

10th WORLD CONGRESS AND EXHIBITION ON
**INTELLIGENT TRANSPORT
SYSTEMS AND SERVICES**
16-20 NOVEMBER 2003 MADRID SPAIN

MADRID 2003

**SOLUTIONS FOR TODAY...
...AND TOMORROW**

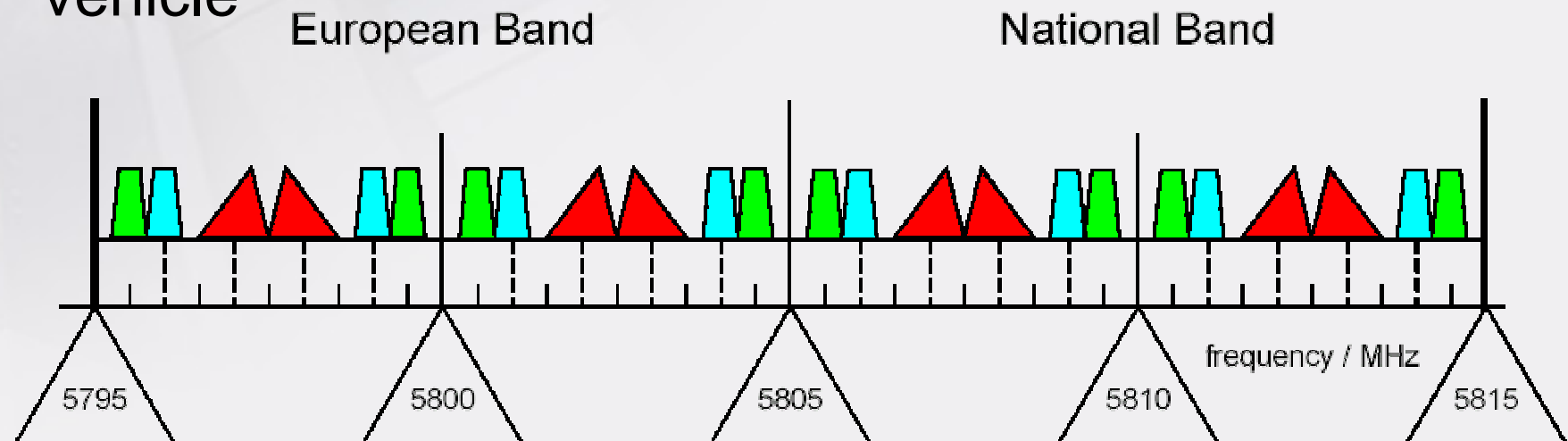
SS16 - ITS radiocommunications New Technologies

5.8/5.9GHz DSRC Standards in ISO/TC204 and Europe

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CEN DSRC Overview

- **D**edicated **S**hort **R**ange **C**ommunication
- **D**edicated = Developed for ITS
- **S**hort-**R**ange = 1 – 40 meters, typ 8-10 m
 - 2W EIRP ASK downlink (roadside – vehicle)
 - 50mW DPSK reflected uplink (veh – roadside)
 - Passive mixing reflector – no RF generated in vehicle



ETC Application
(ISO14906)

ISO and CEN standard

DSRC Profiles (EN13372)

Voting started -
Full consensus

DSRC Application Layer 7 (EN12834)

