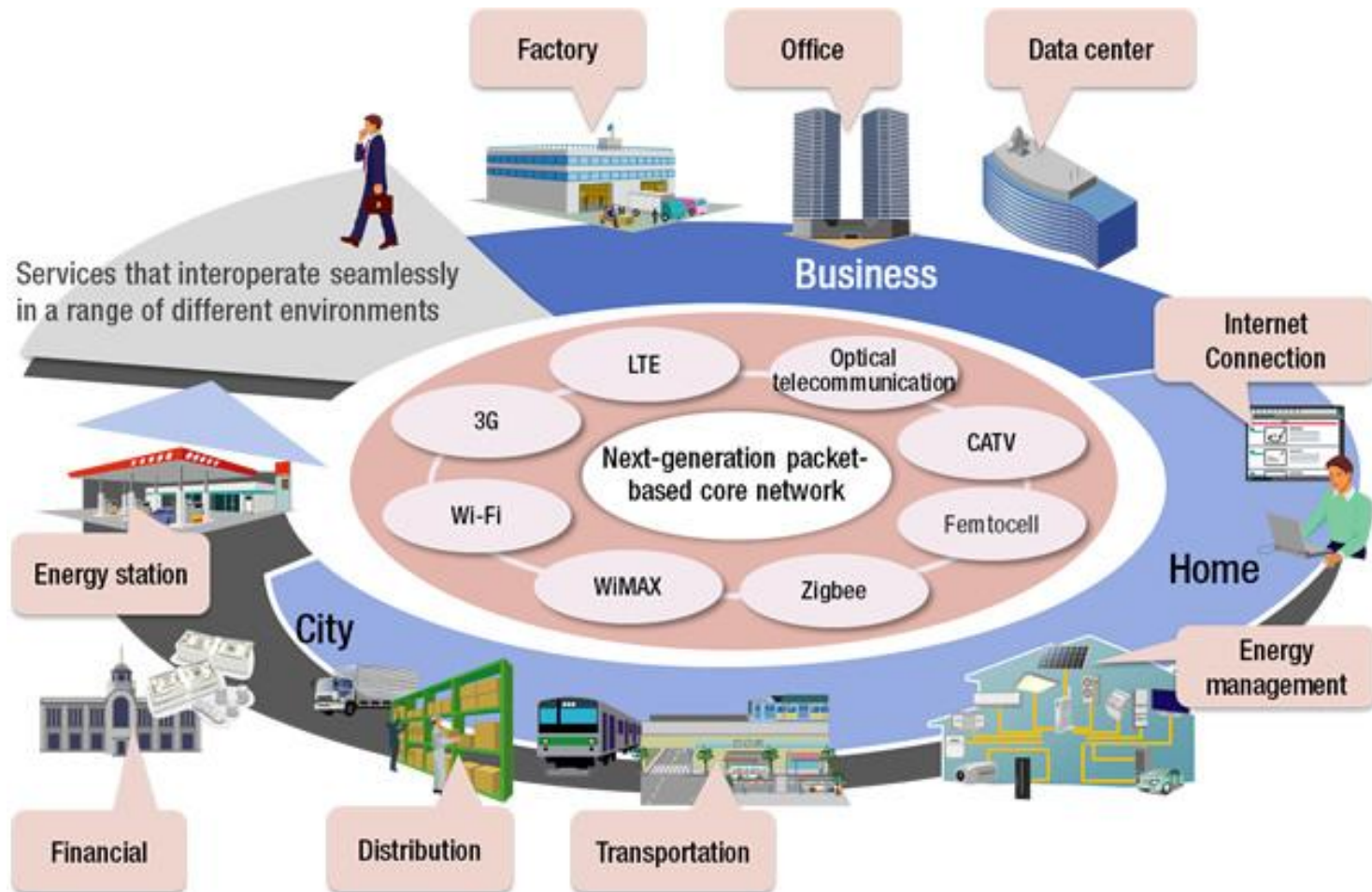


SMART X, M2M y roles de IEEE



Ing. Gustavo Giannattasio SMIEEE
gianna@ieee.org

Wikipedia

“A city can be defined as ‘smart’ when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic development and a high quality of life, with a wise management of natural resources, through participatory action and engagement. (Caragliu et al. 2009).

The smart city concept essentially means efficiency. But efficiency based on the intelligent management and integrated ICTs, and active citizen participation. Then implies a new kind of governance, genuine citizen involvement in public policy “

SMART ECONOMY (Competitiveness)

- Innovative spirit
- Entrepreneurship
- Economic image & trademarks
- Productivity
- Flexibility of labour market
- International embeddedness
- *Ability to transform*

SMART PEOPLE (Social and Human Capital)

- Level of qualification
- Affinity to life long learning
- Social and ethnic plurality
- Flexibility
- Creativity
- Cosmopolitanism/Open-mindedness
- Participation in public life

SMART GOVERNANCE (Participation)

- Participation in decision-making
- Public and social services
- Transparent governance
- *Political strategies & perspectives*

SMART MOBILITY (Transport and ICT)

- Local accessibility
- (Inter-)national accessibility
- Availability of ICT-infrastructure
- Sustainable, innovative and safe transport systems

SMART ENVIRONMENT (Natural resources)

- Attractivity of natural conditions
- Pollution
- Environmental protection
- Sustainable resource management

SMART LIVING (Quality of life)

- Cultural facilities
- Health conditions
- Individual safety
- Housing quality
- Education facilities
- Touristic attractivity
- Social cohesion

CIUDADES INTELIGENTES EN LA.

Search IEEE Urbanization Challenge



Search

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Guadalajara Ciudad Creativa Digital

*Learn about Mexico's first
Smart City*



What's New



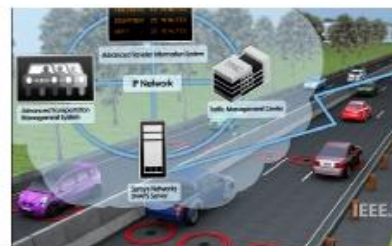
IEEE CCD Smart Cities of the Future

Feature Article



A Vision of a Smart, Happy, City

Technology Spotlight



Video Spotlight: Smart Cities

Useful Links

- "Smart Cities" - IEEE Internet Computing Guest Editor's Introduction
- Standardization: Living in the Smart Cities of the Future: eWork, eMobility and Connection to the Smart Grids
- Exclusive Interview: MIT's Carlo

TUTORIALES DE REFERENCIA IEEE

Smart Cities, IEEE
IEEE Communications Society
Sponsored Tutorial

host.comsoc.org/freetutorial/wiley6/wiley6.html

Free tutorial access compliments of Wiley



Explore Smart Grid titles from Wiley

IEEE | WILEY



Cross Industry View on Smart Grid Communications
(1hr 35min 28sec)

[View Tutorial >>](#)

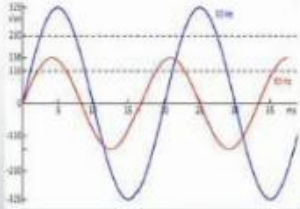
Viewing Recommendations: Adobe Flash Player 10

IEEE COMMUNICATIONS SOCIETY

5 to 10 years



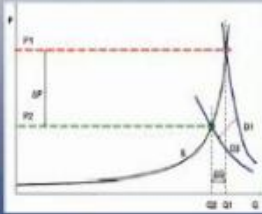
Smart metering



Grid synchronization/
synchrophasors



Conservation Volt
Reduction





APLICACIONES

Smart Parking



© Worldsensing

Smart Bins



Smart City Control Platform



Traffic Flow



Critical Infrastr.



Travel Time



**Proven Technologies
With Solid Deployment
Track-Record Today!**

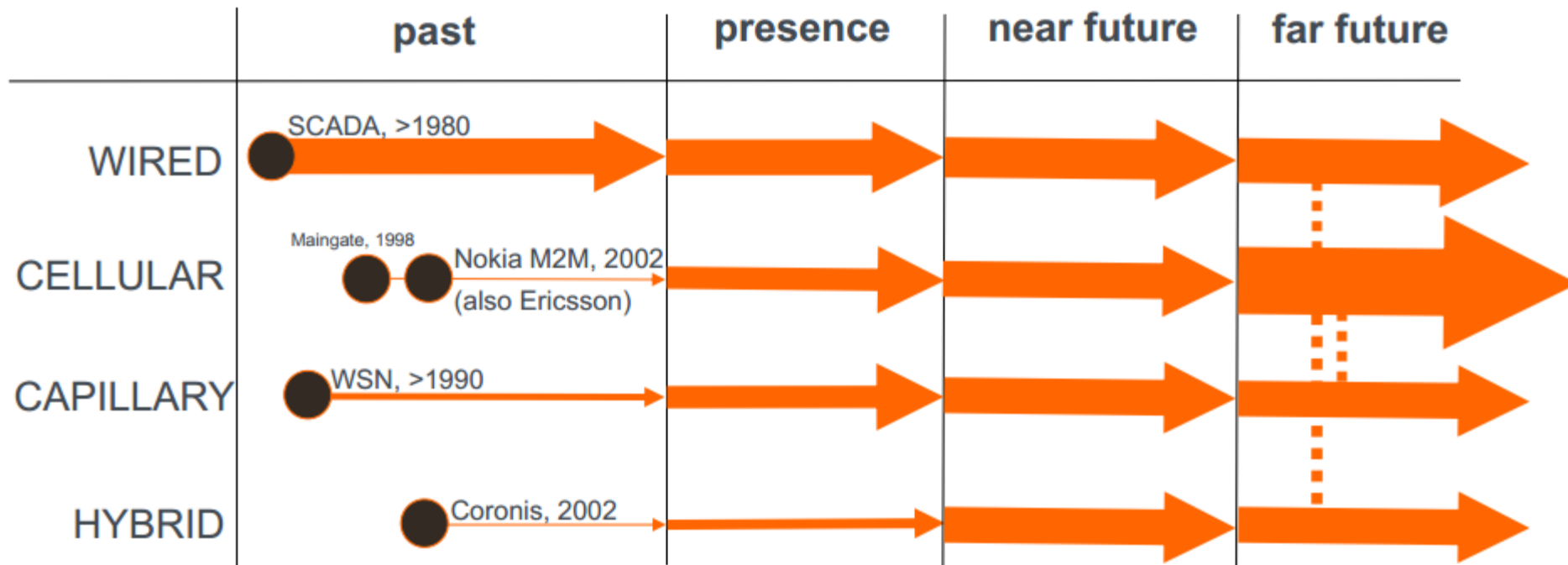
Historic Sites



M2M LA BASE DE TODO

■ Origin of term “Machine-to-Machine”:

