TNO innovation for life

ETSI F5G USE CASES

ETSI
The Standards People

CCSA

F5G JOINT WORKSHOP ETSI AND CCSA

9 NOVEMBER 2022

TEUN VAN DER VEEN| SENIOR CONSULTANT | TNO ICT

Photo by fiercewireless.com

TNO

REVENUE ORGANISATION TNO (INCL. GOVERNMENT GRANT)

540.1 MILLION EURO

- GOVERNMENT GRANT — 48%
- MARKET AND GOVERNMENT SALES — 52%

+1%
534.5 MILLION EURO 2019
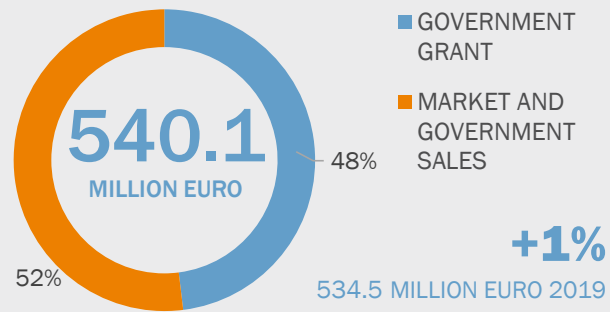
NUMBER OF EMPLOYEES

3,562 TOTAL

3,431 2019

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- HEALTHY LIVING — 'Promoting healthy working and living'
- TRAFFIC & TRANSPORT — 'Making livable and sustainable cities a reality'
- INFORMATION & COMMUNICATION TECHNOLOGY — 'Charting and accelerating the digital transformation'
- ARTIFICIAL INTELLIGENCE — 'AI Technology and Applications'
- DEFENCE, SAFETY & SECURITY — 'We're putting our knowledge and technology to work for safety and security'
- ENERGY TRANSITION — 'Accelerating the Energy Transition'
- INDUSTRY — 'Innovating for employment, prosperity and well-being'
- BUILDINGS, INFRASTRUCTURE & MARITIME — 'Robust constructions, sustainable use'
- CIRCULAR ECONOMY & ENVIRONMENT — 'Directing and accelerating sustainability'
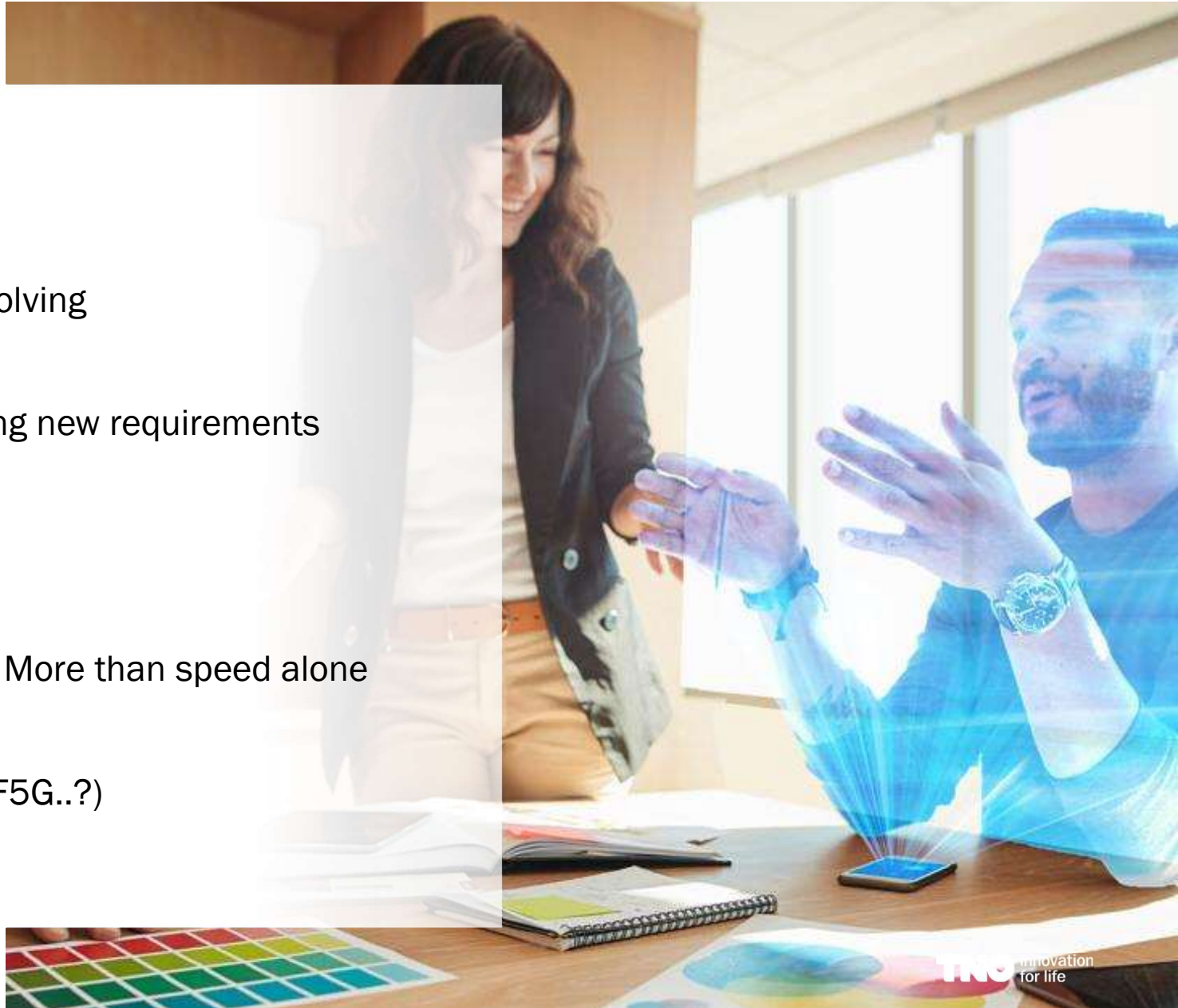- STRATEGIC ANALYSIS & POLICY — 'Turning complex issues into sustainable innovations'

