http://www.gdr-robotique.org

GDR ROBOTIQUE

ETSI

World Class Standards

RÔLE DES STANDARDS DANS LA SÉCURITÉ DES SYSTÈMES AUTONOMES

Toulouse, 4 Juin 2012

Patrick GUILLEMIN – ETSI Secretariat

Strategy and New Initiatives

http://www.etsi.org

ONERA

THE FRENCH AEROSPACE LAB

A PROPOS DE L'ETSI

European Telecommunications Standards Institute http://www.etsi.org

L'ETSI est historiquement basé et fondé en Europe et est utilisé dans le monde entier

- L'ETSI est un Institut leader de développement de standards dans le domaine des TIC (ICT Information and Communication Technologies)
  Le Standard le plus connu est <u>GSM</u>

  <u>5.6 Milliards</u> de souscripteurs de téléphone mobiles (wikipedia)

- Crée pour servir l'Europe, l'ETSI est devenu un organisme respecté grâce à la production de standards techniques à usage mondial

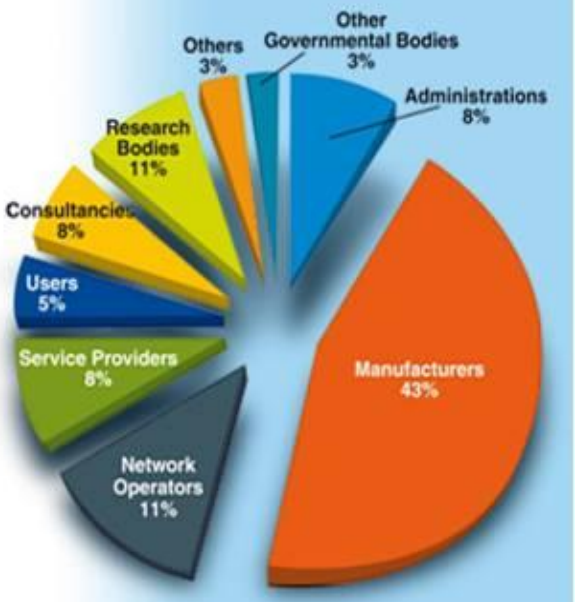
Produits et services ETSI

- Spécifications Techniques et Standards TIC avec un champ d'application global
- Supportant l'industrie et la régulation Européenne
- Standards de tests et Méthodologies de tests
- Evénements & Tests d'intéropérabilités (Plugtests)
- Secrétariat de Fora (Forapolis) http://www.forapolis.com/website/customers/currentcustomers.aspx => DIGITALEUROPE, GCF, HGI, NGMN, OLI, OMA, OIPF, WAVE2M, CEPT ECC

Membership

- Plus de 750 grandes et petites entités venant de plus de 60 pays différents sur 5 continents

- Constructeurs, Opérateurs Mobiles, Compagnies de services, Fournisseurs de contenu, Administrations nationales, Ministères, Régulateurs, Universités, Organismes de Recherche, Consultants, Entreprises Utilisatrices



Un mélange puissant et dynamique de savoir-faire, ressources et ambitions

Définition de la Standardisation d'après la Commission Européenne (2008)

La standardisation est un processus de coopération volontaire (entre l'industrie, les utilisateurs, les autorités publiques…) pour le développement de spécifications techniques par consensus (absence d'objection soutenue). La standardisation est un complément de la concurrence des marchés et sert typiquement à atteindre les objectifs tels que l'interopérabilité entre les produits et services. La standardisation permet de se mettre d'accord sur des méthodes de tests et les besoins de sécurité, de protection de la santé et à garantir la qualité et les performances organisationnelles et environnementales.

Ce processus doit respecter les règles de la concurrence (European Competition Provisions) à tous les niveaux: nationaux (National Standard Body, par exemple l'AFNOR en France), Européens (CEN, CENELEC et ETSI - Directive 98/34/EC) et Internationaux (ISO, IEC et ITU). C'est un fait que l'industrie s'adresse également à des centaines de Fora, Consortia organisés à différents niveaux et se divisant différemment au niveau des régions par rapport à la standardisation formelle. C'est parfois comme un concours de beauté.

L'ETSI a un portfolio de ~90 accords de coopération avec les organismes de standardisation, les Fora et les Consortia.

Bénéfices de la standardisation

- donne plus confiance dans les produits et les services
- permet de commercialiser plus vite les produits et services
- donne directement accès au marché international
- permet d'acheter des produits sur l' étagère
- permet d' économiser les dépenses des PMEs et des centres de recherche
- exploite les résultats de la recherche
- permet l'interopérabilité
- réduit les charges de maintenance que subit l'industrie
- améliore les produits et technologies grâce aux nombreux feed-back

CEN European Committee for Standardisation, http://www.cen.eu
CENELEC European Committee for Electrotechnical Standardization, http://www.cenelec.eu
ETSI European Telecommunications Standards Institute, http://www.etsi.org
ISO International Organization for Standardization, http://www.iso.org
IEC International Electrotechnical Commission, http://www.iec.ch
ITU International Telecommunication Union http://www.itu.int/ITU-T

Innovations: les atouts de l'ETSI « classiques »

- Production de standards rapide et efficace
- Téléchargements gratuits de tous nos standards
- Méthode de travail en ligne économisant le temps et protégeant l'environnement

ETSI ET LA RECHERCHE, LE DEVELOPPEMENT ET L'INNOVATION

“Technology Management” versus “Innovation Management”

