6 Challenges for 6G

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6G Flagship
6G ???
#1 Verticals Driving Development
Wireless connectivity is driving major societal changes:

1980s – 2000s
Millions of voice users

2010s
– 2020s
Billions of Mobile Broadband users

2020s – 2040s
Trillions of connected objects

Applications range explodes and new value chains emerge:

Logistics
Shopping
Agriculture
Industry 4.0
Health
Sustainable energy
Automotive & transportation

EC estimates of 5G in Europe by 2025: €113.1B revenue per year and 2.3M new jobs.
Enormous Societal Change Enabled by Wireless Connectivity

Example:
Japanese vision for Society 5.0:
- Savings in public expenditure
- Creation of new businesses
- Sustainable society

Disruptions needed for realisation:
- New wireless enabled technologies
- ICT legislation & regulation
- new value chains serving different verticals
#2 Network Architectures Change
Short range connectivity starts to dominate

1) Higher frequencies needed => the physics of radio signals propagation mean shorter link ranges
⇒ More basestations needed => **the role of short range connectivity** is drastically increasing.

2) Higher frequencies do not propagate through walls => **base stations must be installed indoors**
⇒ who does that and pays the bill?? => new value chains / business models needed.

3) Spectrum regulation has to enable **local frequency licencing** for the benefit of different verticals
⇒ Radio Spectrum Policy Group (RSPG) in European Commission is pushing this.
More variety in Networks Deployment

Wireless Infrastructure: A Heterogeneous Network

- Massive MIMO LTE-Pro and 5G
- Outdoor Small Cell
- Metro Core Network
- Metro Cell
- RRH
- MSC
- DAS Head-End
- Indoor DAS
- Mobile Backhaul

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Smart society calls for distributed AI.

AI solutions are driven by different verticals.

Whole system architecture is changing: basestation densification, mobile edge computing, fog computing at devices...

What AI/ML brings to wireless systems and what wireless connectivity offers to AI/ML based apps.
#3 New Value Chains Appear
Vertical Specific Service Providers – Micro-Operators (uO)

**uO concept:**

uOs build and operate indoor small cell networks and offer local context related services and content.

**Technical building blocks:**
- Dense small cell networks
- Network virtualization
- Mobile edge computing
- Slicing
- Operation in higher carrier frequencies
- Spectrum sharing and management techniques

**Regulatory building blocks:**
- Availability of 5G spectrum
- Local micro licenses
- Rights to build indoor networks
- Rules for collection and use of data
- Collaboration/competition rules with MNOs

**HUGE ECONOMIC GROWTH VIA FAST DIGITALIZATION OF SOCIETY ENABLED BY AGILE NEW PLAYERS IN THE ECOSYSTEM**

1. It’s about incentives investing locally in wireless connectivity and/or tailored local services.
2. It’s can be a new player, but also existing MNO given incentives to invest are there.
3. It can be either open (requiring national roaming) or closed (private) network.
#4 Connecting the Last Billions
Wireless Solutions for Sustainability

1. No Poverty
2. No Hunger
3. Good Health
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Renewable Energy
8. Good Jobs and Economic Growth
9. Innovation and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible Consumption
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace and Justice
17. Partnerships for the Goals

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Grand Challenges That Have Been Overlooked

How to solve **backhauling** in remote areas?
How remote area networks are **financed**?
How about emerging economies and **developing countries**?

**Spectrum regulation** in remote areas should be handled differently.

Could **uO model** solve some of the problems?---

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**NGMN Alliance launches new projects to boost 5G success**

*Updates on first 5G deployment experiences, further technology development and new business models to be shared at the NGMN Industry Conference in Vancouver, November 6-8, 2016*

**Frankfurt, GERMANY, June 18, 2018** – [Next Generation Mobile Networks](https://www.ngmn.org) (NGMN) has confirmed the launch of four new key projects to support the development and deployment of 5G networks.

The projects – “Spectrum and deployment efficiencies”, “Ultra Reliable Low Latency Communication (URLLC) requirements for vertical industries”, “RAN convergence” and “Extreme long-range communications for deep rural coverage” – have been highlighted as crucial development areas to further optimise and guide the telecoms industry towards the successful deployment of 5G beyond 2018.
#5 Autonomous Wireless Systems
Towards Fully Automated Society

Example of automation
#6 Major Technology Leap Required
6G Enabled Wireless Smart Society & Ecosystem (6Genesis)

National Flagship for 2018-2026

Volume 251M€

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Strategic Research Areas at 6G Flagship Launch

**Wireless Connectivity**
- Ultra-reliable low-latency communications
- Unmanned processes

**Distributed Computing**
- Mobile edge intelligence
- Time critical & trusted applications

**Devices & Circuit Technology**
- THz communications materials & circuits
- Unlimited connectivity

**Services and Applications**
- Multidisciplinary research across verticals
- Disruptive value networks
### Benefits to Partners

#### Brand usage
- Company visibility in all 6G Flagship marketing, upon agreement
- Web site visibility with category
- 6G Co-creator/Pioneer/Affiliate logo in company materials
- Key note/co-creator in annual conference, company talk/pioneer in seminars/workshops

#### RDI agenda
- Steering 6G Flagship agenda (Research, Development, Test Network)
- Defining research theme topics
- Propose new topics and projects

#### Access to resources
- Nominated key account managers for strategic partners
- Priority access to 6G Flagship premises and free access to VIP events
- Pre-access to all published results
- Assisted access to IPR
- Assisted access to 5G/6G experts
- Access to co-creation environments (5GTN etc.)

#### Finding partners
- Full access to profiled partner network
- VIP access to digital partnering service Fenix
- Company active part of partner service

#### Insight to future
- Company customised annual session
- 2 theme specific technology sessions for companies
- Invitation to special events
- Invitation and document delivery on public 6G events

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