- Nokia M2M Platform Family [2002] = Nokia M2M Gateway software + Nokia 31 GSM Connectivity Terminal + Nokia M2M Application Develop. Kit (ADK)



M2M

❑ Common technologies:

- Wireless sensors
- The Internet
- Personal Computers

❑ Communication Types:

- One way: master / slave
- Two ways: participating equally

❑ Basic Stages:

- Data collection
- Data transmission
- Data Assessment
- Response

■ Machine – To – Machine:

- device (water meter) which is monitored by means of sensor [in “uplink”]
- device (valve) which is instructed to actuate [in “downlink”]
- keywords: physical sensors and actuators; cost

■ Machine – To – Machine:

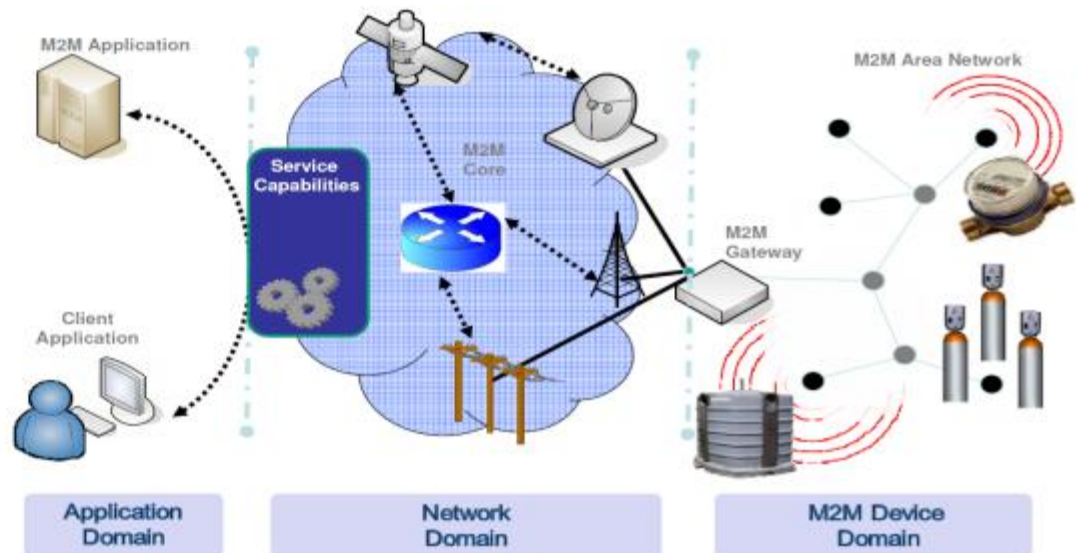
- network which facilitates end-to-end connectivity between machines
- composed of radio, access network, gateway, core network, backend server
- keywords: hardware; protocols; end-to-end delay and reliability; cost

■ Machine – To – Machine:

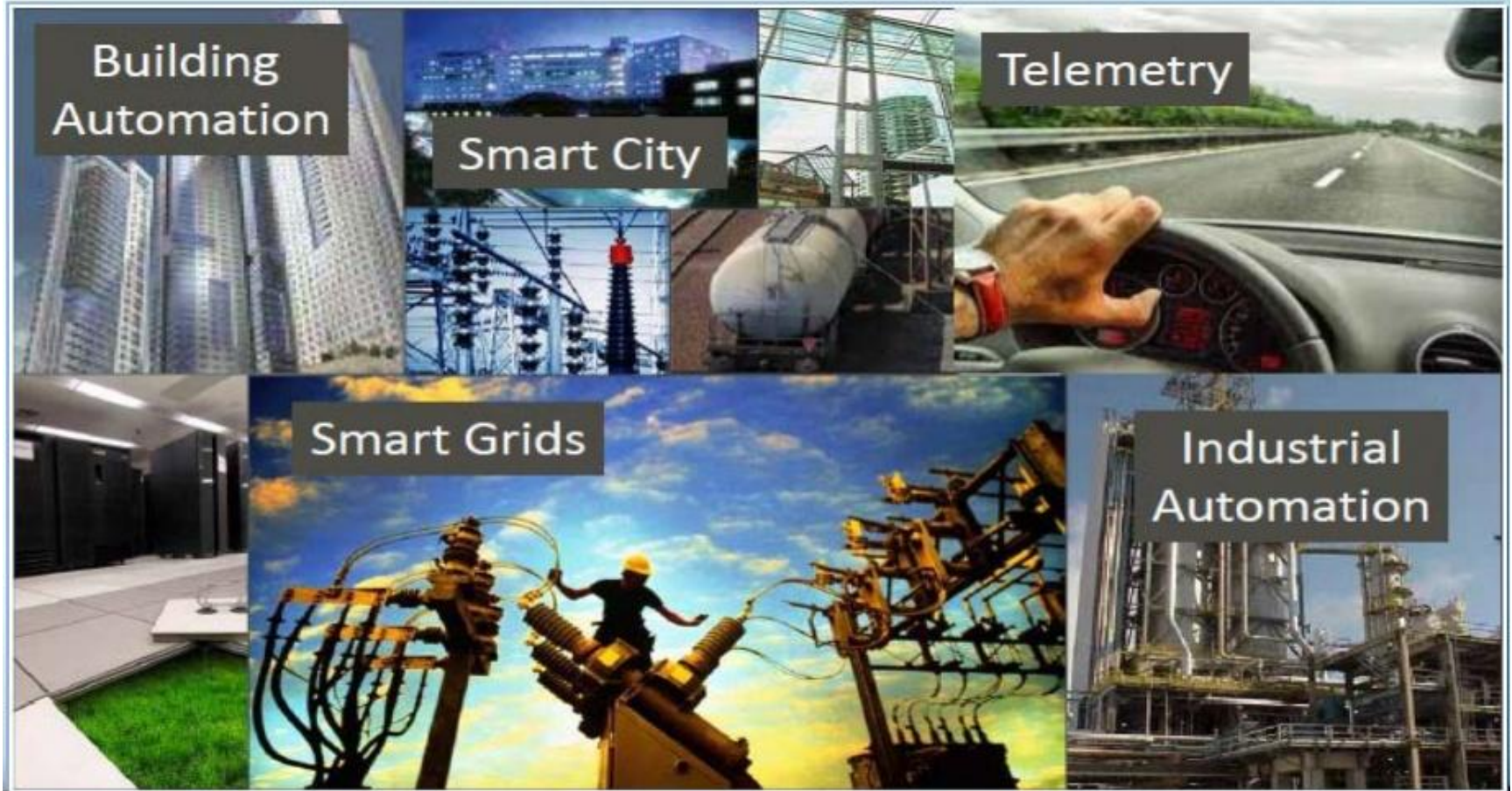
- device (computer) which extracts, processes (and displays) gathered information
- device (computer) which automatically controls and instructs other machines
- keywords: middleware, software, application; cost

M2M DESAFIOS

- **Machine-to-Machine (M2M) means no human intervention whilst devices are communicating end-to-end.**
- This assumes some fundamental M2M system characteristics:
 - support of a **huge amount** of nodes, sending **small data each**
 - **mission-critical** data provision
 - **autonomous** operation
 - self-organization
 - power efficiency
 - reliability
 - etc, etc



M2M POSIBILIDADES



M2M REALIDADES



smart health

346 million people worldwide have diabetes, costing \$465 billion in 2011. Qualcomm Life and Orange are developing connected diabetes and kidney monitoring systems.

346m 

45 mins



smart hospitals

In the UK, Colchester Hospital uses M2M to track clinical equipment. Staff save up to 45 minutes finding equipment, while digital radiology means X-rays appear instantly on screen.

smart shopping

Inventory optimization, targeted digital advertising and ePayments are saving shoppers time. In the retail sector, M2M connections will grow at 22% a year to reach 33 million connections in 2017.

33m



smart water

In the UK, 3.6 megaliters of water leak each day. Innovative smart metering services, like m2o City in France, can watch usage and identify leaks.

3.6ML 



1m

smart devices

Amazon sells over 1 million Kindles a week and Panasonic has developed an Android app to control microwaves, air conditioning, washing machines and blood pressure monitors.



30m

smart metering

Smart energy meters can lead to an 8.7% reduction in energy consumption when real-time usage data is available to consumers. In Italy, 30 million properties already have M2M electricity meters.