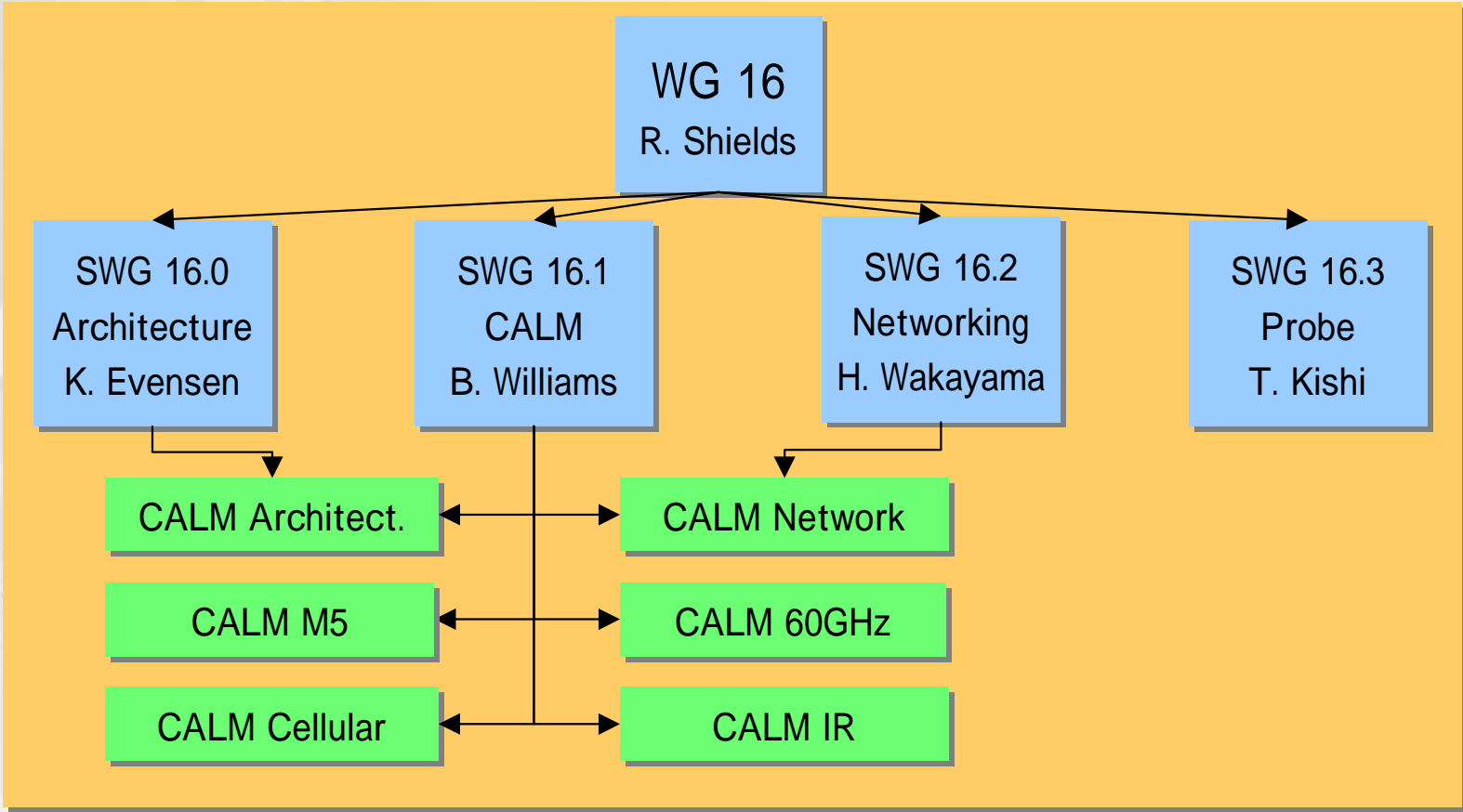
Full European standard

DSRC Data Link Layer 2 (EN12795)

Full European standard

DSRC Physical Layer 1 (EN12253)

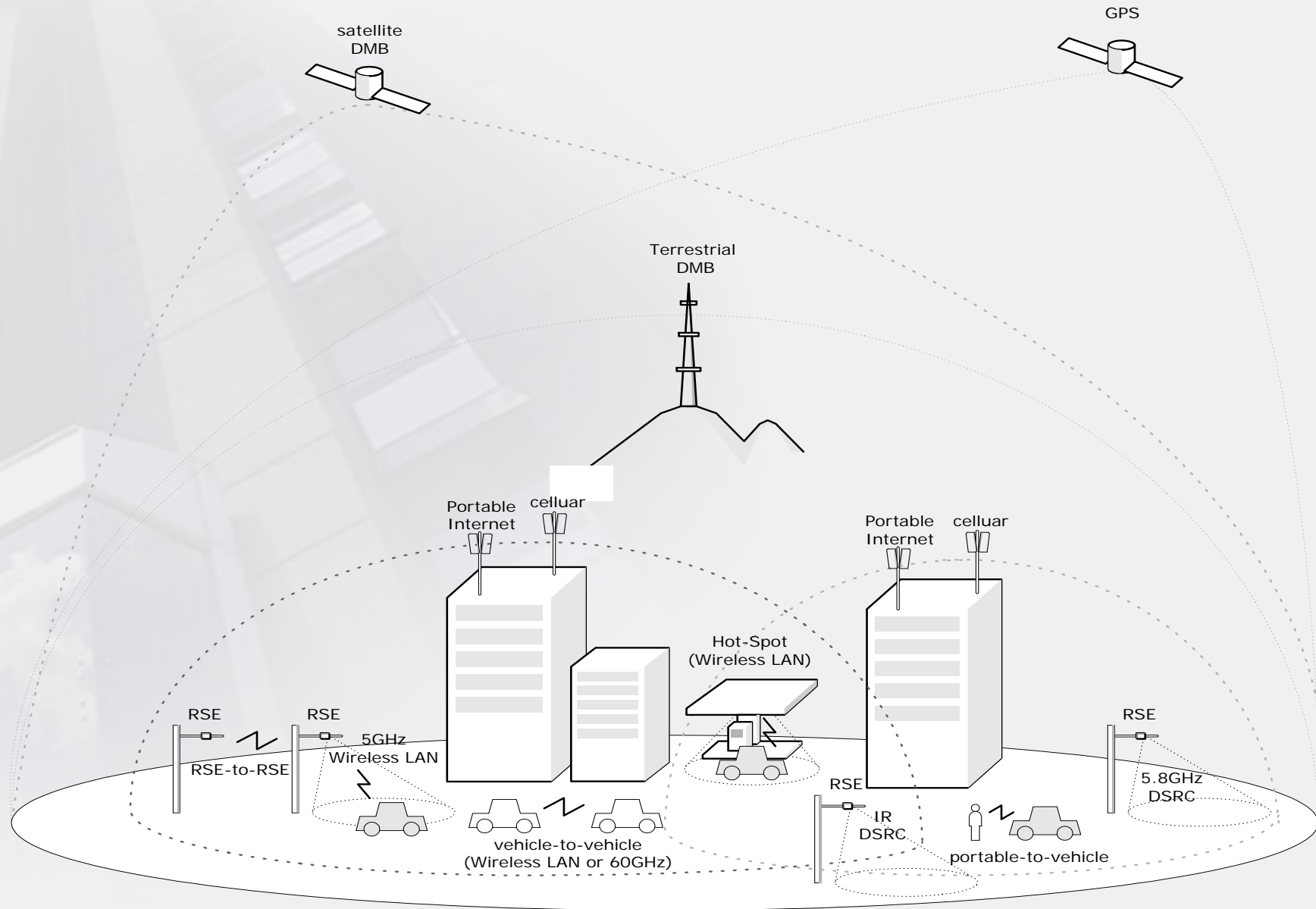
Voting started -
Full consensus



CALM - Overall

- Continuous **A**ir interface for **L**ong and **M**edium distance
- Support continuous communications
- Support client/server and peer-peer modes
- Support user transparent networking
- Support many (any?) communications medium through network layer
- Support handover spanning multiple media, media providers and beacons

