

5G Enabling the Vehicular Communications Market (WWRF's ways forward on V2X)

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Wireless World Research Forum (WWRF)

ITU Workshop on Vehicle Communications and Automated Driving

Beijing, China

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Introduction of WWRF

- ❖ Vertical industries will thrive in 5G networks
- ❖ ITU's visions and requirements on 5G
- ❖ VIA at WWRF – A new platform to develop V2X technologies



WWRF (Wireless World Research Forum)

- Develop future vision of the wireless world
- Enable and facilitate the translation of the vision into reality
- Bring a wide range of parties together to identify and overcome significant roadblocks to the vision
- Inform and educate on trends and developments

- Global operation
- Covers every technical field of wireless communications and mobile networking
- Open to all
- Based on membership

70 member organizations



- Manufacturer
- Network operator
- Industry organization
- Academic institute
- Research organization



- Africa
- Americas
- Asia
- Europe

WWRF publications and activities

Recent white papers and books

- LTE Small Cell Enhancement
- User 2020 – a vision
- User perspectives on social networking
- Smart cities and ageing populations
- Cybersecurity for the Future Internet
- Mobile in Africa

Work in progress

- 5G Vision
- 5G Radio technologies
- Mobile in India



5G Huddle

October 13 & 14, 2015
Copenhagen, Denmark

WWRF #35 Meeting

October 14 & 16, 2015
Copenhagen, Denmark

WWRF #36 Meeting

May, 2016
Beijing, China



Outline

- ❖ Introduction of WWRF

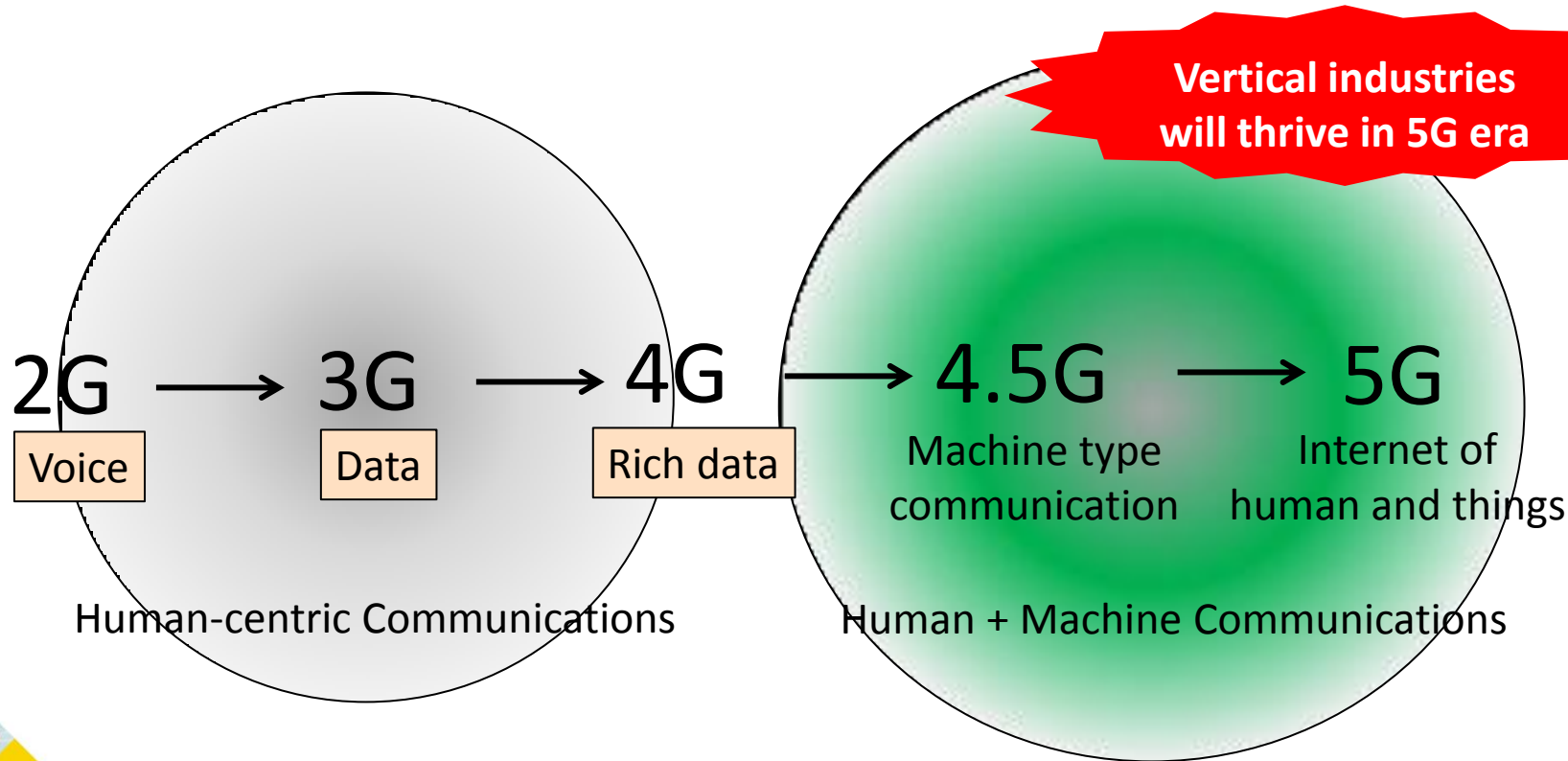
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- ❖ ITU's visions and requirements on 5G

