



***THE FULLY
NETWORKED
CAR***

Knut Evensen

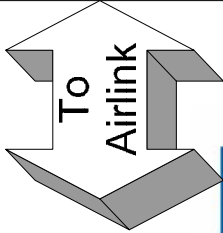
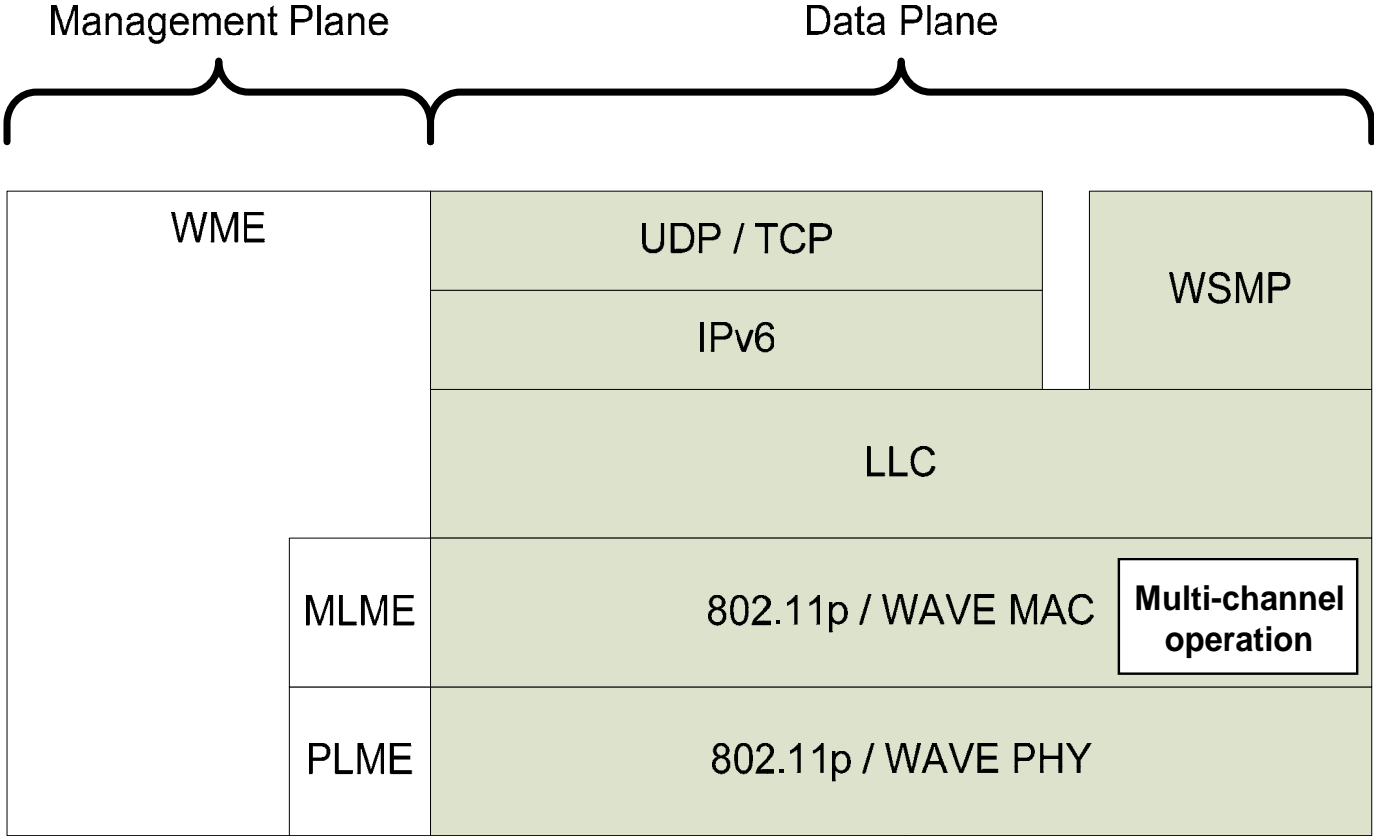
V.P. Technology, Q-Free ASA

