3/6/9-pin Deutsch Cable)

Vehicle Diagnostic Adapter (VDA)

VDA to PC Communications
I.e. USB, Serial

Diagnostic Computer

Application Programming
Interface (API)
and VDA Drivers
(i.e. RP1210)

Diagnostic Application
(I.e. CAT ET, Cummins Insite, etc.)

Standards-Based Protocols

- SAE International Technical Standards
  - Truck and Bus Council: *e.g.* **SAE J1939**
- International Standards Organization (ISO)
- The American Trucking Associations (ATA)
  - TMC: *e.g.* **RP1210**
- Institute for Electrical and Electronics Engineers, Inc. (IEEE)
- United Nations Economic Commission for Europe (UNECE)

Main Protocols in the 1990s

- SAE J1850 VPW (GM and Chrysler)
- SAE J1850 PWM (Ford)
- CAN/ISO15765 (Many major OEMs)
- ISO9141/KWP (Many major OEMs

Note: From 2008 CAN has become the only protocol supported by the USA for legislated diagnostics

Vehicle Network Types
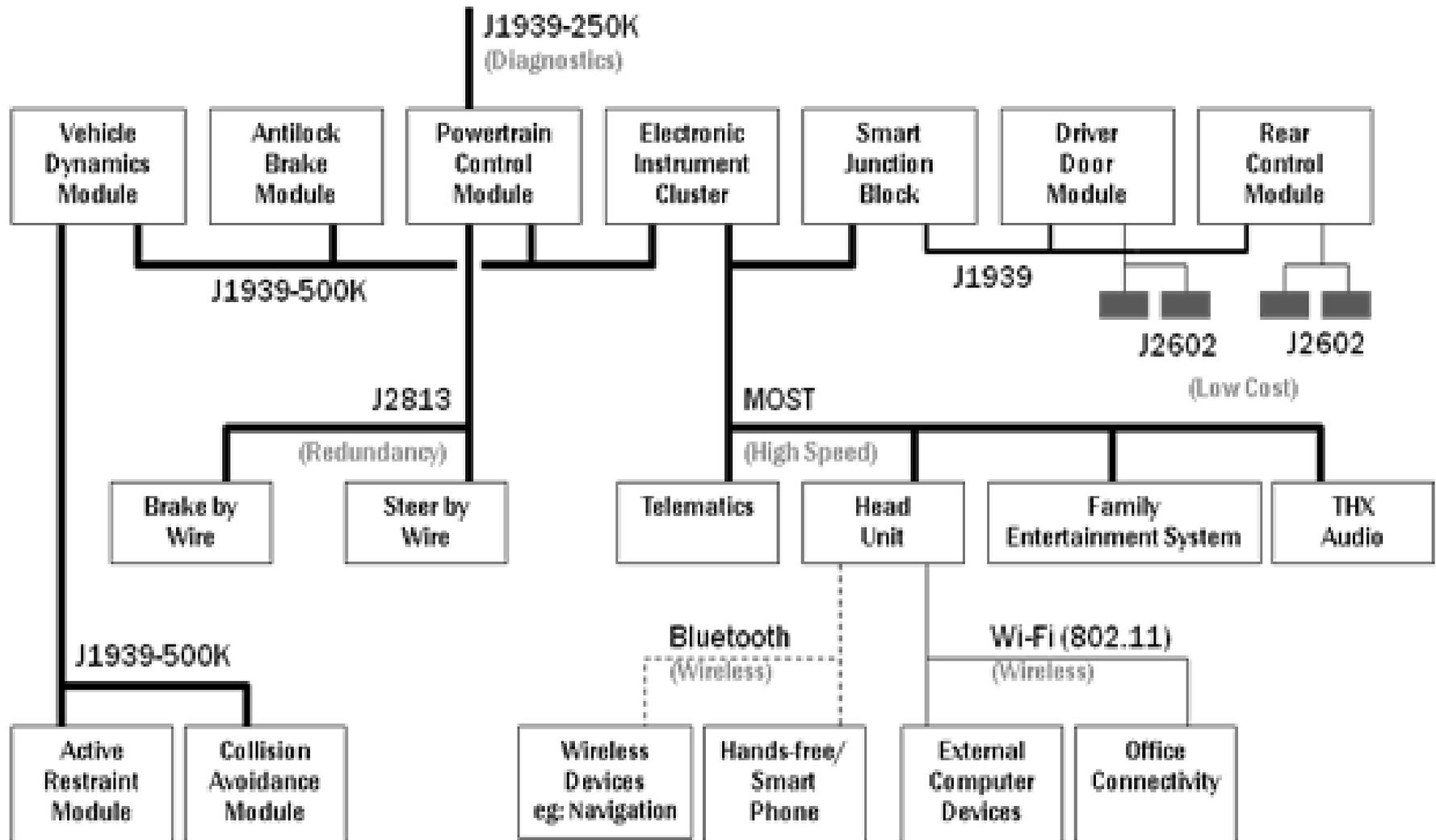
Traditional Uses of Vehicle Networks