50%

smart traffic

Intelligent traffic control systems can make road traffic safer. An adaptive traffic system in Troy, NY, USA reduced serious injury in crashes by 50%.



435k

smart fleets

There are 435,000+ fleet management solutions already deployed in Europe. Scania, Mercedes-Benz and Volvo trucks are fitting fleet management as standard.

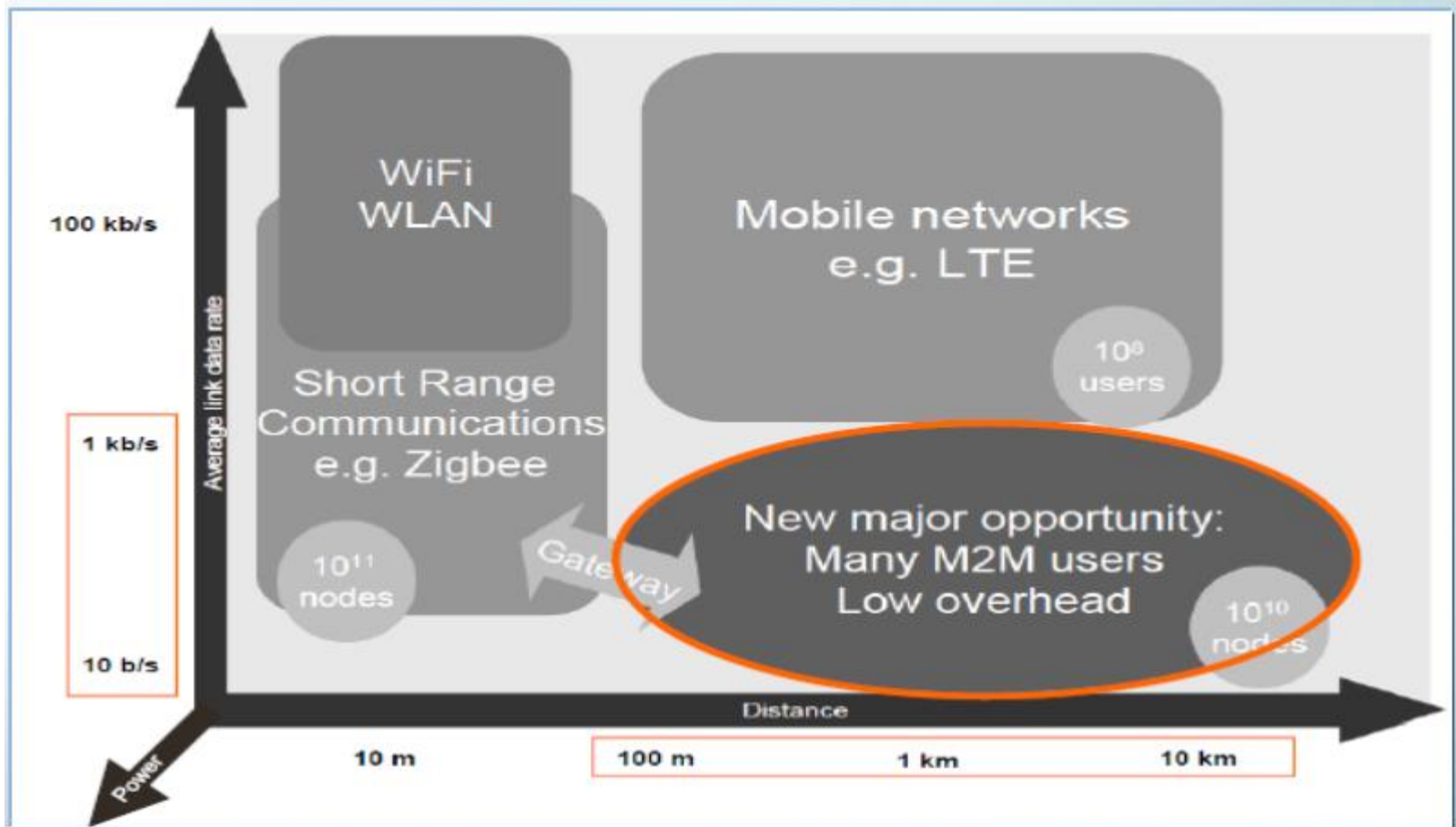
\$3.8bn



smart industry

From mines to vending machines, remote monitoring is enabling new business models. Nespresso knows when its commercial coffee machines need re-stocking. \$3.8bn was spent on industrial M2M services in 2011.

RADIOFRECUENCIA

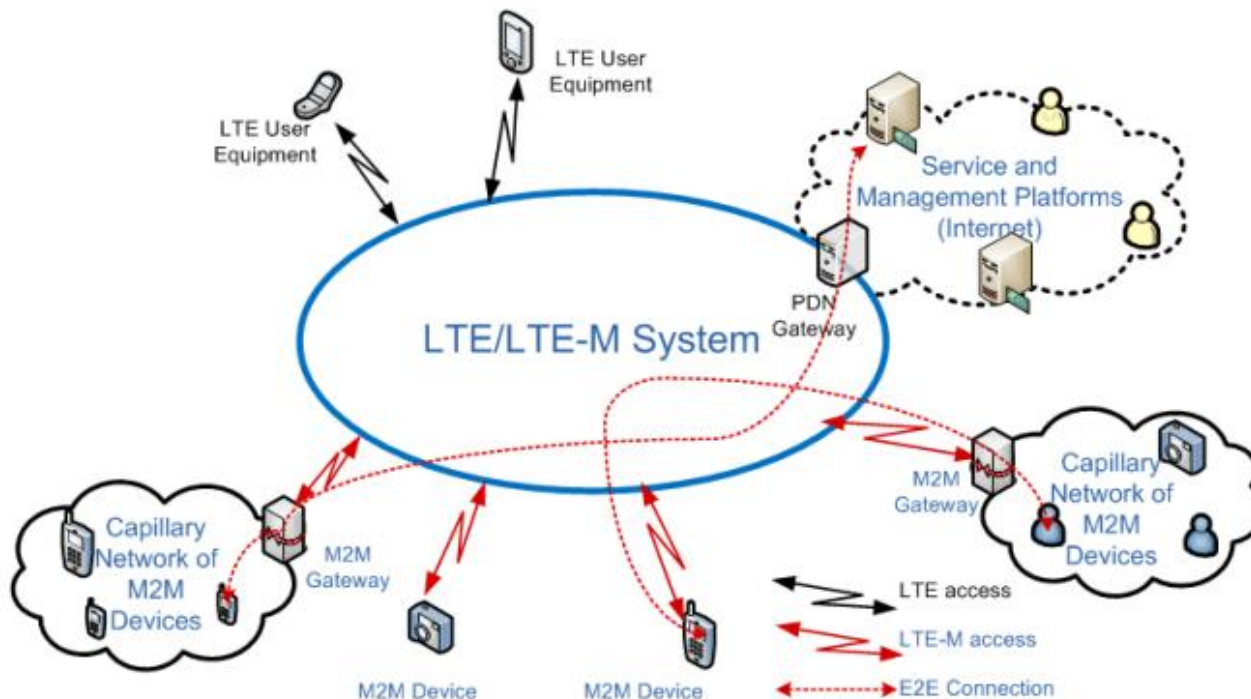


M2M SOBRE LTE

ICT EXALTED



Expanding LTE for Devices



At A Glance: EXALTED

Expanding LTE for Devices

Project Coordinator

Djelal Raouf

Sagemcom SAS

Tel: +33 (0)1 57 61 20 08

Fax: +33 (0)1 57 61 39 09

Email: djelal.raouf@sagemcom.com

Project website: www.ict-exalted.eu

Partners: Vodafone Group Services Limited (UK), Vodafone Group Services GmbH (DE), Gemalto (FR), Ericsson d.o.o. Serbia (RS), Alcatel-Lucent (DE), Telekom Srbija (RS), Commissariat à l'énergie atomique et aux énergies alternatives (FR), TST Sistemas S.A. (ES), University of Surrey (UK), Centre Tecnològic de Telecomunicacions de Catalunya (ES), TUD Vodafone Chair (DE), University of Piraeus Research Center (GR), Vidavo SA (GR)

