European R&D on Communication Systems, what's next ?

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« Smart Networks and Services » Importance for Europe

Markets: *Close to € 300 billion for ICT telecommunications corresponding to 37 % of total ICT. About > 3% of EU GDP*

Jobs: 1,1 million direct jobs in the mobile ecosystem, 1,4 million indirect jobs

Growth: Enabler of growth in the services domain from the increasing cooperation with **vertical sectors,** 720 billion contribution expected in 2022, mostly due to improved productivity driven by continued adoption of M2M and IoT technology

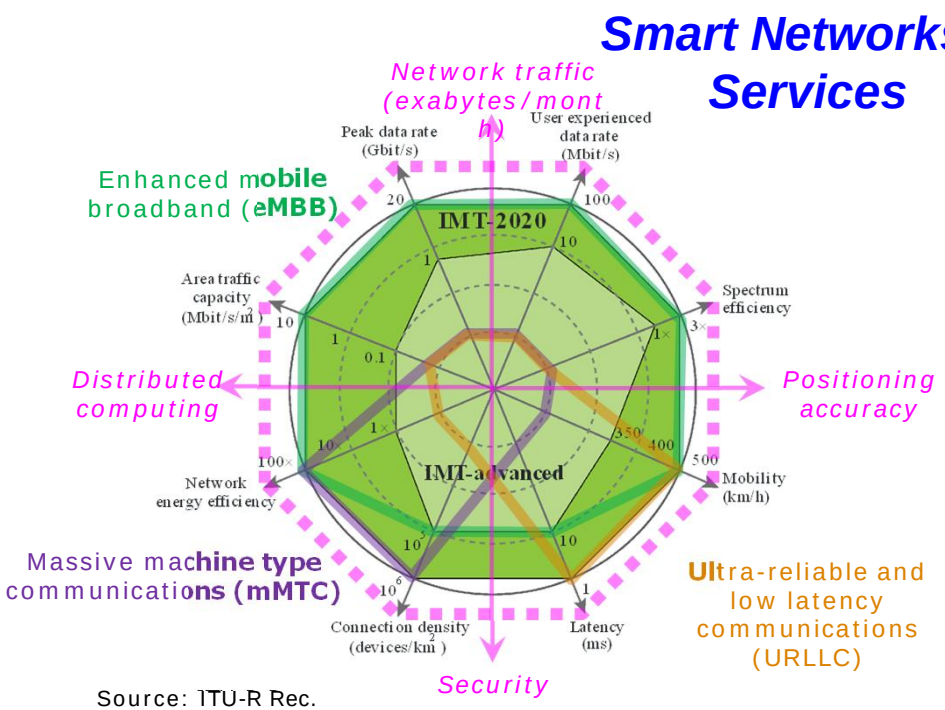
Digitisation: key Enabler of our policy objectives. Digital ecosystems are intimately coupled with connectivity platforms

Critical infrastructures: Networks value in a multiplicity of critical applications

Global Competitiveness: depends on how far we can respond to ambitious plans of other regions

Societal impacts: climate change, road fatalities….

5G Vision and focus Parameters: will they remain valid?



Source: ITU-R Rec. M.2083 (modified)

