

# ISO TC204 Use Cases

Thierry Ernst

IETF – ISO liaison officer from ISO TC204

# Outline

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- Purpose of the IETF – ISO liaison
- ISO TC204
- ITS station architecture in brief
- Example use case

# Liaison ISO TC204 – IETF: Purpose

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- From ISO to IETF: inform about ongoing work developed within ISO TC204
  - In the area of Connected & Cooperative ITS
    - Vehicle / roadside infrastructure / urban infrastructure
  - Use cases include:
    - Public transport
    - Freight & logistics
    - Road safety / Traffic efficiency / Infotainment
- From IETF to ISO
  - Get feedback and advices on the use of IETF protocols in ISO standards (particularly **IPv6, Security**)

# ISO TC204: Intelligent Transport Systems

Started in 1993

## ISO/TC 204 Organization



## Working Groups

## Lead Country

WG 1 : Architecture	United Kingdom
WG 3 : ITS Database Technology	Japan
WG 4 : Automatic Vehicle Identification/ Automatic Equipment Identification	Norway
WG 5 : Electronic Fee Collection	Sweden
WG 7 : General Fleet Management and Commercial Freight Operations	Canada
WG 8 : Public Transport and Emergency	United States
WG 9 : Integrated Transport Information, Management and Control	Australia
WG 10: Traveller Information Systems	United Kingdom
WG 11: Route Guidance and Navigation Systems	Vacant
WG 14: Vehicle/Roadway Warning and Control Systems	Japan
WG 15: Dedicated Short Range Communications	Vacant
WG 16: Wide Area Communication	United States
WG 17: Nomadic Device	South Korea
WG 18: Cooperative systems	Germany

- CALM: Wide Area Communications
- Funded 2001
- Unified communication architecture supporting a variety of access technologies
  - Broadcast & Point-2-Point
  - Adhoc (IP/ non-IP) & permanent connectivity (IPv6)
- Aka “communication toolbox” for other ISO WGs, in particular
  - WG18 *Cooperative ITS*
  - WG17 *Nomadic devices*

# ISO TC204 WG18: Cooperative ITS (C-ITS)

## CEN/TC278/WG16 – ISO/TC204/WG18 Structure 2013



CEN/TC278

**WG16 Co-operative Systems**



ISO/TC204

**WG18 Cooperative Systems**

### **Joint WG16/WG18**

Convenor: **Hans-Joachim Schade**

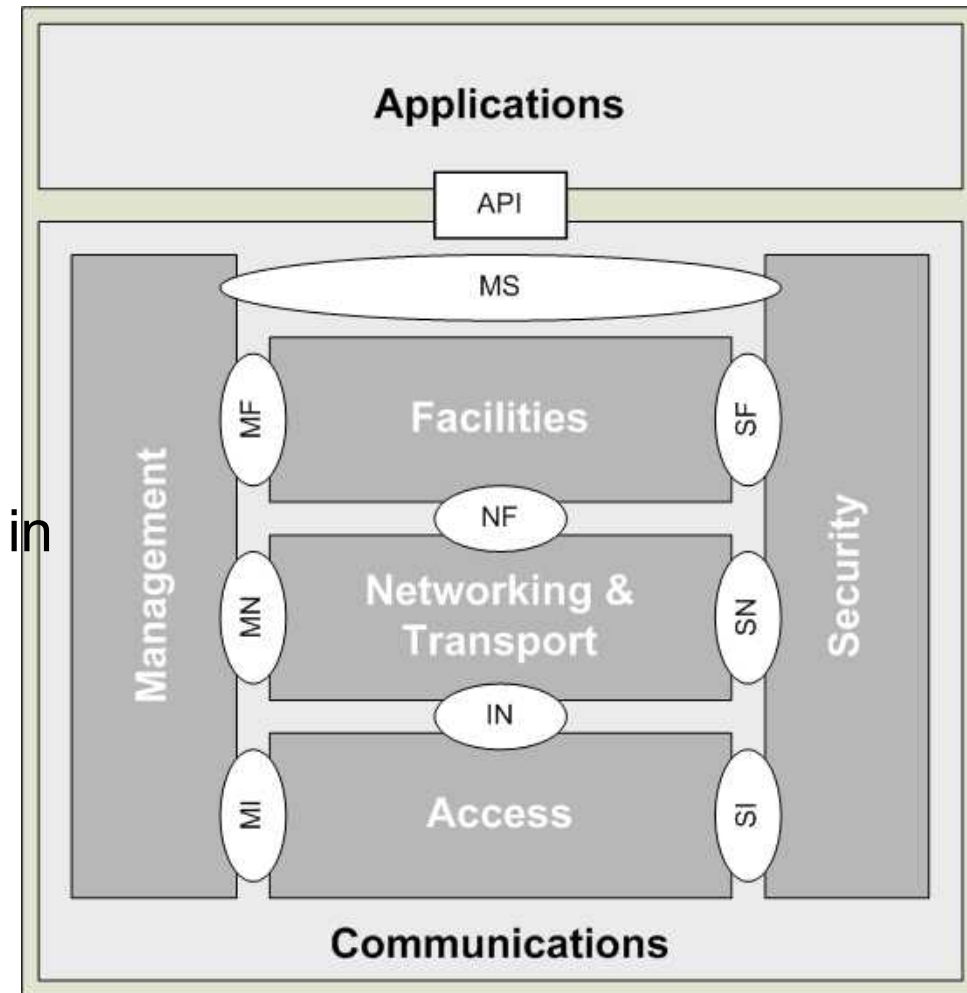
Rapporteur: **András Csepinszky and Eric Wern**

<b>Joint WG16/WG18</b>	<b>SWG1</b>	<b>Harmonization</b>	K. Evensen (NOR)
	<b>DT2</b>	<b>Applications management</b>	H.-J. Fischer (GER)
	<b>DT3</b>	<b>LDM</b>	A. Schalk (AUT)
	<b>DT4</b>	<b>Architecture</b>	T. Herb (GER)
	<b>DT5</b>	<b>Applications</b>	L. Blaive (FRA)
	<b>DT6</b>	<b>Profiles</b>	T. Ernst (FRA)
	<b>DT7</b>	<b>Applications</b>	P. Mieybégue (FRA)
	<b>DT8</b>	<b>Message Sets (V2I, I2I)</b>	H.-J. Schade (GER)
	<b>Liaisons</b>	<b>ETSI TC ITS, SAE</b>	H.-J. Schade (GER)
	<b>Ext. Interfaces</b>	<b>ITS-CG, EU-U.S. TF, FOT</b>	H.-J. Schade (GER)

- Focus on Cooperative ITS services and applications

# ITS station architecture: Motivations

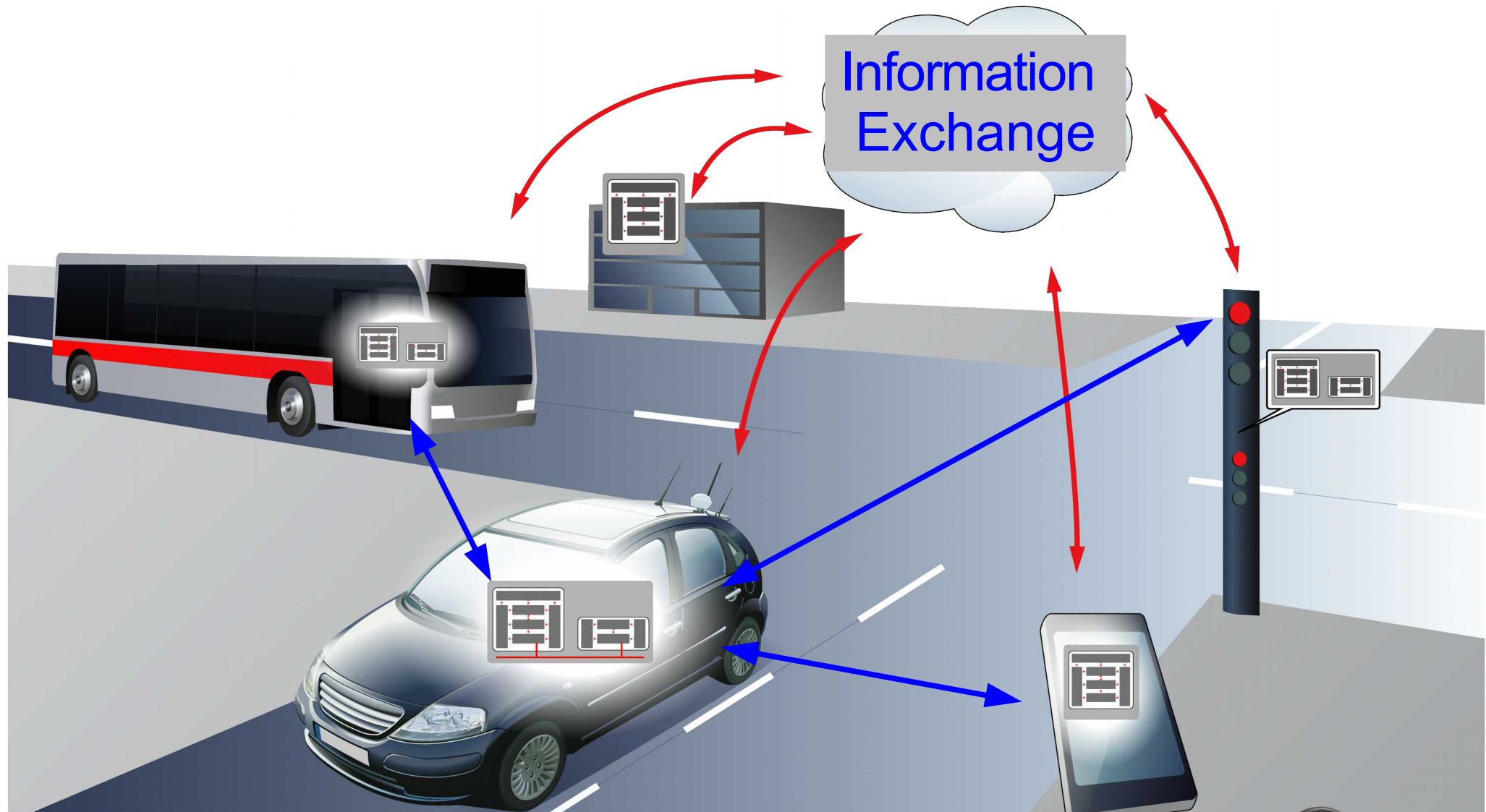
- Abstract, open, flexible, future proof ITS station architecture designed to support any type of:
  - Use (road safety, traffic efficiency, infotainment)
  - ITS station (roadside, control center, vehicle, nomadic devices)
  - Transmission (pt-2-pt, broadcast, ...) in IPv6 or non-IP
  - Access technologies (11p, cellular, satellite, 6LoWPAN, ...)
  - Capabilities
  - Communication scenarios (V2X, V2Internet, Roadside2Center, ..)