Geneva, 7-9 March 2007

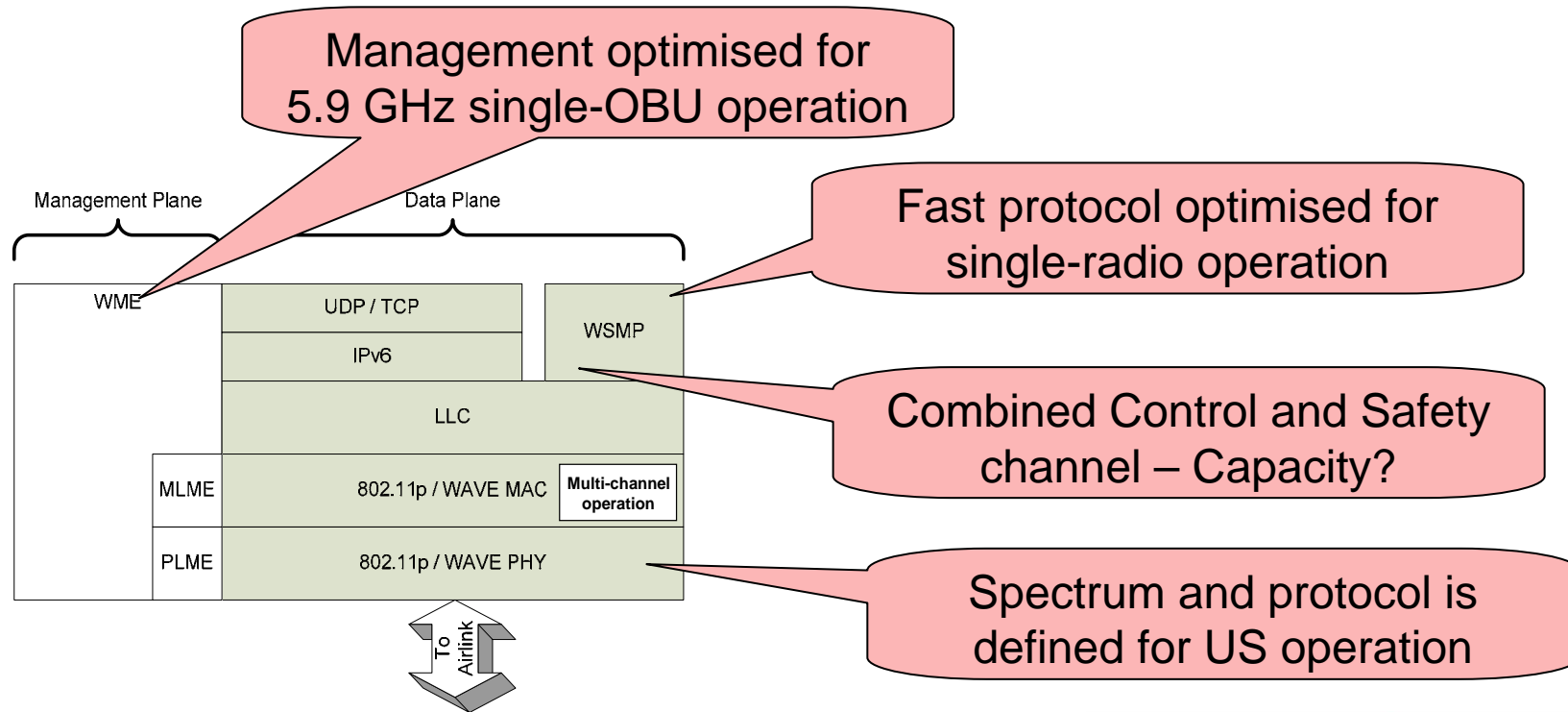


- o IEEE P1609 (VII) architecture
- o C2C-CC architecture
- o CALM basic architecture
- o How CALM include C2C and VII requirements
- o The way forward