Production & Introduction sur Le marché

Technique

Concepts, Prototype, Démonstrateurs

Développement De produits et processus

Concepts, Technologie

Développement expérimental

Recherche appliquée

Théorie

Recherche De base

Technologie Management

R&D Management

Innovation Management

Pre-Développement

Recherche, Innovation et Standardisation

- Le Marché des TIC (ICT) est réglé par les standards
  - produits de facto, industrie, forum, organismes de standardisation
- L'Europe est leader dans la recherche collaborative
- La recherche et le développement (R&D) en Europe dans les TIC doit déboucher sur la standardisation
  - pour développer des nouveaux produits, services et marchés
  - pour conduire les objectifs et non pas seulement disséminer (rapports) des résultats
- Remettre les résultats de la R&D aux organismes de standardisation n'est pas suffisant, il faut aussi, à plus long terme, participer au cycle de vie des standards

Innovations à l'ETSI

- ETSI "New Initiatives"
  - Avec des organisations membre et non-membre de l'ETSI
  - Dans des domaines TIC existants ou complètement nouveaux
  - Pour une standardisation définie ou en cours de réflexion (pré-standardisation)
  - En coopération avec des organismes déjà liés ou à rapprocher
  - Dans un comité/groupe de standardisation déjà existant ou à créer
  - Fondé par des membres, des futurs membres et des non-membres participants

- Examples: ***Quantum Keys Distribution, Trust in Self organizing networks, IT Security Indicators defined by Users, Data Center User's KPI for Green Agenda, Gaming, Translation, Future Internet, IoT, M2M, Clouds...***

Sources & exemples de nouvelles activités

- 3GPP: GSM, UMTS, LTE (2G, 3G 4G…)
- Workshops ETSI (et autres), pré-standardisation « Technical Reports/TR» dans les comités déjà existants, MoU (accords de coopération), Plugtests (test d'interopérabilité ETSI), Projets de Recherche et d'innovation, Régulation, nouveaux Membres, nouveaux produits et services, évolution/maintenance, optimisation, introduction de nouvelles technologies ou services => nouveaux standards, sous-groupes ou nouveaux comités techniques TCs et ISGs (Industry Specification Group)
- « *European Regulatory Framework* »: *Safety, Security, Interoperability, Compatibility, Radio Matters, Maritime, Aviation, Frequencies, SmartGrid, SmartMeter, ElectricVehicle Charging. .. EU Directives and Standardisation Mandates…*

TCs/ISGs créés dernièrement à l'ETSI

- eHealth#1 April'06
- RRS#1 March'07
  Reconfigurable Radio Systems
- GRID#1 Sep'06 (TC CLOUD)
- ITS#1 Dec'07
  Intelligent Transport Systems
- M2M#1 **and** MCD#1 Jan'08
  Media Content Distribution
- INT#1 May'08
  IMS Network Testing
  IP Multimedia Subsystems
- AERO#1 Sep'09
- **E2NA in 2012 + M2M PP**
  Enhancing ETSI network activities

- QKD#1 Sep'08
- AFI#1 Feb'09
- MTC#1 May'09
- INS#1 **and** MOI#1 Sep'09
- ORI#1 May'10
- LIS#1 Aug'11
- OSG#1 Oct'11
- ISI#1 Nov'11
- SMT#1 Feb'12
- OEU#1 May-Jun'12

- *Acronymes ISG de 3 lettres expliqués dans la suite…*

Comités Techniques ETSI et projects de recherche

- En général, les résultats des projets de recherche TIC financés par la Commission Européenne (FP7) aboutissent dans des spécifications des comités techniques de l'ETSI
  - Qui sont soutenues directement par des Membres
  - Qui ne mentionnent pas systématiquement le nom des projets de recherche (FP7 ou non d'ailleurs) dont elles sont issus
- Par exemple: TC M2M
  - RFID/IoT CASAGRAS and CASAGRAS 2 (FP7) et le Cluster IoT
  - Pole SCS, CNRFID et Projet RACE networkRFID, RFID Mandate M/436
- TC RRS
  - E2R (FP6), E2R 2 (FP6) and E^2 (FP7) impliqués dans la création
  - Contacts avec ONEFIT (FP7) et CONSERN (FP7)
- TC CLOUD (GRID, Plugtests) avec INRIA, ERCIM et les projets Européens CoreGRID, CRIDCOMP...

ISG: Industry Specification Group

- a une activité bien précise avec une mise en place rapide (**quelques mois**) décidée par au moins 4 Membres de l'ETSI (ou Applicant)
- est une alternative simple à la création d'un forum
- est un type de comité ETSI spécial comprenant des membres de l'ETSI et éventuellement des organisations non-membres de l'ETSI
- décide de son propre programme de travail et approuve ses propres rapports et spécifications
  - Les ISGs produisent des *ETSI Group Specifications* (GS) qui peuvent correspondre aux TR/TS des Comités Techniques de l'ETSI
- Tous les ISGs adoptent la politique IPR de l'ETSI (IPR Policy)
  - qui est très bien établie, faisant gagner du temps et des frais légaux comparés à la création d'un forum.
- Chaque ISG a son propre *« membership »* avec son propre budget
  - qui est décidé et payé par les membres de l'ISG au moyen de factures gérées par l'ETSI
  - bénéficiant d'un niveau de support basique du Secrétariat de l'ETSI
- Chaque ISG peut décider de ses propres *« working procedures »*
  - basées sur les *« ETSI Technical Working Procedures »* (ETSI Directives)
- Chaque ISG décide de son propre système de vote
  - Nous recommandons d'utiliser soit l' *« ETSI weighted voting »* ou 1 membre = 1 vote