› TNO is an **independent research organisation** in The Netherlands that focuses on applied science
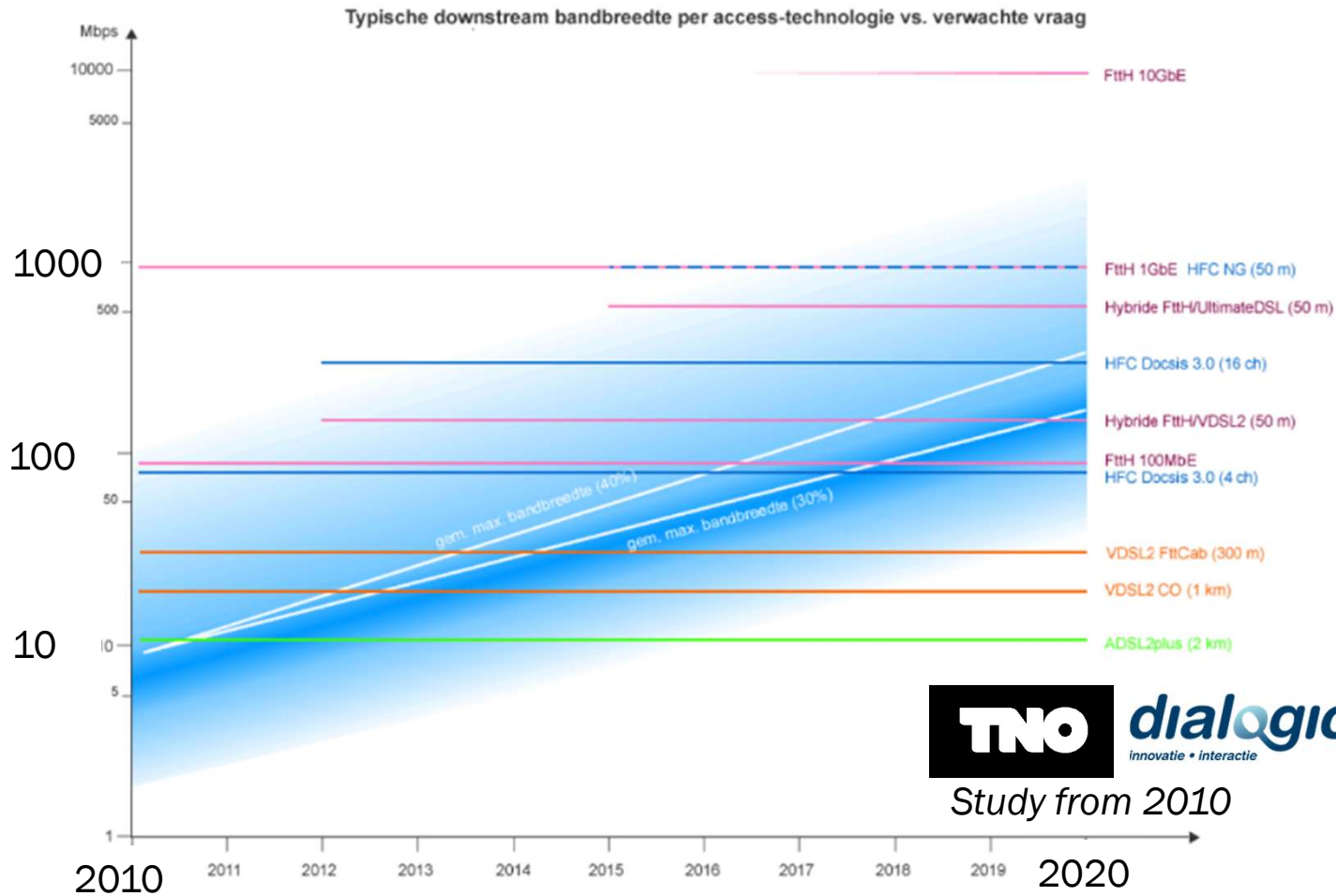
CONTENT