CALM Scenarios

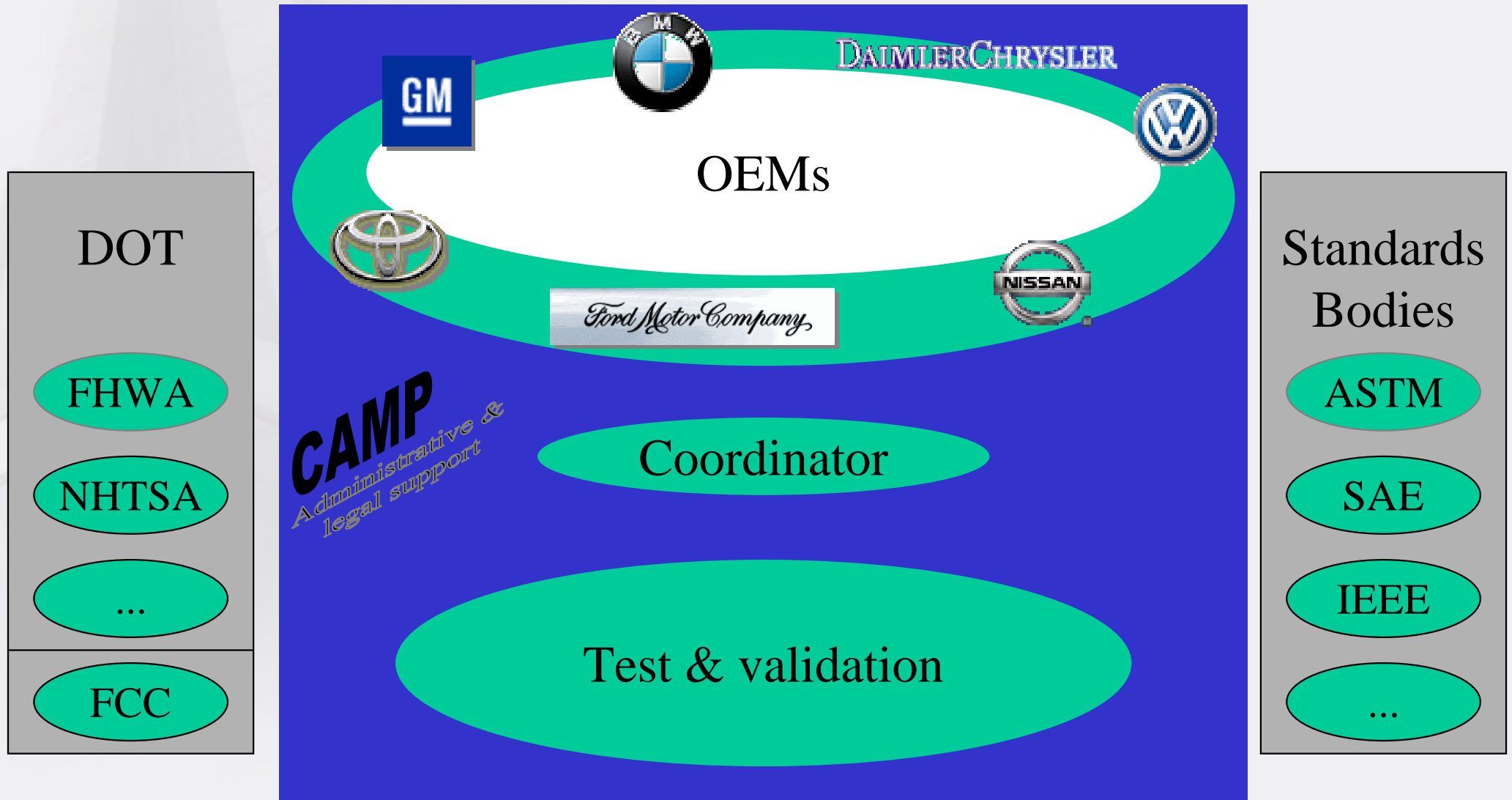


CALM Applications

- Support of Internet services – invisible handover
–(mostly) media independent
- Support of traditional ITS apps – media independent through DSRC L7
- New generation of applications:
 - Major push in safety – Vehicle Safety Communication
 - New commercial applications made possible by high data rate & long range.

- IEEE 802.11 and 1609 – Wireless Access in Vehicular Environments (WAVE) – May become joint stds?
- ETSI ERM TG37 – cell stds, spectrum and testing
- IETF – Internet Network Mobility (NEMO)
- Vehicle Safety Communication Consortium (VSCC)

VSCC Project Organization



- Adaptive Drivetrain Management
- Adaptive Headlight Aiming
- Blind Merge Warning
- Cooperative Adaptive Cruise Control
- Cooperative Vehicle-Highway Automation System (Platooning)
- Curve Speed Warning – Rollover Warning
- Enhanced Route Guidance and Navigation
- GPS Correction
- Highway Merge Assistant
- Highway/Rail Collision Warning
- Intersection Collision – Infrastructure-Based Warning
- Intersection Collision – Vehicle-Based Warning
- Just-In-Time Repair Notification
- Left Turn Assistant
- Low Bridge Warning
- Low Parking Structure Warning
- Map Downloads and Updates
- Non-Stop Tolling
- Pedestrian Crossing Information at Designated Intersections
- Point of Interest Notification
- Road Condition Warning
- Safety Recall Notice
- Safety Recall Notice
- Stop Sign Movement Assistance
- Stop Sign Violation Warning
- Traffic Signal Violation Warning
- Work Zone Warning

- Blind Merge Warning
- Emergency Vehicle Signal Preemption
- Infrastructure-Based Traffic Management – Probes
- Intelligent On-Ramp Metering
- Intelligent Traffic Lights
- Intersection Collision – Infrastructure-Based Warning
- Intersection Collision – Vehicle-Based Warning
- Just-In-Time Repair Notification
- Non-Stop Tolling
- Post-Crash Warning
- SOS Services
- Stop Sign Movement Assistance

