GRUPPO TELECOM ITALIA

M2M Network Infrastructures for Massively Distributed Smart City Applications

Almanac Workshop – Copenhagen 30th September 2015

ALMANAC Capillary Network Gateway Technologies

Telecom Italia initiatives

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Tilab

Introduction: Telecom Italia smart city concept

The Smart City services

From the City to the "Connected City" and from the Citizens to the "Connected *(to the city)* Citizens"

Telecom Italia is committed on all these services with commercial offering and/or innovation activities

Mobility

- Intelligent Transport Systems
- Integration of Public & Private Transportation
- Car Sharing
- Safety
- ….

Quality of Life

- Citizen participation and participatory sensing
- Smart Education
- Smart Government
- Safecity
- Social & sharing
- Tourism
- Intelligent building
- ….

Energy and Green

- Energy Efficiency
- Smart Grid
- Pollution Reduction
- Electric vehicles
- Water management
- Waste cycle optimization
- Smart Lighting
- Eco Buildings
- …..

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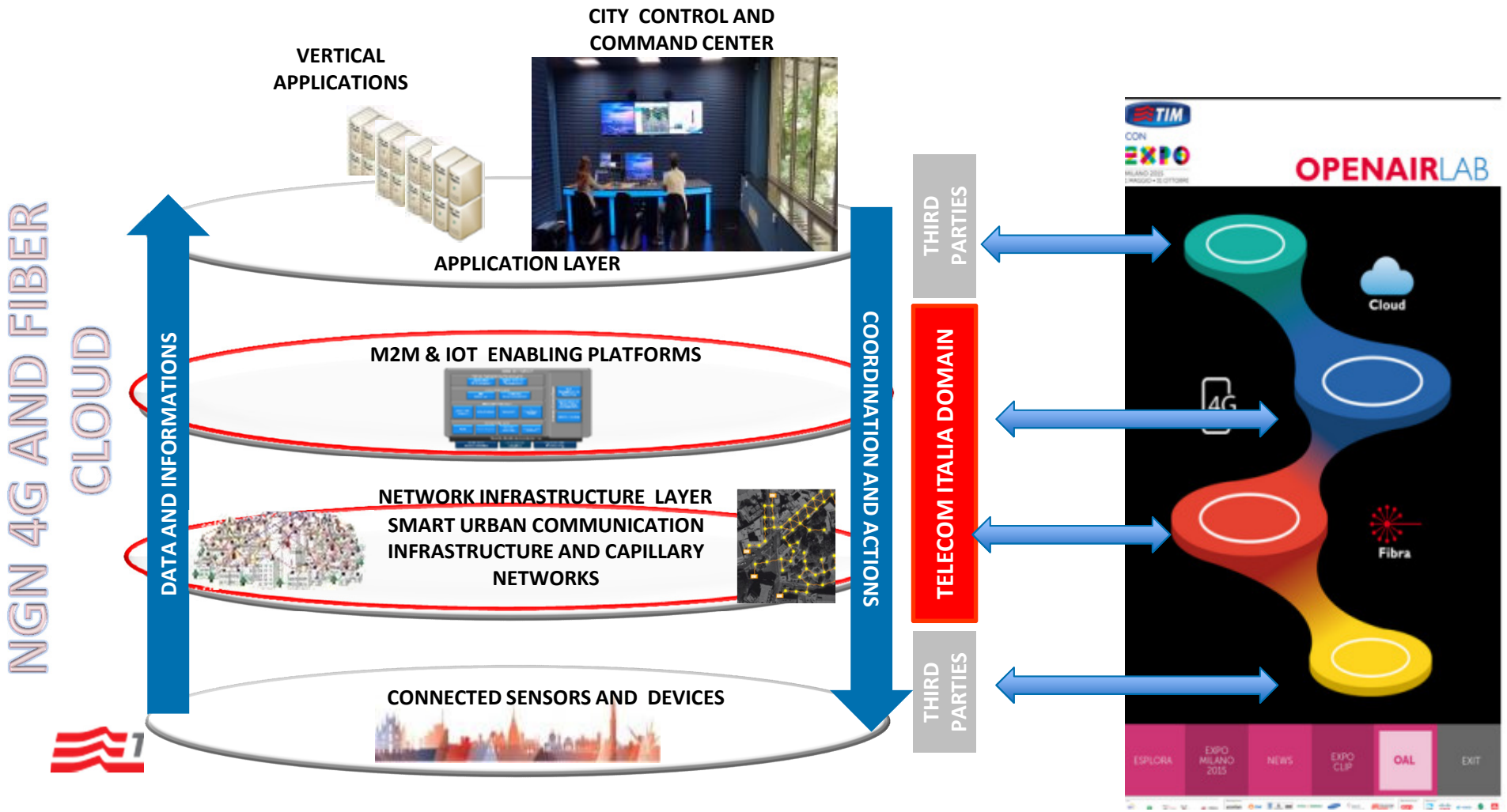
What is the Smart City (EC 2020 SETPLAN definition)