[ISO 21217]



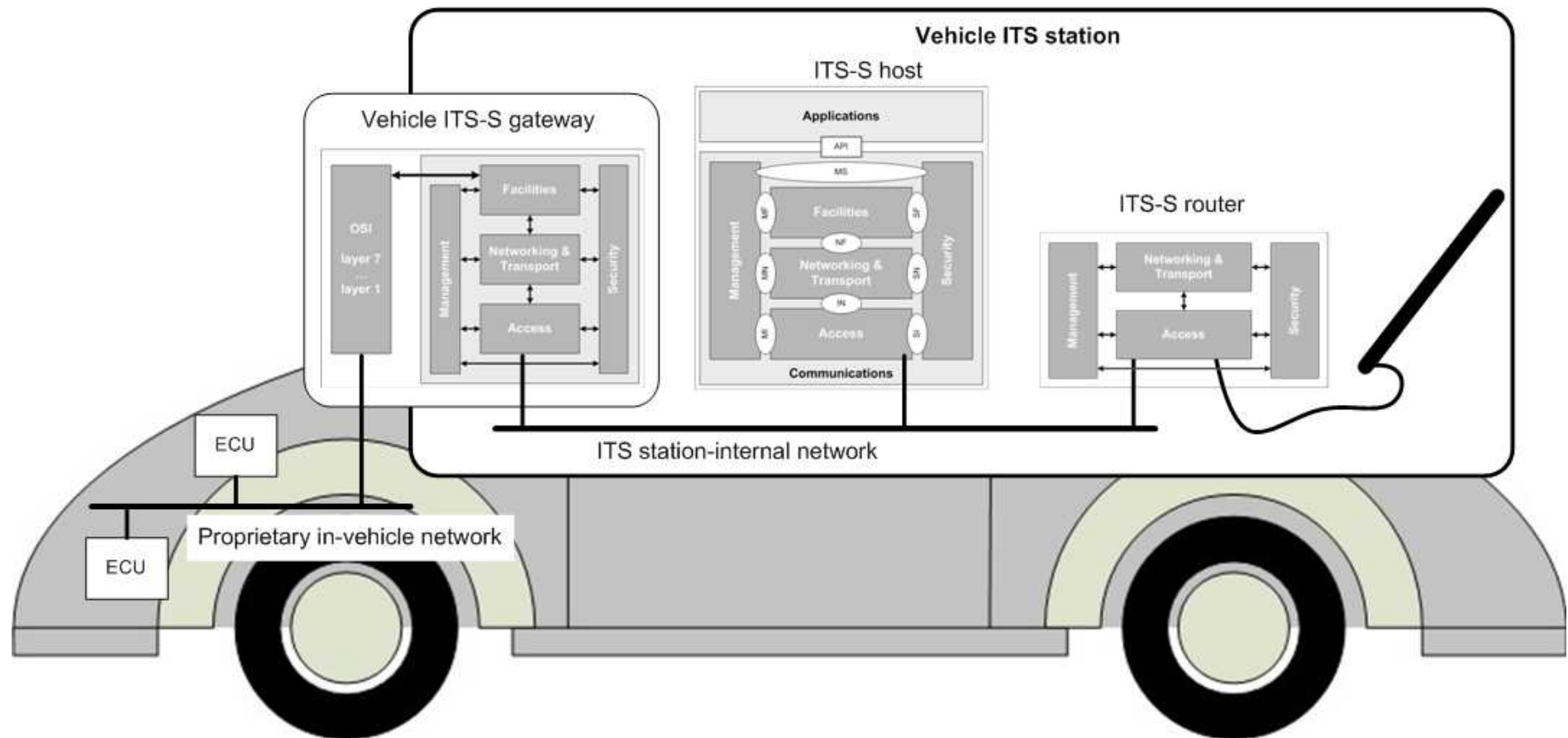
# ITS station architecture: Communications





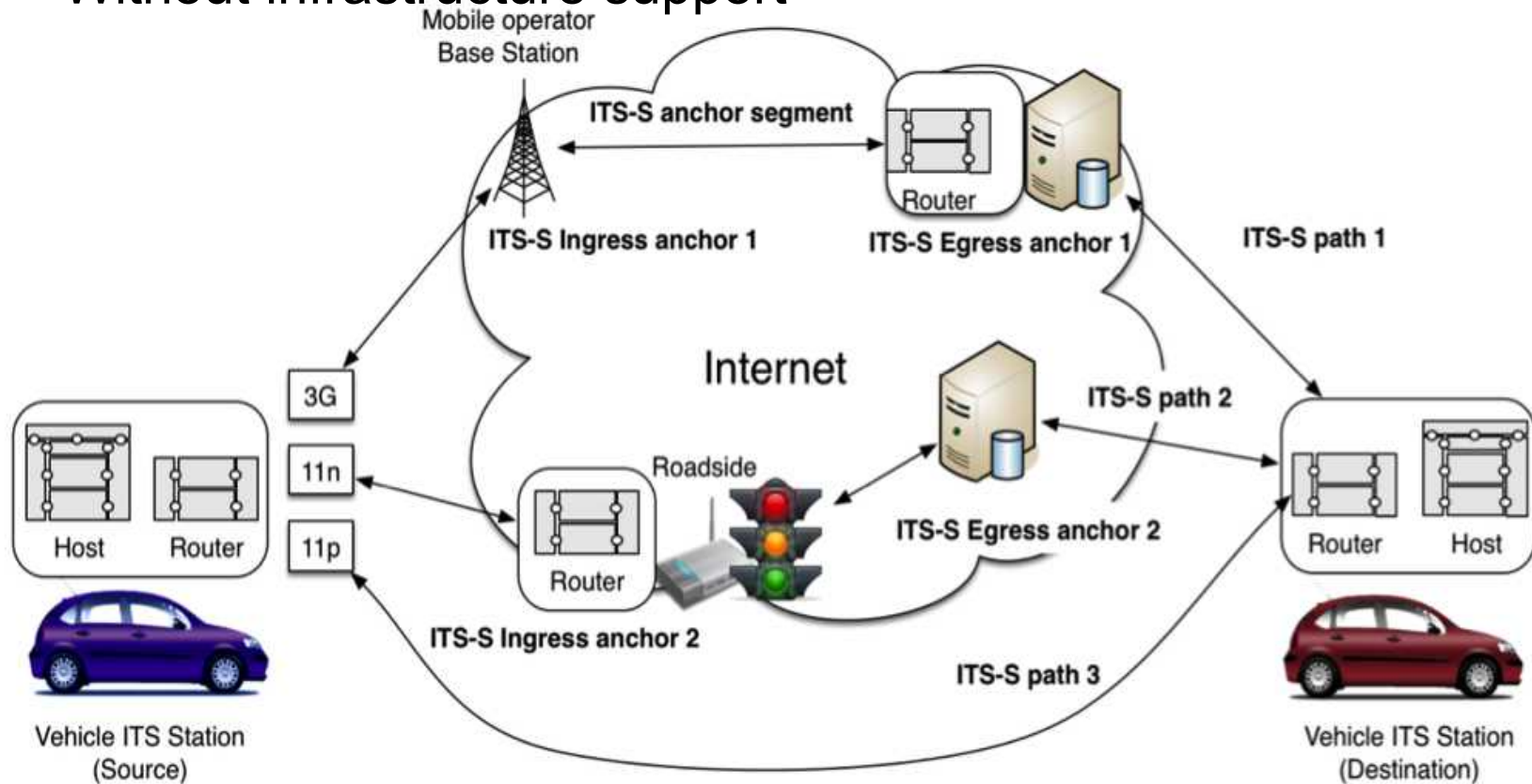
# Vehicle ITS Station (V-ITS-S)

- Instantiation example: **Hosts, Mobile Router** and **Gateway**



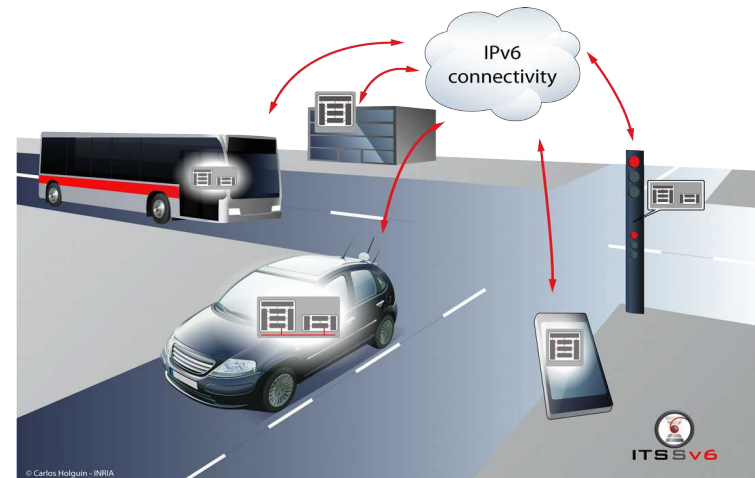
# Hybrid communications: Multiple paths

- Multiple communication paths may exist between ITS stations
  - Using distinct access technologies (wifi, cellular, satellite, ...)
  - Using distinct access networks (roadside infrastructure or public)
  - Without infrastructure support



# IPv6 in the ITS station: ISO 21217

- Cooperative ITS standards are only referring to IPv6 (not IPv4)
- Specific ISO TC204 standards specifying the use of **IPv6 in an ITS station**
  - what IPv6 features are necessary for ITS,
  - how do they map in the ITS station,
  - in which situations is IPv6 used



# IPv6 in the ITS station: ISO 21217

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- Describe how IPv6 is integrated and operated in the ITS station architecture, basic features required
  - IPv6 addressing auto-configuration, address allocation, DAD, ...
  - IPv6 entities involved (router, host, fixed or mobile) each entity needs different features, depending on scenarios / some are optional
  - IPv6 forwarding and routing neighbor discovery, forwarding table look-up
  - How handovers are performed and sessions maintained IPv6 session continuity (NEMO) / IPv6 mobile edge multihoming support (MCoA, etc.)