US WAVE architecture

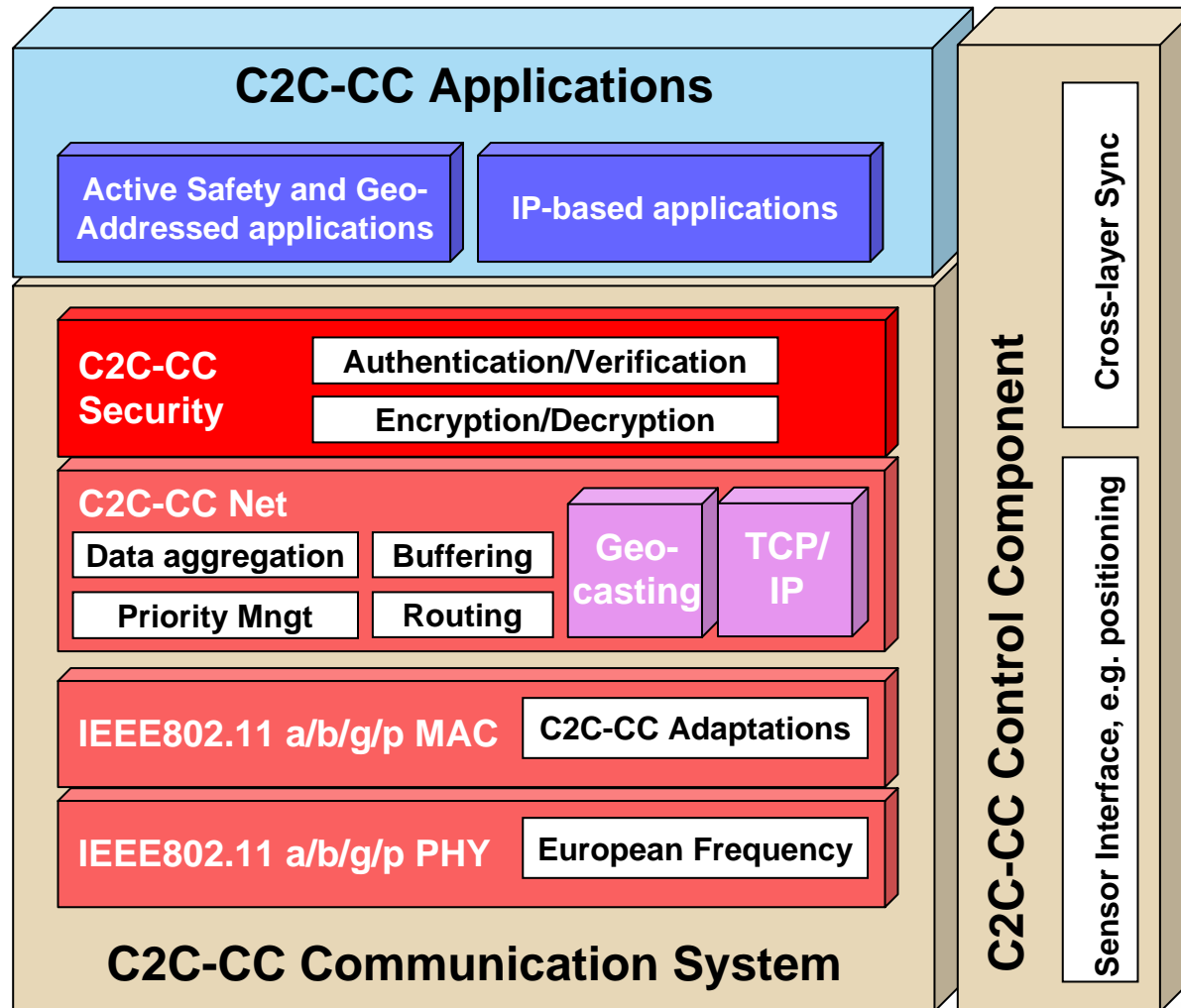


WAVE: IEEE trial use standards.