Duration: Sept. 2010 – Feb. 2013

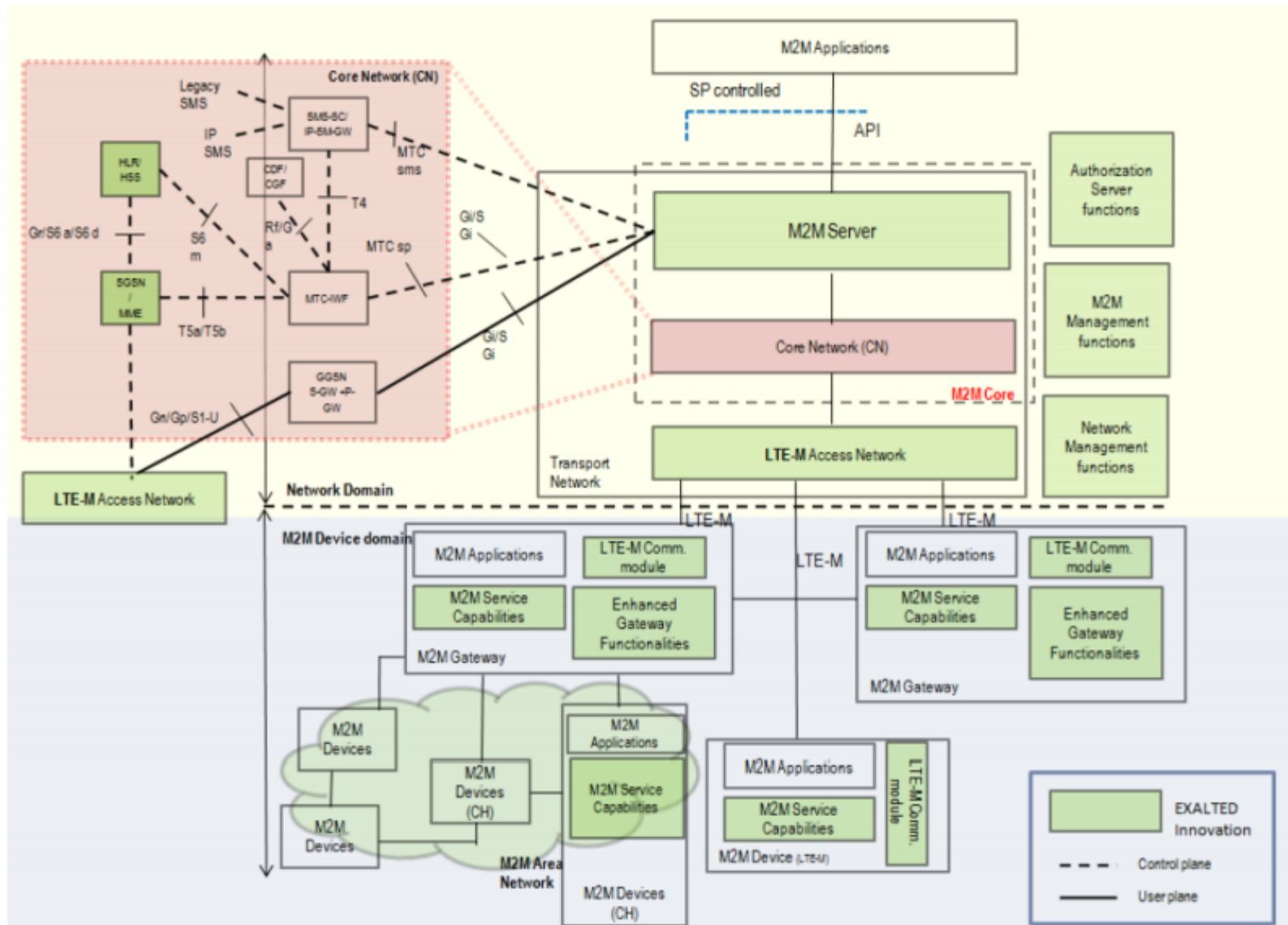
Funding scheme: IP

Total Cost: €11m

EC Contribution: €7.4m

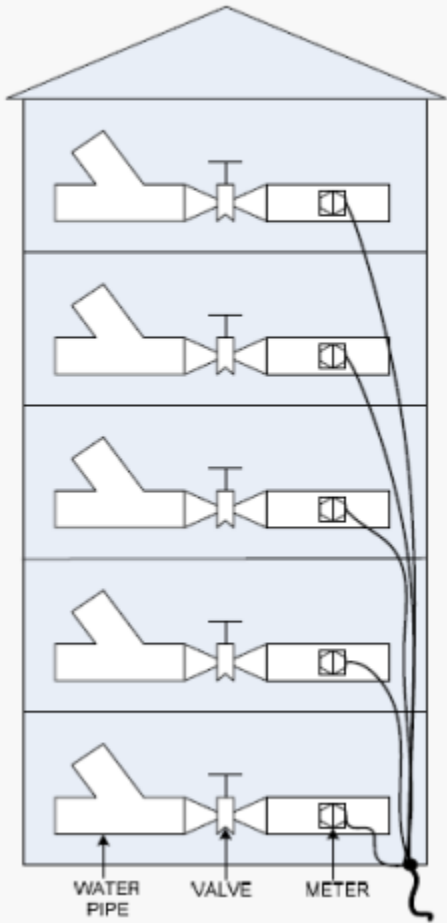
Contract Number: INFSO-ICT-258512

M2M SOBRE LTE

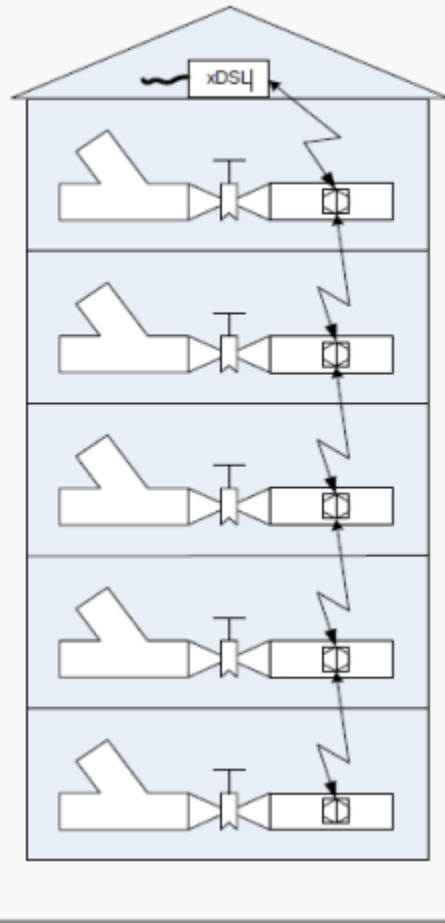


MODELOS M2M

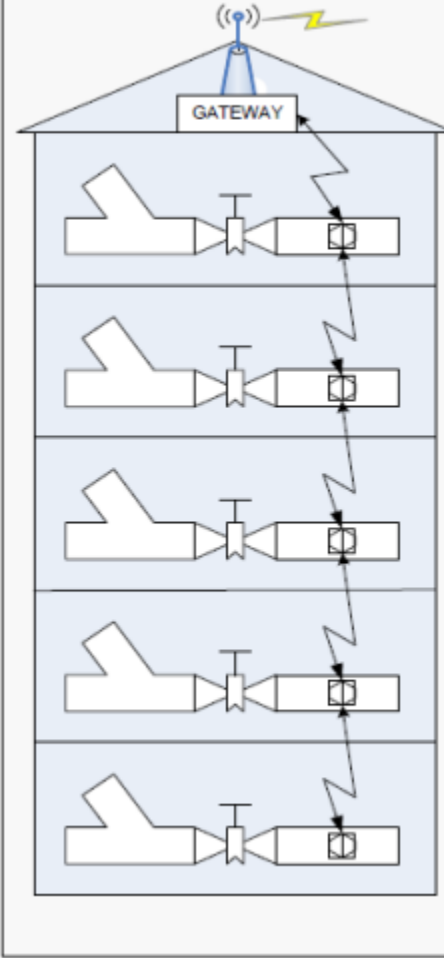
WIRED



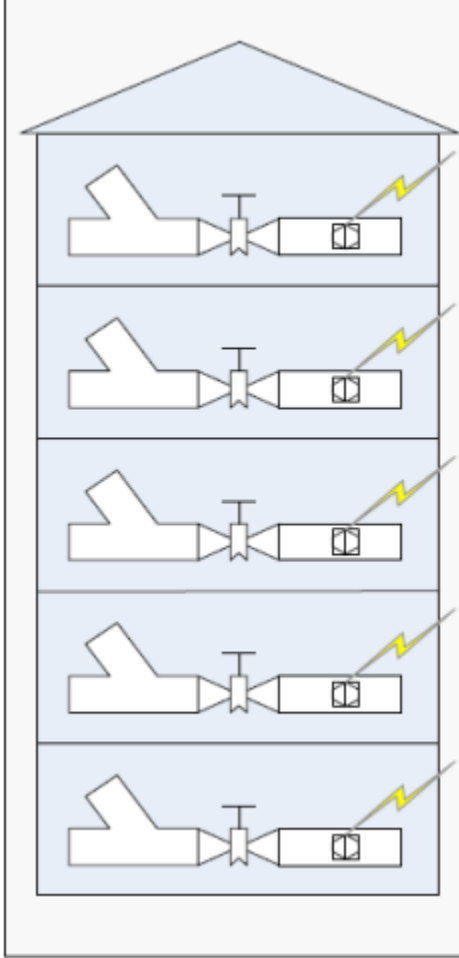
CAPILLARY - WIRED



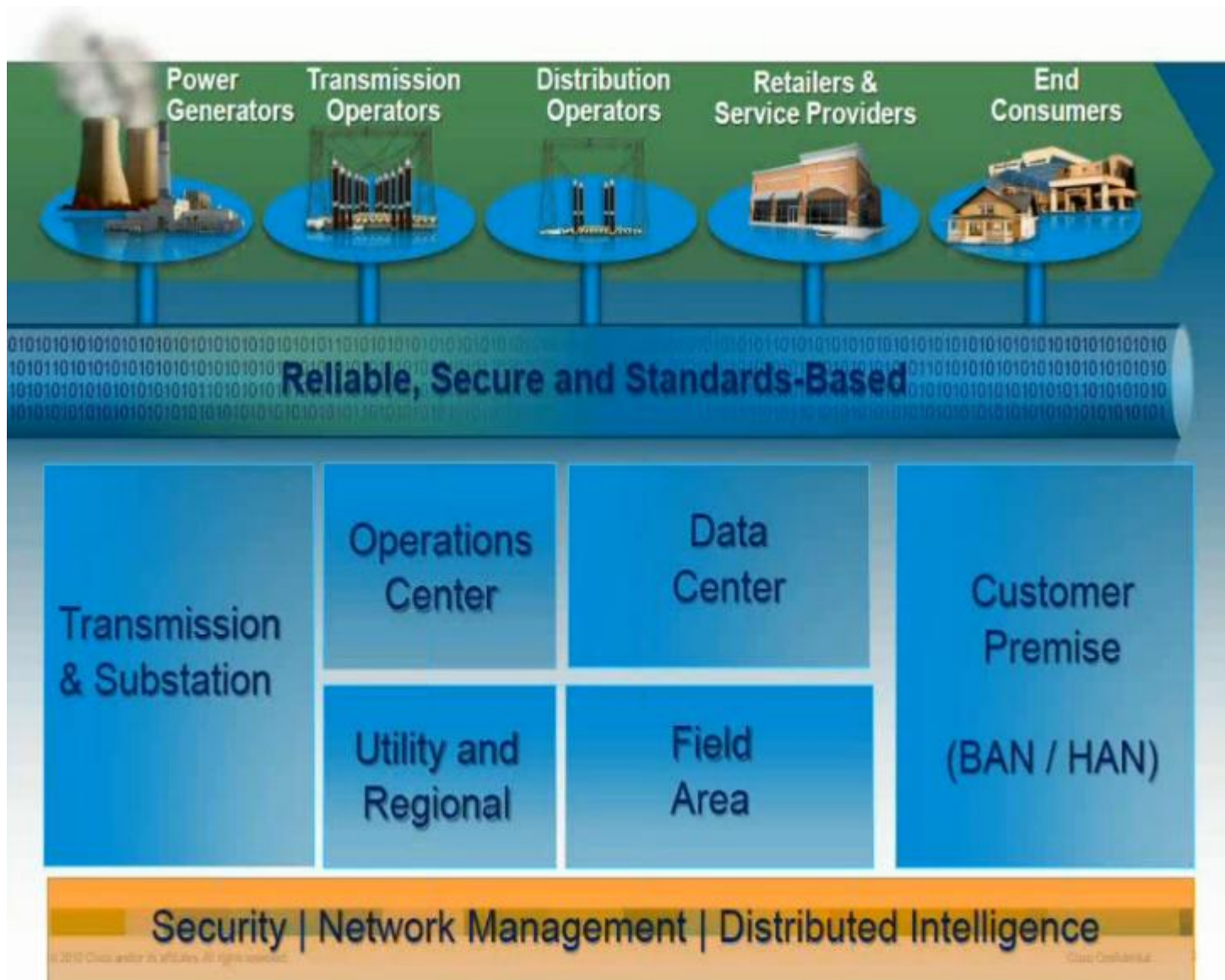
CAPILLARY - CELLULAR



CELLULAR



GRID INTELLIGENTE



DESAFIOS GRID

- Compliance with standards: NERC/CIP..
- Multiple challenges
 - Industry coordination (CERT/PSIRT)
 - Physical security
 - User authentication
 - Infrastructure: protocols & services (AAA server, CA server..)
 - End 2 End security...