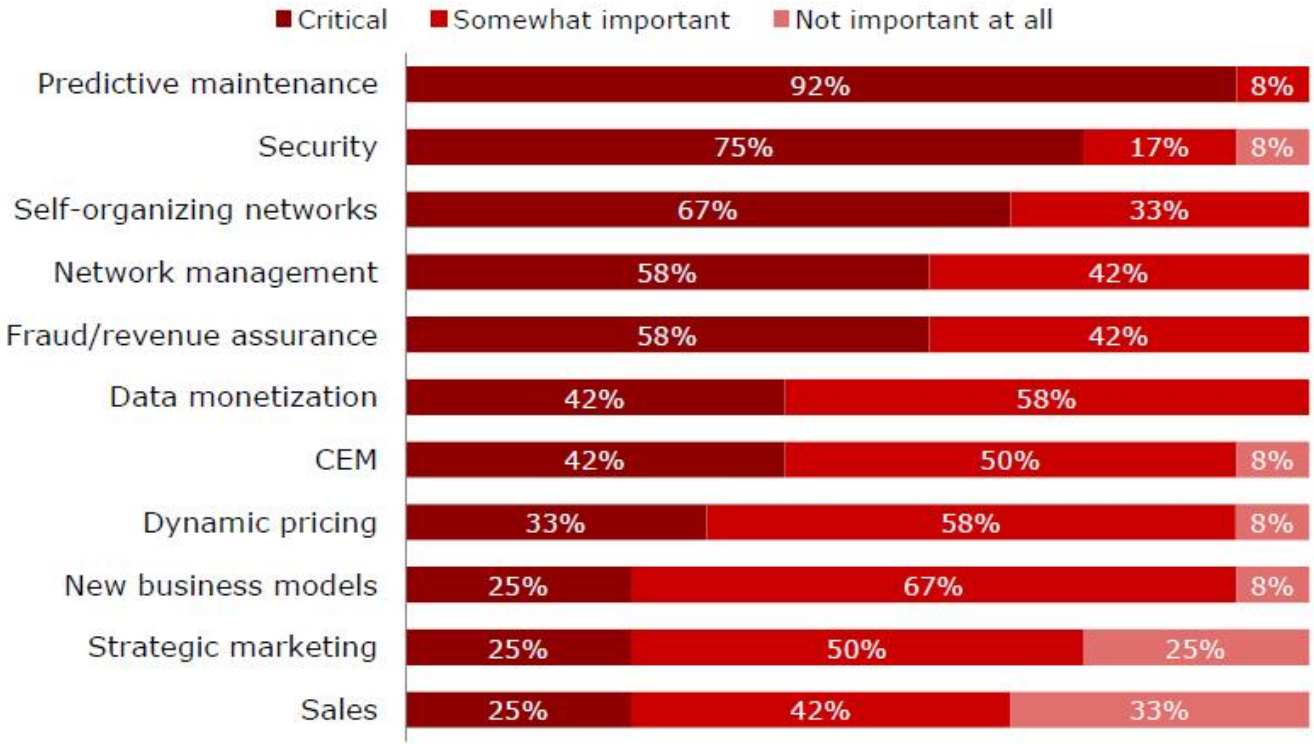
Use cases and drivers

- **Capacity, still 50% traffic increase/ year**
- **local applications, sub-ms latency**
- **Gbps availability, e.g XR applications**
- **Extreme reliability beyond 5x9;**
- **mMTC “everywhere “**
- **Extreme energy efficiency**
- **Very high security/trust**
- **Very high mobility**
- **cm-level localization**

What is (relatively) new in the toolbox?

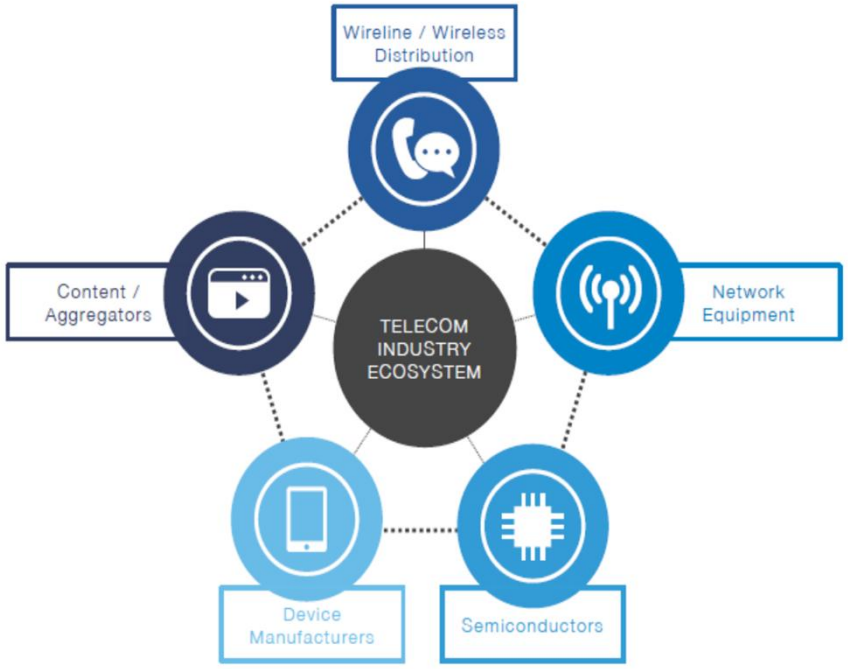
- « Zero latency » Internet, local data governance è Edge cloud-device convergence and integration
- Ultra high capacity, BW hungry applications (e.g. real time XR beyond 8K) è ultra high density, “lamppost connectivity”
- Ultra high capacity, spectrum efficiency/sharing è ultra high frequency spectrum, THz coms, FSO coms
- Waveforms??
- Cost efficiency, flexibility è more use of unlicensed bands
- lower capex, new actors, micro ops, neutral hosts è Pervasive SW and massive virtualisation, from NE to VF, towards cloud native
- Lower cost, busines model diversity è open/shared infrastructure, open source?
- Network automation, security, SON, è AI/ML, blockchains
- Low latency AI based apps è Network architecture for assisted AI