11 Industry Specification Groups (ISG)

QKD	09/10/2008	Quantum Key Distribution
AFI	26/02/2009	Autonomic network engineering for the self-managing Future Internet
MTC	20/05/2009	Mobile Thin Client Computing
INS	16/09/2009	Identity management for Network Services
MOI	18/09/2009	Measurement Ontology for IP traffic
ORI	25/05/2010	Open Radio equipment Interface
LIS	18/08/2011	Localisation Industry Standards
OSG	20/10/2011	Open Smart Grid
ISI	07/11/2011	Information Security Indicators
SMT	08/02/2012	Standardization of an Embedded Module Form Factor based on Surface Mount Technique
OEU	*31/05/2012*	*Operational energy Efficiency for Users*

Mapping – ETSI ISGs to FP Projects

- **QKD – Quantum Key Distribution**
  - Results from FP6 SECOQC project
- **AFI – Autonomic network engineering for the self-managing Future Internet**
  - Results from the FP7 EFIPSANS project and UniverSelf (FP7)
- **MTC – Mobile Thin Client Computing**
  - Results from the FP7 MobiThin project
- **MOI – Measurement Ontologies for IP traffic**
  - Results from FP7 Moment project
- **INS – Identity and access management for Networks and Systems**
  - Related to SWIFT (FP7) and Daidalos (FP6)

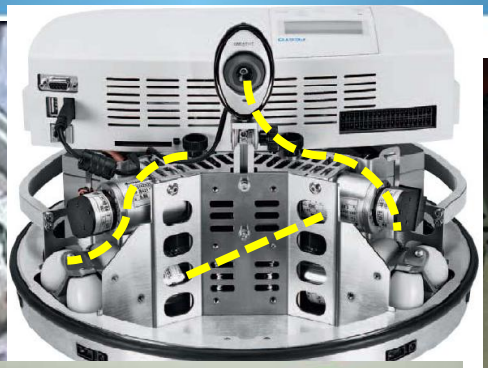
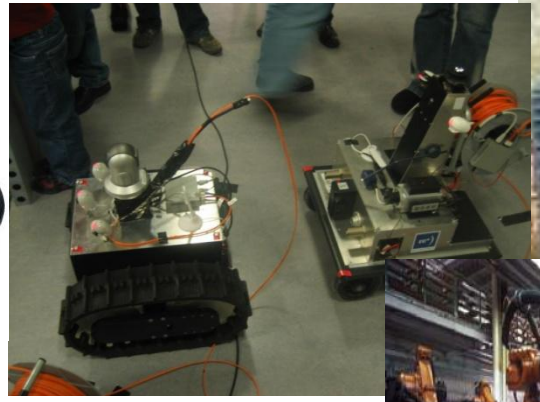
ISGs	ETSI Members	ISG Participants	ISG Counsellors
AFI	17	4	
INS	10	2	
ISI	8	6	
LIS	10	17	1
MOI	5	5	
MTC	5	1	
ORI	24	9	
OSG	6	0	
QKD	23	0	
SMT	7	1	
Total	**115**	**45**	**1**

Industry Specification Groups (ISG)

ETSI Member	ISGs	Count
Alcatel-Lucent	AFI, INS,ISI,LIS,ORI	5
Telefonica S.A., Telefonica Investigacion Y Desarrollo, S.A. Unipersonal	INS,AFI,MOI,QKD	4
Waterford Institute of Technology	AFI,INS,MOI,OSG	4
Deutsche Telekom AG	INS,MTC,ORI	3
FOKUS - Fraunhofer Institute for Open Communication Systems, Fraunhofer	ISI,AFI,INS	3
Huawei Technologies Co. Ltd	ORI,LIS,SMT	3
Institut Telecom, TELECOM ParisTech	ISI,MTC,QKD	3
Telecom Italia S.p.A.	AFI,ISI,ORI	3
THALES, Thales Communications S.A	QKD,AFI,OEU	3
AT&T Global Network Services Belgium SPRL	ORI,SMT	2
Cisco Systems Belgium, Cisco Systems Inc.	AFI, LIS	2
CNIT	INS,MOI	2
Electronics and Telecommunications Research Institute (ETRI)	AFI,ORI	2
France Telecom SA, ORANGE	AFI, OEU	2
Fujitsu Laboratories of Europe Ltd	AFI,ORI	2
Greek Research & Technology Network (GRNET)	AFI, MOI	2
Nokia Siemens Networks GmbH & Co KG	INS,ORI	2
SK Telecom	ORI,QKD	2
Telcordia Technologies	AFI,QKD	2

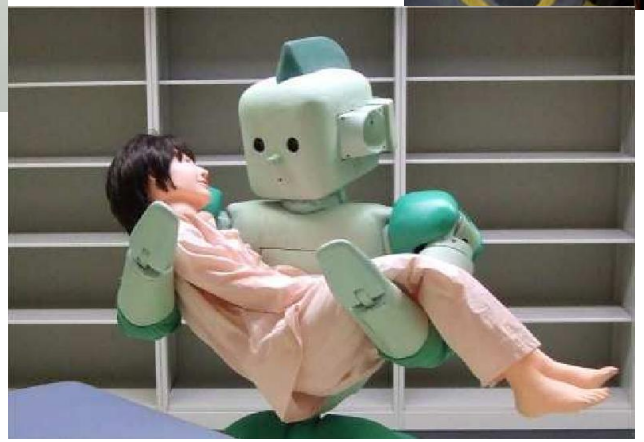
EXAMPLE 1: INTELLIGENT TRANSPORT SYSTEMS (ITS)

