6G NETWORKING:
MYTHS AND REALITIES

Contact: Sébastien Faye [sebastien.faye@list.lu]
6G Technology & Innovation Line manager

LUXEMBOURG
INSTITUTE OF SCIENCE
AND TECHNOLOGY | LIST

WHY DO WE NEED THESE GENERATIONS?
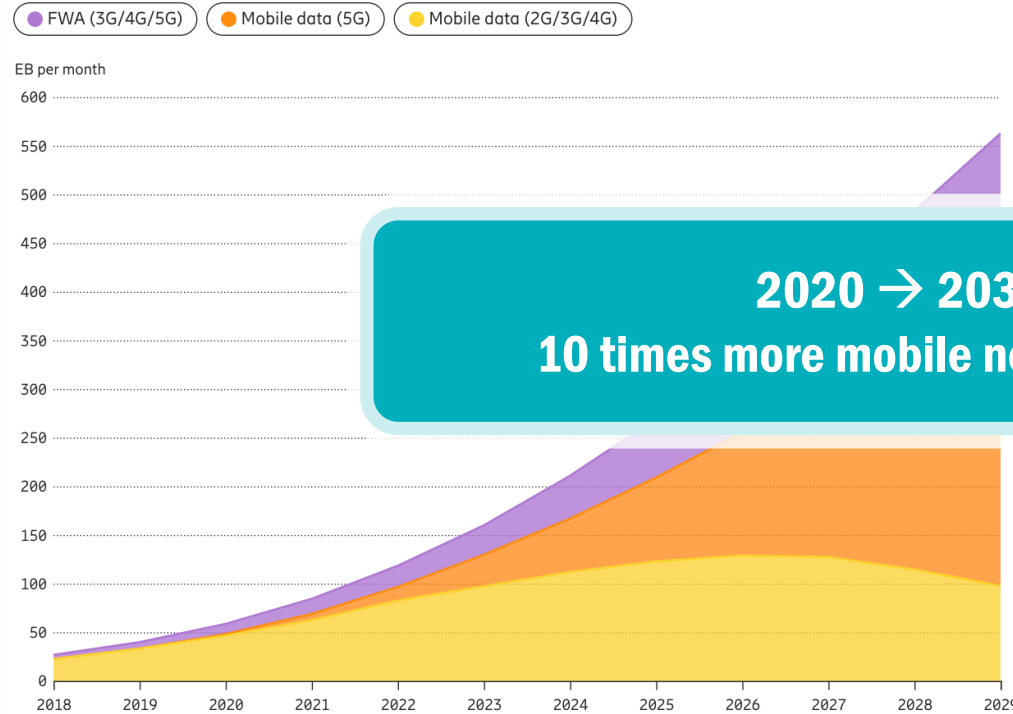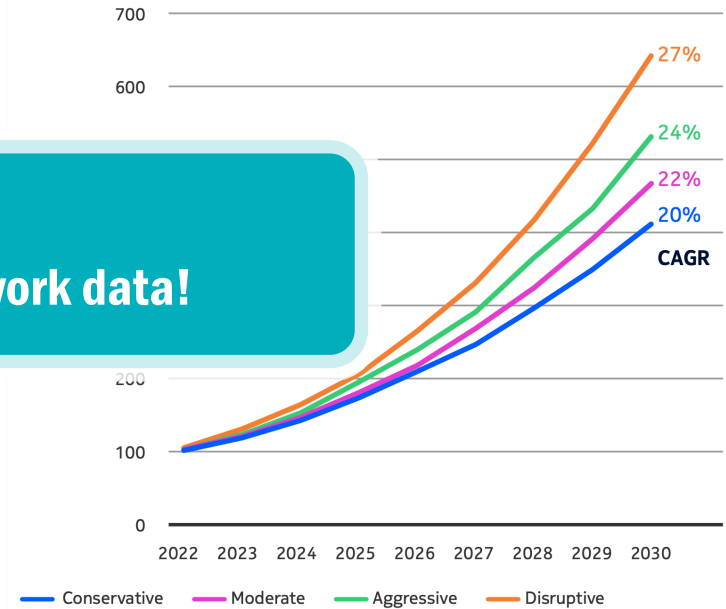