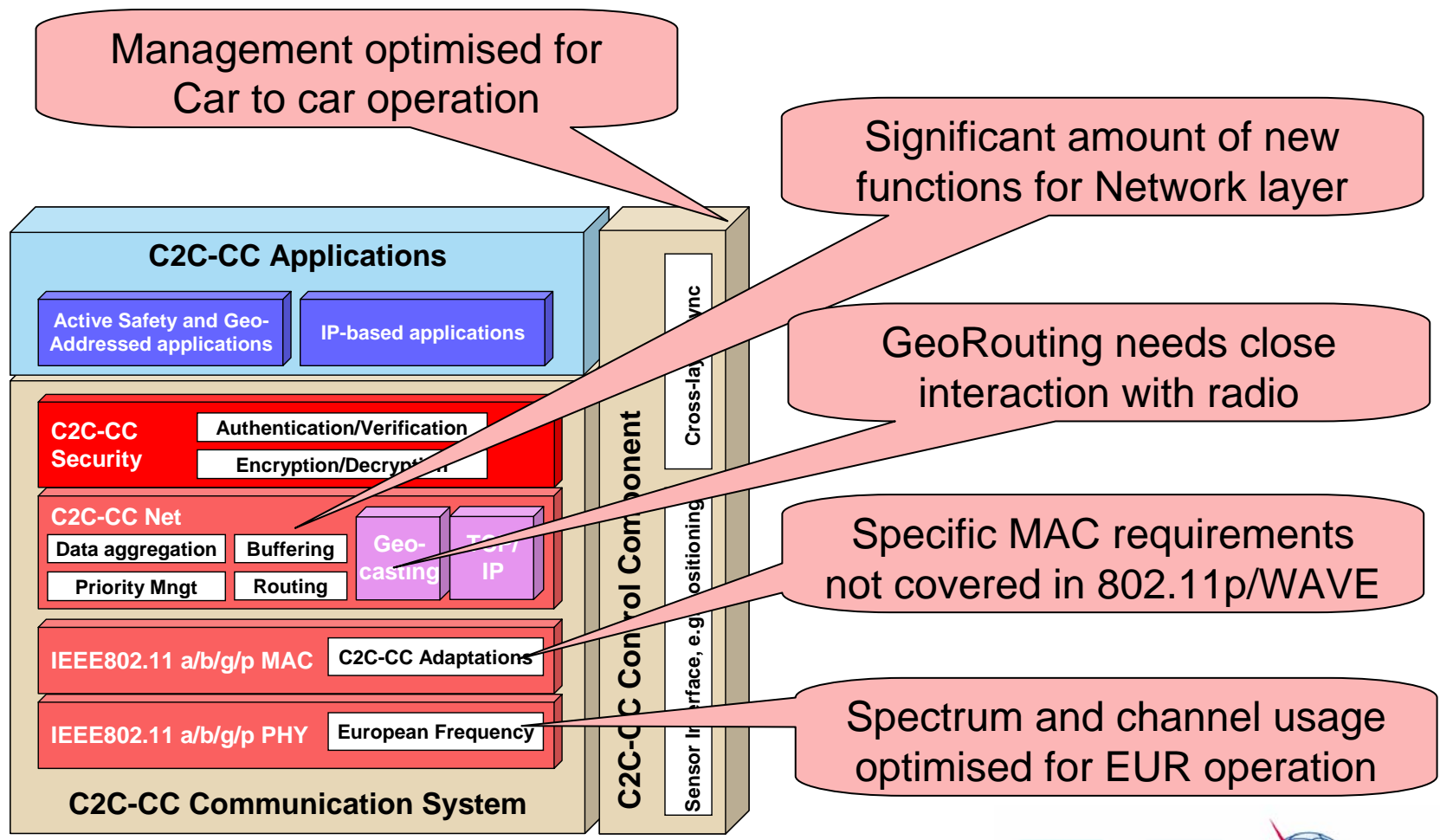


C2C-CC Architecture

C2C-CC System Components and Functionality. Source: Timo Kosch BMW



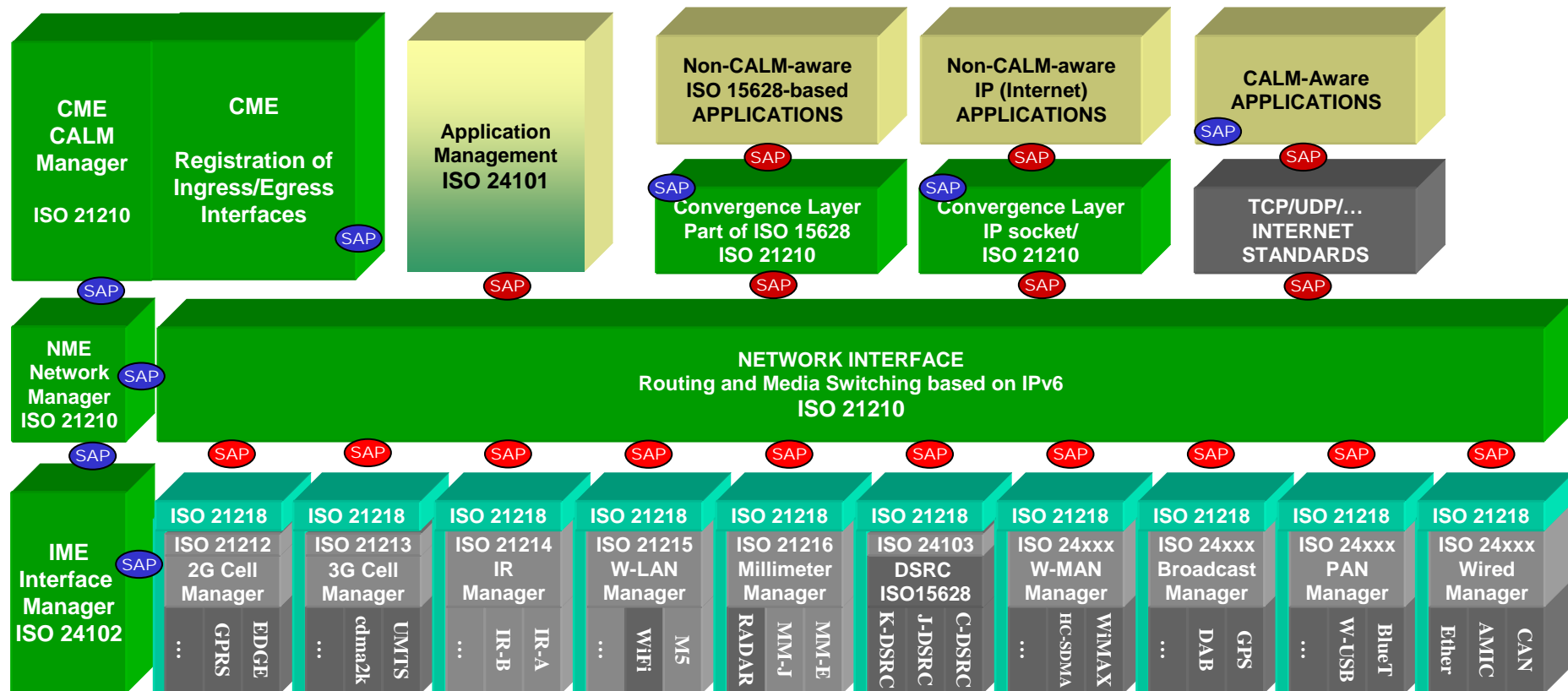