# IPv6 in the ITS station: ISO 16789

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- Specify extensions of ISO 21210 in order to improve the performance and allow the ITS station to manage hybrid communications
  - Management of multiple IPv6 paths
  - Optimized IPv6 communications between vehicle and roadside ITS stations
  - Direct communication between ITS stations (adhoc)
    - Generically applicable IETF standard is sought on this otherwise ISO will develop its own

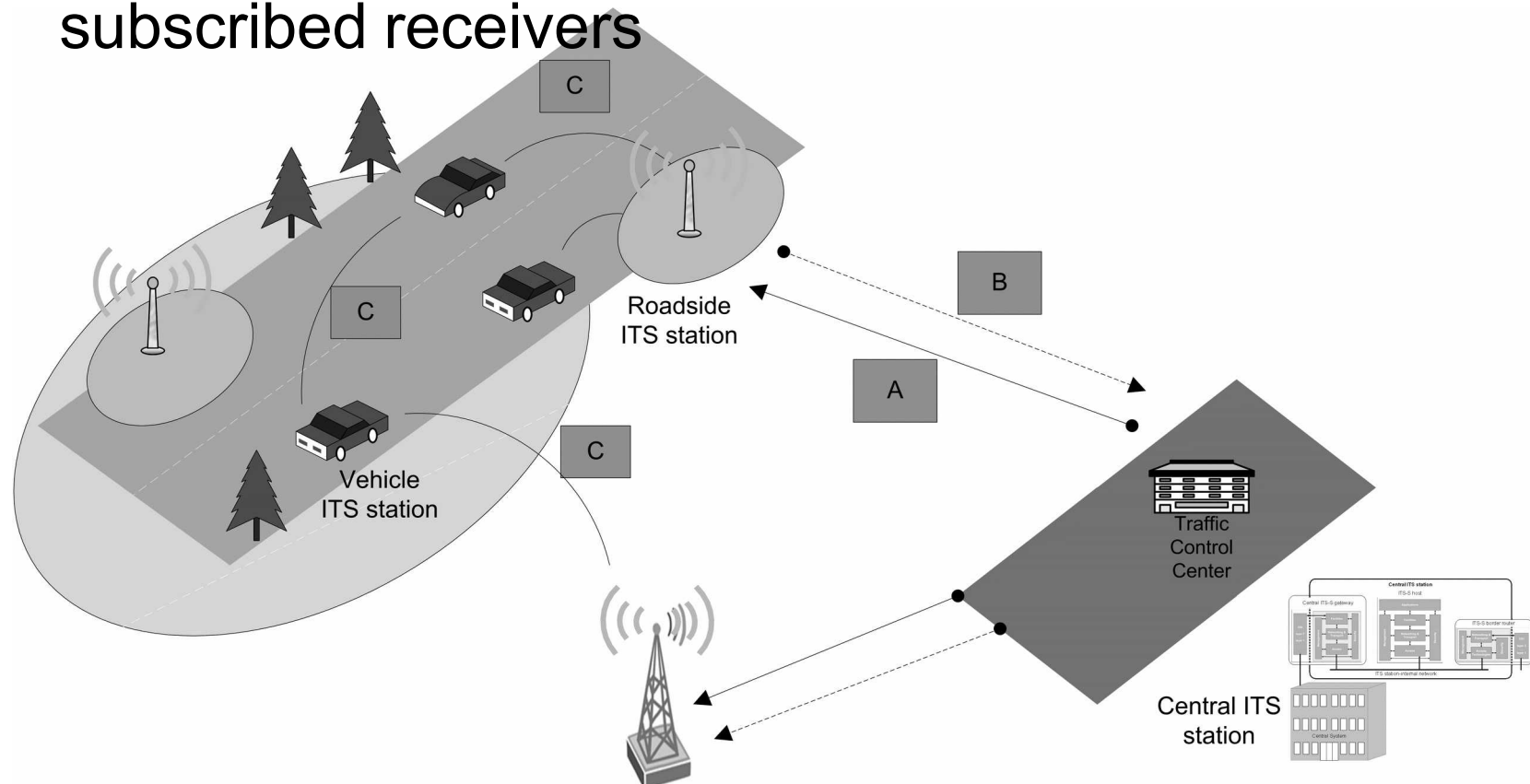
# Case study: In-Vehicle Signage (IVS)

- **Data exchange** for the presentation of external road and traffic related data
- **Challenges**
  - **Trust**: ensuring the data is coming from authoritative sources
  - **Resilience**: ensuring the transmission can be performed in all situations (lack of deployment of a given technology, white areas, attacks, ...)



# Case study: In-Vehicle Signage (IVS)

- 2 modes:
  - Broadcast from a roadside ITS station
  - Point-to-point transmission from a central ITS station to subscribed receivers





# Hybrid communications: Core standards

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- ISO 21217 / EN 302 665: *ITS Station Architecture* published
- ISO 21210 *IPv6 networking* published
- ISO 16789 *IPv6 networking optimisation* work in progress
- ISO 24102.6 *Flow and Path Management* close to publication
- ISO 17429: *Generic ITS stations facilities* close to publication
- ISO 17423: *ITS application requirements and objectives for selection of communication profiles* published
- ISO 17419 *Classification & management of ITS applications in a global context* published
- New work items recently approved
  - ISO 21196 Guidelines on the use of C-ITS standards for hybrid communications

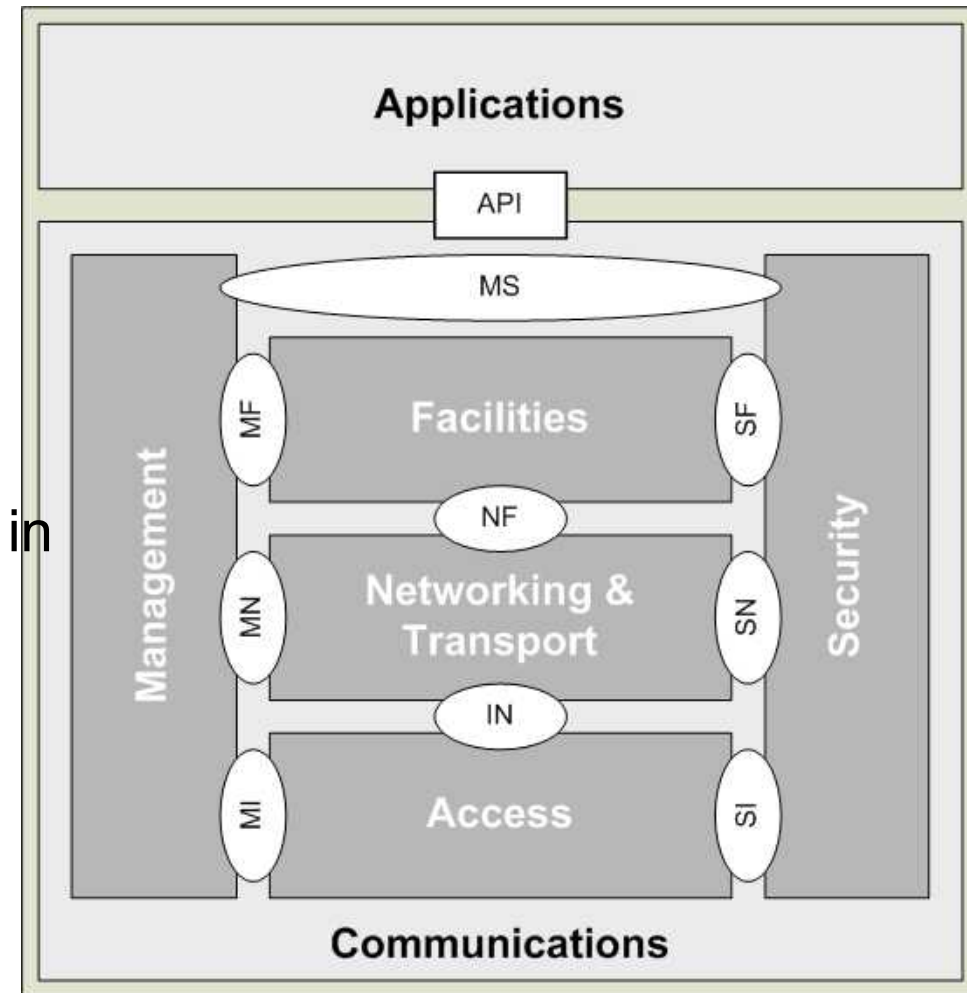
# Thanks for your interest in ISO activities related to ITS

for more information, contact ISO TC204's IETF  
liaison officer at  
[thierry.ernst@yogoko.fr](mailto:thierry.ernst@yogoko.fr)