Figure 9: Global mobile network data traffic

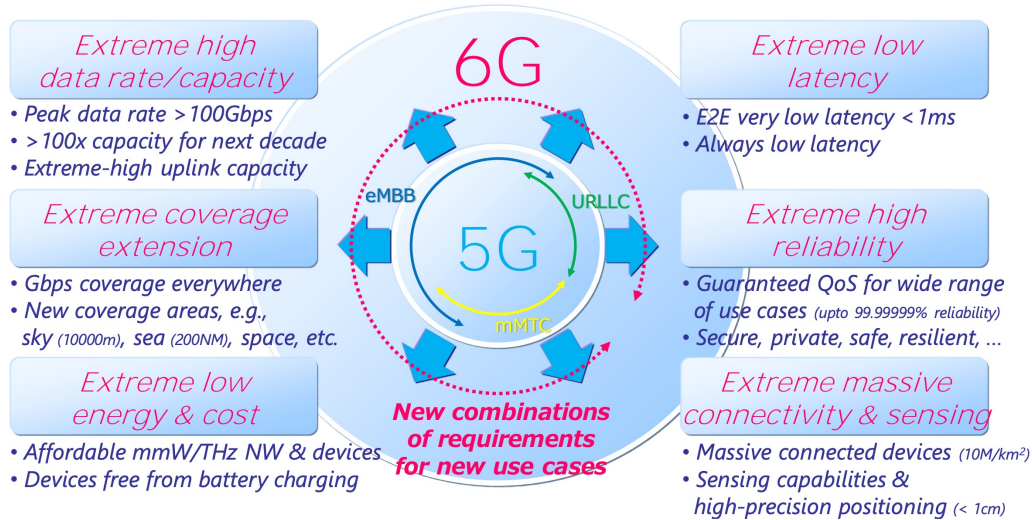- FWA (3G/4G/5G)
- Mobile data (5G)
- Mobile data (2G/3G/4G)

EB per month

2020 → 2030
10 times more mobile network data!

Figure 2. Global mobile data traffic and CAGR

27%
24%
22%
20%
CAGR

— Conservative — Moderate — Aggressive — Disruptive

WHAT IS 6G? OUR VISION

- **Extreme performances**:

Extreme high data rate/capacity
- Peak data rate >100Gbps
- >100x capacity for next decade
- Extreme-high uplink capacity

Extreme coverage extension
- Gbps coverage everywhere
- New coverage areas, e.g., sky (10000m), sea (200NM), space, etc.

Extreme low energy & cost
- Affordable mmW/THz NW & devices
- Devices free from battery charging

6G
5G
eMBB
URLLC
mMTC

New combinations of requirements for new use cases

Extreme low latency
- E2E very low latency <1ms
- Always low latency

Extreme high reliability
- Guaranteed QoS for wide range of use cases (upto 99.99999% reliability)
- Secure, private, safe, resilient, …

Extreme massive connectivity & sensing
- Massive connected devices (10M/km²)
- Sensing capabilities & high-precision positioning (< 1cm)