A diversity of robots

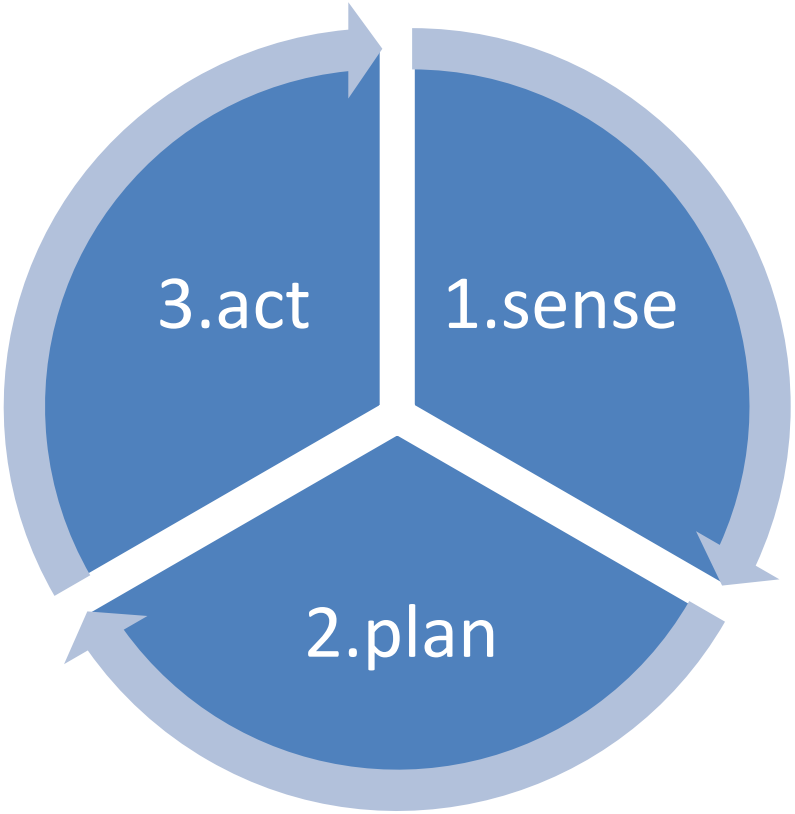








Commonalities of robots



Several Instances of robots, e.g.

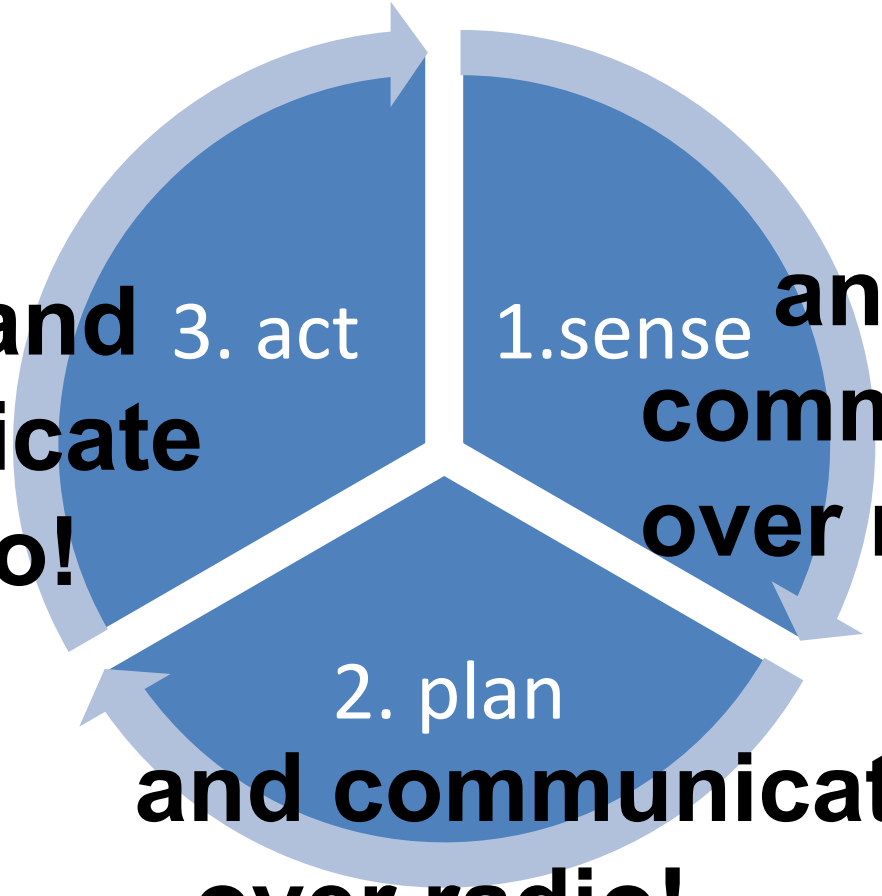
Industrial Robot
wait for trigger signal – act

Behaviour Based Robot
sense – act

Pervasive Computing
sense – plan – tell the user how to act

Networked Wireless Robots (1)

Smart artefacts which



and communicate over radio!

and communicate over radio!

and communicate over radio!

Networked Wireless Robots (2)

- communicate with humans (e.g. with a tele-operator), with each other, with machines, and with the smart environment, allowing for a wide range of applications
- combine a large degree of autonomy with complex collaborative behaviour to accomplish common tasks
- use digital (radio) communication links and packet networks - discrete in their nature - for networked control of analogue phenomena, e.g. continuous movement

EXAMPLE 1: INTELLIGENT TRANSPORT SYSTEMS (ITS)

What is Cooperative ITS

- Self organised ad hoc communication
- Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I)
- Safety - traffic efficienty – sustainable driving
- Improved traffic management

Why cooperative ITS ?