- The smart city definition used by Tilab is based on the EC SETPLAN2020 definition and in particular is referred to four service macro categories: Smart Mobility, Smart Energy, Quality of Life and the Connected City and the ICT platform.
- In the figure it is represented the Tilab Smart City ICT reference platform. In particular the Tilab focus is on layer 2, smart urban communication infrastructures based on capillary networks and on layer 3, Cloud, M2M Platform and Service Delivery Platforms. In house developments of these two layers have been done and evolutions are on going.



Smart Urban Network Infrastructure and the Almanac Capillary Networks

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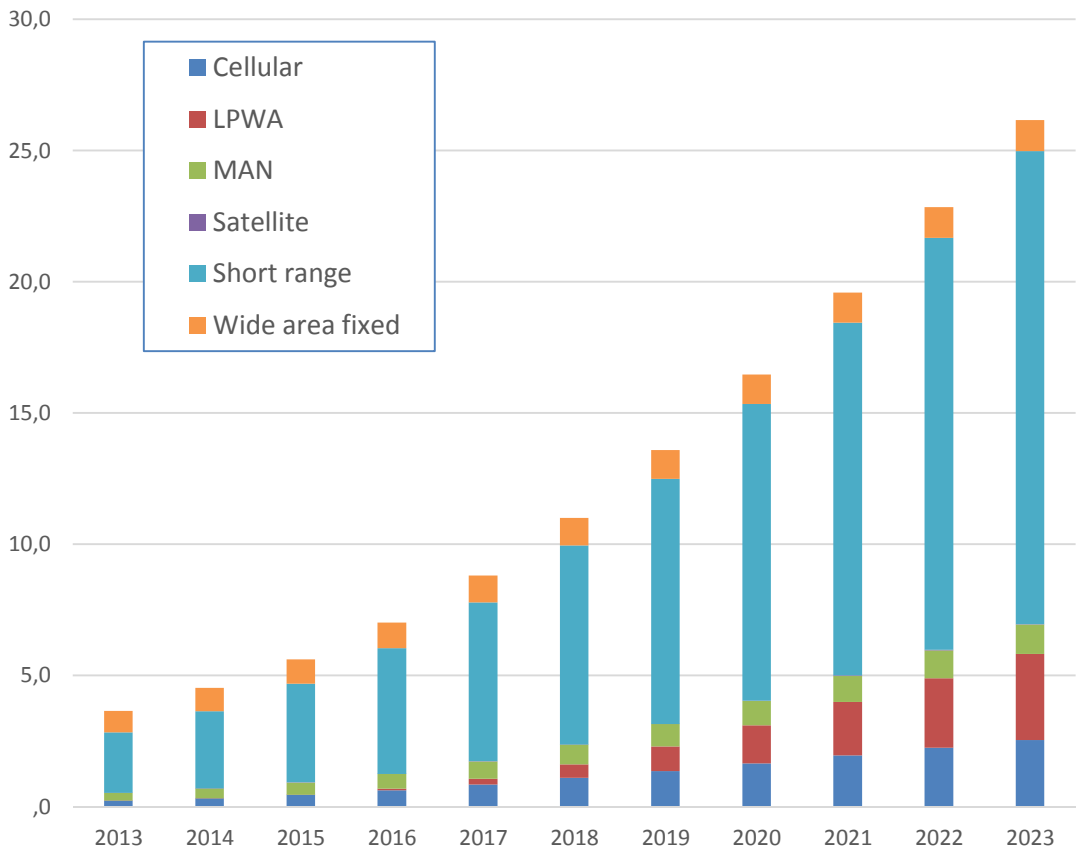
IoT: not only cellular