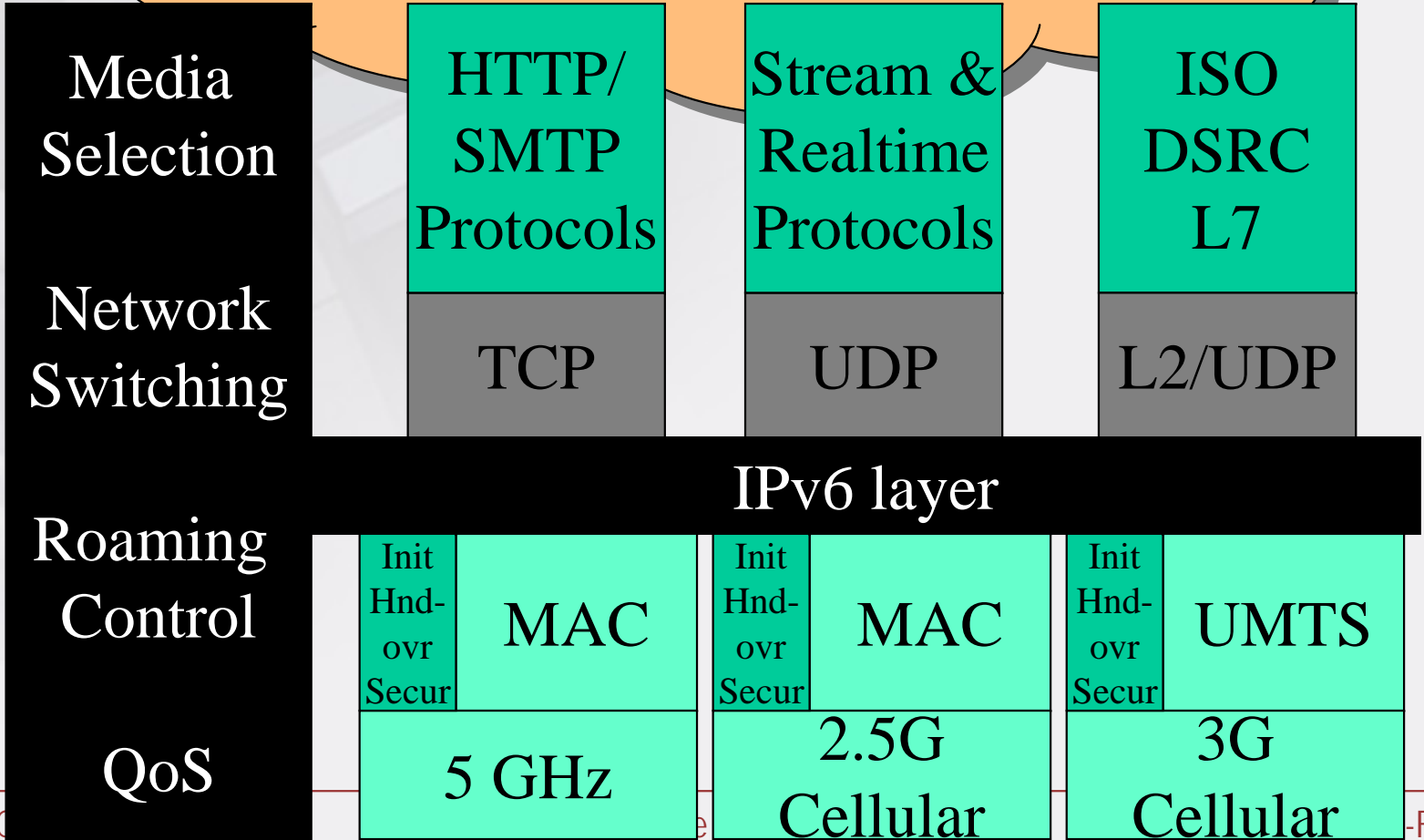
- Approaching Emergency Vehicle Warning
- Blind Merge Warning
- Blind Spot Warning
- Cooperative Adaptive Cruise Control
- Cooperative Collision Warning
- Cooperative Glare Reduction
- Cooperative Vehicle-Highway Automation System (Platooning)
- Electronic Brake Lights
- Highway Merge Assistant
- Highway/Rail Collision Warning
- Instant Messaging
- Intersection Collision – Vehicle-Based Warning
- Lane Change Assistant
- Left Turn Assistant
- Post-Crash Warning
- Pre-Crash Sensing
- SOS Services
- Stop Sign Movement Assistance
- Vehicle-Based Road Condition Warning
- Vehicle-to-Vehicle Road Feature Notification
- Visibility Enhancer
- Wrong-Way Driver Warning

CALM Strengths

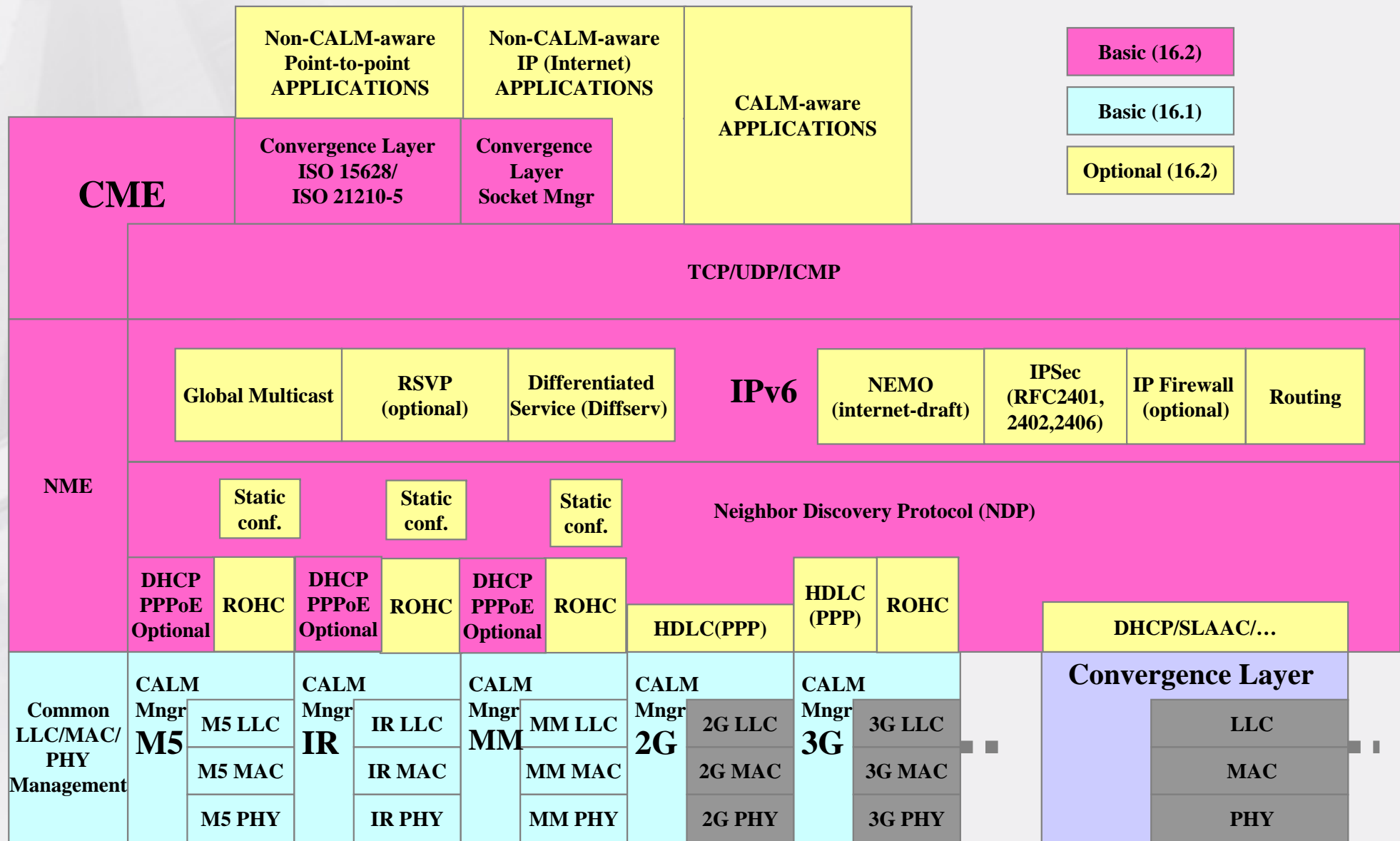
- TCP/IP based – will support Internet in native mode (+legacy applications)
- CALM will give several new services :
 - multiple media support
 - Internet connectivity,
 - Handover for continuous communication
- Integral part of vehicle in future