- Design for reliability and resilience
 - open standards for multi-layer security : Authentication, Encryption, Privacy, Integrity



BIG DATA



© <http://www.zdnet.com/big-data-all-you-need-to-know-1339335818/>



<http://strata.oreilly.com/2012/01/what-is-big-data.html>



<http://tinyurl.com/bro8y8u>



<http://tinyurl.com/dyu2ncs>

ARQUITECTURA SMART

© Worldsensing

Instrumented + Interconnected + Intelligence = Smarter Data



embedded
computing

+

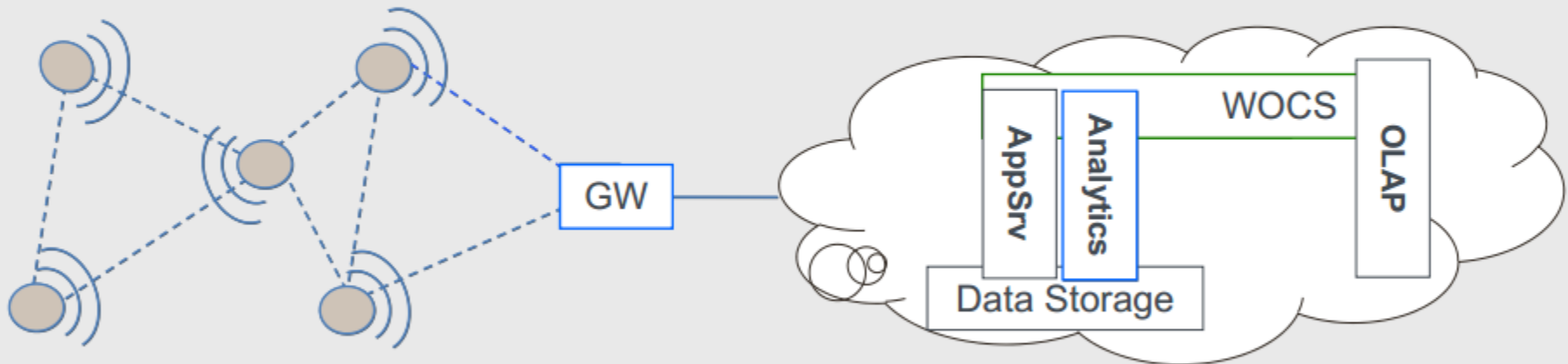
network
computing

+

cloud
computing

=

reliable real-time &
statistical data



sensor
(efficiency)

network
(reliability)

gateway
(availability)

LOW POWER NETWORK

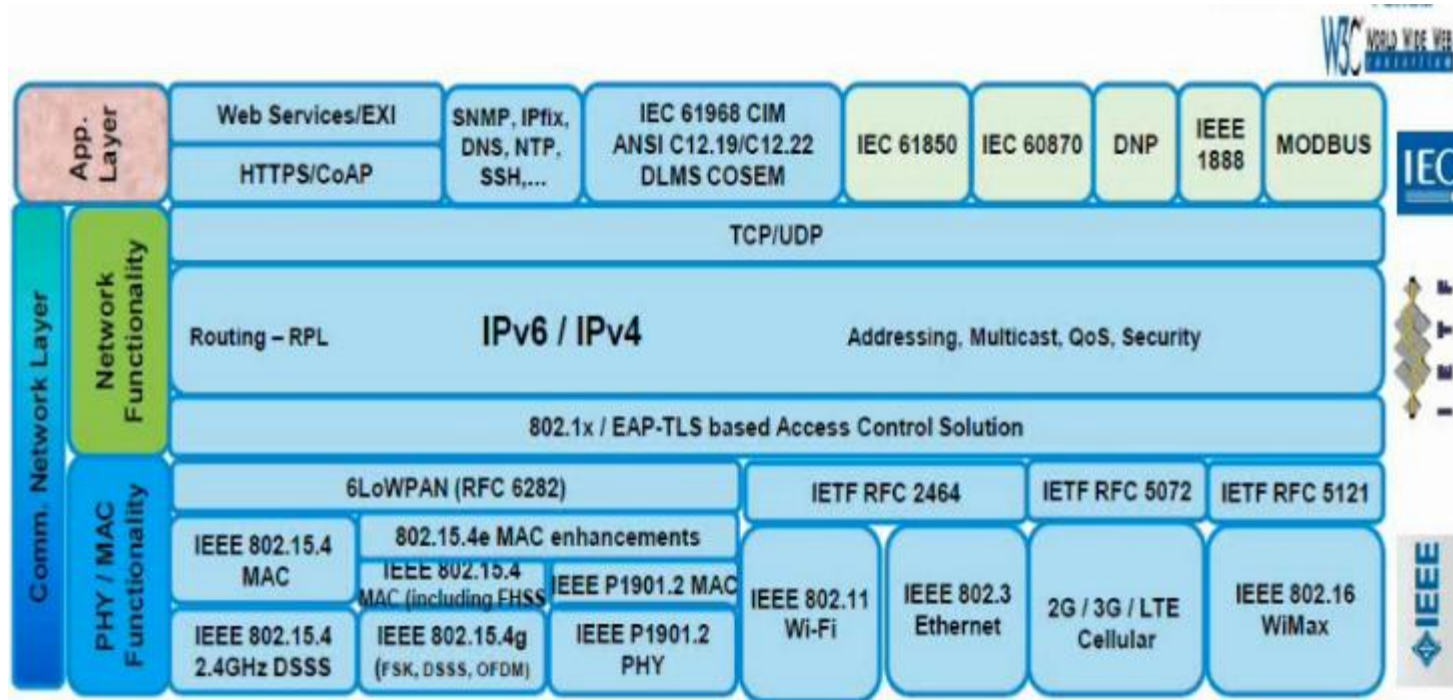
cloud
(ubiquitous)

data
(scalable)

storage
(availability)