C2C-CC Challenges



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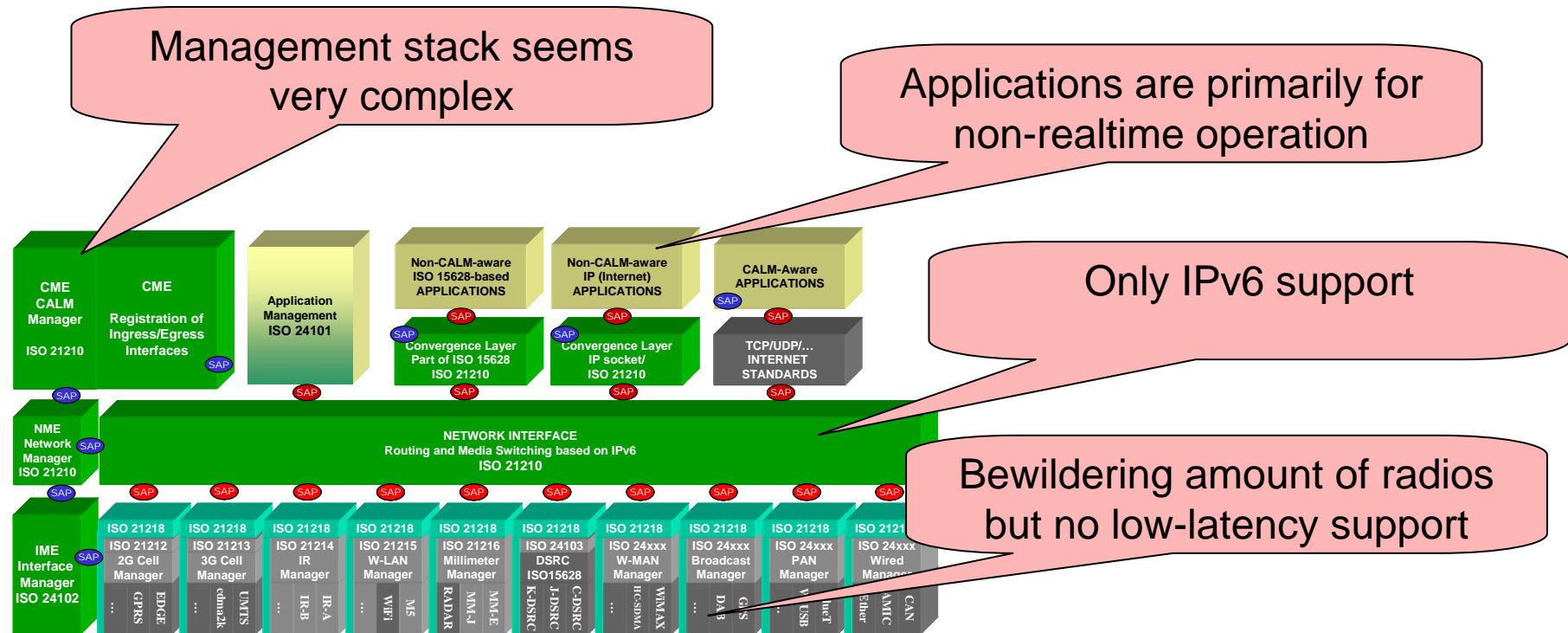
CALM 2005 architecture