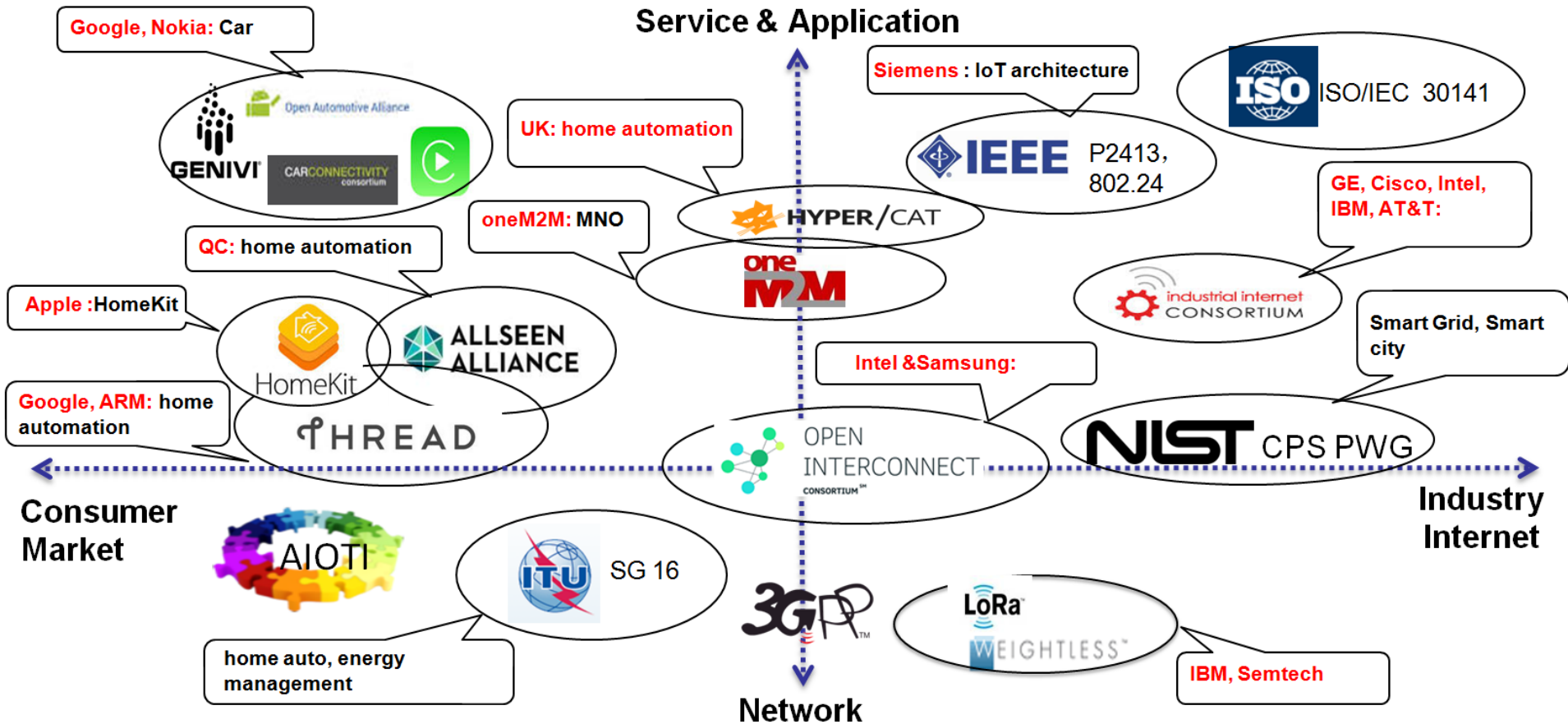
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5G: enabling internet of human and things