DRIVERS FOR NETWORK EVOLUTION
BANDWIDTH DEMAND IMPORTANT DRIVER

Typische downstream bandbreedte per access-technologie vs. verwachte vraag
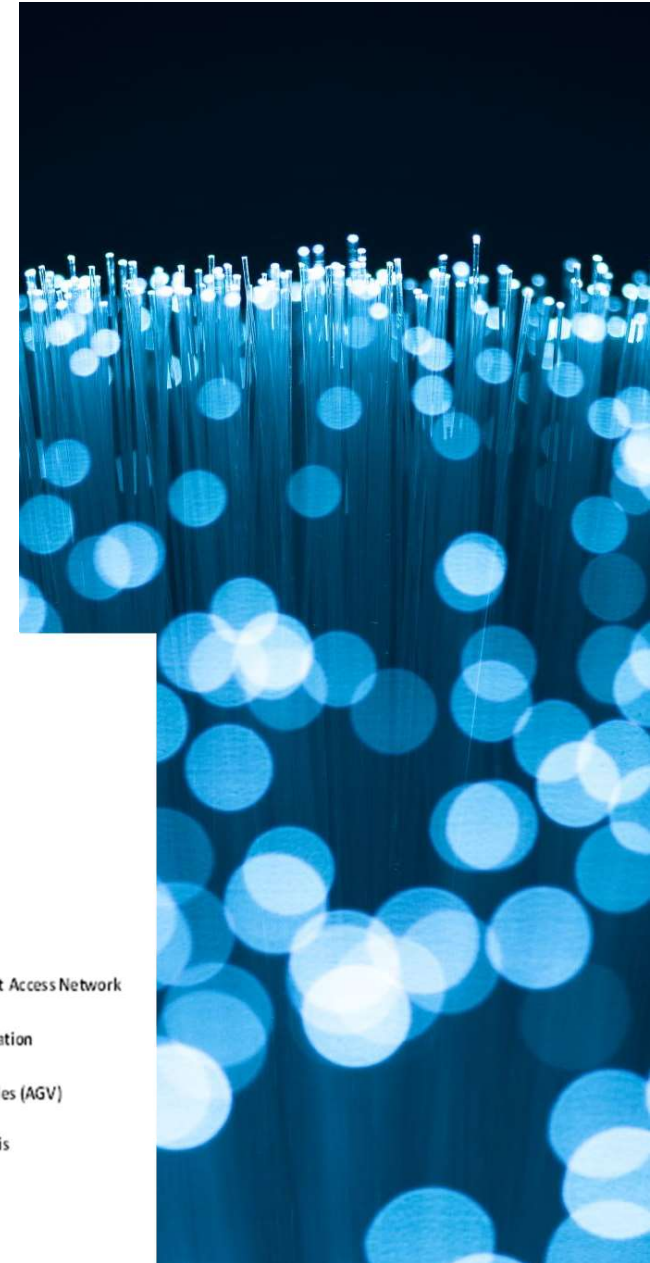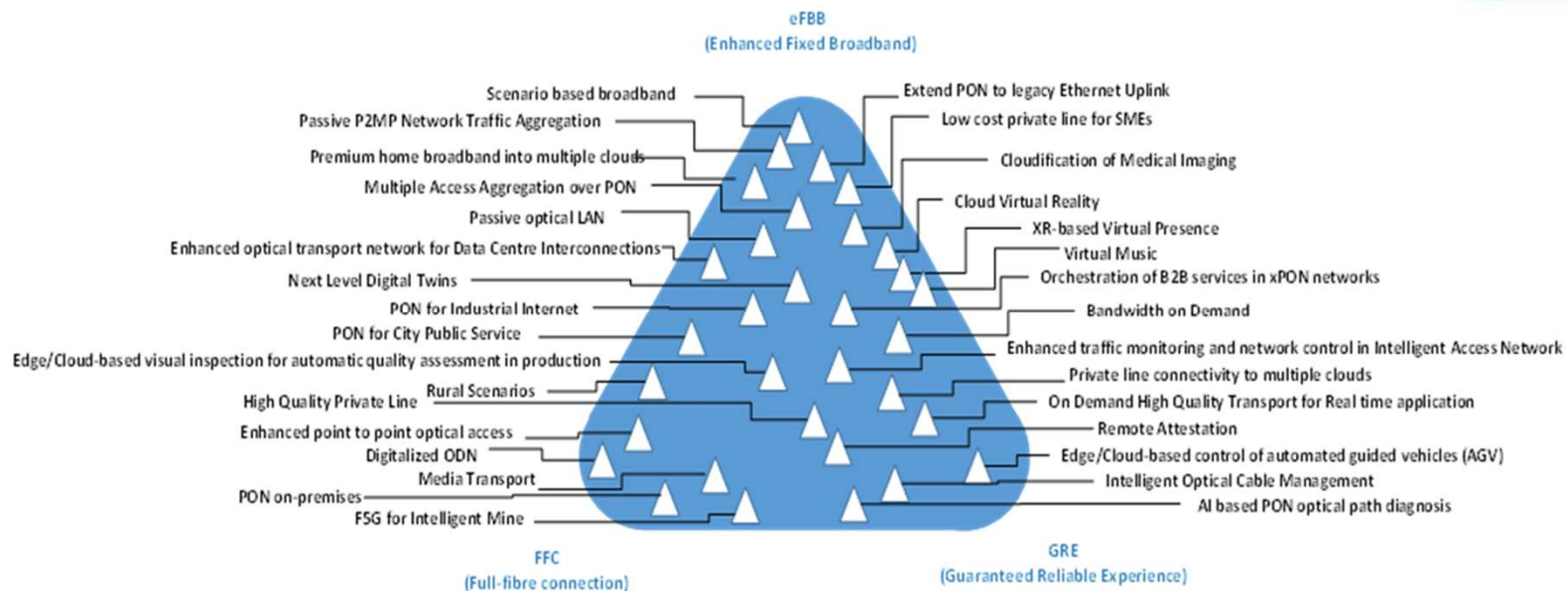
Study from 2010