AI/ML Aspects



Heavy Readings sept 2018 AI in telecom networks

Some Change factors



Value:

- *Overall value of telecom services moved from 58% (2010) to 45 % (2018) of the ecosystem value (World Economic Forum)*

- Content aggregation, ***distribution and devices*** *moved in parallel from 29% to 40%*

Opportunities:

- IoT = new generation of devices

- Edge computing = new opportunities for data management and value creation

è Value chain approach, beyond 5G PPP

Risks…

Value Chain Approach: Smart Networks and Services

Target: **leverage connectivity to foster industrial developments across full value chain**

Business layer, business service/application requirements

Services: computing and storage, data analytics

Networks: numerous implementation scenarios, one versatile infrastructure

Mobile & Last Mile | High density access | Corporate nets | Indoor Short Range | Dense IoT | Fixed wired access

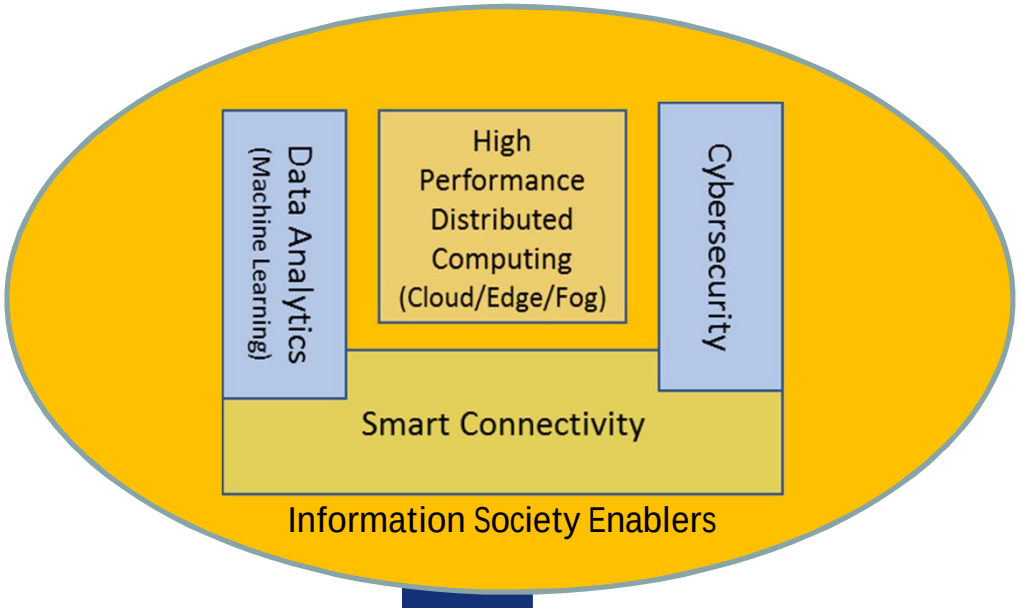
Devices: types of connected devices potentially unlimited