Source: NTT docomo

Source: Samsung

LUXEMBOURG
INSTITUTE OF SCIENCE
AND TECHNOLOGY
LIST
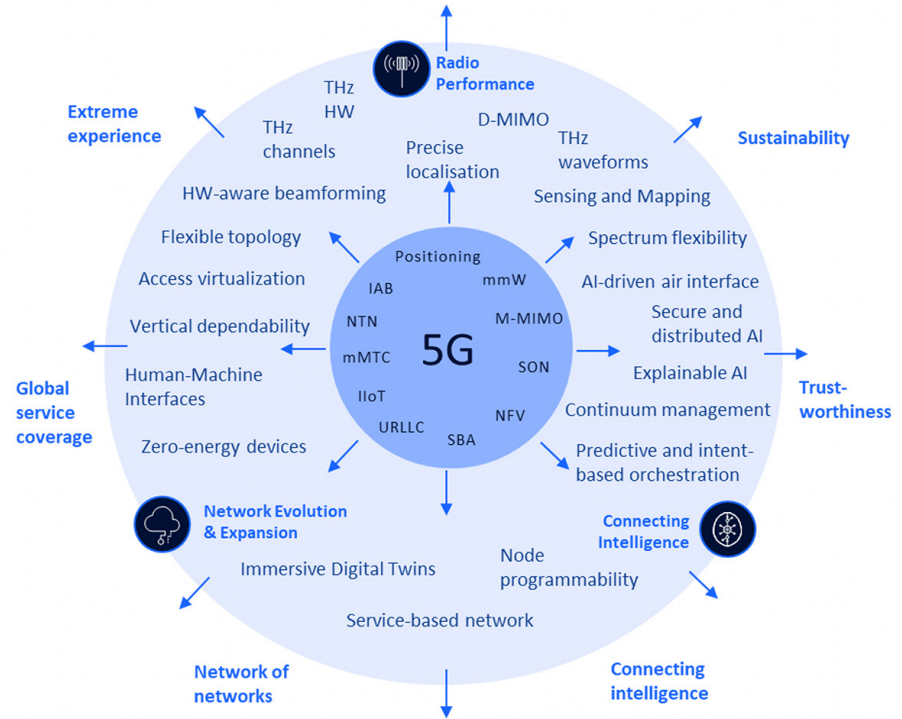
WHAT IS 6G? OUR VISION

6G is a set of technologies that go much further than pure networking. It includes three key components:

1. **AI-driven networking**
2. **Network of networks**
3. **Advanced applications and services**: holographic communications, XR, 3D networking, etc.

Source: Hexa-X

CHALLENGES AND OPPORTUNITIES

➢ Today's networks remain on relatively simple architectures that are designed to access content and are built for human end-users.

➢ Tomorrow's networks will increasingly be used for **machine-to-machine applications** (e.g., IoT, V2X) and will implement **complex system architectures**.

➢ Other challenges: **business cases & awareness**?

Hans Vestberg, former CEO Ericsson & current CEO of Verizon: *"We started to design 3G when the Internet **wasn't even truly around**; and we started to design 4G when the smart phone **wasn't invented yet**."*
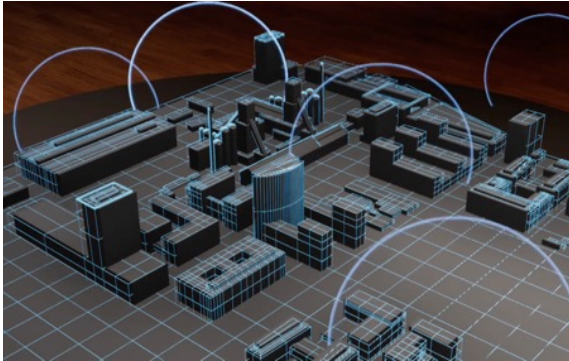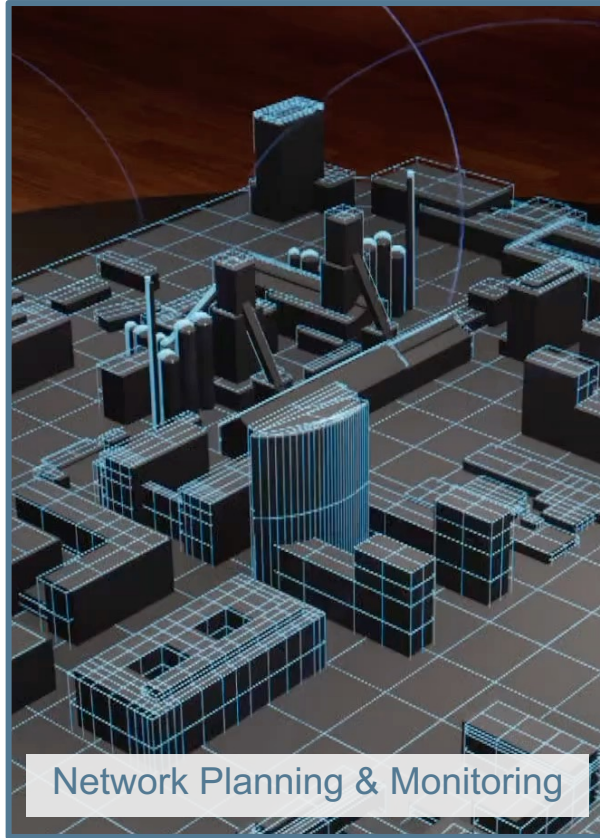
COMBO PROJECT