Voice over:
Our forecast on bandwidth demand vs. supply from 2010 proved to be quite accurate...
..And we see no sign of levelling off yet.

So: Bandwidth will remain important

ETSI F5G USE CASES BRING NEW REQUIREMENTS

› F5G Use cases bring requirements along three dimensions:

1. Enhanced Fixed Broadband (towards "Faster")

2. Guaranteed reliable experience (towards "Smarter")

3. Full-fibre connection (towards "Wider")

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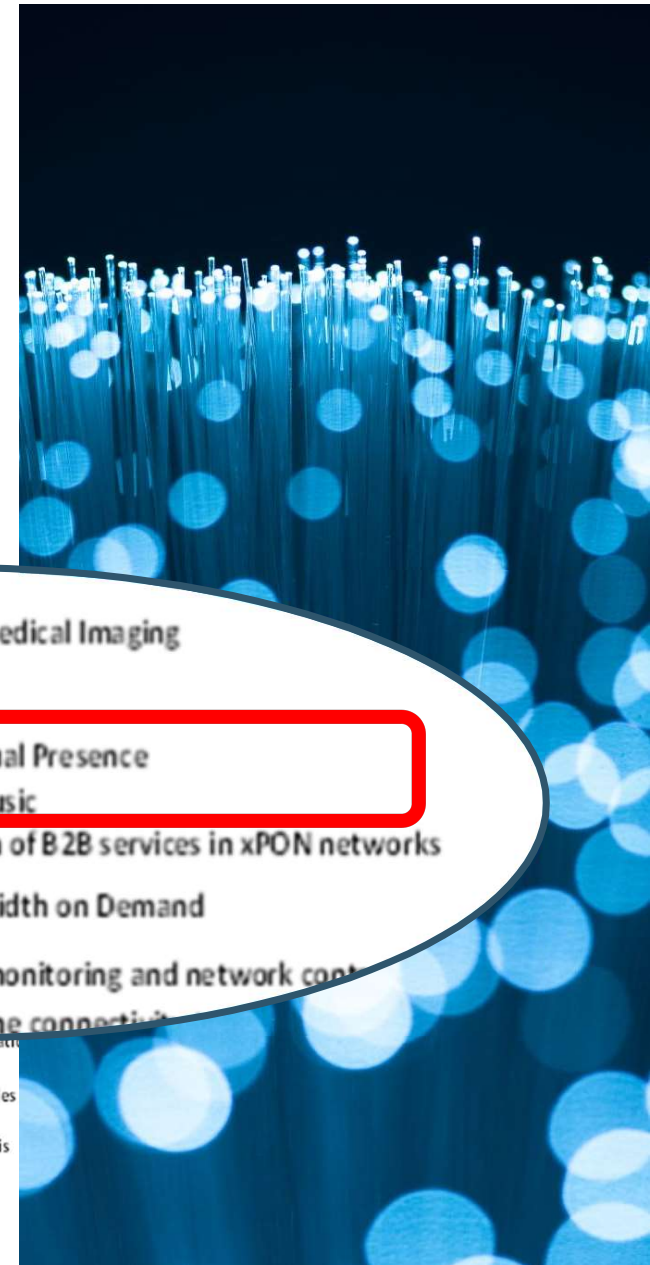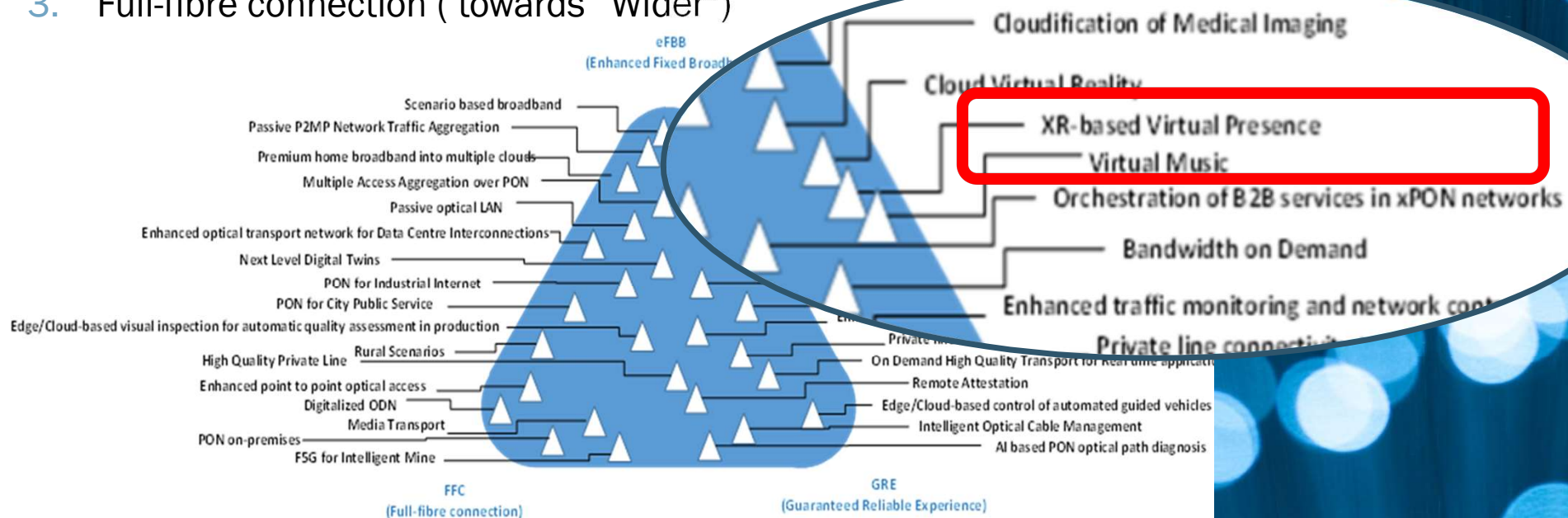
› USE CASE VIRTUAL PRESENCE
BREAKING THE BARRIERS OF DISTANCE WITH SOCIAL XR