Road safety

Transport EU-25, road accidents

41.600 fatalities

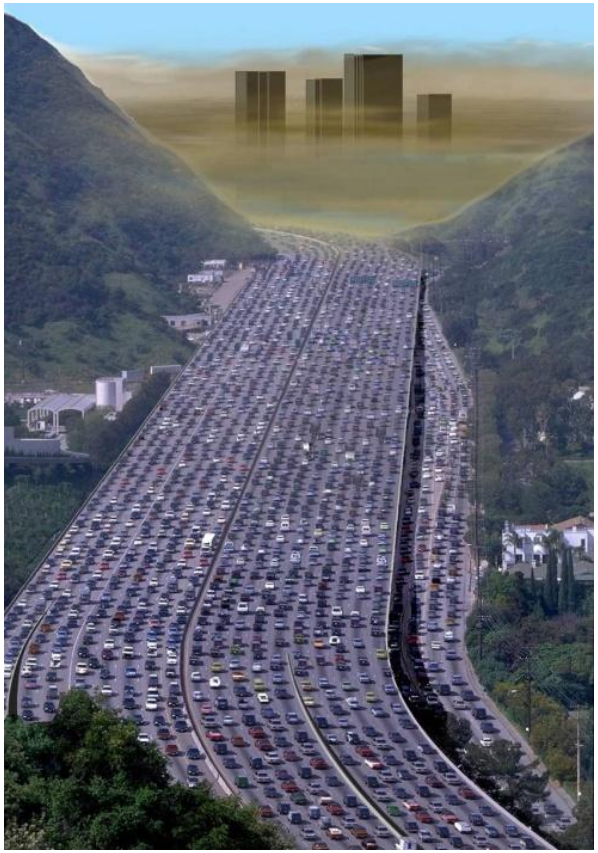
1.4 million accidents involving injury

Costs €200 bn/Y or 2% EU GDP

2.0 million injuries

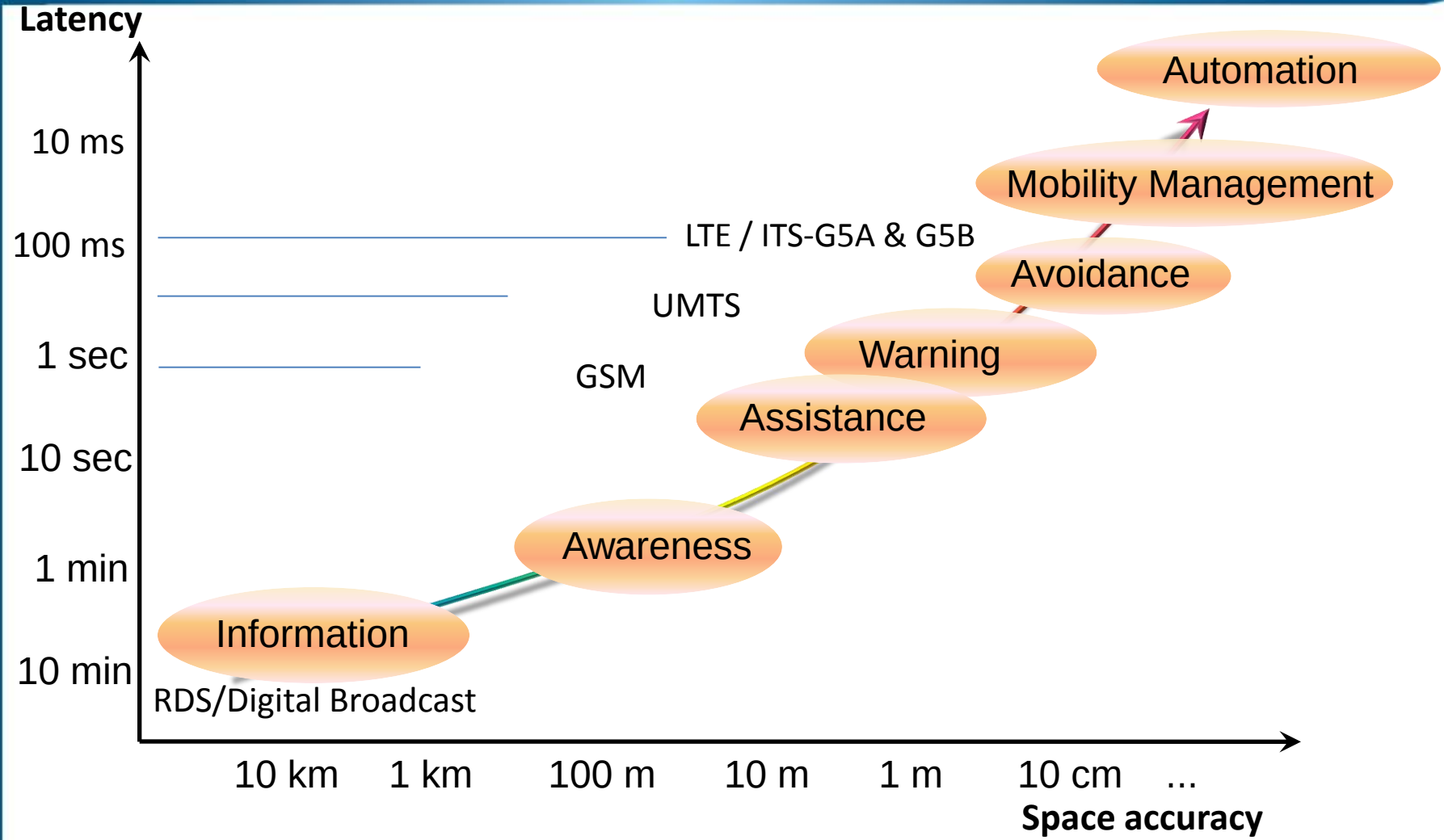
Source: DG TREN-Statistical Pocket Book 2004

Traffic efficiency required
Sustainable driving required



Development of ITS – communication focus

Straightforward relationship with Mobile technologies



ITS: Basic set of applications (TR 102 638: extract)