- **LPWA is set to have a significant impact**
  - **Sigfox EUR100 million funding**
  - **LoRa launch with key tech**
  - **Huawei bought Neul for USD25 million** – forms basis for Cellular IoT
- **Features:**
  - Low chipset costs
  - Out-of-the-box connectivity
  - Long battery life
  - High latency
  - Low bandwidth
- **Expected to grow to 3 billion devices in 2023**

Global machine-to-machine connections 2013-23
Source: Machina Research M2M Forecast Database, 2015

Radio Access for IoT

Current situation: 3GPP Vs. non 3GPP solutions

- From a very general point of view, **current** Radio Access Technologies for M2M wireless communication could be **grouped in 3GPP-based** and **non 3GPP-based** solutions**.** Each one is characterized by PROs and CONs.

The Power Consumption issue

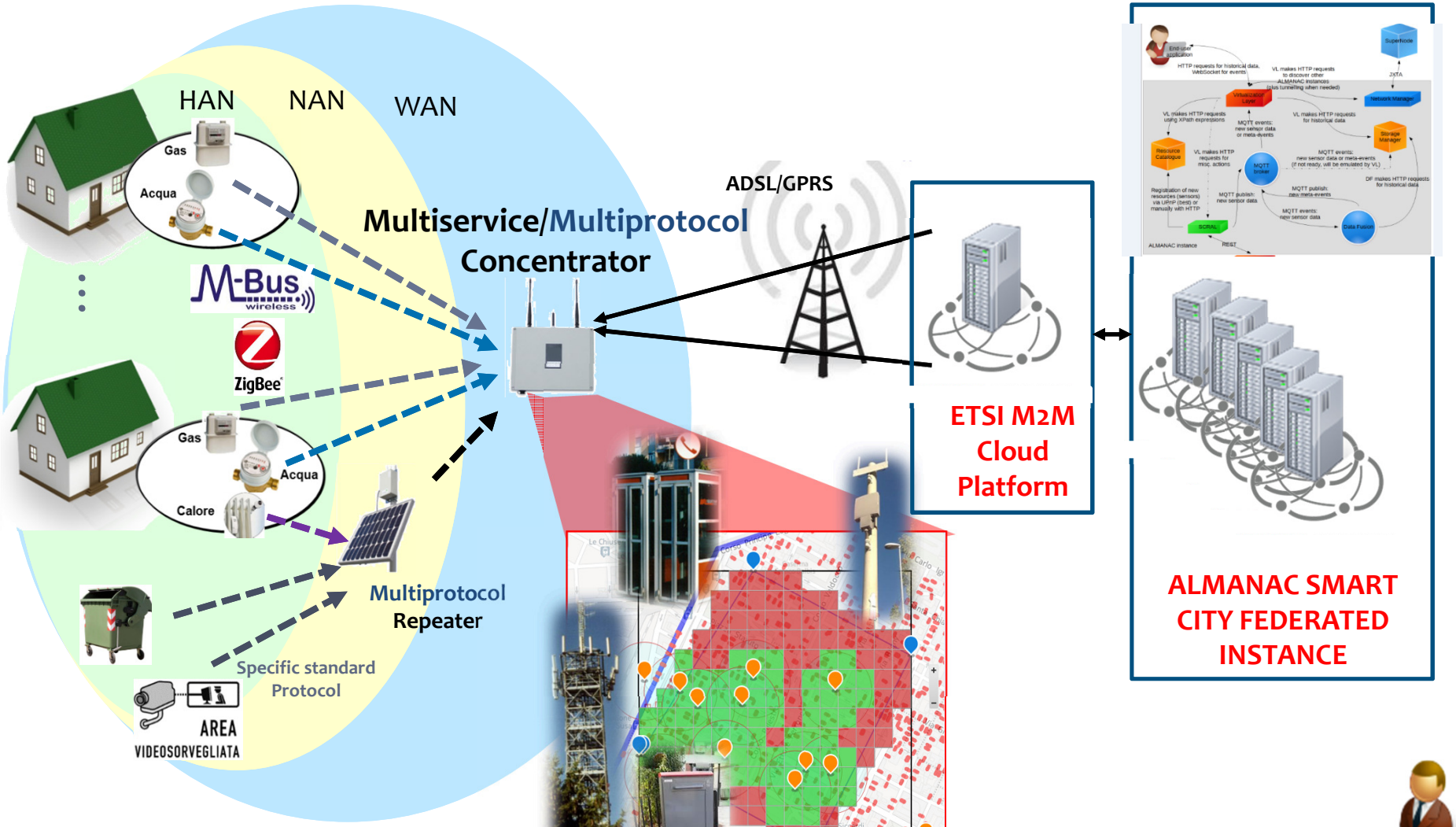
- ***To send a data packet of 1 Kb***

TECHNOLOGY	POWER CONSUMPTION
GPRS	22.64 J/day
868 MHZ	69 mJ/day
169 MHZ	84 mJ/day

Capillary Network

- ***GPRS power consumption is something like 260 times bigger !***

Zoom of the Capillary Network Architecture Integrated in ALMANAC Platform



The 169 MHz Frequency in EC (1/2)