VIRTUAL PRESENCE with Social eXtended Reality (XR)
work, learn, and interact while remaining physically distant; enable contact when physical distancing
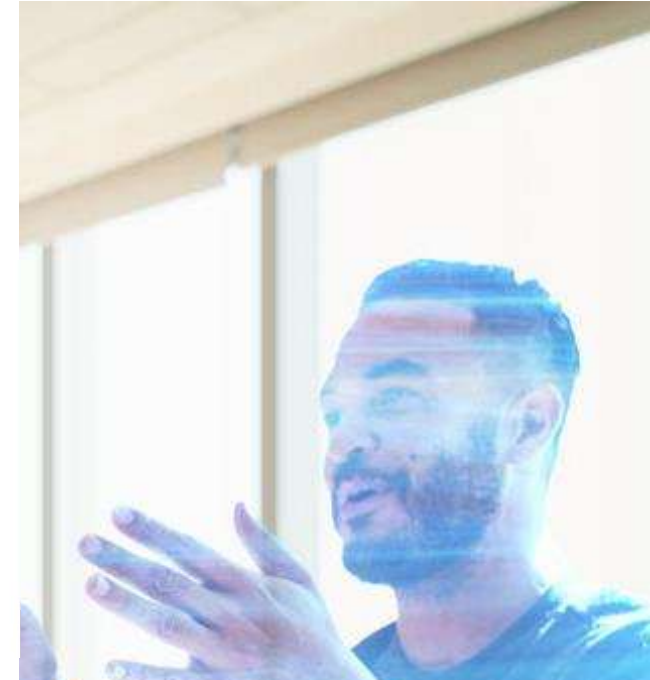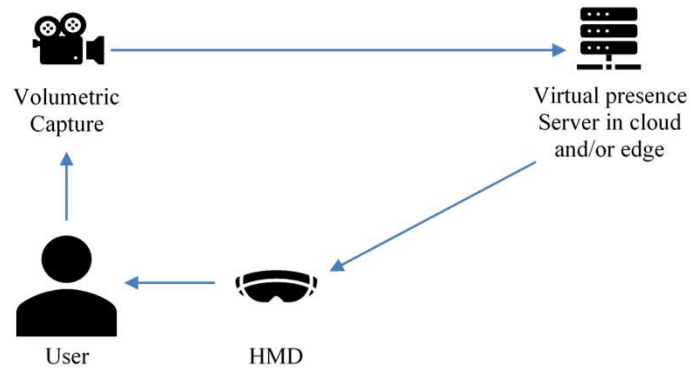XR is the overarching concept covering a.o. VR and AR