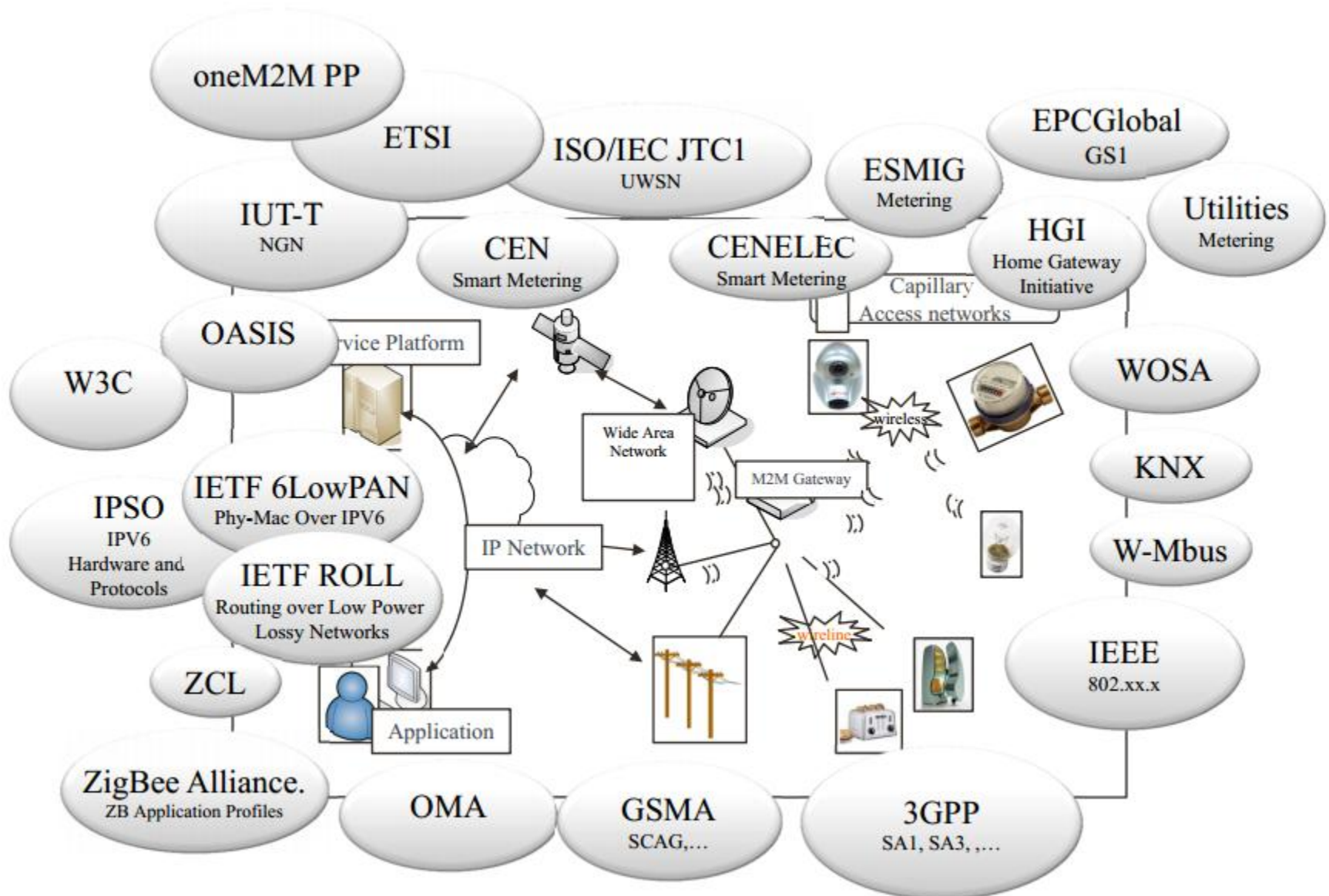
BIG DATA HANDLING

PROTOCOLS SMART

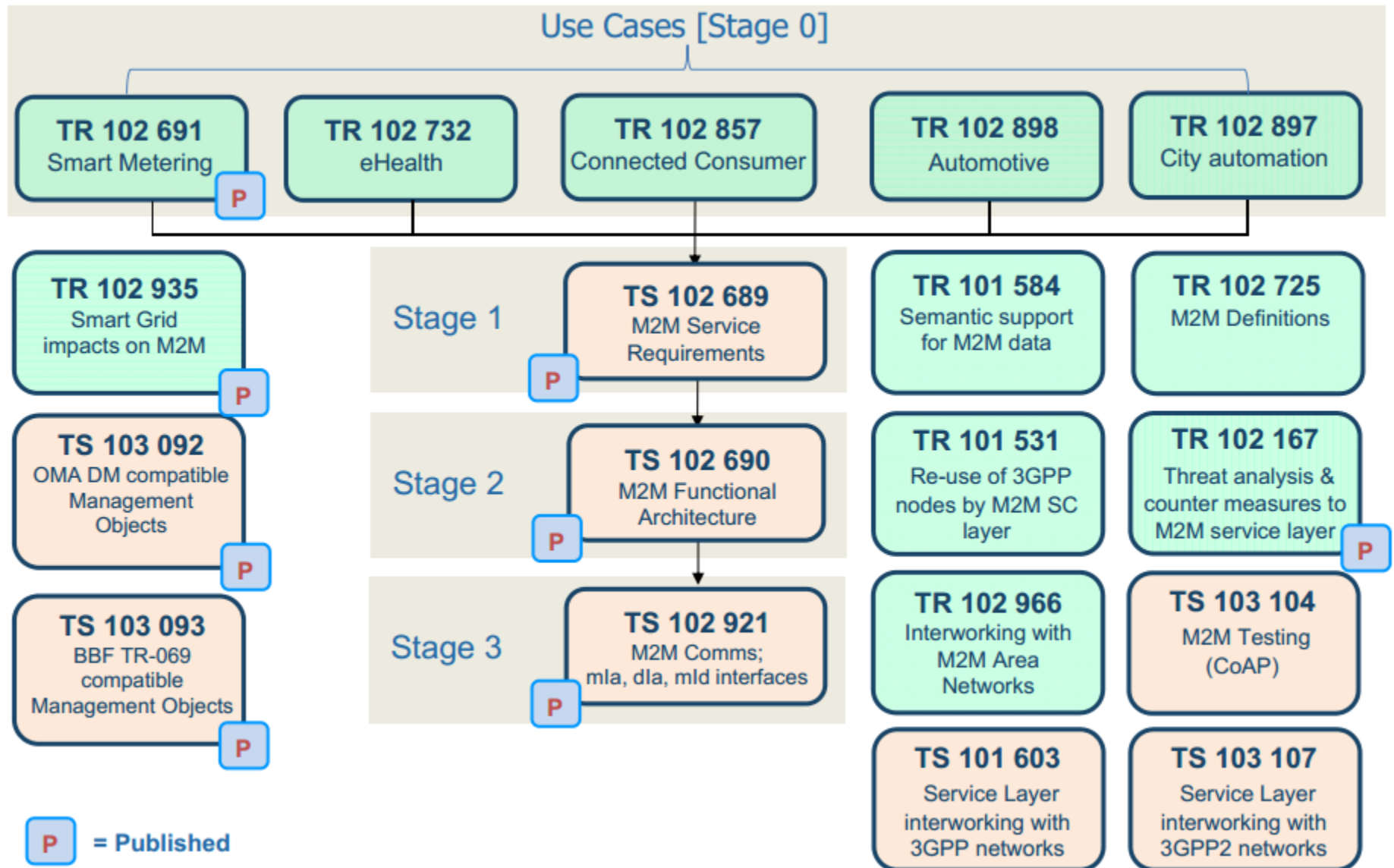


- Standardization at all levels to ensure interoperability and **reduce technology risk** for utilities
- Enables common application layer services over various **wired and wireless communication** technologies