- ***COMMISSION DECISION of 20 December 2005 on the harmonisation of the 169,4-169,8125 MHz - (2005/928/EC) - Official Journal of the European Union - 27.12.2005 based on CEPT frequency Plan for 169 MHZ:***
  - …..; (4) Meter reading systems used by water and electricity utility companies; ….
- ***CEPT (European Conference of Postal and Telecommunication Administration) : ERC Recommendation 70-03 – 2/2014 - Relating to the Use of Short Range Devices (SRD).***
- **ALMANAC Capillary is compliant with 169 MHZ specification !**

	Frequency Band	Power / Magnetic Field	Spectrum access and mitigation requirements	Channel spacing	ECC/ERC Decision	Notes
a	456.9-457.1 kHz	7 dBµA/m at 10 m	No requirement	Continuous wave (CW) – no modulation		Emergency detection of buried victims and valuable items. Note: Centre frequency is 457 kHz
b	169.400-169.475 MHz	500 mW e.r.p.	≤ 10% duty cycle	≤ 50 kHz	ECC/DEC/(05)02	Meter Reading. The frequency band is also identified in Annex 1

The 169 MHz Frequency in EC (2/2)

- ***So 169 MHZ is a Reserved Band (not licensed);***
- ***For Water Management CEPT is working also on 868 MHZ frequency band that is Free Band (not licensed and also not reserved) to assess if part of the band could be allocated for smart metering.***
- **Telecom Italia is monitoring the status of this work.**