- Inter-Module communication
- Legislated On-Board Diagnostics
- Manufacturer specific Diagnostics
- Module reprogramming

ON-BOARD DIAGNOSTICS: OBD II

Government regulators (e.g. California ARB) established goals for the OBD II system to implement:

- A stringent new vehicle certification process
- Detect all emission related faults
- Assist vehicle technicians with fixing faults
- Faster diagnostics and repair of system issues


VSI-2534
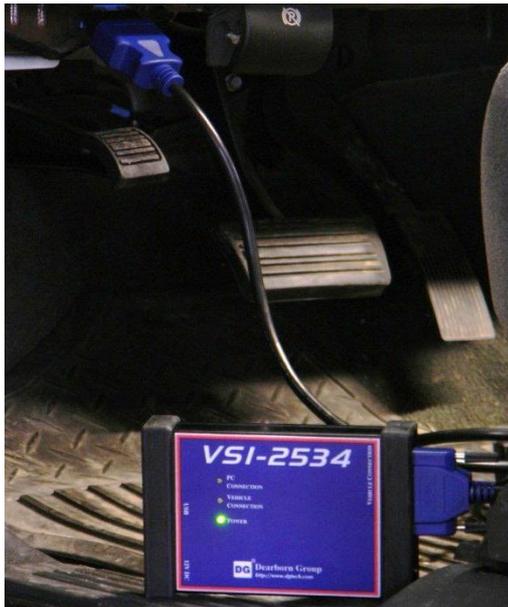
Vehicle Diagnostics Application

- Vehicle and component identification – make, model, serial number, software version, etc.
- Vehicle fault detection and analysis
- Vehicle data monitoring
- Vehicle data archiving
- Special test routines