XR MEETINGS

XR VISITS

REMOTE EXPERTISE

See also www.tno.nl/en/smart-society/

USE CASE VIRTUAL PRESENCE
REQUIREMENTS ON NETWORKS

Volumetric Capture → Virtual presence Server in cloud and/or edge

User ← HMD

| Use case aspect to support	Requirement in F5G
Personalized 3D immersive video formats (AR/ VR)	Up to 2 Gbps downstream per user
Interaction, good user experience	Fine granular slicing (down to 5 ms latency) Communication QoE parameters
Flexible and dynamic handling of service	Edge computing
Secure and private communication	Prevent the claiming of more resources than needed

USE CASE VIRTUAL MUSIC
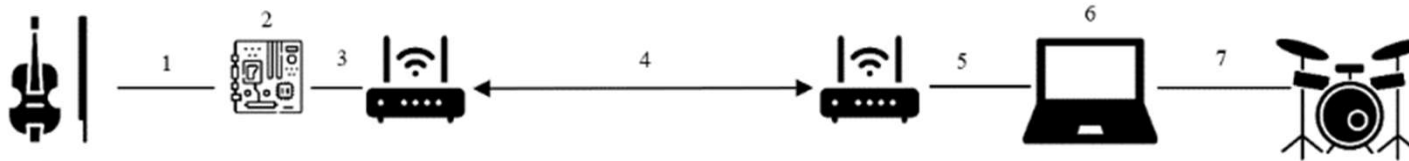
E2E chain for virtual music
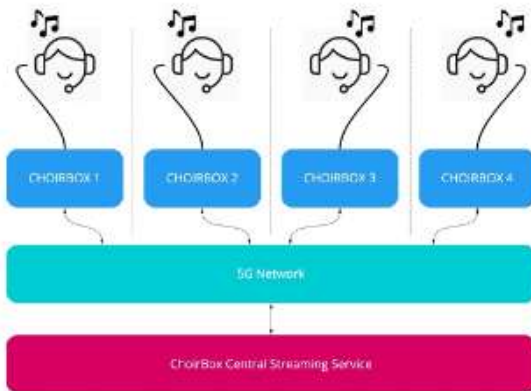
IMEC/VRT research on choir box via 5G

JAMULUS

Dutch national newspaper NRC ("Music ensemble develops superstream for live music")

Swisscom

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USE CASE VIRTUAL MUSIC

E2E chain for virtual music
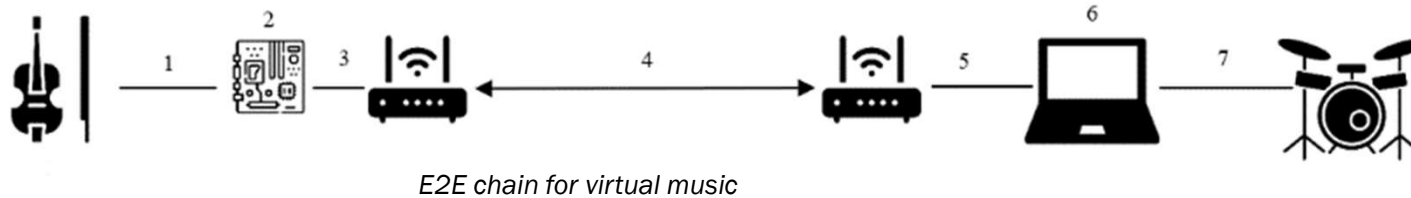
| Use case aspect to support	Requirement in F5G
Ultra-low latency and jitter for increased distance between musicians	The network should provide constant/deterministic low latency: 13 ms E2E one way latency + 2 ms E2E one way jitter
Dynamic set up of audio channel	Dynamic set up and release of the high-quality end-to-end network channel for audio of a virtual music session
Audio server placement	Dynamic (re)allocation of a central server optimised to reduce overall end to end latency