Organizations for vertical industries



Why bring verticals into telecom ?

- Maximize the value of the telecom networks
 - Monetize the telecom network → **Create new services**
 - Reuse the existing infrastructure as much as possible → **Environment-friendly**
 - Virtualization and resource sharing among different verticals → **Environment-friendly**



Telecom



Airport



Banking



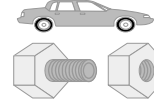
Construction



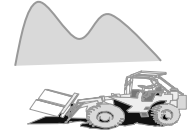
Food & Agriculture



Healthcare



Manufacturing



Mining



Retailer



Port & Shipping



Public Security



Oil & Gas



Transport

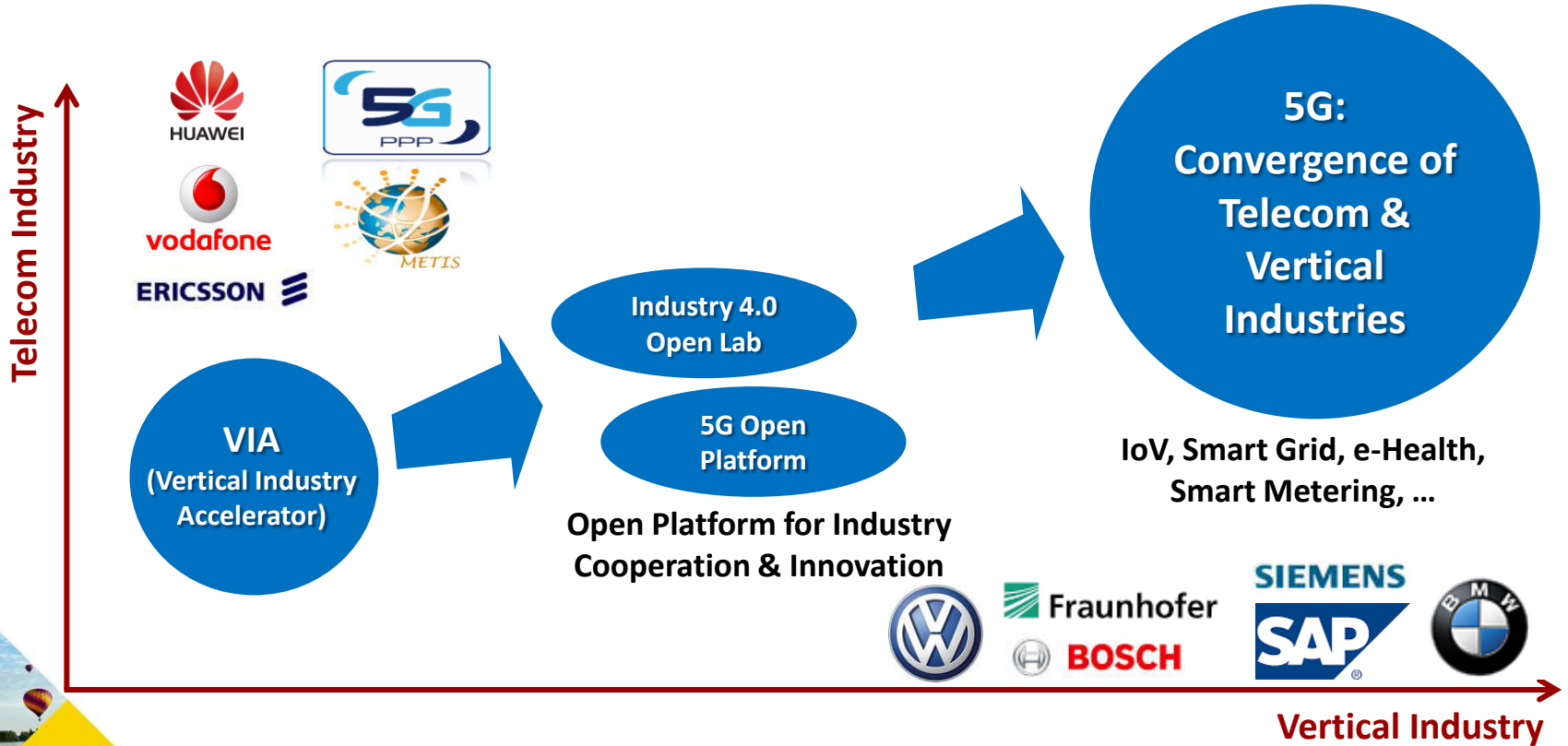


Water / Wastewater



Wearable

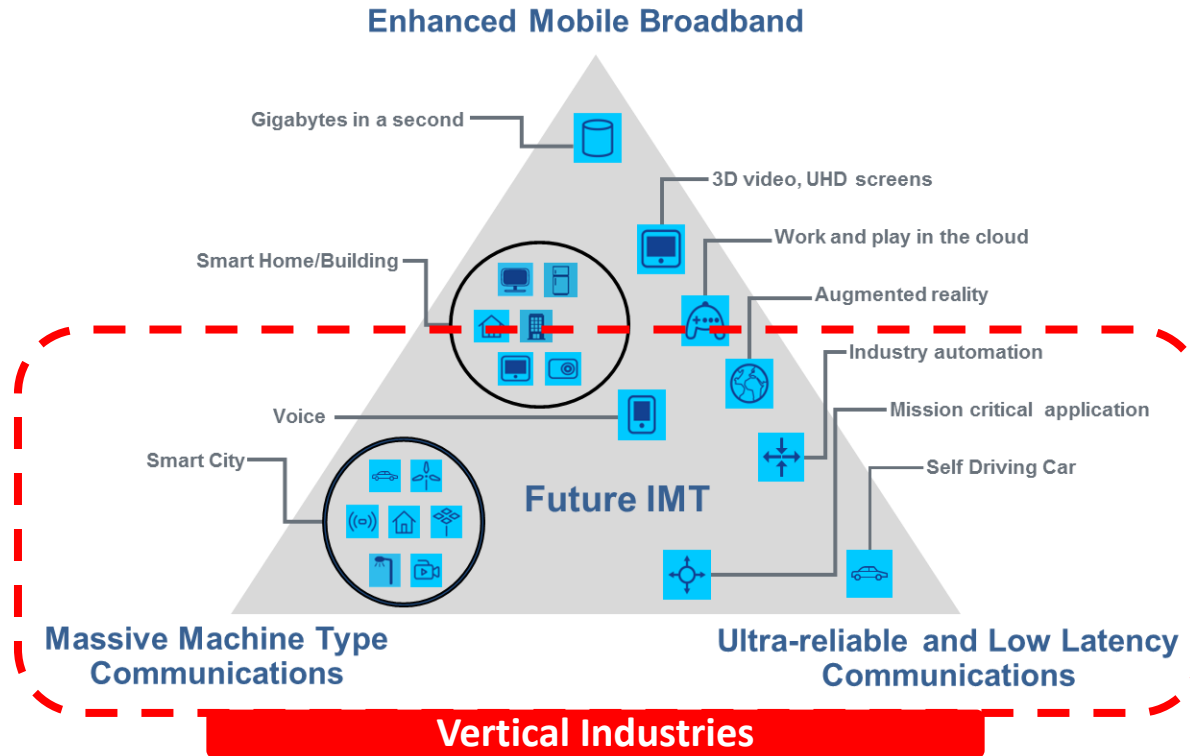
5G: convergence of telecom & vertical industries