REMOTE CONTROL LIVE EXPERIMENTATION OF A ROBOT USING 5G TECHNOLOGIES

OPPORTUNITIES AND CHALLENGES

Virtual & augmented reality

Network Planning & Monitoring

Connected & Automated Mobility

And much more: Industry 4.0, Agriculture, Energy, …

HOW ABOUT RESEARCH?

6G TWIN

11 partners from 8 Member States
or associated Member States

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST

Politecnico di Bari

imec

uB UNIVERSITÉ DE BOURGOGNE

TECHNISCHE UNIVERSITÄT DRESDEN

ubiwhere

A(celleran

R2M SOLUTION
RESEARCH TO MARKET

ERICSSON

telindus

VIAVI

European Commission

6GSNS

Horizon Europe Framework; 2024-2027; € 4m

HOW ABOUT RESEARCH?

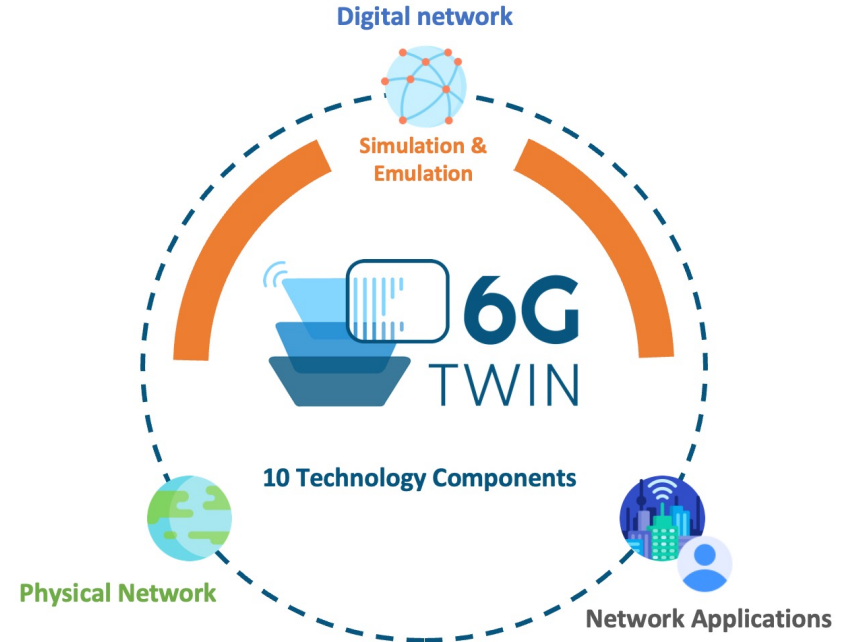- Network simulation and planning

- Network operation and management

- Data generation by simulation

- AI training and inference

- What-If analysis

Digital network

Simulation & Emulation

6G TWIN

10 Technology Components

Physical Network

Network Applications

[1] X. Lin, L. Kundu, C. Dick, E. Obiodu, T. Mostak and M. Flaxman, "6G Digital Twin Networks: From Theory to Practice," in IEEE Communications Magazine, vol. 61, no. 11, pp. 72-78, November 2023, doi: 10.1109/MCOM.001.2200830.

LUXEMBOURG
INSTITUTE OF SCIENCE
AND TECHNOLOGY | LIST

THANK YOU!

6g-twin.eu

@6Gtwin

6G-TWIN

Sébastien Faye
[sebastien.faye@list.lu]
6G Technology & Innovation Line manager

LUXEMBOURG
INSTITUTE OF SCIENCE
AND TECHNOLOGY

LIST