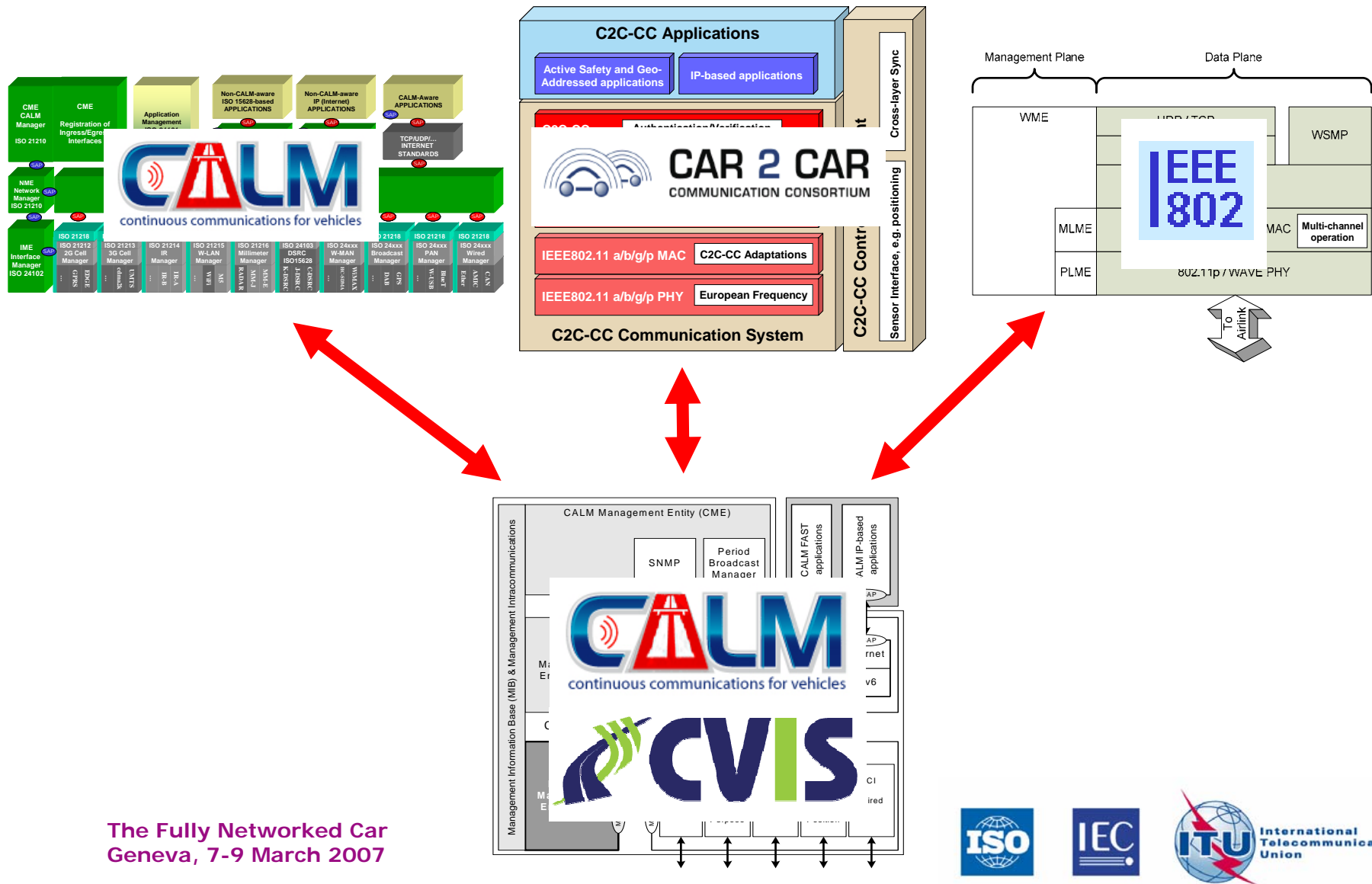
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CALM 2005 Challenges



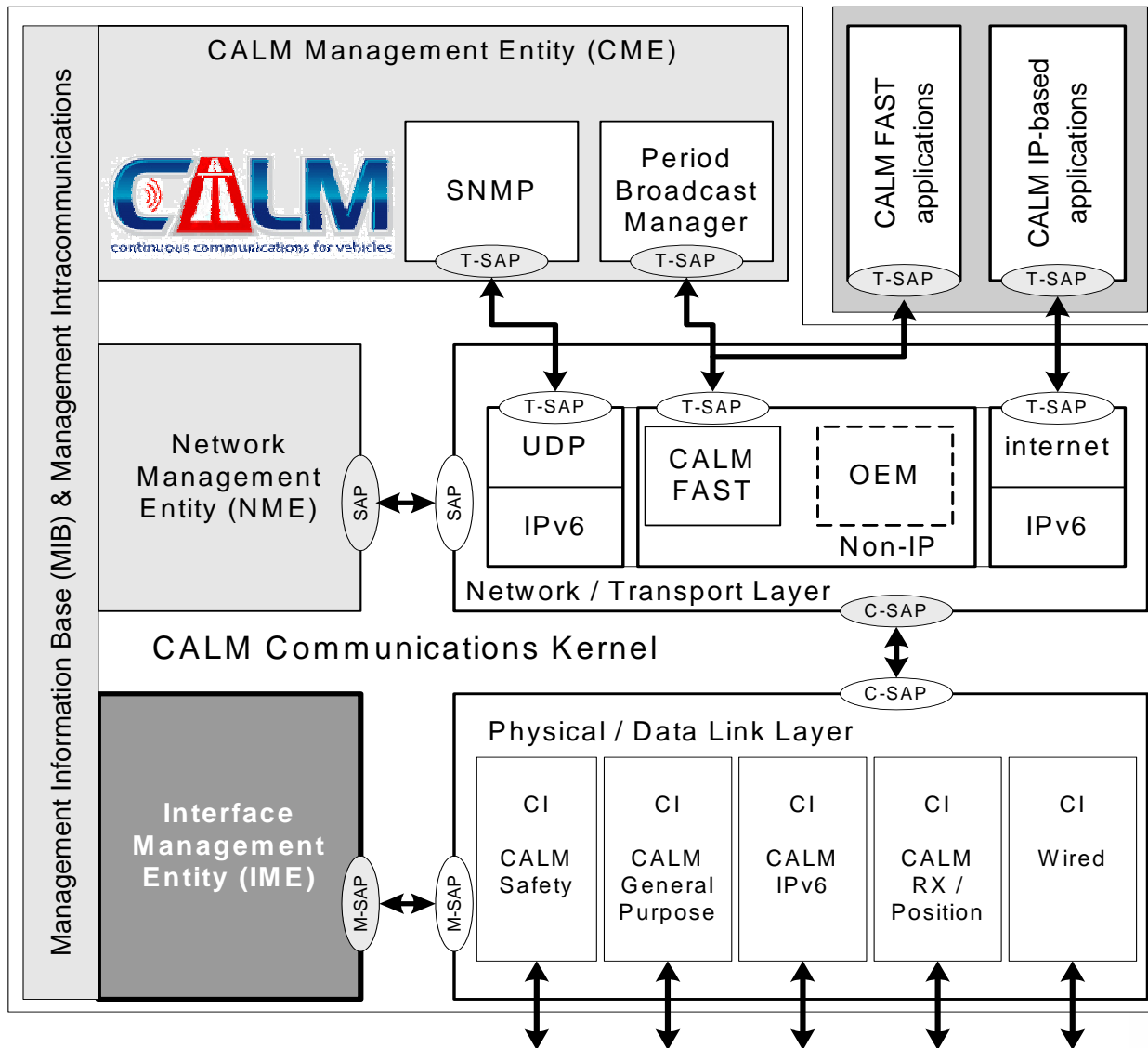
What is being done?