# Additional information about the ITS station reference architecture (ISO 21217)

# ITS station architecture: Motivations

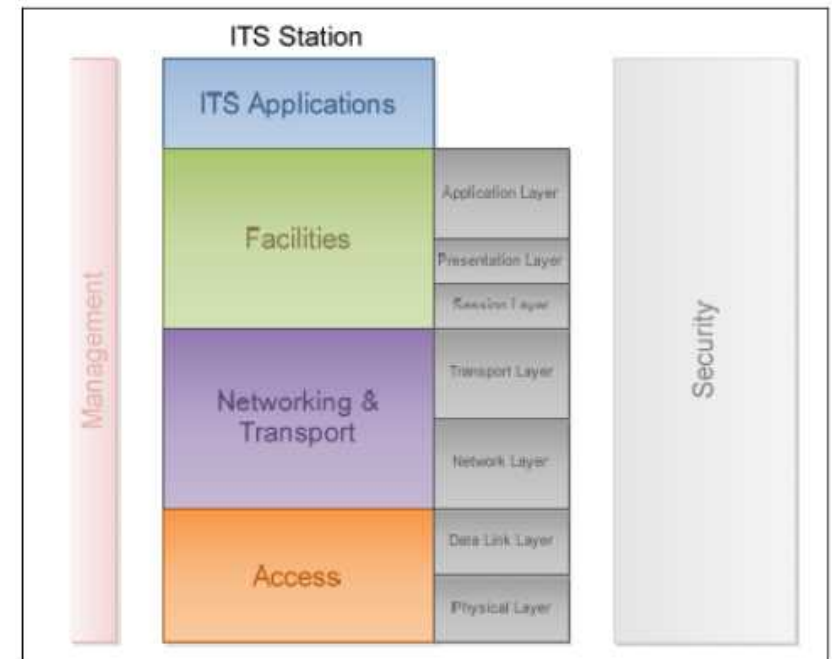
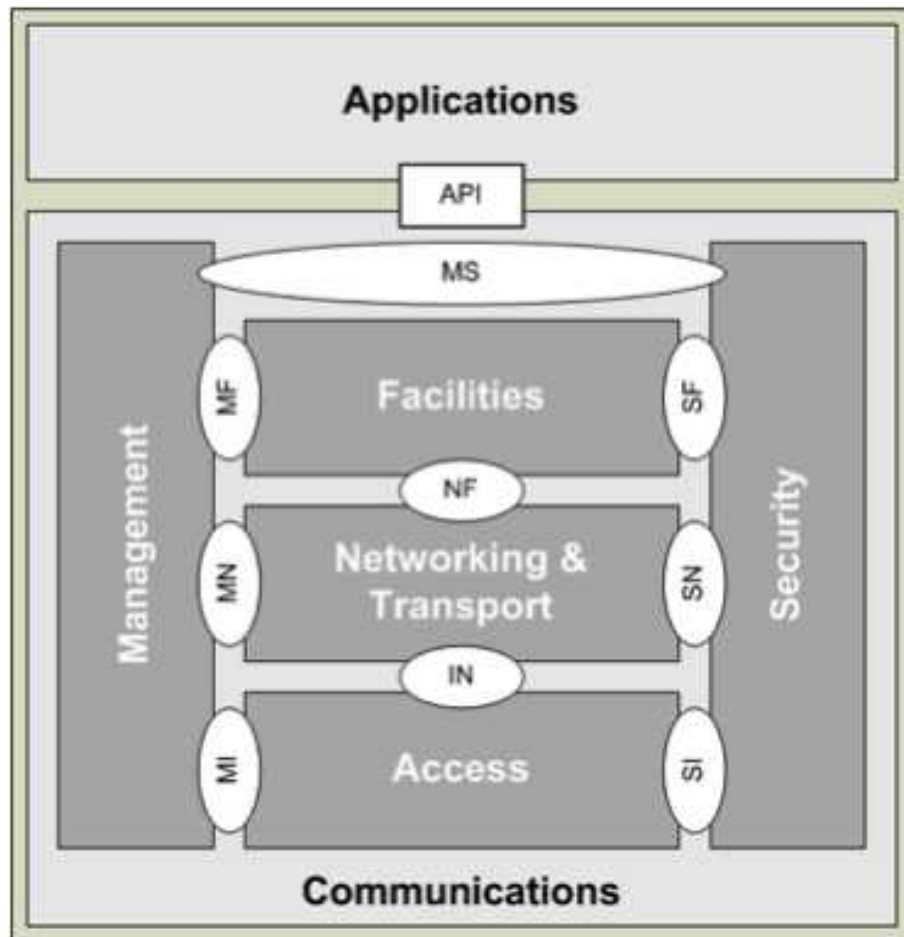
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[ISO 21217]

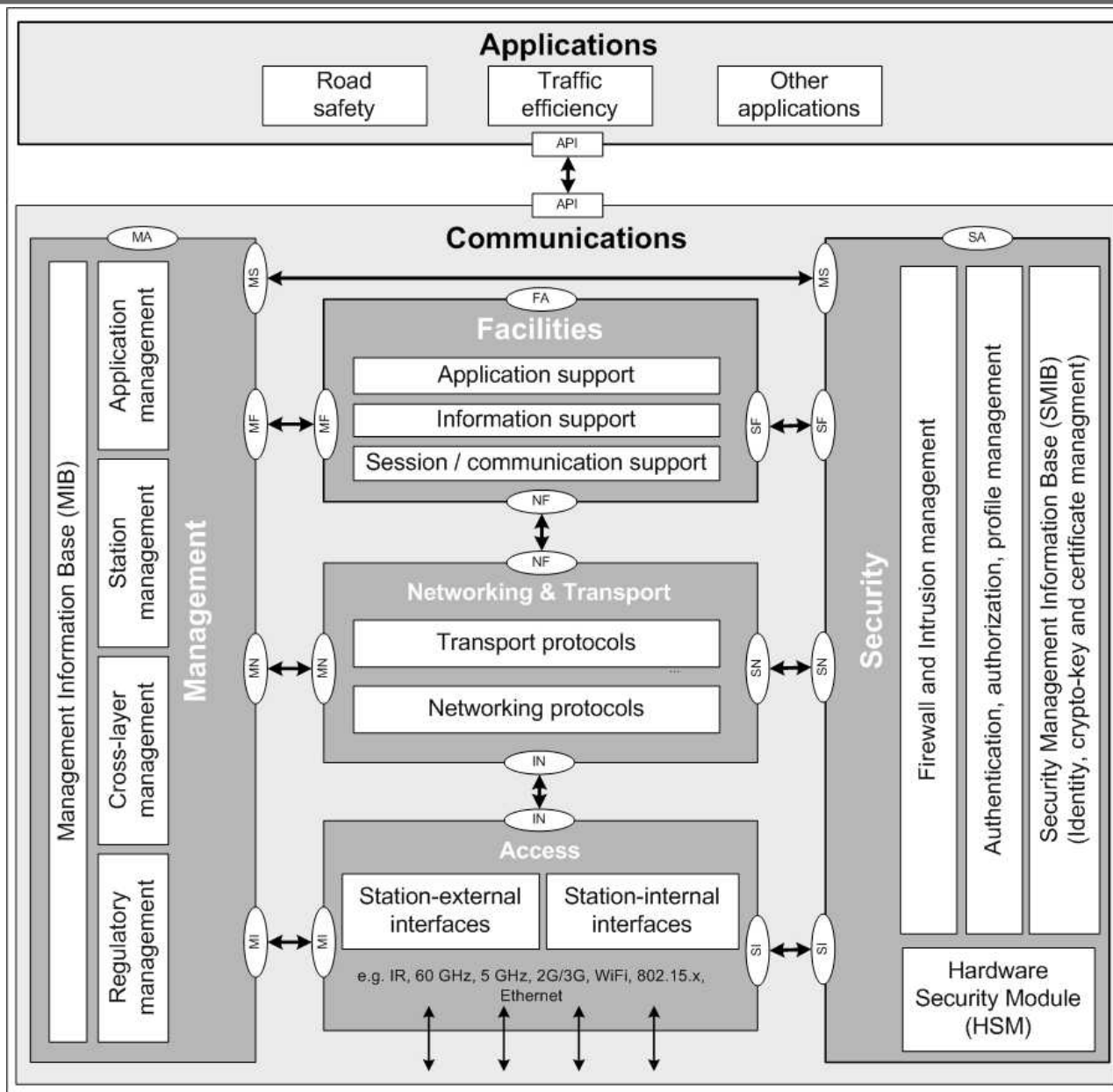
# ITS station communication architecture

- OSI-like communication architecture adapted to ITS (specified as ISO 21217)



Mapping ITS station – OSI architecture

# ITS station architecture: Detailed

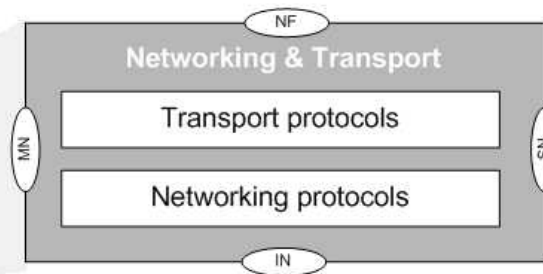
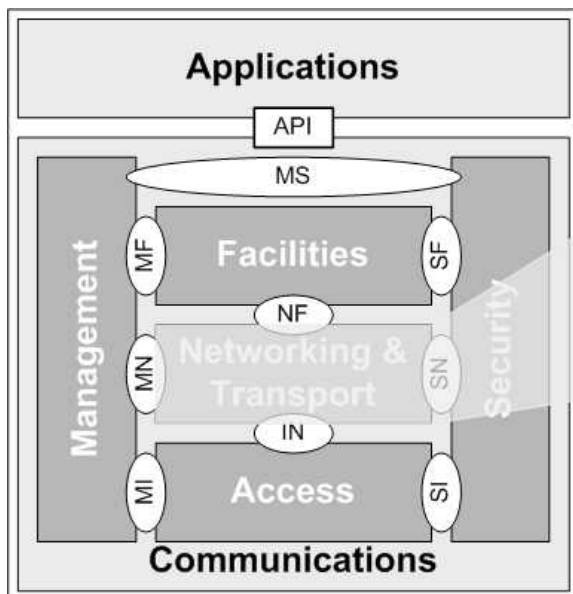
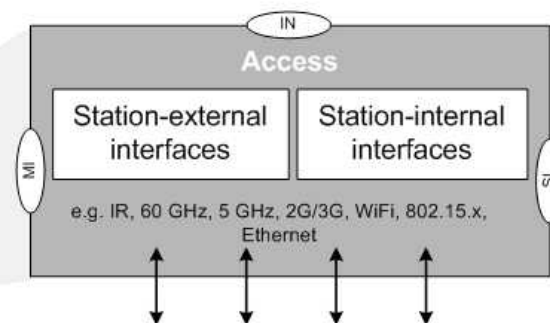
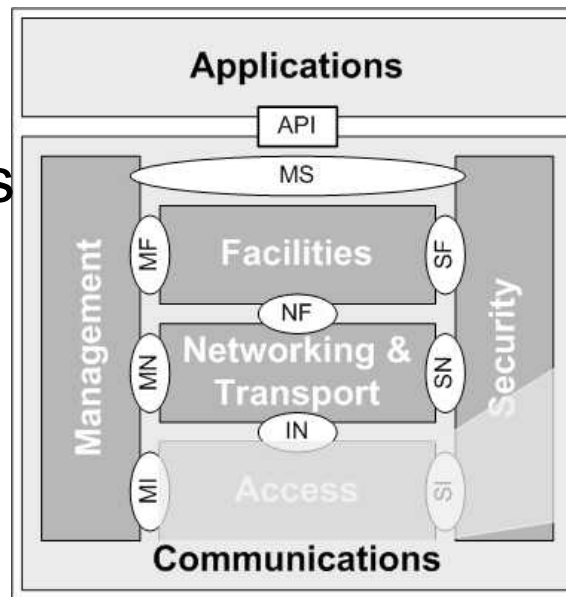