- Co-operation between US DoT, 8 vehicle mfg, ITS mfg for safety application
- Intended for new generation of ITS applications that require:
 - Vehicle-vehicle communication
 - Data rates of 6-54 Mbit/s
 - Communication distance to 300m or more
- Joint development with IEEE 802.11

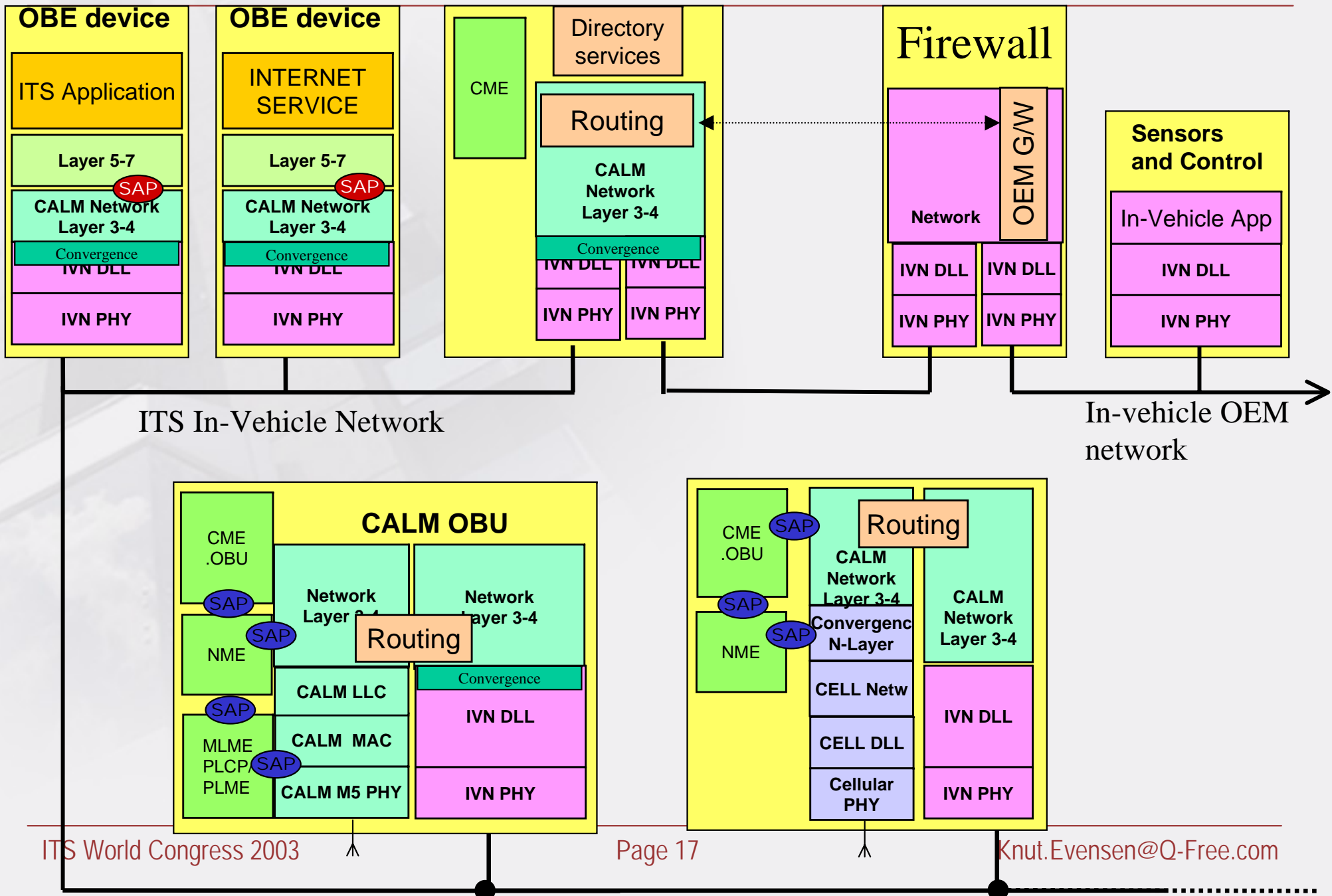
ISO TC204 ITS APPLICATIONS



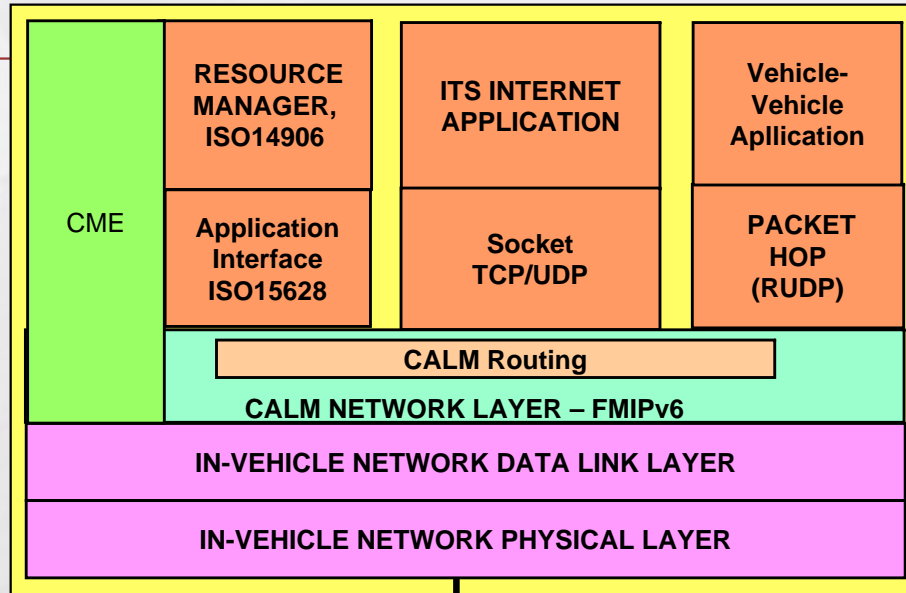
CALM *element* ARCHITECTURE



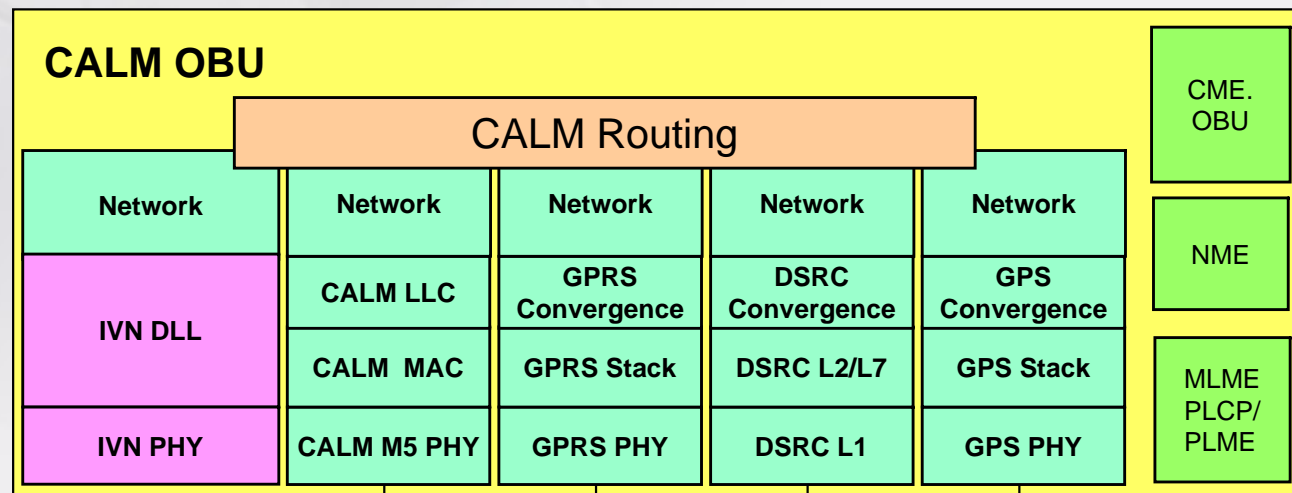