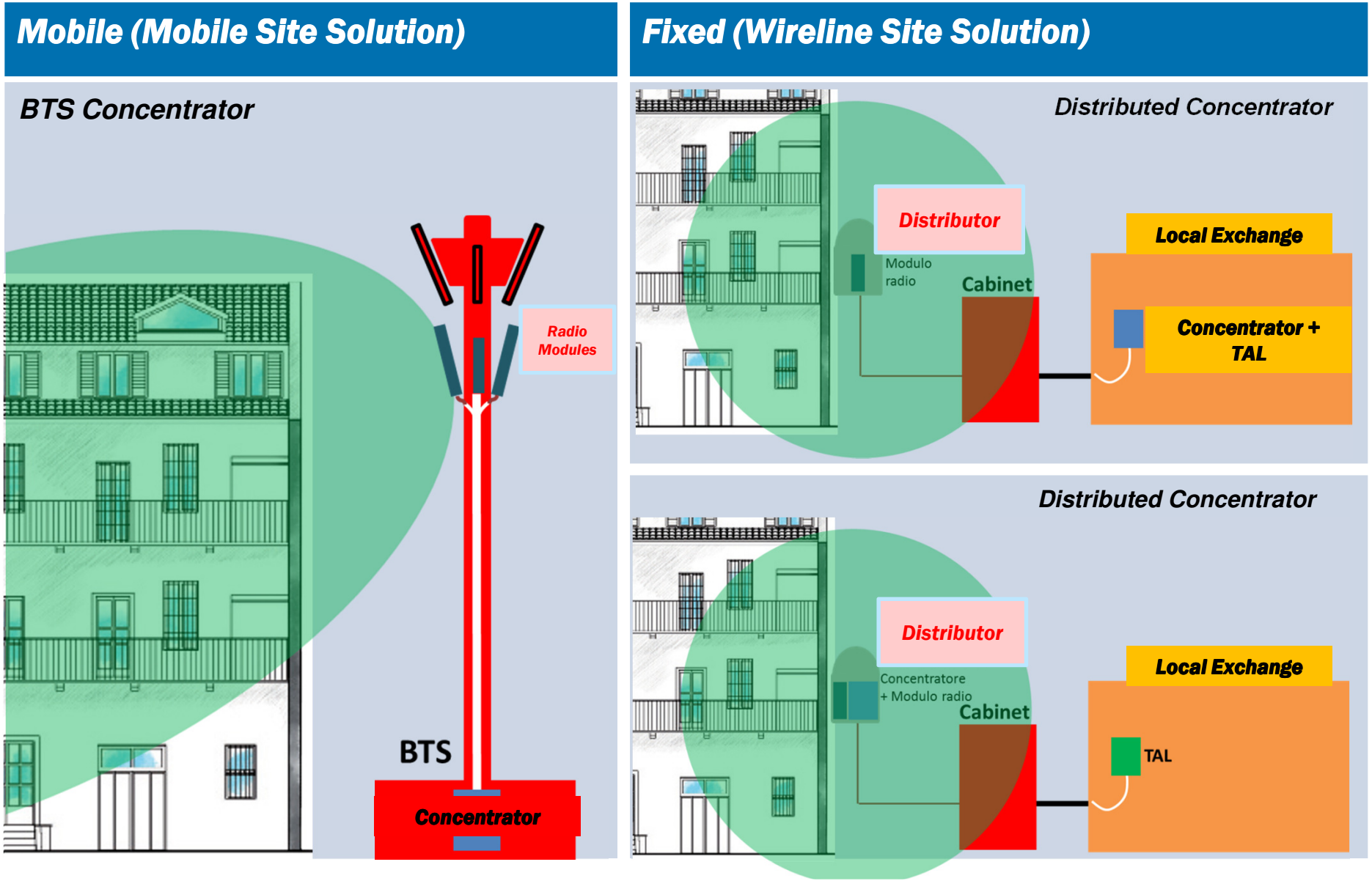
WMbus protocol

- ***EC Mandate 441 (M/441) to CEN/CENELEC/ETSI for Smart metering protocol standardization.***
- ***CENELEC in charge of standardization for electrical smart meters (Power Line based);***
- ***CEN in charge of standardization for battery powered smart meters:***
  - ***TC294 Committee -> delivered EN13757 standard specification in which EN13757 Part 4: Wireless meter readout - Radio meter reading for operation in SRD bands is WMBus standard.***