[ISO 21217]

# ITS station architecture: Detailed

## Multiple access technologies

- WiFi (vehicular, urban)
- Cellular (3G, 4G)
- Satellite, infra-red, MM



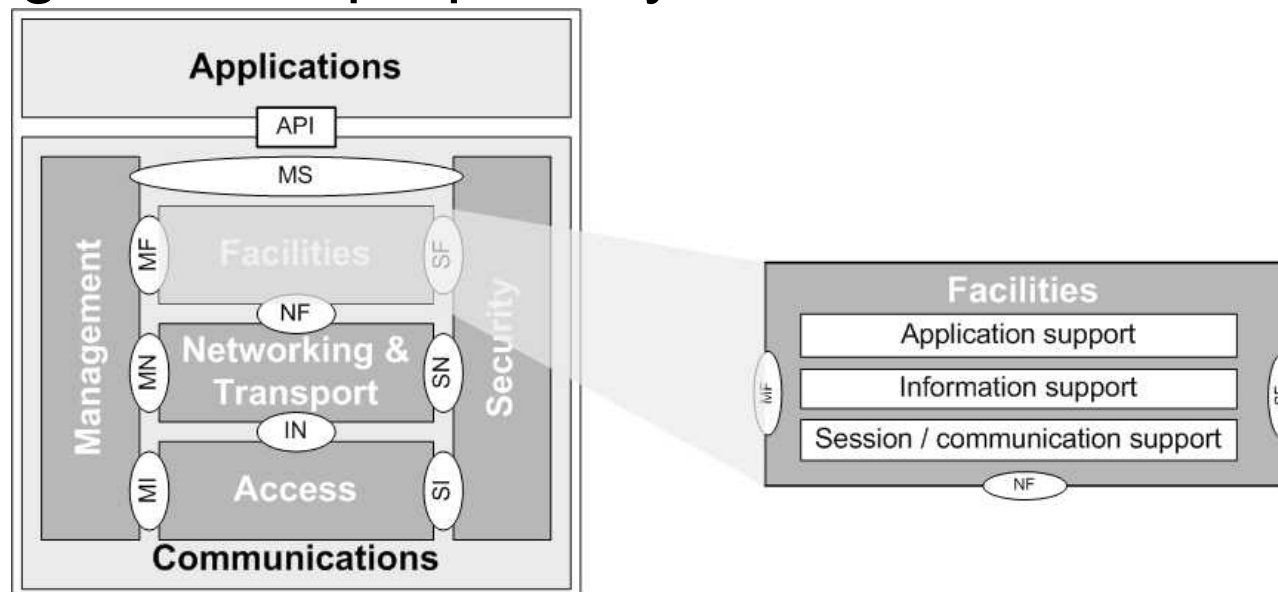
## Choice of protocols stack

- Internet connectivity
- V2X (ad hoc)
- Sensor nodes

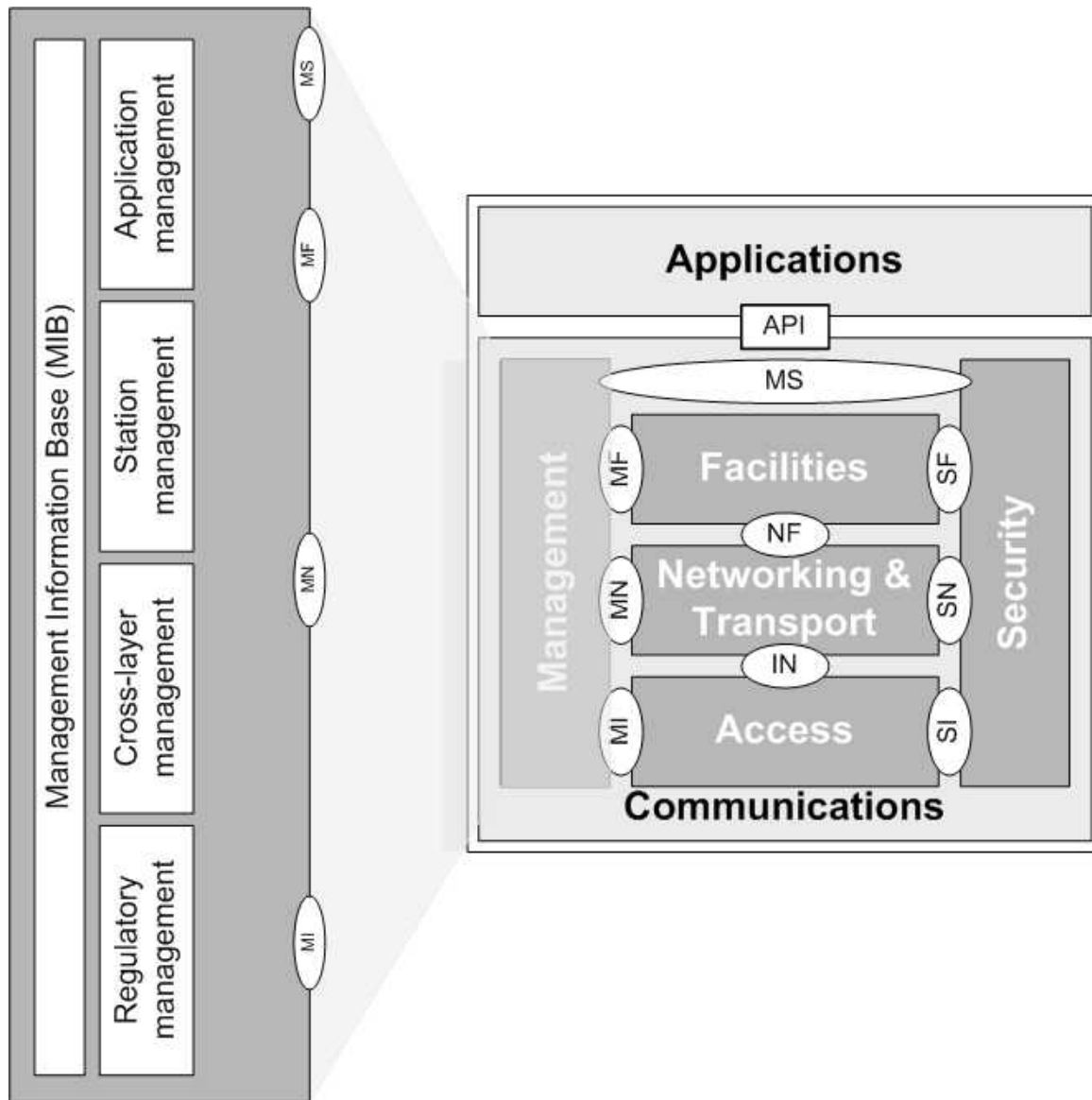


# ITS station architecture: Detailed

- Facilities [ISO 17429]
  - Protocol stack selection mechanism
  - Message exchange mechanism
  - Publication / Subscribe mechanism to share “well known” data objects (C-ITS)
  - Other generic or proprietary mechanisms

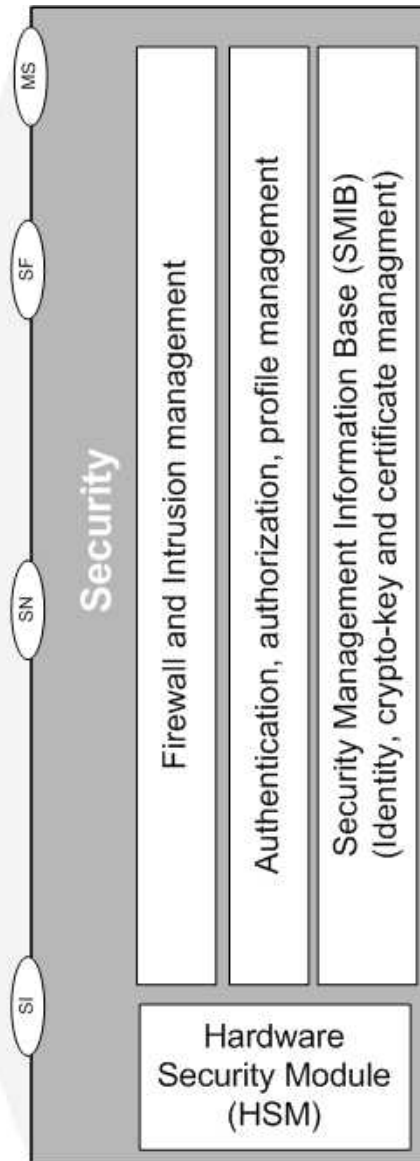
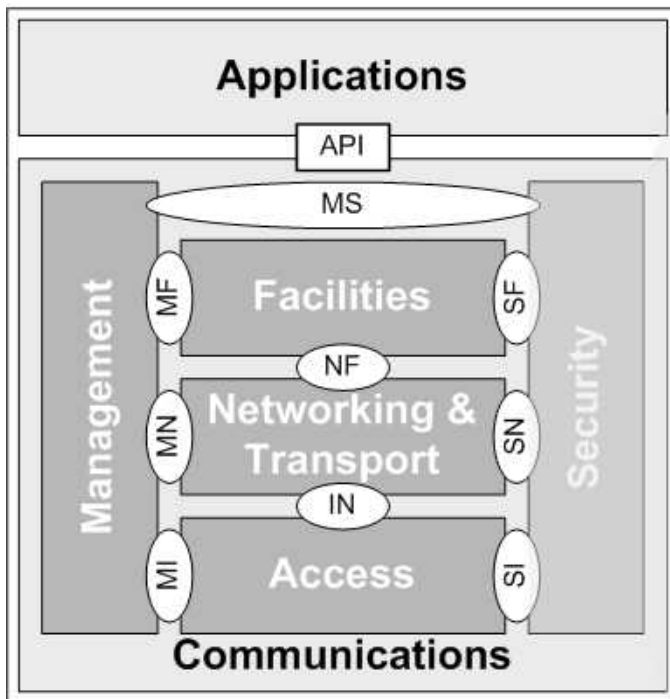