Table 6.1: Basic Set of Applications definition

Applications Class	Application	Use case
Active road safety	Driving assistance - Co-operative awareness	Emergency vehicle warning
		Slow vehicle indication
		Intersection collision warning
		Motorcycle approaching indication
	Driving assistance - Road Hazard Warning	Emergency electronic brake lights
		Wrong way driving warning
		Stationary vehicle - accident
		Stationary vehicle - vehicle problem
		on warning
		on warning
		rning
		Collision risk warning
		Decentralized floating car data - Hazardous location
		Decentralized floating car data - Precipitations
		Decentralized floating car data - Road adhesion
		Decentralized floating car data - Visibility
		Decentralized floating car data - Wind
Cooperat ffic efficienc	Speed management	Regulatory / contextual speed limits notification
		Traffic light optimal speed advisory
	Co-operative navigation	Traffic information and recommended itinerary
		Enhanced route guidance and navigation
		Limited access warning and detour notification
		In-vehicle signage
o-op ative local services	Location based services	Point of Interest notification
		Automatic access control and parking management
		ITS local electronic commerce
		Media downloading
bal internet services	Communities services	Insurance and financial services
		Fleet management
		Loading zone management
	ITS station life cycle management	Vehicle software / data provisioning and update
		Vehicle and RSU data calibration.

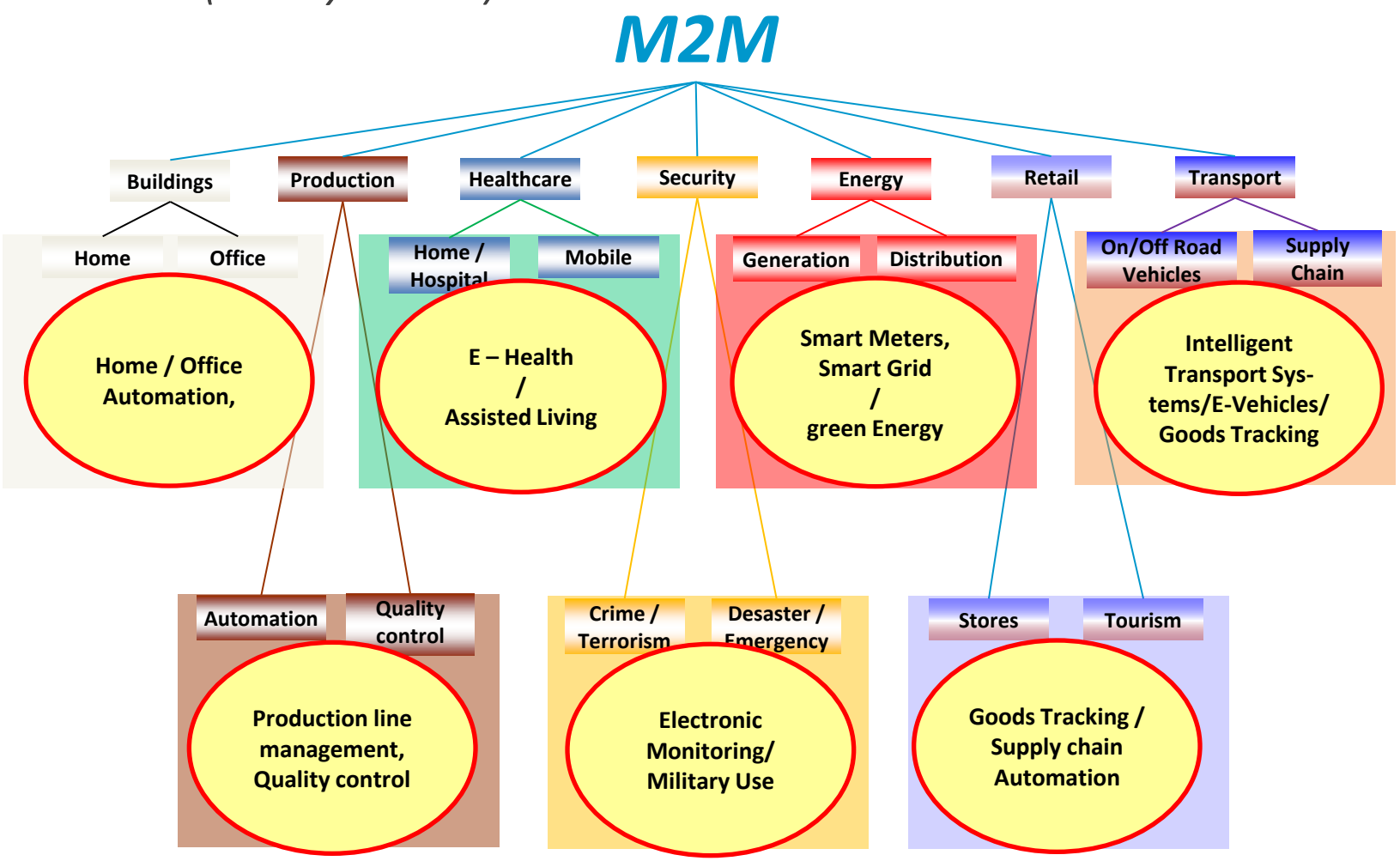
Autonomous vehicles?