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› CONCLUSION
F5G FIBRE NETWORKS: MORE THAN JUST SPEED

› Network evolution: Traditionally focused on speed

› New use cases bring different and stricter requirements on top of speed

  › Social XR: Combination of Speed, Latency

  › Virtual Music: Every millisecond counts

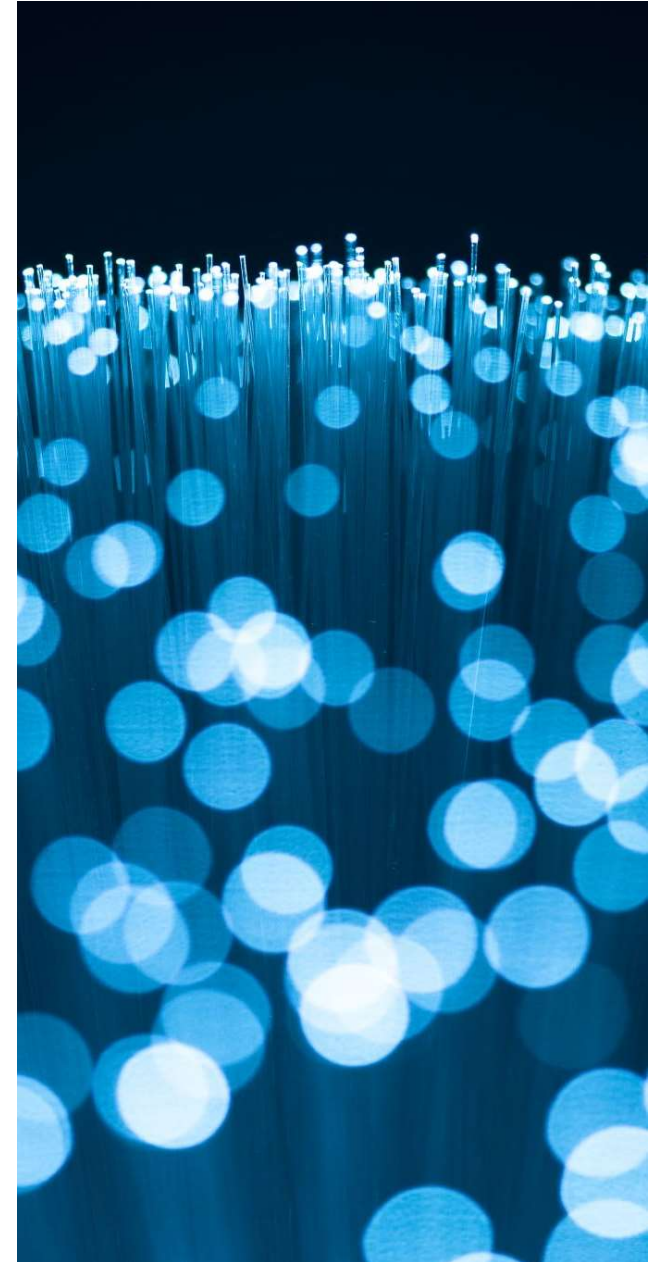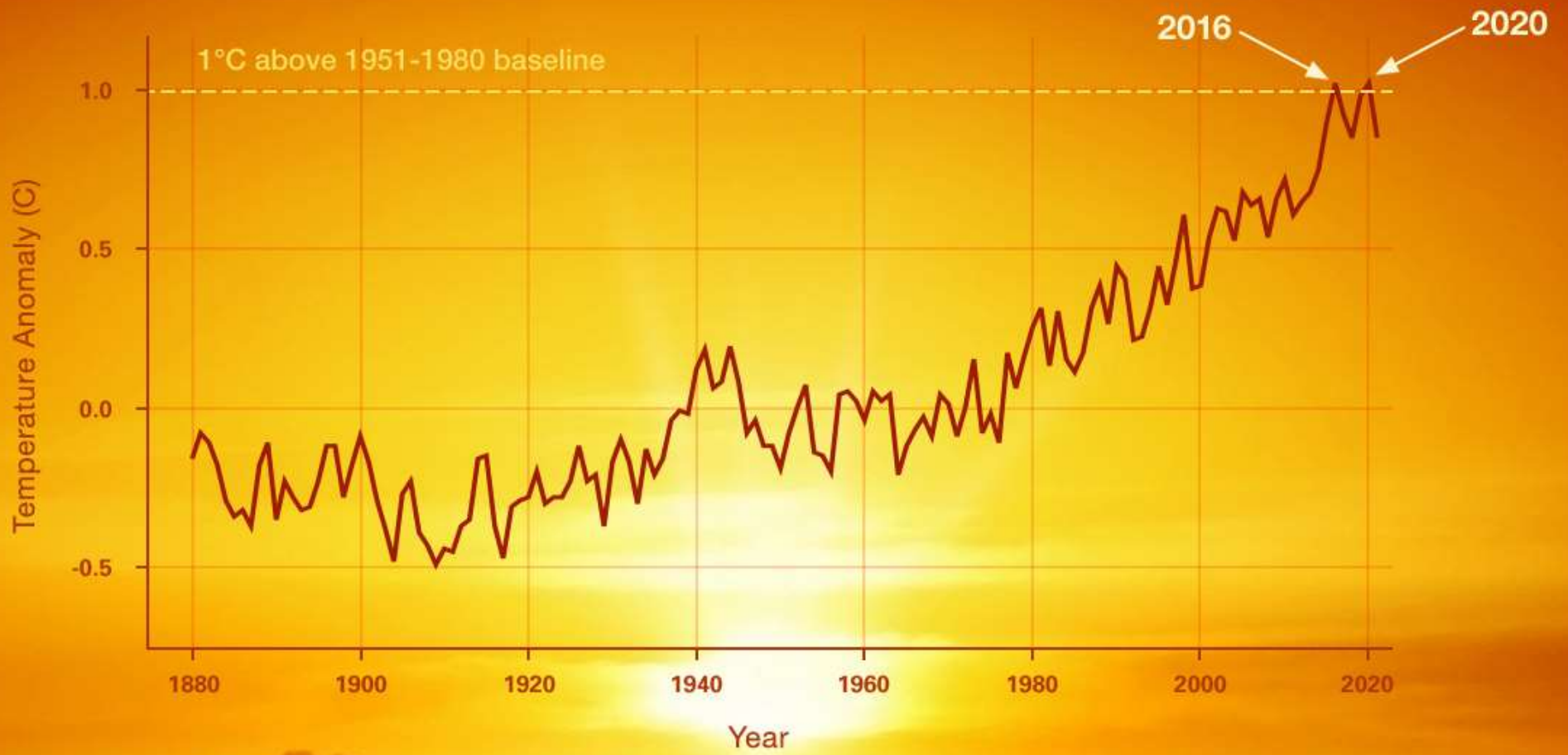 › Both examples: Dynamic network setup, edge computing.
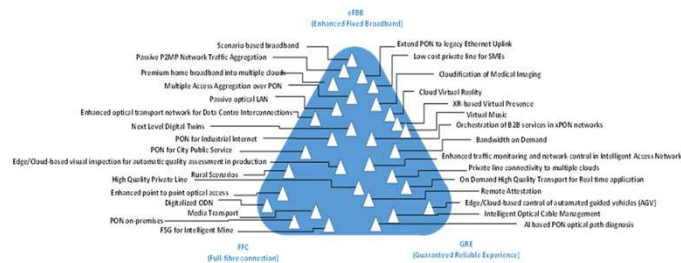
ETSI F5G: Describing a broad scope of requirements starting from novel use cases