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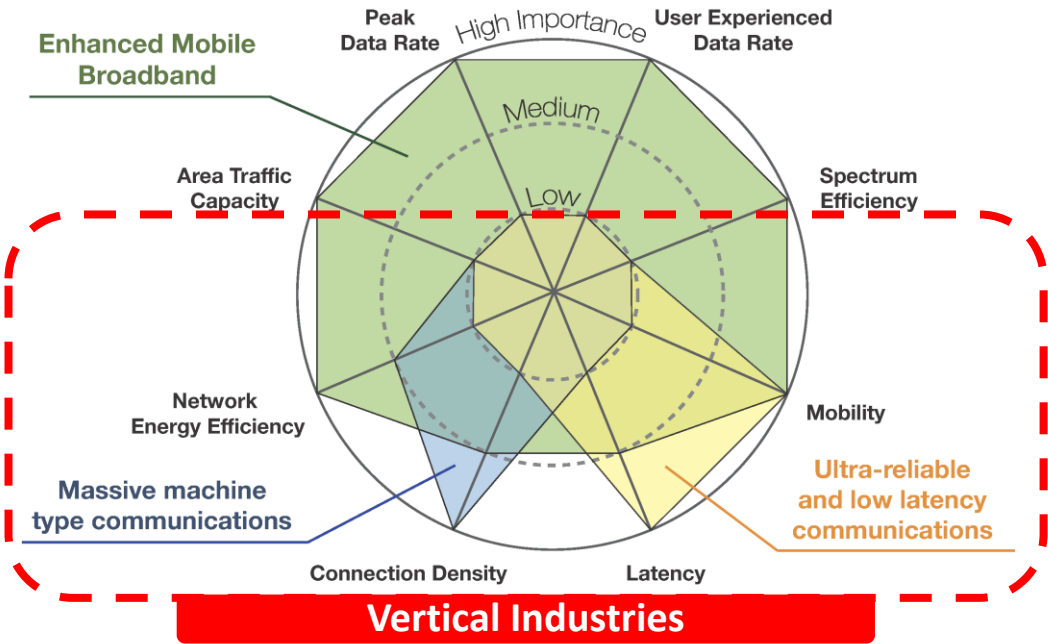
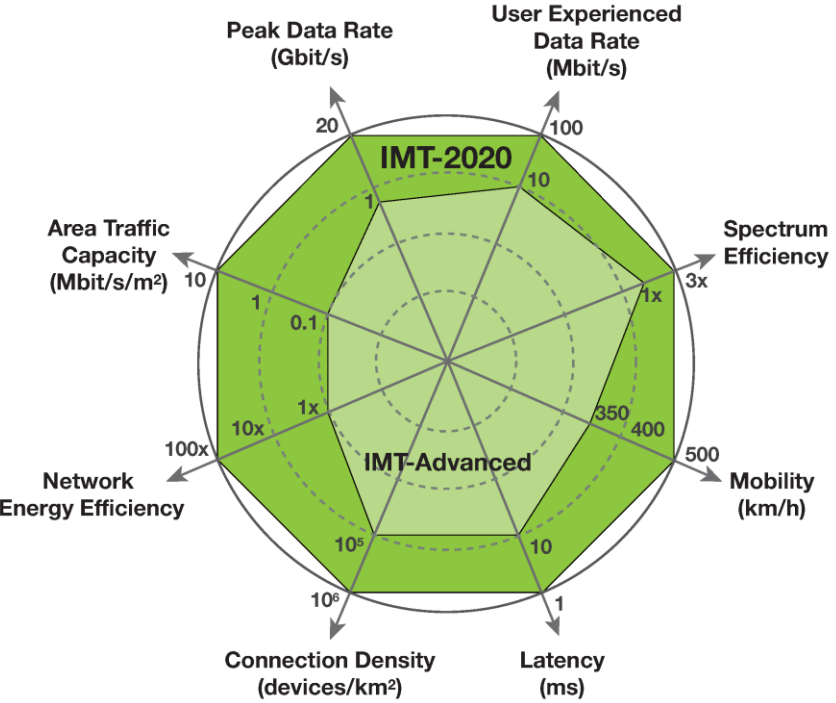


Source: Document 5D/TEMP/625-E, ITU 22nd Meeting of Working Party 5D, San Diego, USA, 10-18 June 2015

ITU's requirements on 5G (IMT-2020)

Enhancement of key capabilities from IMT-Advanced to IMT-2020

The importance of key capabilities in different usage scenarios



Source: Document 5D/TEMP/625-E, ITU 22nd Meeting of Working Party 5D, San Diego, USA, 10-18 June 2015