ETSI ITS Interop event (with Car2Car Consortium)

EXAMPLE 2: MACHINE TO MACHINE (M2M)

M2M Applications

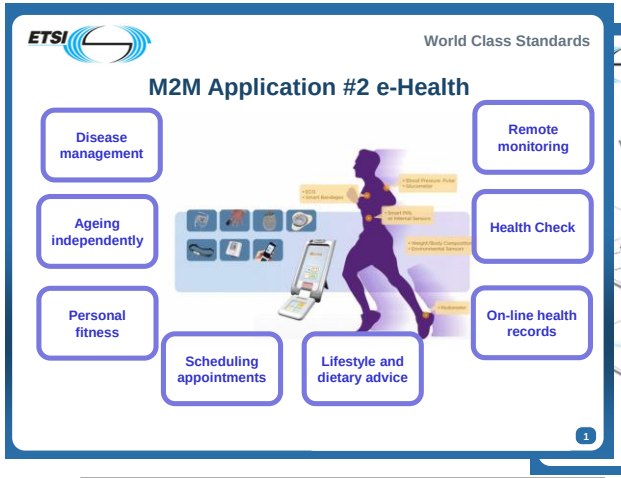
- *Machine-to-Machine (M2M) is about communication among Machines without (or only limited) human intervention*

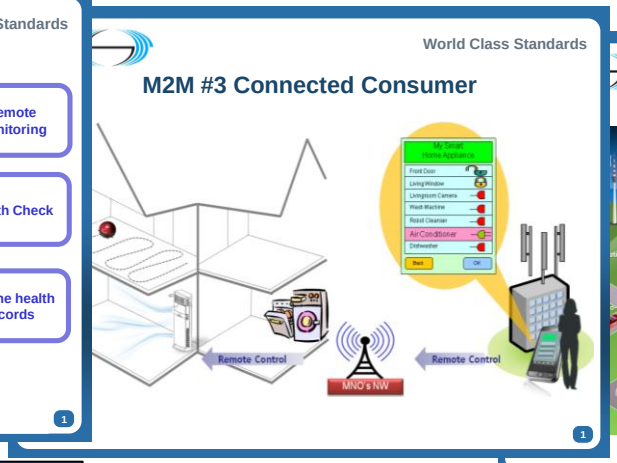


The ETSI M2M Challenge

- M2M technical solutions are highly fragmented and usually dedicated to a single application (e.g. fleet management, meter reading)
- Multitude of technical solutions and disperse standardization activities result in the slow development of the M2M market
- Standardization is a key enabler to remove the technical barriers and ensure interoperable M2M services and networks

Other ETSI M2M usecase scenarios





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TR XXX XXX:
Use Cases for Networked Mobile Wireless Robotics?

		V1.1.1	Smart Metering Use Cases	
		V0.3.1	Use cases of eHealth	Rel-2?
		V0.3.0	Use cases of connected consumer	Rel-2?
DTR/M2M-00007	102 897	V0.1.1	City Automation Use Cases	Rel-2?
DTR/M2M-00008	102 898	V0.3.0	Automotive Use Cases	May 2011
DTR/M2M-00011	102 935	-	Smart Grids	Rel-2?

A global initiative for M2M Standardisation

The following SDOs are involved in the global initiative: the Association of Radio Industries and Businesses (**ARIB**) and the Telecommunication Technology Committee (**TTC**) of Japan; the Alliance for Telecommunications Industry Solutions (**ATIS**) and the Telecommunications Industry Association (**TIA**) of the USA; the China Communications Standards Association (**CCSA**); the European Telecommunications Standards Institute (**ETSI**); and Telecommunications Technology Association (**TTA**) of Korea.

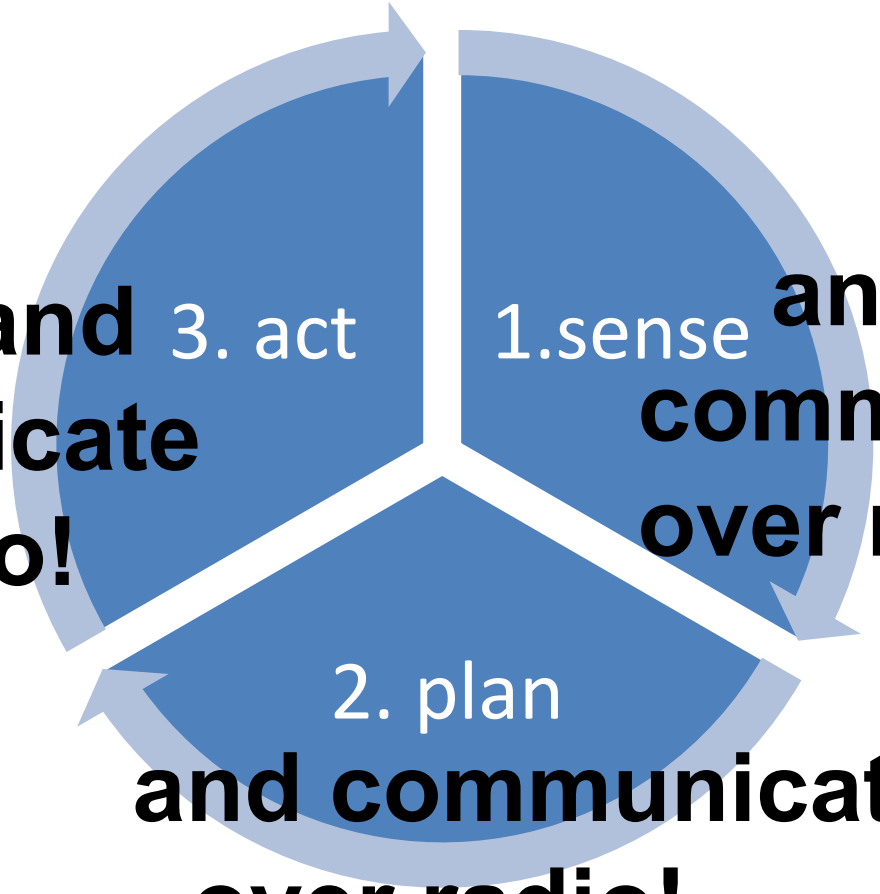
A STANDARDIZATION PROJECT PROPOSAL FOR ‘NETWORKED WIRELESS ROBOTS’

ETSI is open for ICT innovations

- Reduced barriers to participate
  - Reduced fees for Small/Medium Enterprises, Users and Research Bodies
  - Reduced costs of participation (electronic working methods)
    - New portal project ongoing
    - Remote collaboration tools
- Facilitating new ideas
  - Linking to research
  - Industry Specification Group (ISG) www.etsi.org/isg
- ETSI Centre for Test & Interoperability: assist development, validate standards and test interoperability of products

Networked Wireless Robots

Smart artefacts which



and communicate over radio!