Industrial Automation | 360º VR/XR | Fully Automated Vehicles | Haptic Communications for surgery | Agri sensors | Smartphones | Computers | Drones

end to end resource management and energy efficiency

end to end Security and trust

The Smart Networks and services concept provides the necessary infrastructure and builds on scientific advances in the areas of physical and logical sciences as well as key enabling technologies to provide a coherent framework supporting the future networks and associated value chains designs. It includes a combination of Smart Connectivity, Data Analytics (AI and ML), high performance distributed computing and Cybersecurity



Key aspects: Vertical use cases & Human Centricity

An ICT continuum platform for multiple business models

- E.g., clouds, networks, IoT and data will enable multitudes of entities and devices to combine to form dynamic and intelligent collectives
- Will intelligently learn from the network environment and historic data, and dynamically adapt to a changing situation

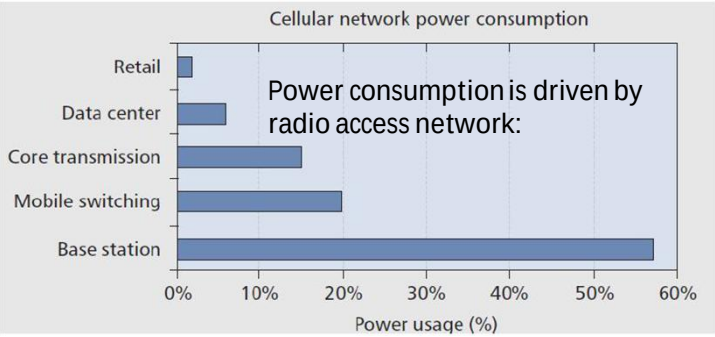
Supporting E2E Industries digital transformation

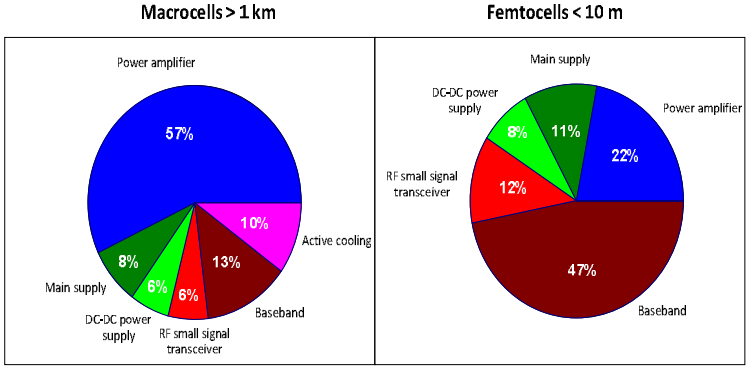
- Business models are changing and opening new opportunities
- Multiplicity of actors and interop requirements

Users want a greater level of control

- Going towards human-centric
  - E.g., be more transparent in interactions with digital services