A lot of uncertainties in 5G vertical requirements

Tech Map of 5G Scenarios
(updated on 2015-05-25)

| Scenario | eMBB | | | MMC | URC | |
|----------------------------------|-----------------------------------|------------------------------------|-----------------------|----------------------------------|--|--------------------------|
| | Seamless Wide-Area Coverage | Hot-spot (high traffic density) | | | Tele-presence | V2X |
| Key applications | Very high performance data access | Ultra high performance data access | | Smart grid | Industrial control, tele-surgery, etc. | Safety of transportation |
| Mobile devices | Smartphones, wearables | Phablets, tablets, laptops | | Sensors, wearables | Machines | Vehicles |
| Requirements | | | | | | |
| Data rate (peak) | 10~20Gbps | 10~20Gbps | 10~20Gbps | 1K~1Mbps | 1K~1Mbps | 1K~1Mbps |
| Data rate (cell edge) | 100M~1Gbps | 100M~1Gbps | 100M~1Gbps | 1K~1Mbps | 1K~1Mbps | 1K~1Mbps |
| Area traffic capacity | 10Mbps/m ² | 10Mbps/m ² | 10Mbps/m ² | [[[?]]] | [[[?]]] | [[[?]]] |
| Latency (air interface) | <1~10ms | <1~10ms | <1~10ms | 1ms~hours | <1ms | <1ms |
| Coverage | Large | Small | Small | Very large | [[[?]]] | [[[?]]] |
| Power consumption (battery life) | 1 day ~ 1 week | 1 day ~ 1 week | 1 day ~ 1 week | < 10 years | [[[?]]] | [[[?]]] |
| Mobile speed | < 500km/h | [[[?]]] | [[[?]]] | [[[?]]] | [[[?]]] | [[[?]]] |
| Connection density | [[[?]]] | [[[?]]] | [[[?]]] | 10 ⁶ /km ² | [[[?]]] | [[[?]]] |
| Cell average spectrum efficiency | [3+]*(IMT-A) | [3+]*(IMT-A) | [3+]*(IMT-A) | [[[?]]] | [[[?]]] | [[[?]]] |
| Network energy efficiency | 100*(IMT-A) | 100*(IMT-A) | 100*(IMT-A) | [[[?]]] | [[[?]]] | [[[?]]] |

Vertical Industries

- ❖ Requirements for vertical industries (MMC, URC) are still vague
- ❖ That's where **VIA-WGs** come in

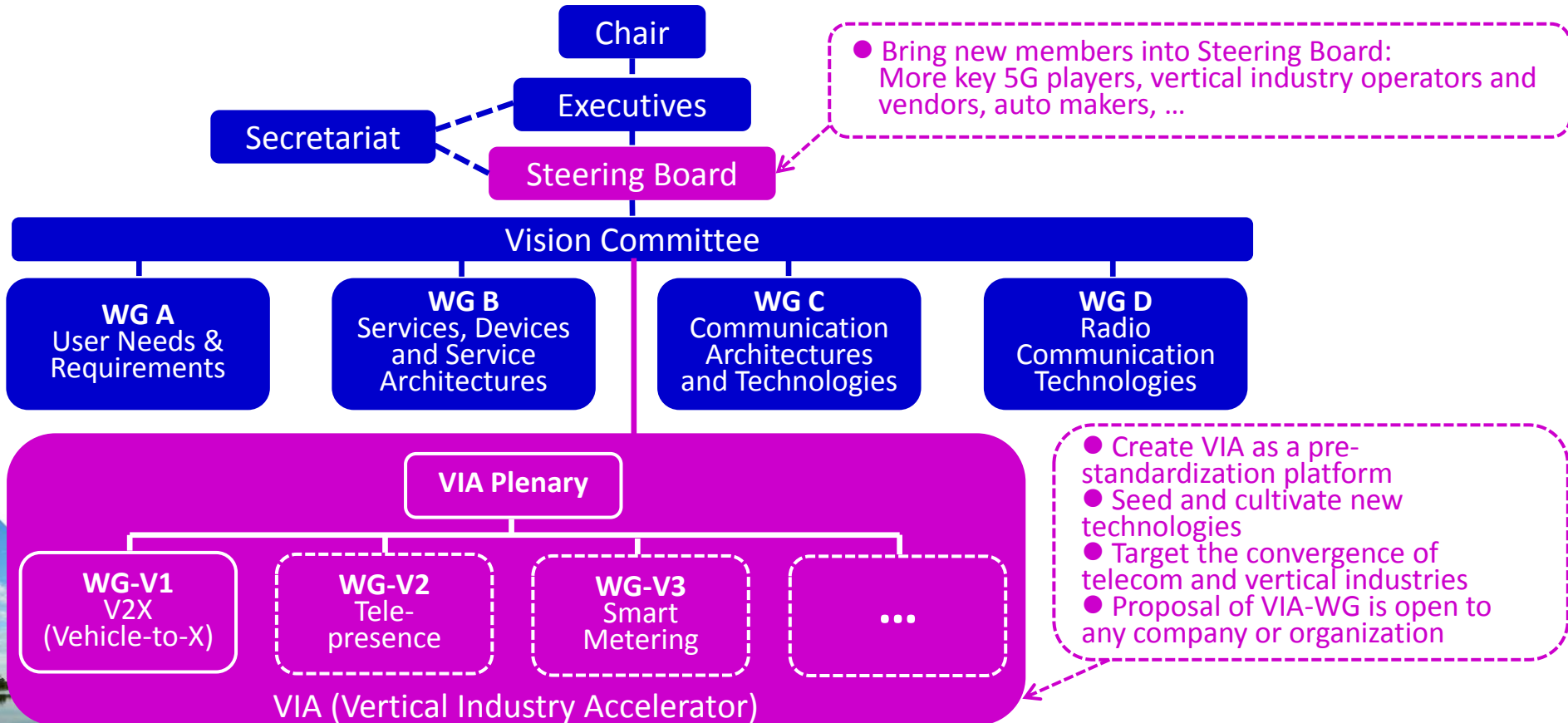
VIA-WG: Vertical Industry Accelerator — Working Group