Vehicle Module Reprogramming

- Vehicle and component identification – make, model, serial number, software version, etc.
- Link to OEM portal to get the latest software
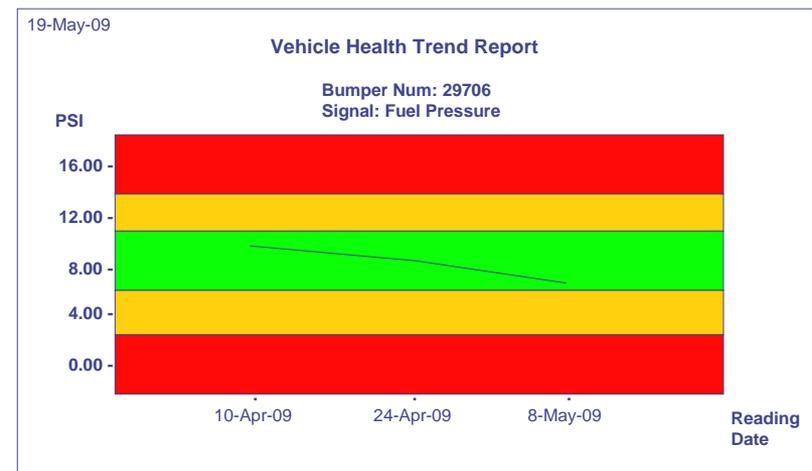- Secure reprogramming of the vehicle Module
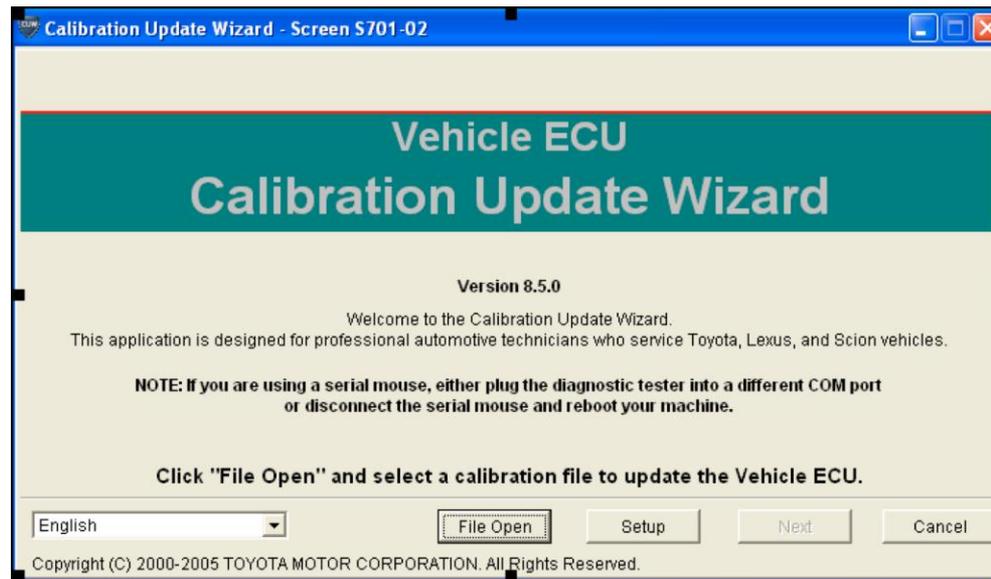
Vehicle Networks for the Future

- Fleet Management
- Condition Based Maintenance (CBM)
- Remote Diagnostics
- Consumer Awareness
- On-Board Data Collection
- Link the vehicle to the world

FLEET MANAGEMENT SYSTEMS

- Vehicle fleet health monitoring
- Vehicle maintenance scheduling and tracking
- Prognostics and Condition Based Maintenance (CBM)
- Fleet reports
- Interface to parts order processing applications
- Geo-fencing & delivery docs

19-May-09

Vehicle Health Trend Report

Bumper Num: 29706
Signal: Fuel Pressure

PSI

16.00 -

12.00 -

8.00 -

4.00 -

0.00 -

10-Apr-09   24-Apr-09   8-May-09

Reading Date

Condition Based Maintenance

- Equipment Maintained at the right time

- Condition of the Equipment Monitored and health assessed before a maintenance decision is made