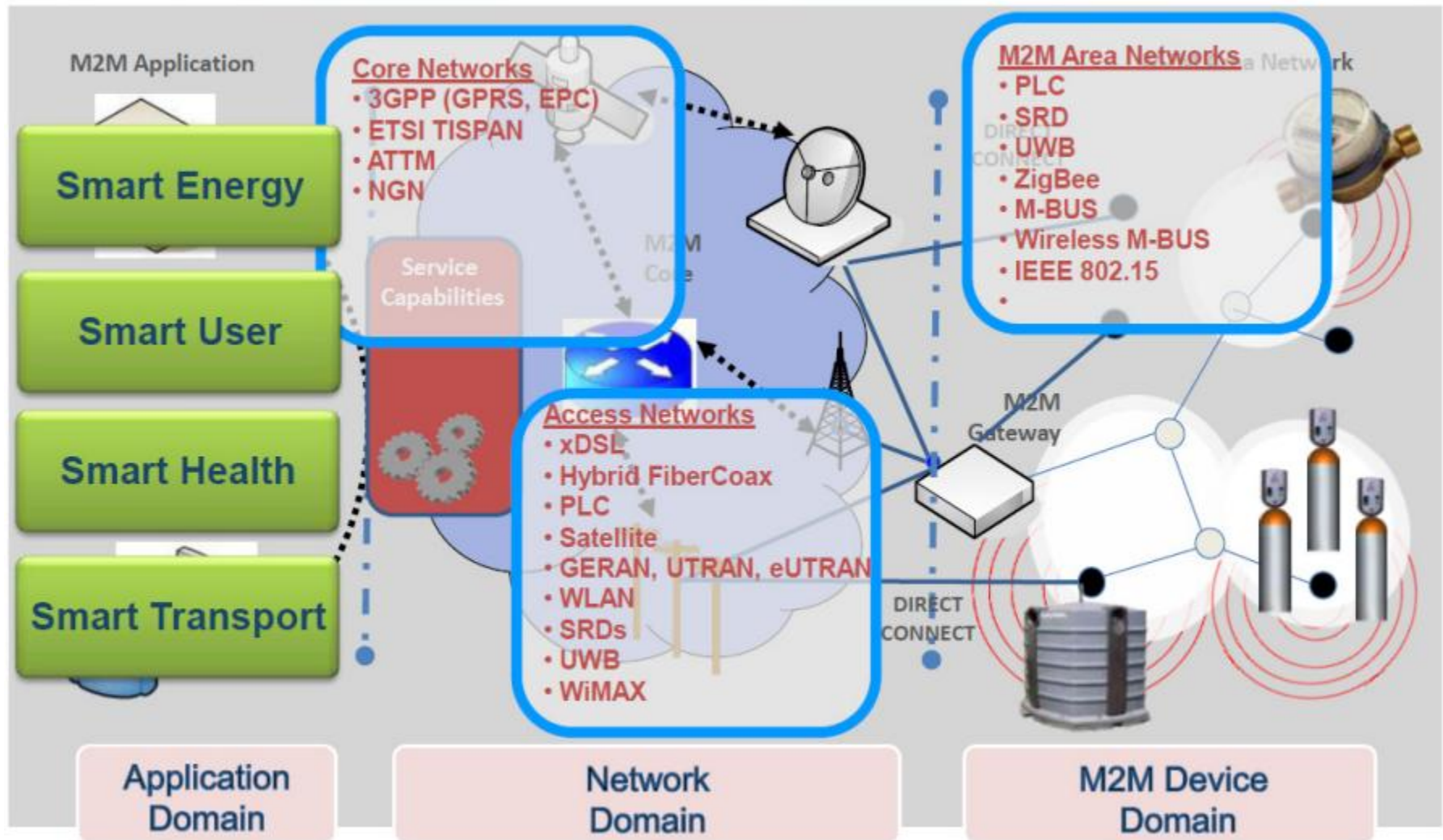
ENTIDADES DE STANDARIZACION M2M



ETSI

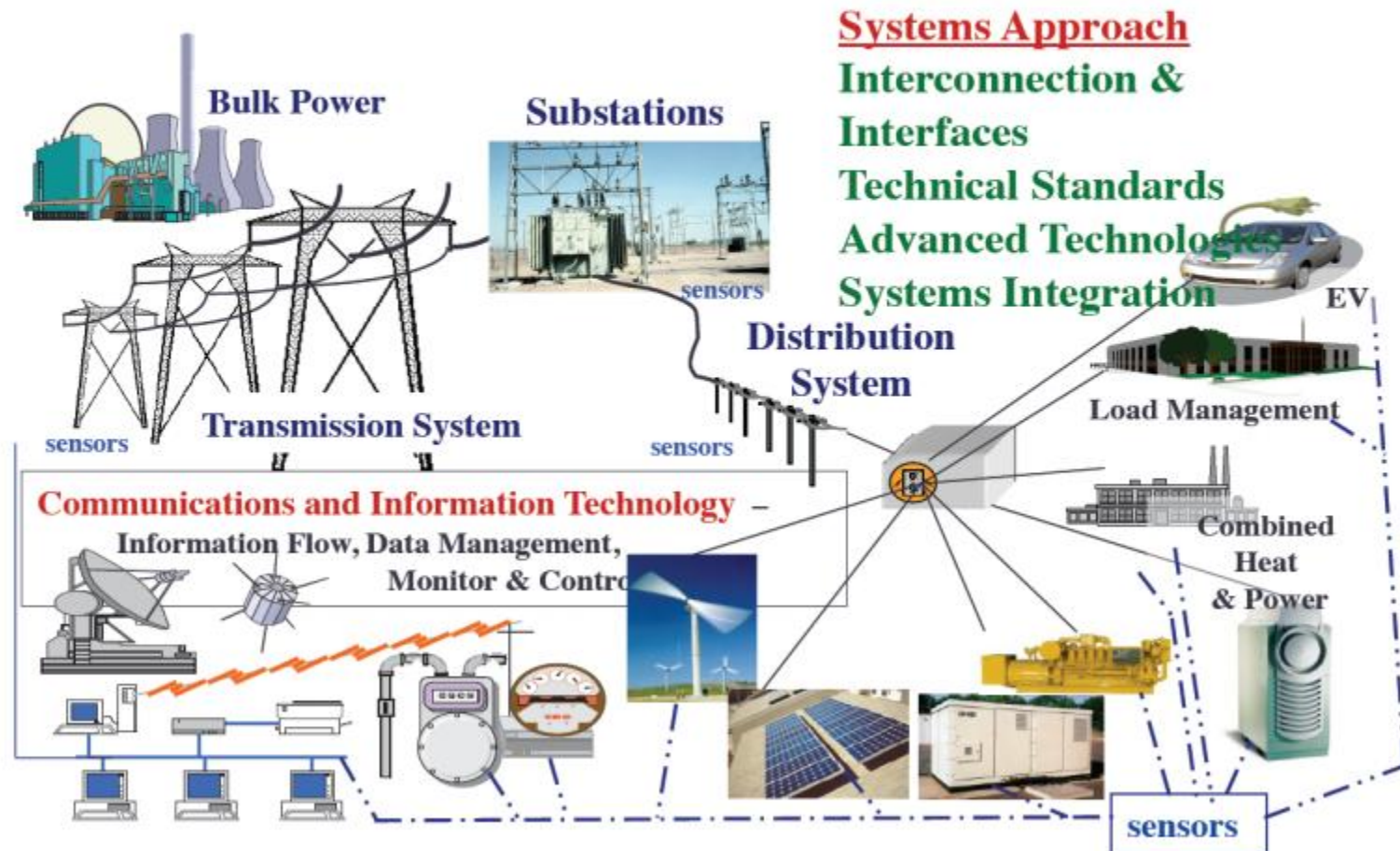


ETSI



GRID INTELLIGENTE

IEEE P2030 Interoperability Concept



TRANSPORTE INTELIGENTE



STANDARDS DEVELOPMENT WORKING GROUP

WG P2030.1 - Guide for Electric-Sourced Transportation Infrastructure Working Group

STATUS:

Active Working Group



Working Group Chair:

Paul Bishop

Society:

[IEEE-SASB Coordinating Committees](#) 

Sponsor:

SCC40 - Earth Observation Committee (SASB/SCC40)

IEEE-SA Liaison:

Soo Kim

Active Projects Managed by this Working Group

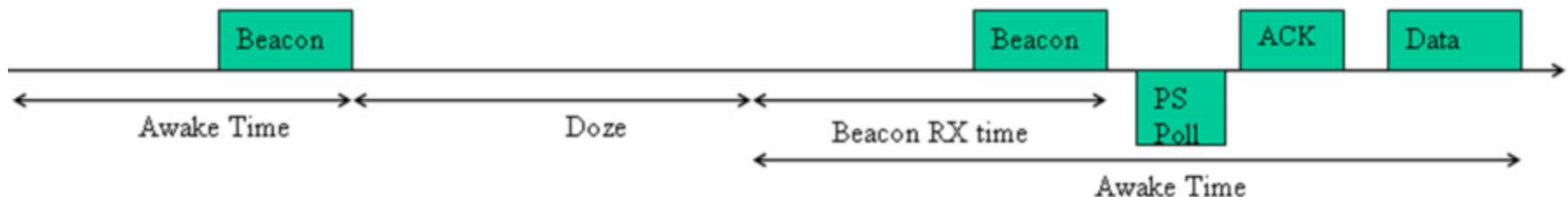
Project

[P2030.1 Guide for Electric-Sourced Transportation Infrastructure \(P\)](#)

802.11...

IEEE 802.11ah - LP WiFi

- IEEE 802.11ah use cases target low rate, long range applications (metering, sensors, automation)
- Battery operated devices should limit the power consumption by:
 - limiting the packet transmissions
 - limiting the awake/receive time (for low transit power devices, RX power consumption may be comparable with TX power consumption)
- Listening for beacons/traffic information maps (TIM) frames consumes power:
 - clock drift during long sleep requires an early wake up before Beacon/TIM (5min doze time, 20ppm -> node should wake up to 12ms before the Target Beacon Transmission Time (TBTT))
 - reception of beacon/TIM may require several milliseconds



VENTAJAS 802.11ah

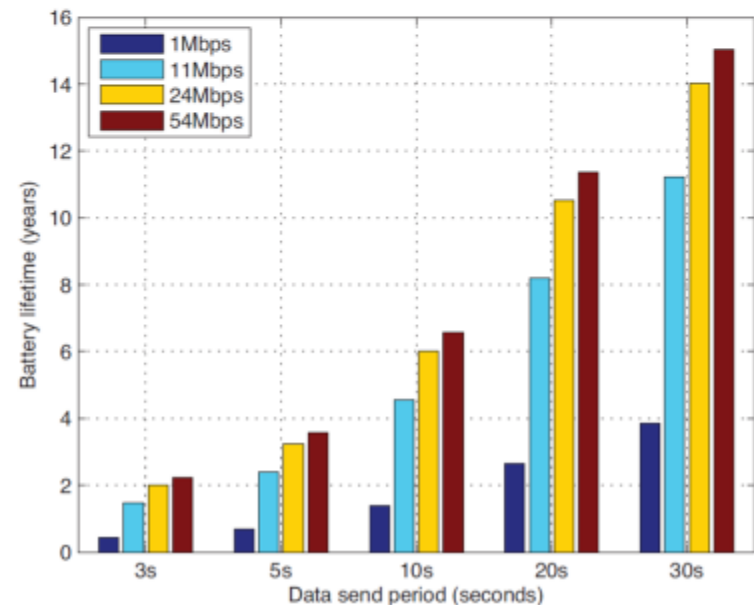
6LoWPAN vs. LOW-POWER WI-FI AT 54MBPS

	6LoWPAN		Low-power Wi-Fi	
<i>Packet size</i>	8 Bytes	1024 Bytes	8 Bytes	1024 Bytes
<i>Time (ms)</i>	6	23.61	11.3	16.58
<i>Energy (mJ)</i>	2.5	9.17	0.55	1.28

10x

“Low-power Wi-Fi provides a significant improvement over typical Wi-Fi on both latency and energy consumption counts.”