# ITS station architecture: Detailed



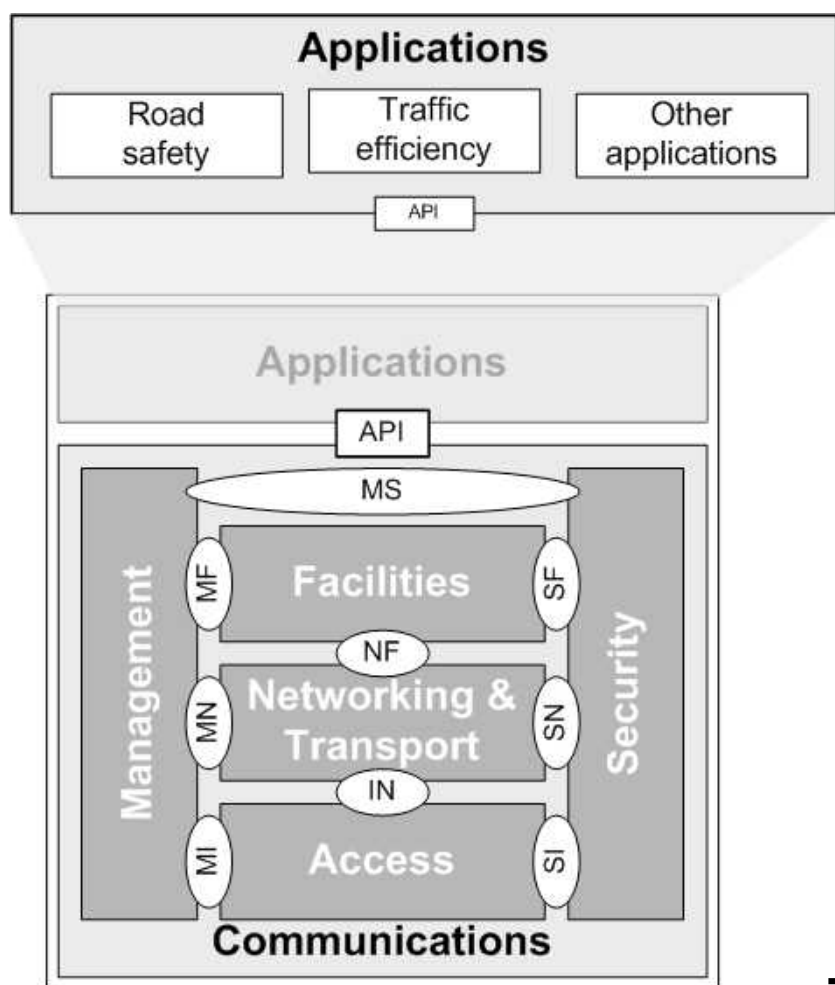
- Management of the capabilities of the ITS station
- Management of communication profiles of ITS applications
- Monitoring of local network conditions
- Management of ITS-S applications

# ITS Station: Security Entity



- The security entity provides atomic security functions and security material management (keys, certificates, pseudonyms)
- Each layer accesses to the requested security function through an interface (SAP)

# ITS station architecture: Detailed

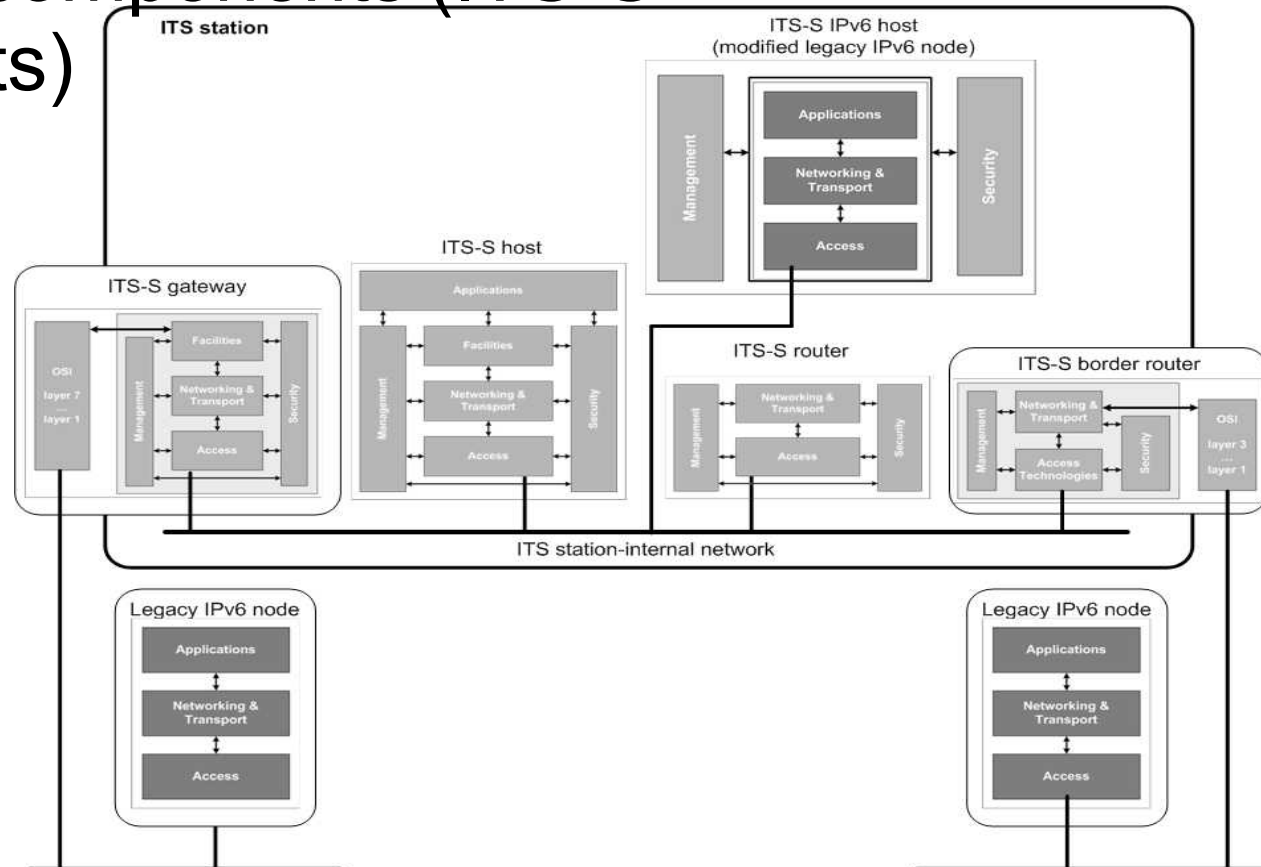


- Dangerous goods contextual speed [ISO 17426], in-vehicle signage, [ISO 17425], SPaT/MaP, pedestrian detection, ...
- Public transport / Freight
- Probe data, POI, EV charging, Internet access, infotainment, ...
- Remote diagnostic

=> applications for different purposes, with very different needs

# ITS Station Communication Units (ITS-SCU)

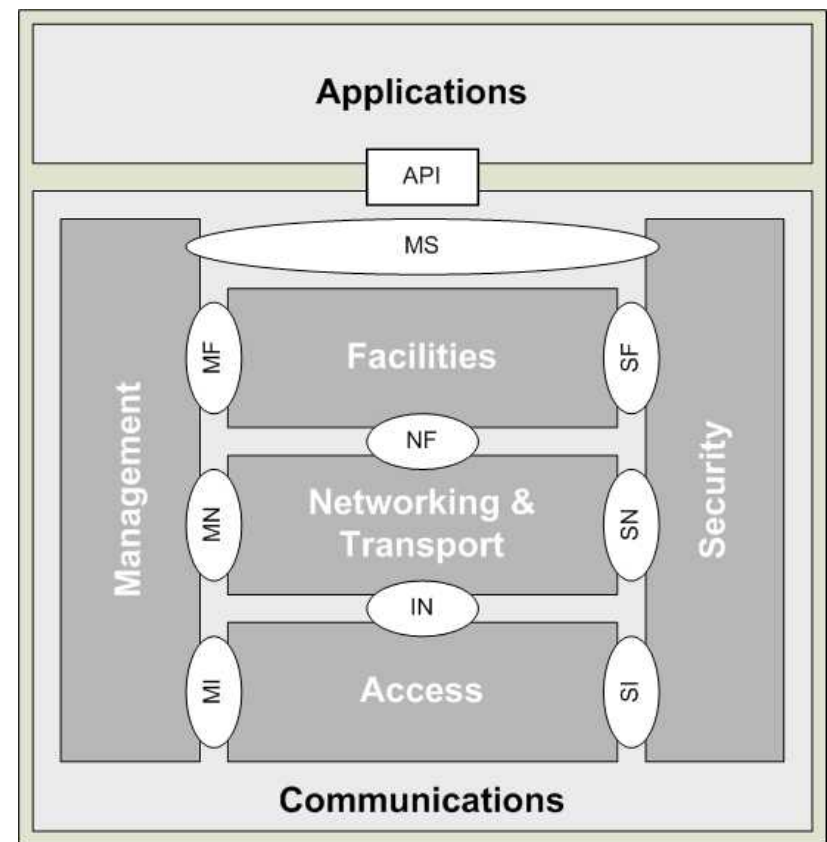
- ITS station functionalities can be distributed in several networked components (ITS-S communication units)