CALM Vehicle Architecture



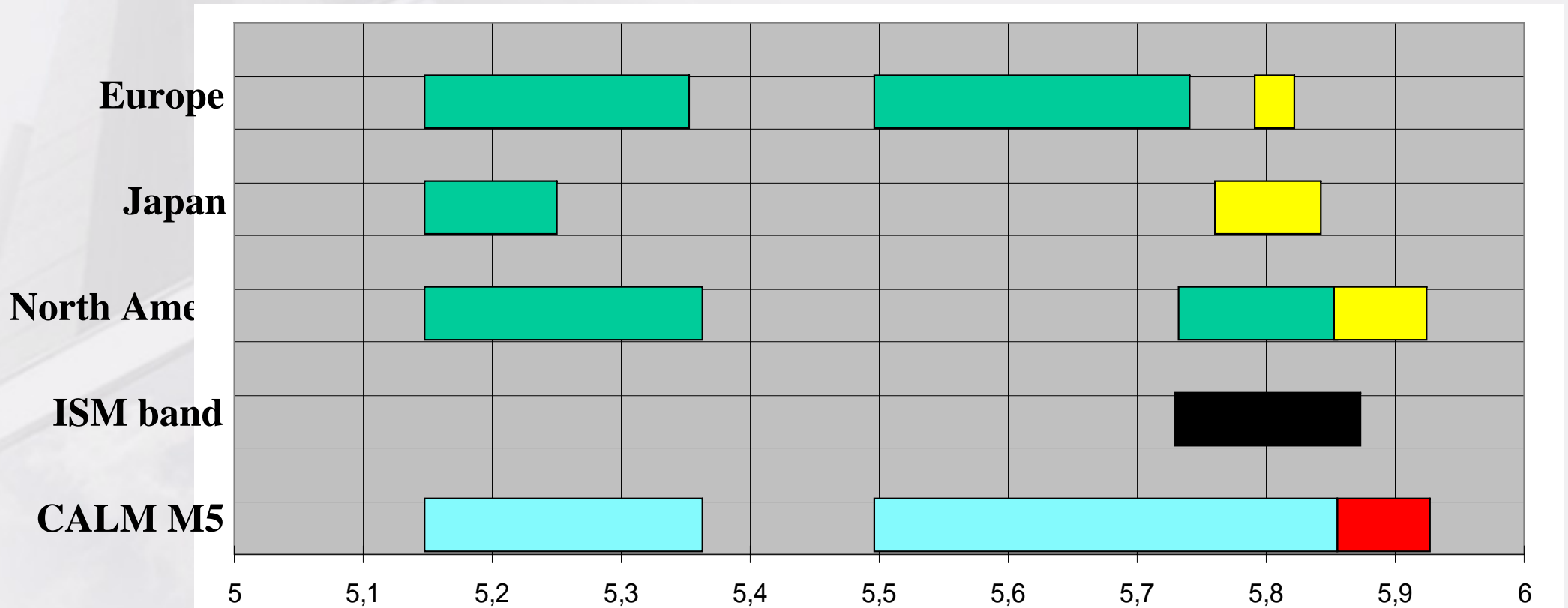
Example – Implementation Architecture



ITS In-Vehicle Network



5 GHz Band Spectrum



Unlicen. W-LAN

Dedicated ITS (DSRC)

Partly available regionally: ISM + shared unlicensed

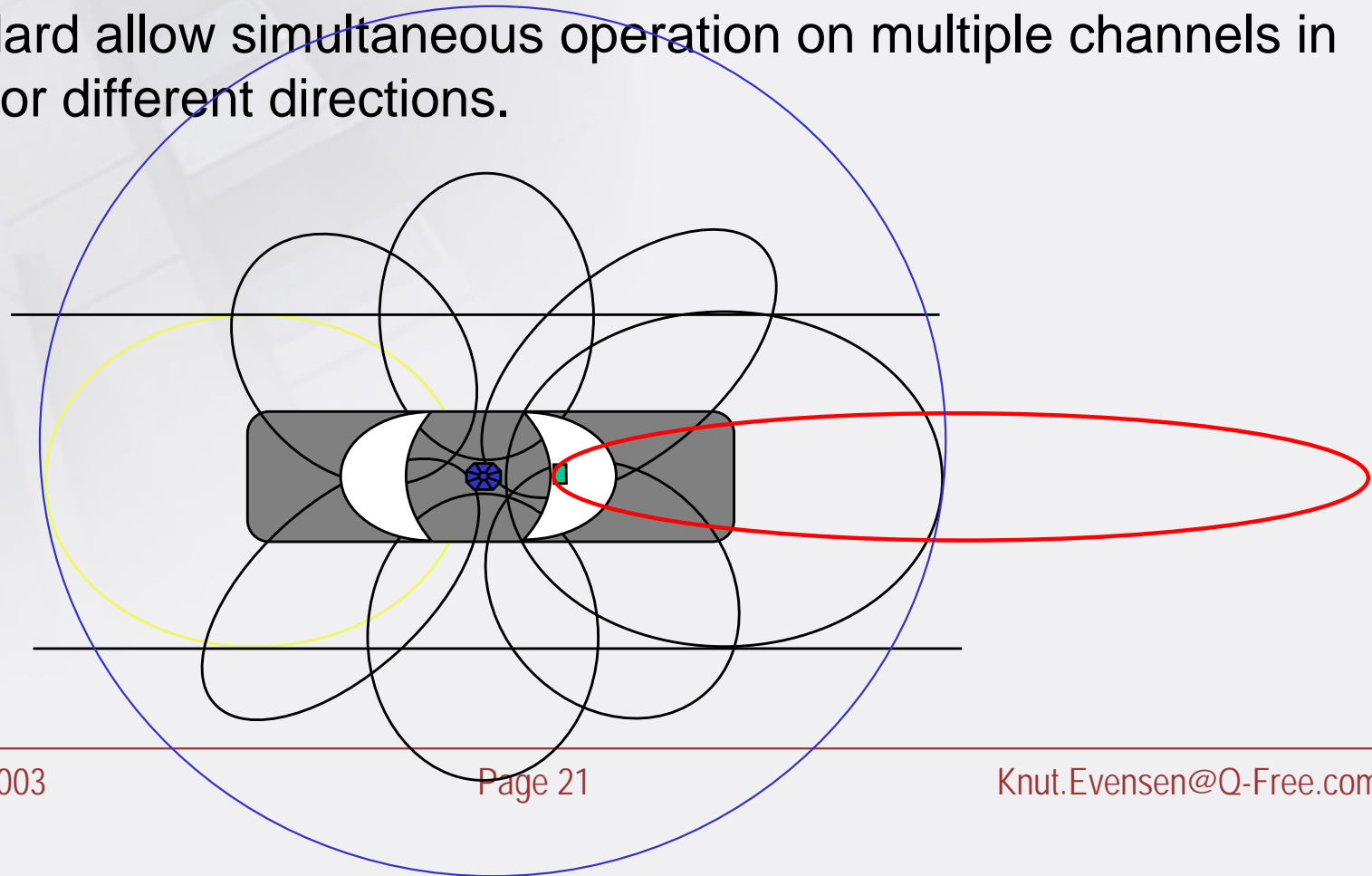
Requested from ITU: Global ITS Safety allocation 5.85-5.925

Global Spectrum Configuration

- The mobile unit (OBU) shall be configurable when moving between regulatory areas
- The OBU shall not start operation until an authorised source (e.g. fixed, licensed RSU) has provided profile information.
- Profiles may be autonomously initiated if the OBU can ascertain its position.
- National regulatory bodies can place limitations on channel utilisation and maximum channel usage on a per channel basis, and the unit shall be configurable / programmable to operate within these limitations.