“LP-Wifi consumes approx the same as 6LoWPAN for small packets but is much better for large packets.”



Enabling Consumer Connectivity Through Consensus Building

Smart Grid into Home Devices Standards

IEEE 1675 / IEEE 1775
IEEE 2030 / IEEE P2030.1
IEEE 1901 / IEEE P1901.2

Home Networking Standards

IEEE 802
IEEE 1901
IEEE P1901.2
IEEE 1815

Smart Metering Standards

IEEE P1377
IEEE 1701
IEEE 1702
IEEE P1703
IEEE P1704
IEEE P1705

Mobile Video Standards

IEEE P2200
(Intelligently Cached
Mobile Content)

Smart Grid into Home Devices Standards

IEEE 1547 Series
(Distributed Energy Interconnection
Solar, Wind, Storage, etc.)
IEEE 2030

Mobile Video Standards

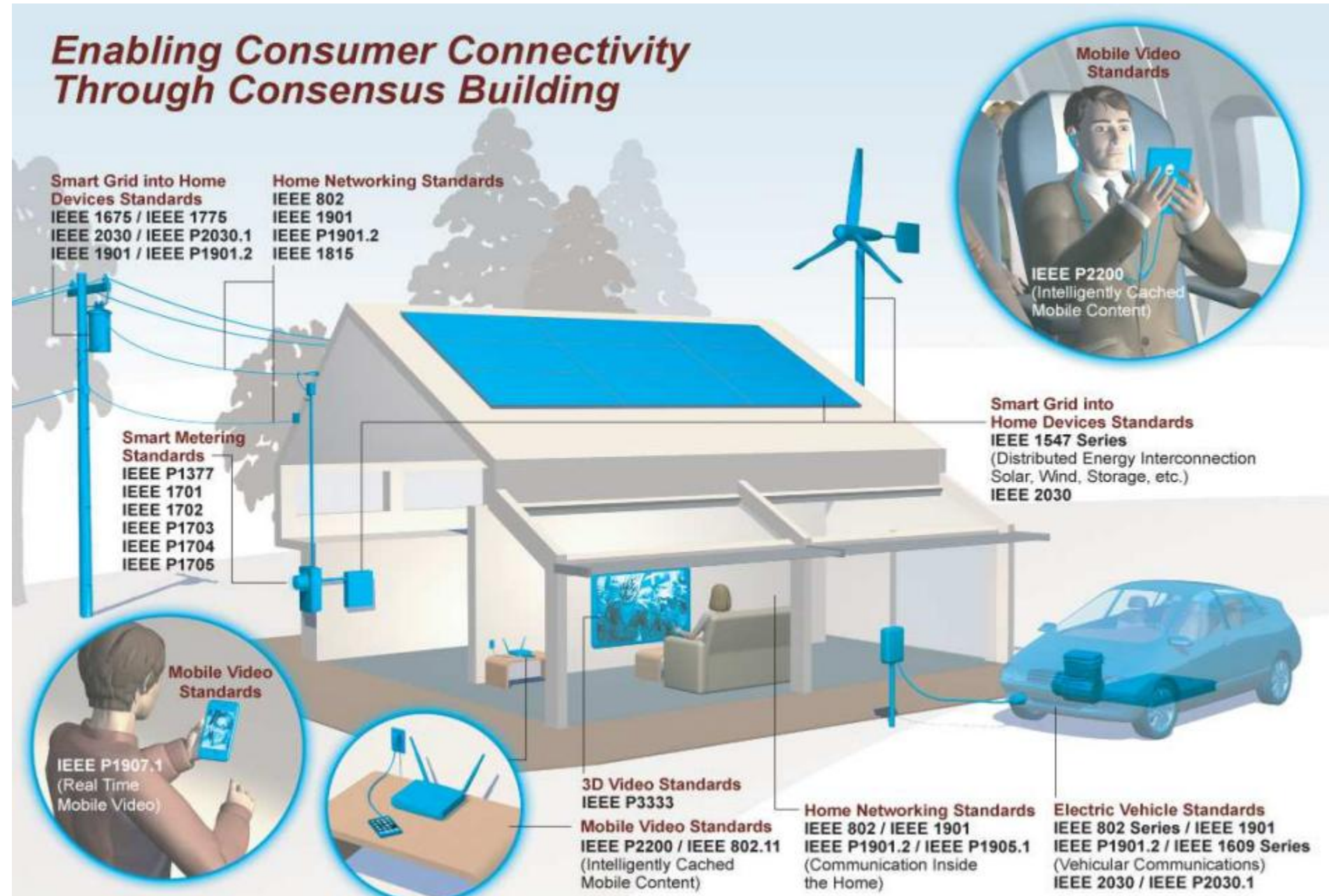
IEEE P1907.1
(Real Time
Mobile Video)

3D Video Standards IEEE P3333

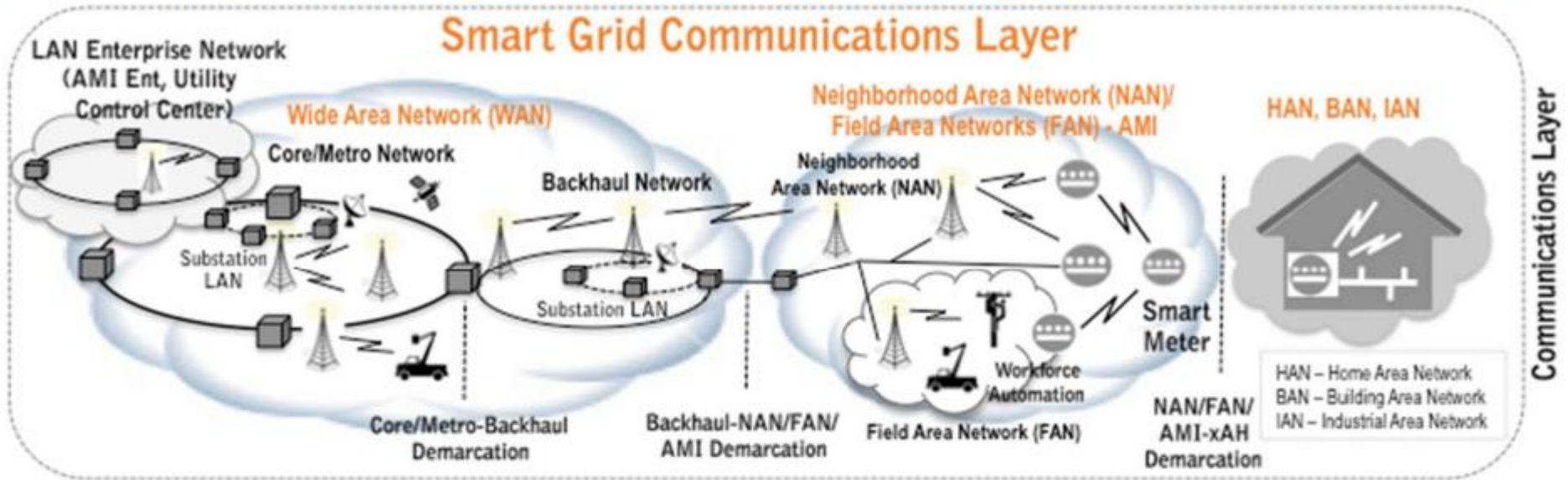
Mobile Video Standards
IEEE P2200 / IEEE 802.11
(Intelligently Cached
Mobile Content)

Home Networking Standards
IEEE 802 / IEEE 1901
IEEE P1901.2 / IEEE P1905.1
(Communication Inside
the Home)

Electric Vehicle Standards
IEEE 802 Series / IEEE 1901
IEEE P1901.2 / IEEE 1609 Series
(Vehicular Communications)
IEEE 2030 / IEEE P2030.1



IEEE Standards for Smart Networking/Communications



Communications Layer

Technology Standards

Smart Grid Network Technology & Protocols Standards Mapping

Wide Area Network (WAN)			NAN/FAN			Smart Meters	HAN, BAN, IAN	
Substation	Core/Metro Network/Backhaul Network		Substation				Wireline	Wireless
	Wireline	Wireless		Wireline	Wireless			
LAN IEEE 1815/IEC 61850 Several Options	IEEE 802.1 IEEE 802.3	IEEE 802.16d/e IEEE 802.20 IEEE 802.22	LAN IEEE 1815/IEC 61850 Several Options	IEEE 802.1 IEEE 802.3 IEEE 1901	IEEE 802.11 IEEE 802.15.4 IEEE 802.16	IEEE SC31 (1377, 1701, 1703, P1704)	IEEE 802.1 IEEE 802.3 IEEE 1901 IEEE 1901.2 IEEE P1905.1	IEEE 802.11 IEEE 802.15.4

IEEE Standards - Improving Personal Health



RESUMEN

- M2M es la base de arquitecturas “X inteligente”
- Las aplicaciones M2M optimizarán el desempeño de los servicios de una ciudad
- Existen numerosas entidades de standardización
- IEEE juega un rol clave en el desarrollo de estándares con mas de 200 publicados para SMART X
- IEEE tiene abierto concurso para apoyar como referente tecnológico independiente a 9 ciudades en 2014 que se sumen al desafío SMART CITIES y SMART eGOVERNMENT