- Smallest functional element in an ITS station that gets certified

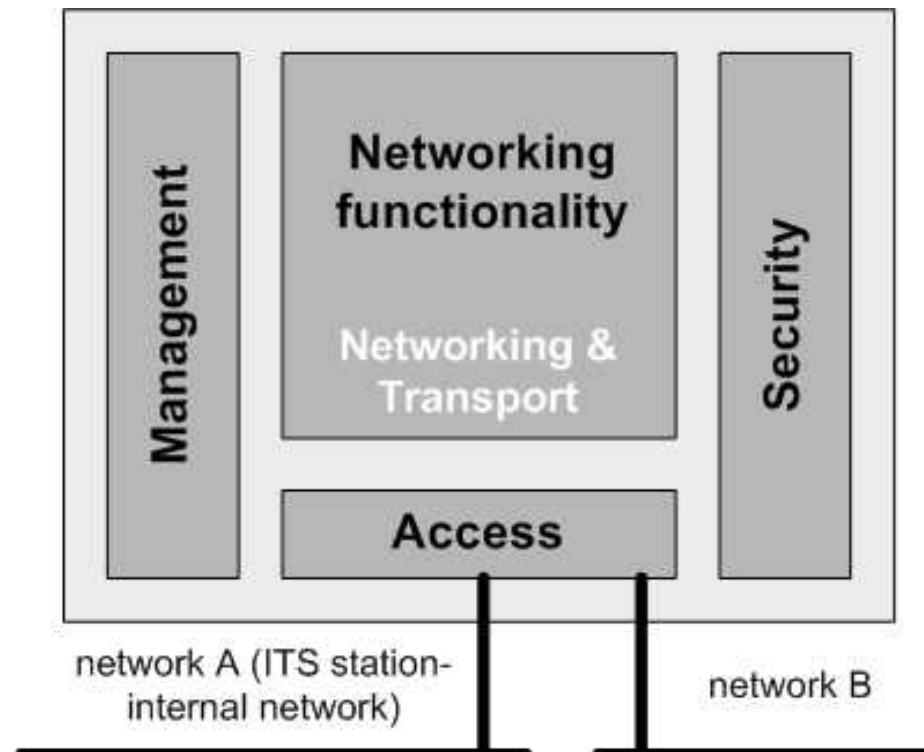
# ITS Station: Host

- ITS station **host** running **ITS applications**
  - Application Units (AU)
  - Hand-held devices (**multimedia applications**)
  - Comfort sensors



# ITS Station: Router

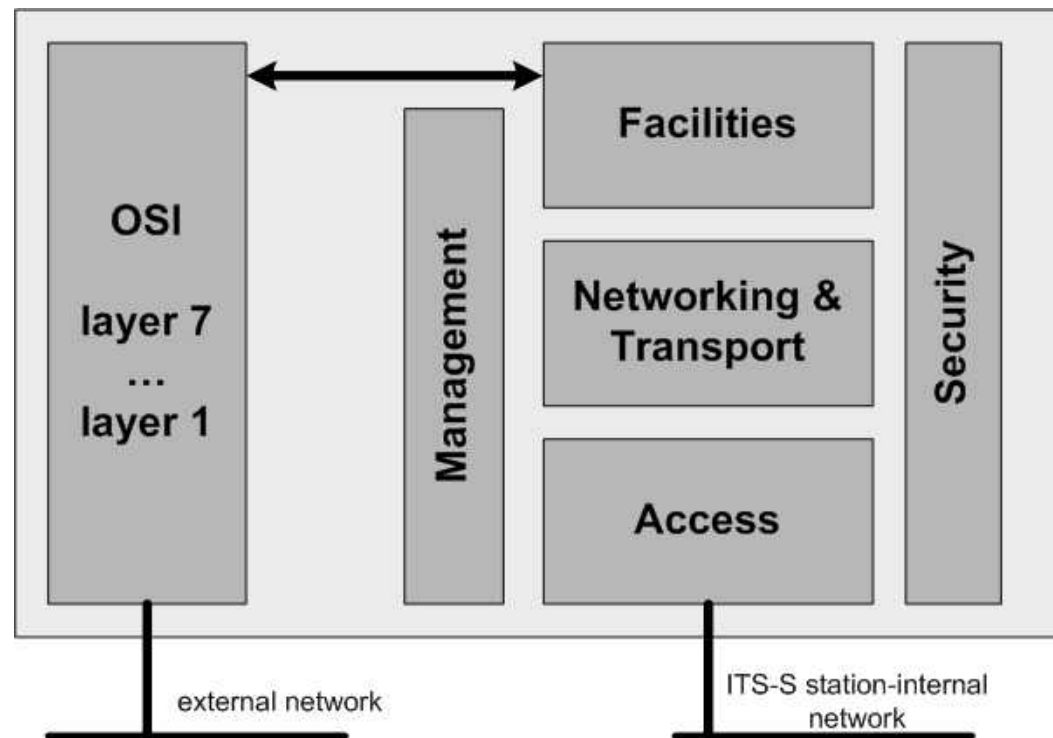
- ITS station **router** managing communications
  - Providing access (access routers at the roadside) aka RSU
  - Getting access (mobile routers in vehicles) => aka OBU
  - Gateways between networks (border routers)



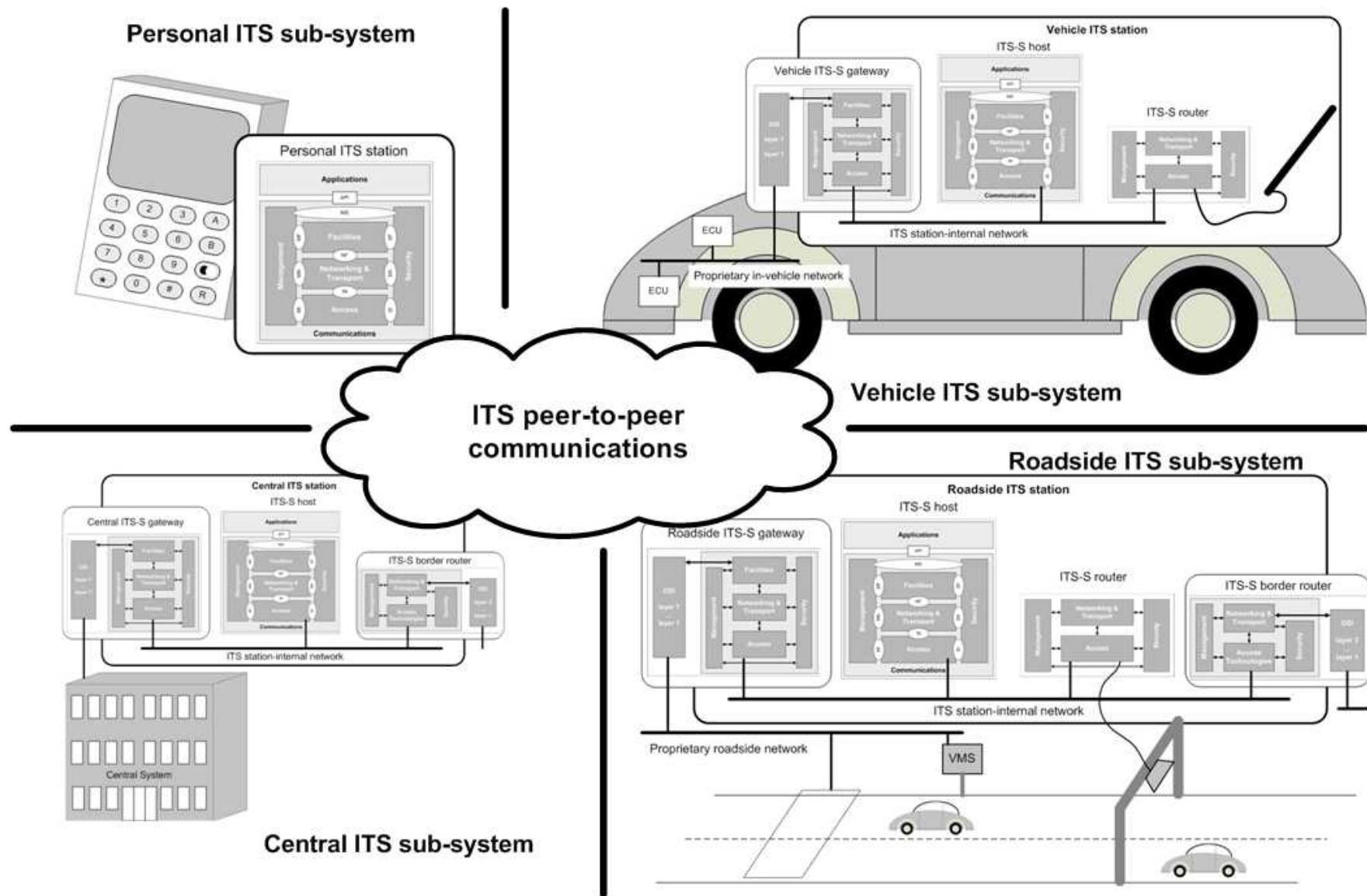


# ITS Station: Gateway

- ITS station **gateway** between different protocol stacks, e.g.
  - Gateway between IP and CAN / proprietary network
  - Gateway between IP and sensor loop / proprietary network