Horizontal issue: Energy Efficiency



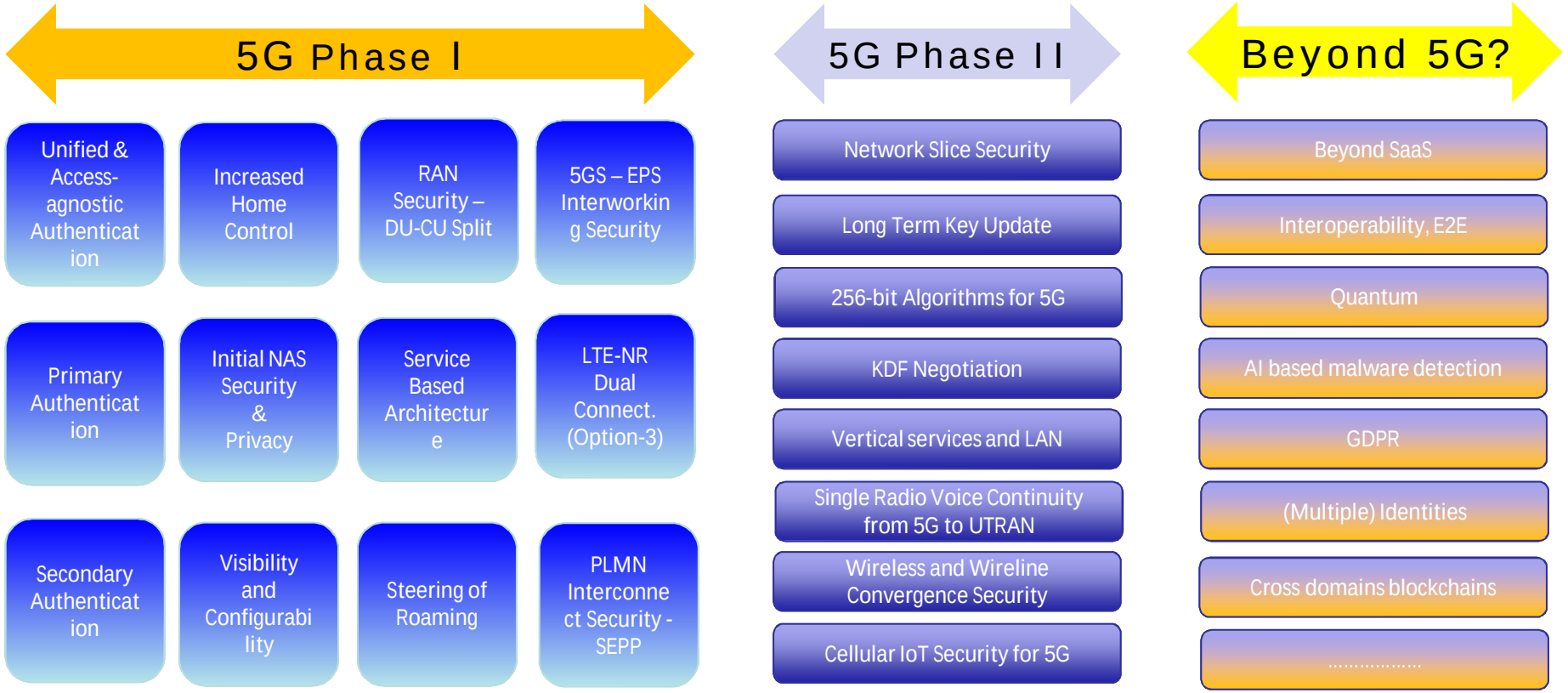


Moderate societal impact, but raising concern of operators

- Architecture dependent, an technological impact: Increasing carrier frequency will increase path loss and transmission power;
- Sleep mode limitations
- Optical, virtualisation, densification: parts of the solution

è Towards EE as part of the network management, « EFCAPS » + E2E integration

Horizontal issue: Security



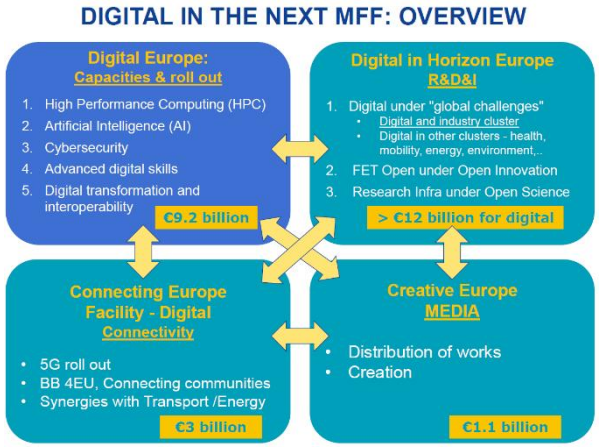
"Journal of ICT Standardization" *OpenAccess by River Publishers* Special issues on "5G non-standard aspects" and "3GPP 5G specifications"

Our approach: a Partnership under Horizon Europe (FP9)