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- R&D projects and STANDARDISATION is working jointly to save time
 - In Europe CVIS, COOPERS, SAFESPOT,.. links CALM, ETSI and IETF
 - In the US VII directly links IEEE 802.11p and P1609 (WAVE)
 - Close interrelation between European and US experts
- CALM has been discussing architecture and requirements with key actors in IEEE and C2C-CC
- Results have been incorporated in a new CALM architecture view
- Formal CALM ISO standards based on this architecture are being fast-tracked through the standards process
- ETSI is designing formal test suites for CALM
- Open test implementation is being done in the CVIS project
- Open CVIS platform offered for other projects
- CVIS, SAFESPOT, COOPERS and other European projects will evaluate standards

CALM Architecture –2007 merged version



- o non-IP support
- o fast protocol/ security support
- o geo-routing protocol support
- o proprietary protocol are now supported
- o broadcast manager
- o simplified stack management
- o global operation for 5.9 GHz and 802.11abg supported in CALM M5

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- o A lot of work has gone into resolving differences recently
 - Positive attitude from experts from Europe, US and Japan
- o Differences between C2C-CC, CALM and IEEE are mainly fixed and joint comms architecture largely stable
 - Some details remain (Sophia Antipolis workshop 7 May)
- o All basic test standards expected to be complete second half 2007
 - Will be validated by CVIS, SAFESPOT, COOPERS, VII and other projects
- o Feedback to permanent standards 2008
 - Joint work between ISO, IEEE, ETSI, IETF and Projects

Thanks for your attention...