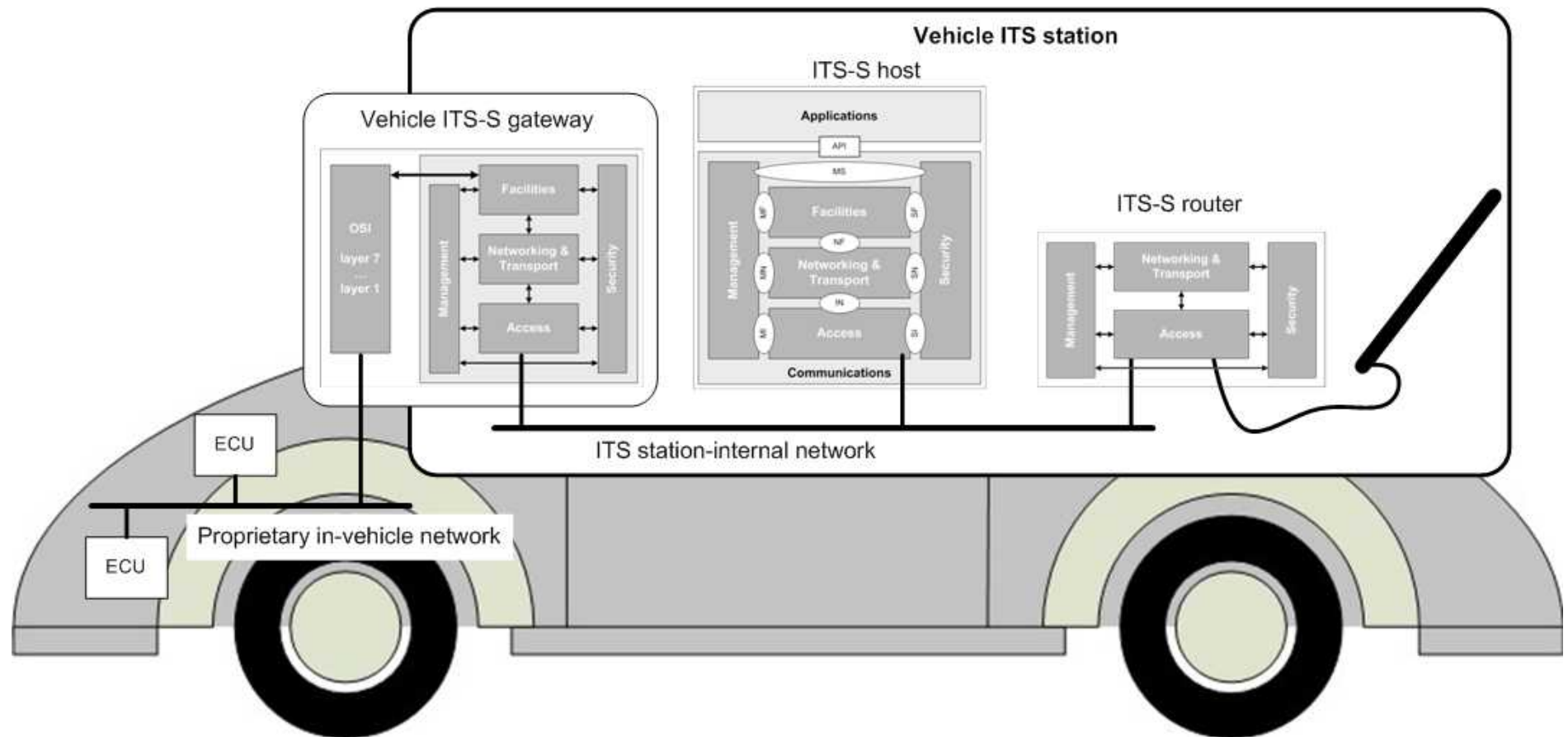


# ITS Stations: Types (examples of instantiations)



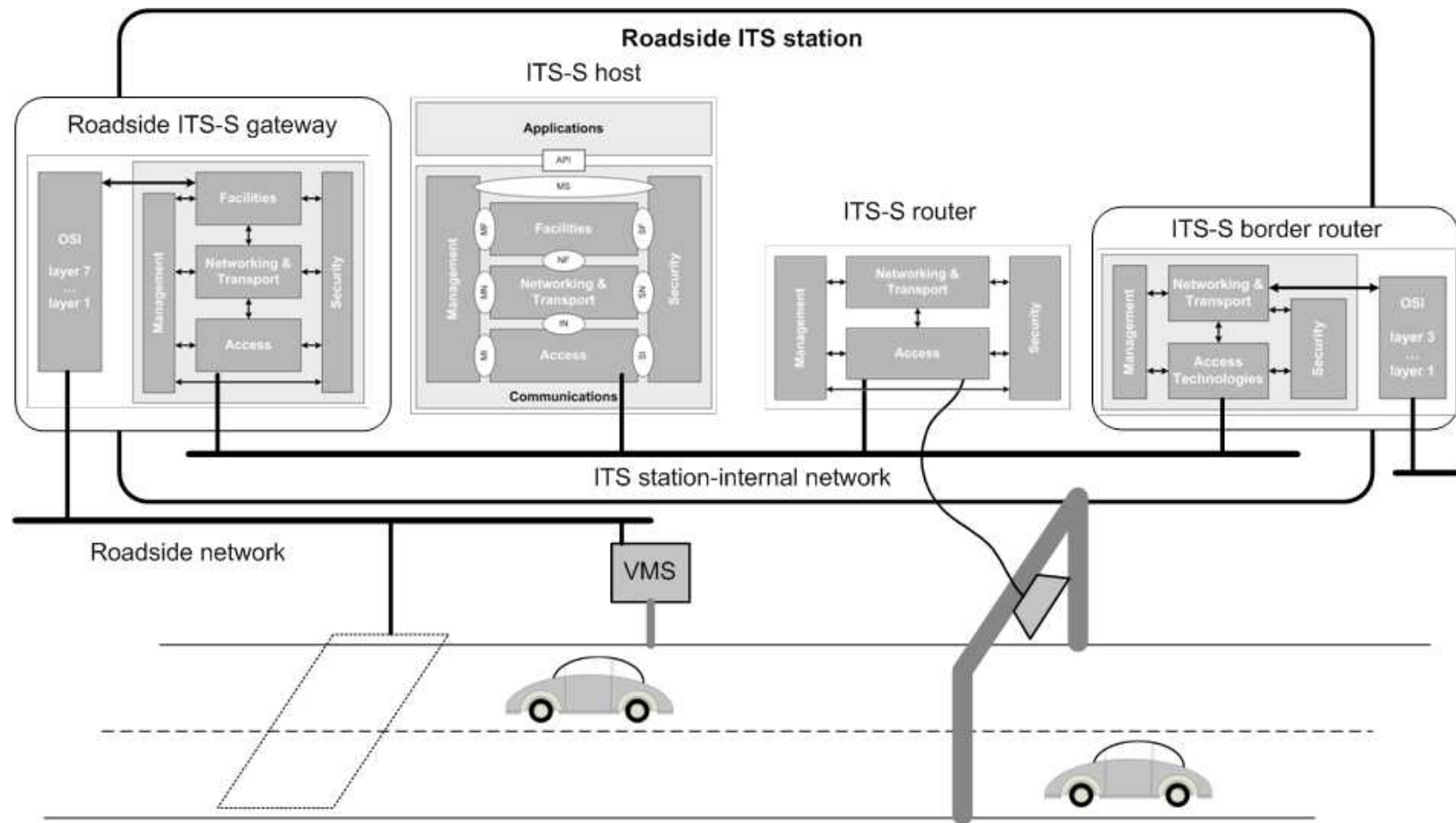
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- Instantiation example: **Hosts, Mobile Router and Gateway**



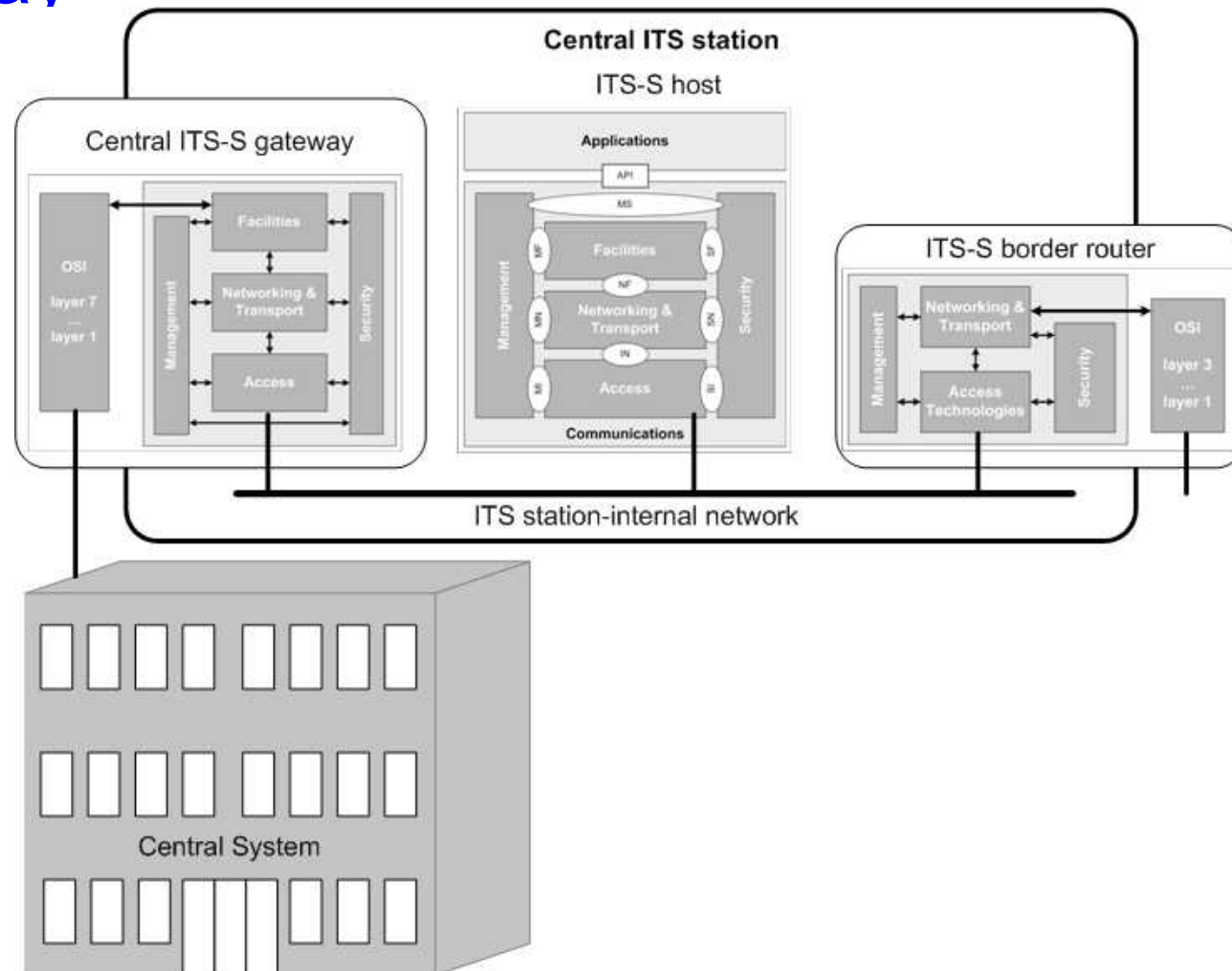
# Roadside ITS Station (R-ITS-S)

- Instantiation example: **Hosts**, **Access Router**, **Border Router** and **Gateway**



# Central ITS Station (C-ITS-S)

- Instantiation example: **Hosts, Border Router and Gateway**



# Personal ITS Station (P-ITS-S)

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- Combined **Host/Router**