Outline

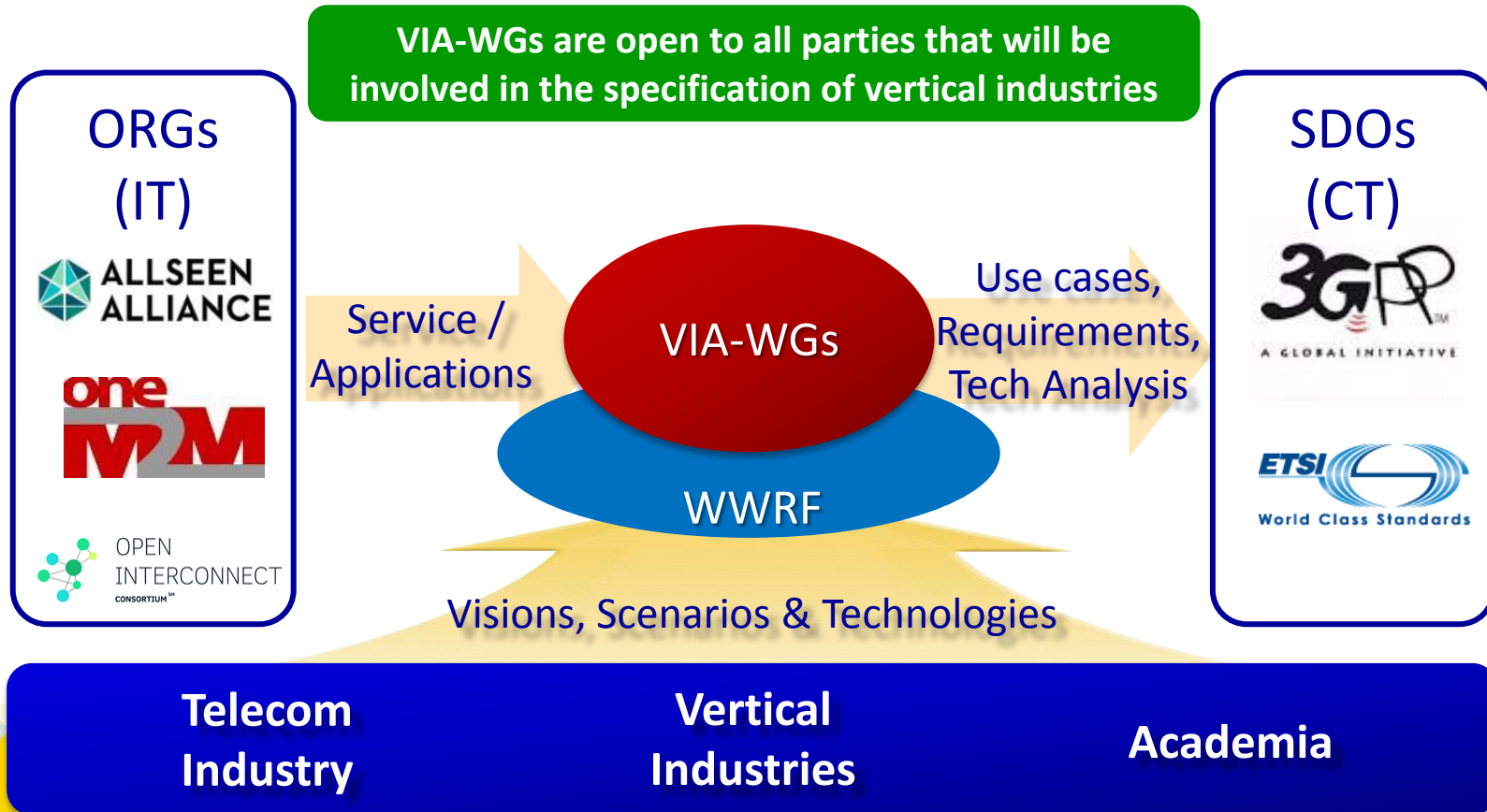
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VIA under construction in WWRF