knut.evensen@q-free.com

www.cvisproject.org

www.calm.hu

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Backup slides

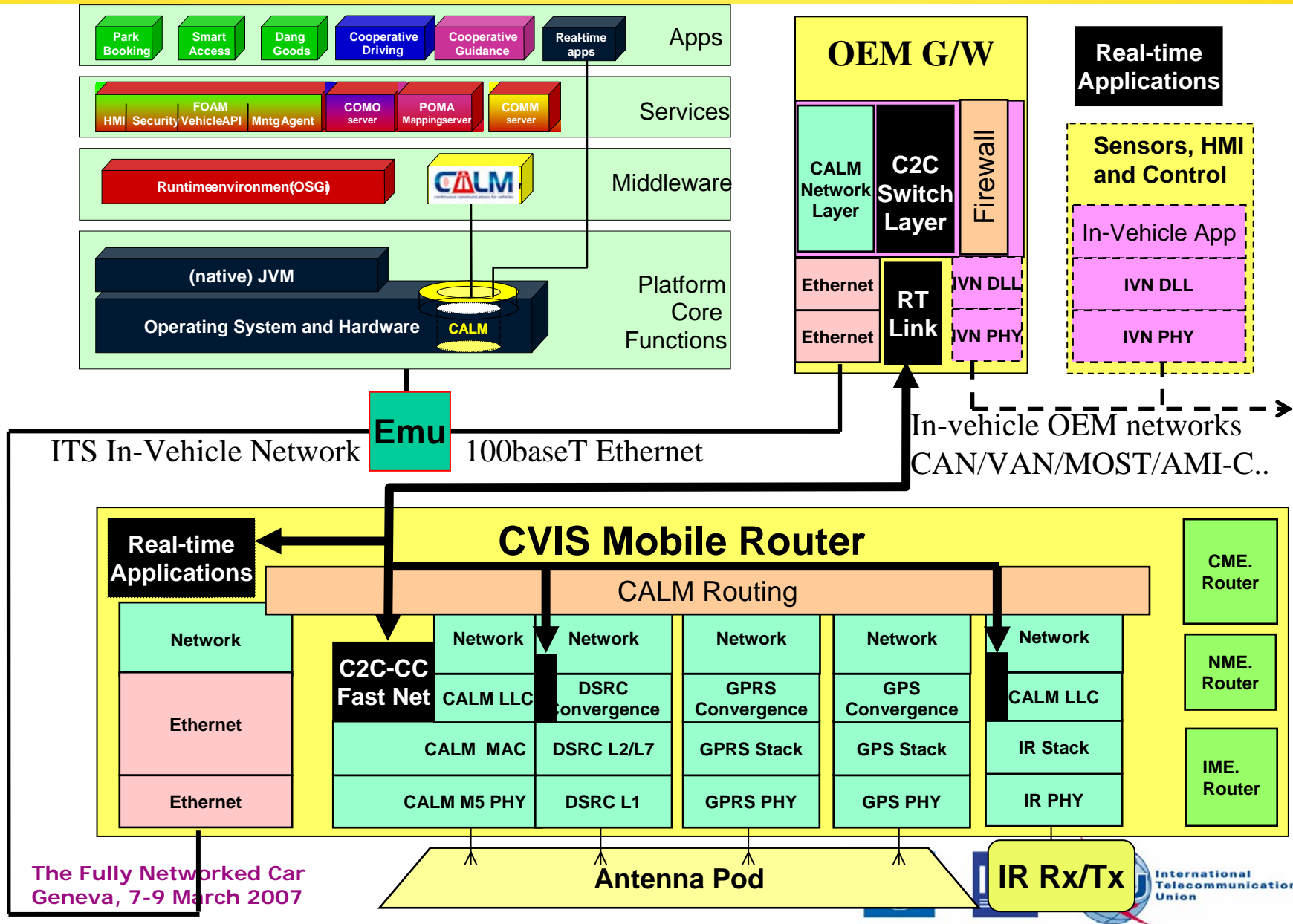
14

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- CALM is an ISO activity that currently covers more than 15 distinct ISO standards. The aim is to provide an architecture and a set of protocols to separate applications from the communication media. A wide selection of media is covered, and a basic network protocol (IPv6) is used together with a comprehensive management stack. Please see www.calm.hu.
- The Car2Car Communication Consortium was initiated by European vehicle manufacturers, but now open for other partners. The Car2Car Communication Consortium is dedicated to increasing road traffic safety and efficiency by means of inter-vehicle communications. Please see www.car-to-car.org.
- The two groupings have developed architectures and protocols that are mostly complementary, but also partly overlapping and in some cases conflicting. There is currently intensive work to harmonise and incorporate the C2C-CC needs into the CALM protocols.
- Two new INFSO projects are involved in this process. CVIS (www.cvisproject.org) is mainly supporting the basic CALM protocols, while SAFESPOT (www.safespot-eu.org) also needs some of the features provided by C2C-CC. There is a formal agreement between the projects to co-operate both on architecture and on technical aspects to find interoperability. There are also several common test sites that require a high level of technical compatibility and interoperability between the projects.
- The presentation will give an overview of the different architectures and protocols, and report on the status of the harmonisation work. Advice on the way forward and possible outcome will also be given.

From functional Architecture...



- o Pentium M 783, 1.4GHz
- o 40GB Harddisk (Automotive)
- o Intel VGA Graphics
- o 1GB Memory
- o Ethernet 10/100
- o 4 USB 2.0 ports
- o 3 RS232 ports
- o Audio in/out
- o PS/2 for Keyboard/Mouse



... to deployment hardware?

- Two-piece solution:
 - Integrated roof antenna
 - Small radio module plugged into vehicle computer
 - All services running in vehicle computer
- Four configurable radios are usually needed:
 - IEEE 802.11abg+11p
 - DSRC
 - GSM/UMTS
 - GPS (Galileo)



- o Two miniPCI off-the-shelf Atheros radios
 - exactly same HW as in (some) US tests
- o Additionally includes:
 - Synchronization to European DSRC Toll Collection systems according to ETSI requirements
 - **Don't forget this even for tests!**
 - European 5.9GHz spectrum plus 802.11abg
 - GPS time-slot sync for performance optimization
 - Full P1609.4 stack (US operation compatible)
 - Full CALM management for parallel stacks
 - Open access to APIs and SAPs, both native code LINUX and OSGi/GST based portable services