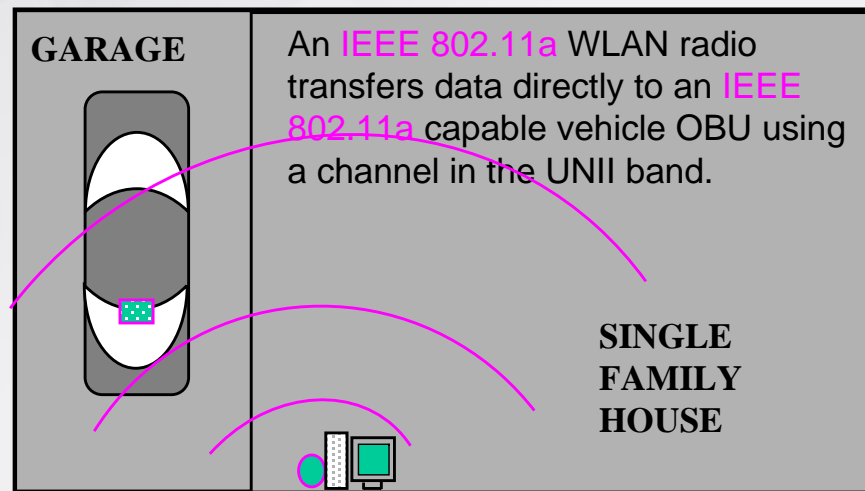
M5 Directivity

- CALM M5 include omni-directional as well as directive patterns.
- The standard allow control of multi-sector directed antenna elements.
- The standard allow simultaneous operation on multiple channels in the same or different directions.



5 GHz – Infrastructure mode

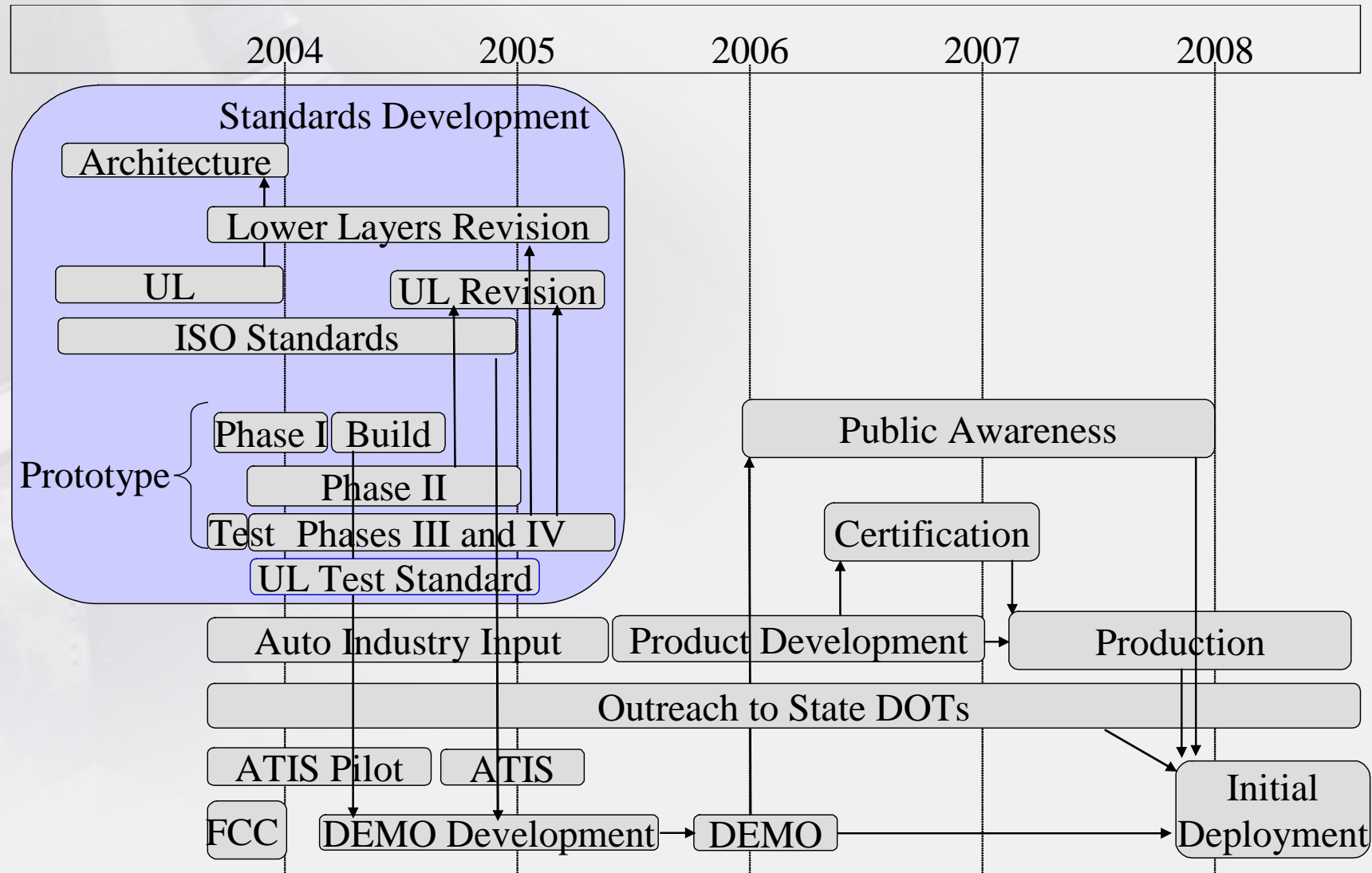
- The vehicle can communicate with normal IEEE 802.11a access points – your vehicle can access your normal home W-LAN – even through the walls.



CALM Status

- Work is aligned between ISO and IEEE
- First media drafts are available
- Complete set of drafts available March 2004. Will be jointly distributed and commented
- Firstly prototyping and validation – final standards may take 2-3 more years

Schedule



Conclusion

- Multiple networked communication will be integrated in vehicles - **Timescale ?**
- Wireless LAN technology is part of this – and **so are the DSRC technologies**
- European ITS actors need to:
 - Be more active in these ISO/IEEE standards
 - Check compatibility with CEN DSRC