Why VIA-WGs?



Why WWRF for VIA-WGs?

- WWRF is a **mature** international organization
 - Full-fledged charters and bylaws
 - Diversified members from both industry and academia
 - In a nutshell, **a platform with very good infrastructure !**
- WWRF would like to become a forum
 - where new ideas / concepts are announced to the world → **World leading forum**
 - where industry meets academia → **Pre-standardization platform**
 - where telecom industry meets vertical industry → **Convergence of horizontal and vertical**
 - where CT (communication tech) meets IT (information tech) → **Convergence of IT and CT**
- On this pre-standardization platform
 - The telecom and vertical industries need to sit down to talk
 - New scenarios, use cases, requirements and technologies need to be discussed
 - Consensus needs to be built
 - ...
 - Necessary preparation needs to be done before going to SDOs like 3GPP

V2X (vehicle-to-anything)

Self-driving car is **NOT** accident-free ...
(11 accidents in 6 years for Google's self-driving car)

An OS for cars ?



Safety of Transportation

Huge demands for data



V2X
(vehicle-to-anything)



Auto and telecom engineers have different knowledge sets

Auto Engineer:
What the heck is modulation, channel coding, TTI, ... ?

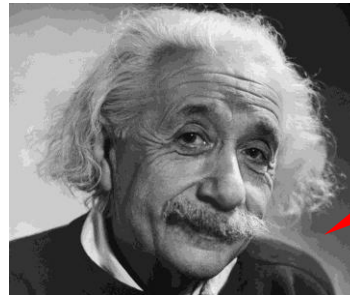


Telecom Engineer:
I don't understand the mechanics, radar or sensors built in the car.



V2X Project
How to pull it off ?

V2X: vehicle-to-anything
(vehicle, infrastructure, pedestrian, ...)



Professor:
I'm not familiar with either engineering or standard issues.

VIA-WG will bridge automotive and telecom industries

Auto Engineer:

The response time of auto-brake has to be less than 1ms to avoid crash.



Telecom Engineer:

Well, I think we can help by shortening the TTI to 0.1ms ...



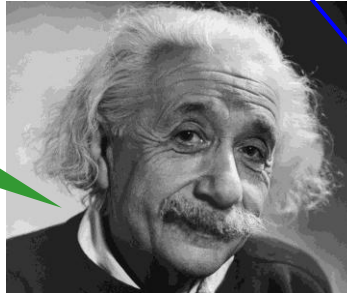
A GLOBAL INITIATIVE

Study Items
(scenarios, requirements,
tech trends)

VIA-WG
on
V2X

Professor:

Didn't you know that I have invented a ground-breaking technology?



VIA-WG

- Pre-standardization platform prior to SDOs
- Consensus building for different industries
- Sort out scenarios / requirements
- Boil down scenarios to technologies
- Seed & cultivate new technology
- Identify future trends

***Join us !
Thank you !***

<http://www.wwrf.ch/>