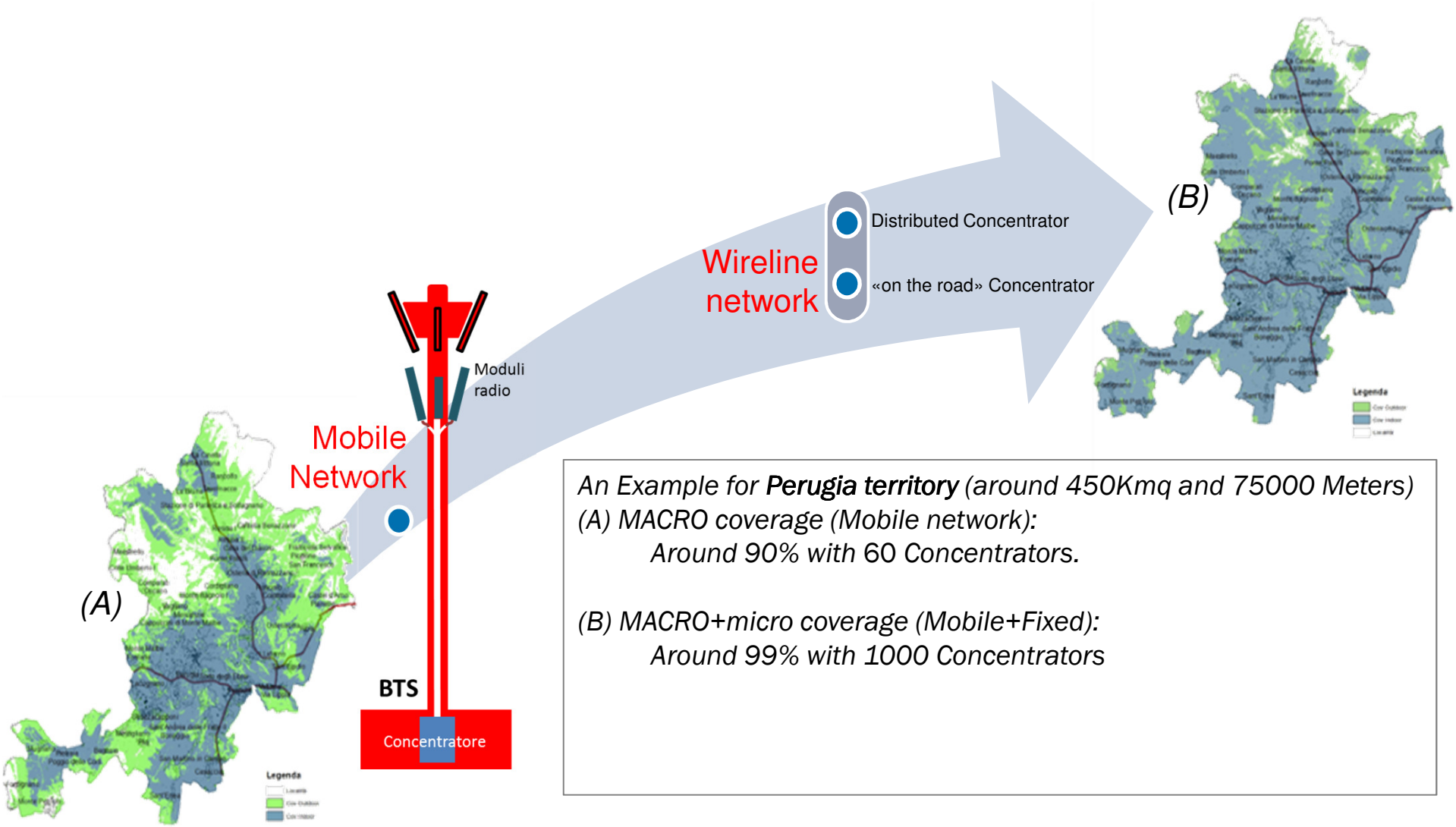
- **ALMANAC Capillary is Compliant with EN13757**

The Almanac Capillary Network Deployment

Capillary: studies for the deployment



The coverage issue



*An Example for **Perugia territory** (around 450Kmq and 75000 Meters)*
(A) MACRO coverage (Mobile network):
Around 90% with 60 Concentrators.

(B) MACRO+micro coverage (Mobile+Fixed):
Around 99% with 1000 Concentrators

Real installations

Real installations

Real installations

Other Concentrator installations PoCs

Distributed Concentrator – Module in house

Distributed Concentrator – Module RX/TX and antenna

Concentrator for «BTS» 4 antennas

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