NEXT STEPS

Is there something after F5G?

1°C above 1951-1980 baseline

2016

2020

climate.nasa.gov

daulon/Shutterstock

# DEMAND FOR ENERGY EFFICIENCY WILL LIKELY BRING NEW REQUIREMENTS

ETSI F5G: "To keep power consumption under control, F5G Advanced [..] needs to tackle all aspects of the fixed network, with a special emphasis on reducing power consumption in optical access networks"

Key Technologies
- Energy aware switching/routing
- Optimisation of network architecture
- Application specific energy reduction
- Power saving modes at equipment level

See ETSI F5G resources on ETSI - Our group Fifth Generation Fixed Network (F5G)
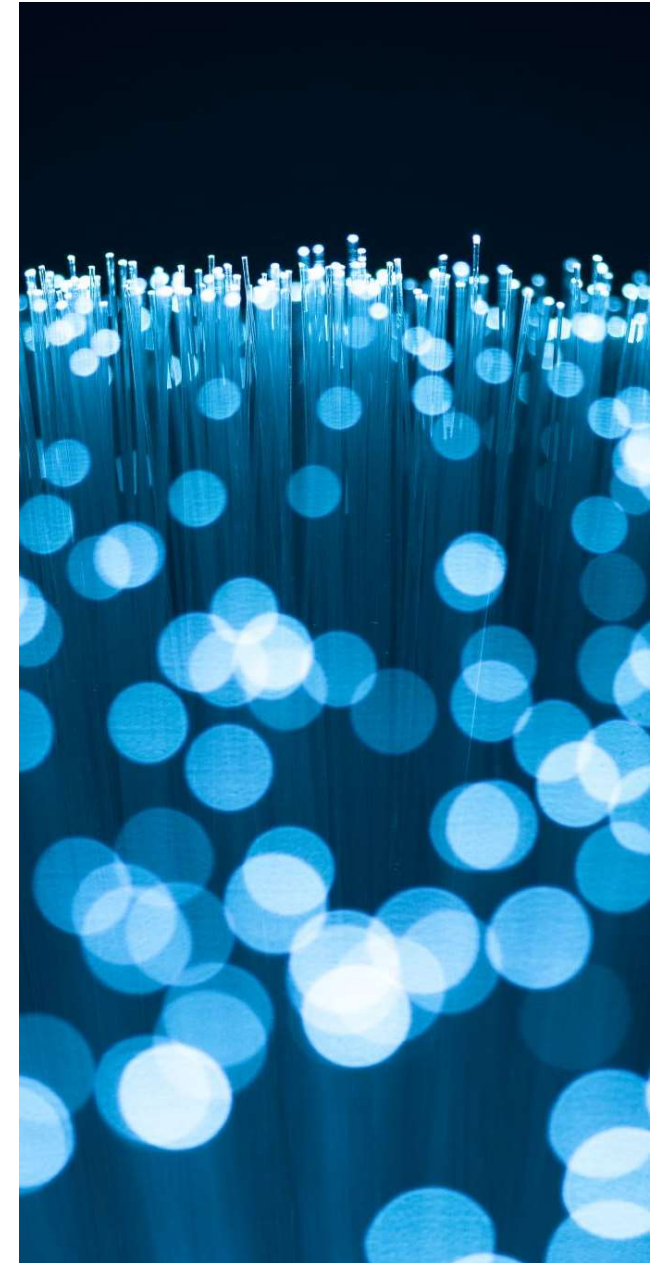
THANK YOU
FOR YOUR TIME

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