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A plethora of emerging robots applications

- Markets evolve for products and services addressing societal challenges. Robots in many different flavours will be part of the solution to tackle e.g.
  - climate change (service robots to maintain many small remote power stations for renewable energy in future smart grids)
  - demographic change (personal service robots in Ambient Assisted Living environments).
- There are numerous application areas for different types of robots, including elder care/home assistance, exploration, fire fighting, homeland security, de-mining, cleaning, inspection/repair, search and rescue robots, security and surveillance, space exploration, transportation, unmanned (aerial) vehicles, and many more.....

Some technical challenges

- Autonomous decision making
- Formation and self-organisation
- Awareness
  - Purpose
  - Situation including context
  - Resources including power
- Robustness
- Trustworthiness
- Safety and security

Draft scope of work (1)

- Development of taxonomy of networked robotic applications and their requirements
  - Different levels of autonomy according to operating environment
  - Is communication critical or not
- Prioritization of the use cases
- Development of a reference model and various instances starting from
  - sense and communicate over radio
  - plan and communicate over radio
  - act and communicate over radio

Draft scope of work (2)

- Identify interoperability problems, make a gap analysis and assess alternative solutions
- Evaluation of options for a Networked Wireless Robots standards. Is there a way for a family of comprehensive robotic standards?
  - one solution supporting all applications
  - a bare-minimum solution
  - a standard for more immediate well defined applications

Draft scope of work (3) - radio

- Unlicensed ISM bands are crowded and required QoS levels cannot be ensured. A dedicated spectrum is regarded as way forward.
- Existing standardized radio technologies cannot be regarded as proper solution for many application scenarios (severe performance degradation in scenarios characterized by distributed control and non-centralized communication among robots).

Draft scope of work (4) – communication interfaces

- Communication between a (mobile) robot and a fixed base station, e.g. for
  - remote control of the robot under real-time conditions
  - enabling the robot to obtain access to the Internet
- Communication between robots, without a base station
  - Robots should be able to communicate directly with one or a (potentially large) number of peers, when they get into transmission reach.
  - This will involve operating modes for self-organizing, ad-hoc and wireless sensor networks.
- Communication between the individual components of the robot itself.
  - The internal wiring of robots can become very clumsy, even messy and unmanageable – ultimately it may impair the robot's mobility.
  - This is particularly important in the case of humanoid robots with many degrees of freedom and actuators that need to be controlled with timely and highly synchronized commands.

Draft scope of work (5) – system design

- distributed network and interference management
- disruption tolerant networking
- a real-time communication option
- data aggregation may require extremely high data rates
- positioning capability and location aware protocols
- high security by design
- P2P, sensor, ad hoc network protocols.

Draft scope of work (6) – RANET (Robotic Ad-Hoc Network) protocols

- could be based on *VANET (Vehicular Ad-Hoc Networks)* protocols as a solution for inter-robot communication. Extend them with:
  - node redundancy and energy optimization techniques from the *SANET (Sensor and Actuator Network)* domain, and better flow support.
- exploit the synergy of RANETs and *Cognitive Radio Networks (CRNs)*
  - there are already some defined standards for CRNs that could be revised, as appropriate and be adopted for RANETs
- to ensure an efficient and dynamic fault management process for reliable RANETs, including rapid and dynamic fault localization and service survivability

Organization and working method (1)

- Liaise with ETSI TBs as appropriate, especially with TC M2M, TC ITS, TC DECT, TC ERM, TC RRS and ISG AFI.
- Liaise with other SDOs/Forums as appropriate.
- Use the recognized 3-stage standardization method, identifying first the requirements, then developing architecture and information flows, and finally performing detailed specifications. Use-cases will be used as part of the requirements development process. The use of APIs will be explored to provide interfaces to robot system components.

Organization and working method (2)

- Refer to existing work done elsewhere, or encourage existing groups to fulfil its requirements, and only where such work does not meet the requirements for 'Networked Wireless Robots', detailed specification work will be performed.
- Cross-fertilization between cognitive systems and robotic networks by exploiting the synergy between the two as they are strongly interlinked when operating in actual operating environments with quality of service (QoS) guarantees

Participation

- It is a must to have at least four ETSI members in order to launch a standardization project.
- Typically the first deliverables of a new standardization project are reports and studies, including gap analysis, use cases and requirements gathering. This – strictly speaking pre-standardization phase – is then followed by the actual standards setting phase, in which standards are developed.

Who to involve ?

- Intel, Cisco, NEC, RENESAS, TATA…working on « Terms of reference »
- And you present here today?
  - Thalès, Dassault/ONERA, EADS, Sagem, Renault, CNES, CNRS, INRIA, IRISA, LASS…;
  - French Government/DGA;
  - GDR Research Institutes & stakeholders http://www.gdr-robotique.org/entreprises.php
- ../.. ?

Thank you for your attention.

ETSI Strategy and New Initiatives

patrick.guillemin@etsi.org

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