- Budget proposal: **€97.6 billion**
- Three pillars to be financed

Open Science → Global Challenges → Open innovation

Includes successor of LEIT programme



Health (7.7 B€)	Inclusive and Secure Society (2.8 B€)	Digital Industry and Space (15 B€)	Climate, Energy and Mobility (15 B€)	Food and Natural Resources (10 B€)
Health throughout the life course	Democracy	Manufacturing technologies	Climate science and solutions	Environmental observation
Environmental and social health determinants	Cultural heritage	Digital technologies	Energy supply	Biodiversity and Natural capital
Non-communicable and rare diseases	Social and economic transformations	Advanced materials	Energy systems and grids	Agriculture, forestry and rural areas
Infectious diseases	Disaster-resilient societies	Artificial intelligence and robotics	Buildings and industrial facilities in energy transition	Sea and oceans
Tools, technologies and digital solutions for health and care	Protection and Security	Next generation internet	Communities and cities	Food systems
Health care systems	Cybersecurity	High performance computing and Big Data	competitiveness in transport	Bio-based innovation systems
		Circular industries	Clean transport and mobility	Circular systems
		Low carbon and clean industry	Smart mobility	
		Space	Energy Storage	

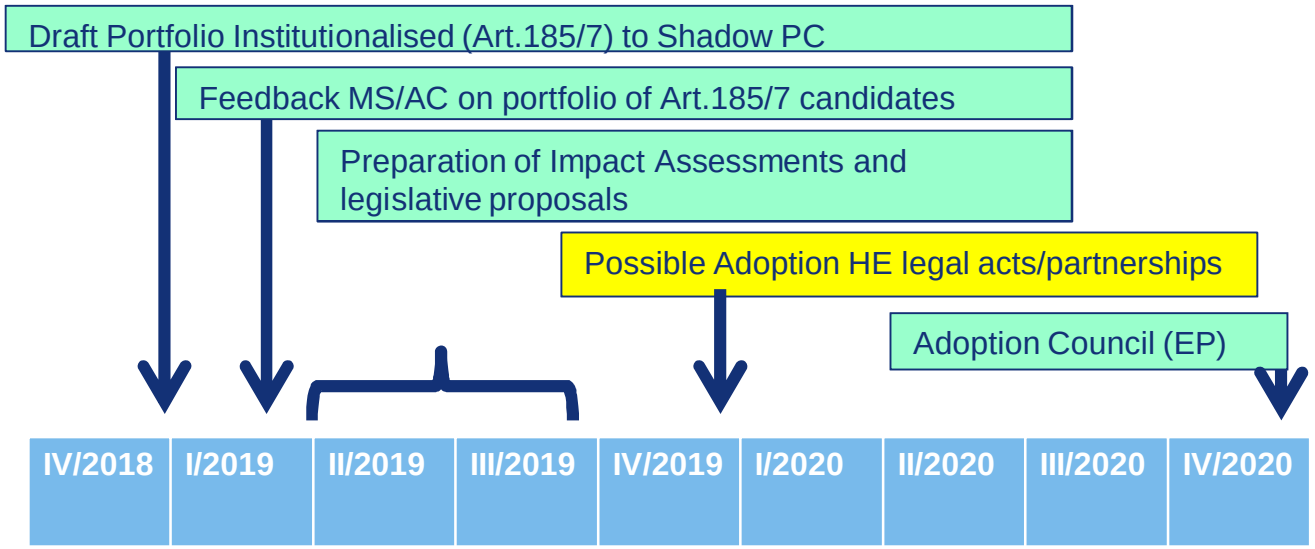
Pillar 2 Structure: Intervention Areas

Partnership, proposed Scope of activities

- Pillar 1: R&I challenges:
  - Smart Networks and Services Enabling Technologies and architectures
  - Includes IoT, Cloud, smart data and software-defined infrastructures
  - Large scale technology validation, synergies to capacity building actions in DEP
  - Building up on extended stakeholders SRIA
- Pillar 2: Deployment and capacity building of infrastructure for smart connectivity and associated services (focus on 5G Corridors for Connected and Automated Mobility) building on MS corridors support è Stakeholders Strategic Deployment Agenda

è European federating umbrella for Beyond5G

Indicative timeline European Partnerships



Thank you for your attention !