- Minimizes maintenance costs, down time and increases productivity

Remote Diagnostics

- Remote diagnostics and periodic reports

- Accident assistance

- Navigation

- Hands-free telephony

Vehicle – A node on the global network
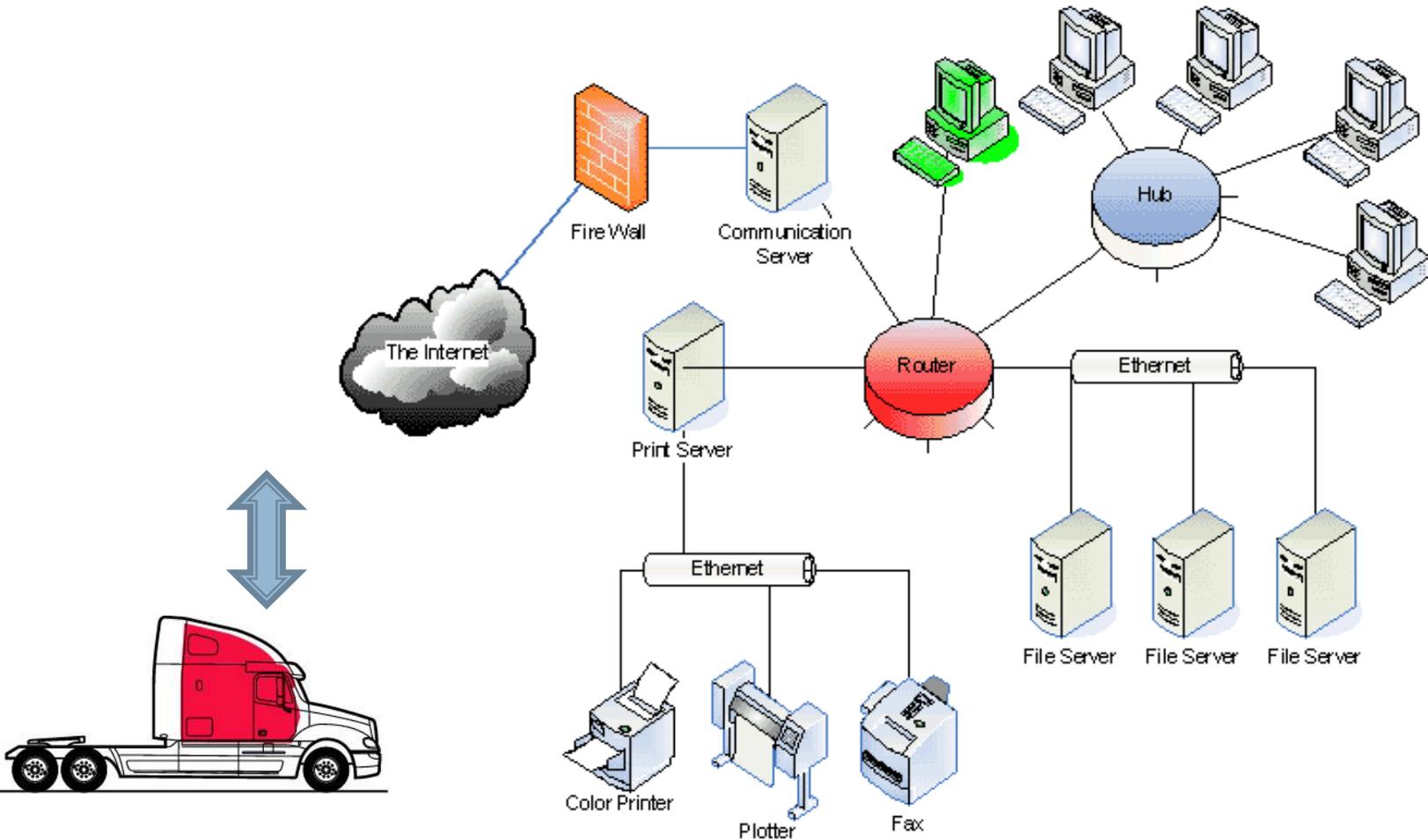
Wirelessly Linked Vehicle

Some typical examples of current solutions:

- Bluetooth as in Ford Sync

- Cellular as in GM Onstar

- Zigbee and 802.11 used in Military Fleets

- Wired Ethernet used by some OEMs

Selection Criteria

Some selection Criteria for Wireless Technologies

- Data Throughput

- Data Security

- Cost of Operation and Maintenance

Conclusions

- Large amounts of vehicle data waiting to be exploited for value added services

- Remote diagnostics, fleet management solutions and CBM+ solution will increase

- Wireless data delivery infrastructure and next-generation data backbone available

- There is industry effort to standardize data delivery and content

TECHNOLOGIES
Vehicle Network Solutions

John McNelis
(248) 888-2000, Ext 386
(248) 802-4214, Mobile

Headquarters:

- 33604 West Eight Mile Road
Farmington Hills, MI 48335
    (248) 888-2000
    (248) 888-9977 fax

Heavy-Duty Development Center:

- 2415 Directors Row Suite G
Indianapolis, IN 46241
    (317) 248-9332
    (317) 248-1504 fax