

Vodafone Tech Innovation Center

Applications driving 5G&6G

Networks Forum, Dresden Congress Center

June 13th 2024

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Head of Tech Innovation Center Dresden



Vodafone Tech Innovation Center Dresden



Interdisciplinary Skills Hub

Co-Creation Space

Tech Innovation Center Dresden –Approach & Infrastructure



JOINT BUSINESS & TECHNOLOGY INNOVATION



CO-CREATION WITH CUSTOMERS
especially Germany and global players



TOP UNIVERSITY & RESEARCH LANDSCAPE
Strong collaboration with TU Dresden



FAST PRODUCT INCUBATION WITH PILOTS



PUBLICLY FUNDED INNOVATION PROJECTS



COOPERATION WITH CYBER SECURITY AGENCY

VODAFONE TECH INNOVATION CENTER DRESDEN

INNOVATION PARTNERS

Institutions & Organizations



AR/XR



Research Institutions



Security



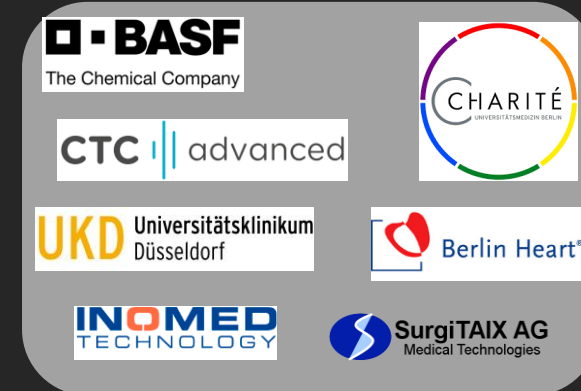
Technology



Automotive/Transportation



Healthcare & Chemistry



How do we know today what we need for 6G ?

NGMN's PATH FROM 4G TO 6G

+ ...
ITU-R Framework for IMT-2030
Review and Future Direction
6G Position Statement, An
Operator View
6G Requirements and Design
Considerations
6G Use Cases
6G Drivers & Vision

6G

+ ...

5G White Paper 2
5G White Paper (Requirements)

5G

Beyond HSPA & EVDO
White Paper
Technology Evaluation

4G

6G POSITION STATEMENT

KEY MESSAGES

1

Overarching Statement

6G is the graceful evolution of communication networks building on and extend beyond existing 5G ecosystem

3

Operational Priorities

such as network simplification, absolute energy reduction, automated and proactive operations and quantum safe infrastructure.

5

Spectrum:

- Existing IMT spectrum remains essential
- **6-15GHz must be licensed for IMT**
- Sub-THz bands may adopt a new radio technology

2

Innovations and New Services

based on IMT-2030 features, facilitate seamless integration and interoperability with fixed and satellite networks and inherently support network related APIs

4

Guiding Principles:

- Global 6G standards
- No intrinsic need for hardware refresh
- Software upgrade to 6G
- No degraded performance for 5G customers
- No compromise to existing services
- Access across mobile, fixed and NTN
- Backwards compatibility with 5G
- Robust resilience



NGMN 6G GENERIC USE CASES

ENHANCED HUMAN COMMUNICATION

XR immersive holographic telepresence communication

Multi-modal communication for teleoperation

Intelligent interaction: sharing of sensation, skills & thoughts

ENHANCED MACHINE COMMUNICATION

Robot Network Fabric

Interacting Cobots

ENABLING SERVICES

3D hyper-accurate positioning localization, and tracking

Interactive mapping, digital twins & virtual worlds

Automatic detection protection & inspection

Digital healthcare

Smart Industry

Trusted composition of services

NETWORK EVOLUTION

Trusted Native AI – AlaaS

Coverage expansion

Energy Efficiency

Hands on 5G/5G+ enterprise & consumer testbeds and demos help to drive 6G development



Connected Mobility Trains



Adressing railway challneges with 5G & 6G



Challenges in the railway environment

- Digitalization in rail and track
 - Railway operations
 - Passenger internet & infotainment
- Coverage @ 33.000 km track
- Network Technology LifeCycle 2G (GSM-R/TETRA) ..4G..5G ECTS/FRMCS
- Resiliency, Security
- International standards & regulatory approval
-



Driving solutions with innovative technologies



Annaberg | Erzgebirgsbahn (TU Chemnitz)

Europe's first 5G teleoperated train 2019

Europe's biggest 5G innovation playground for railway industry



Hamburg / Siemens @ ITS World Congress | SBahn

Sensor4Rails Use Cases; World first Automatic Train Operation (ATO) with network slice



Hamburg | SBahn

Automatic Train Operation (ATO) over Vodafone Network Slice with priority;

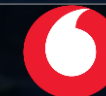


Schlettau/Braunschweig

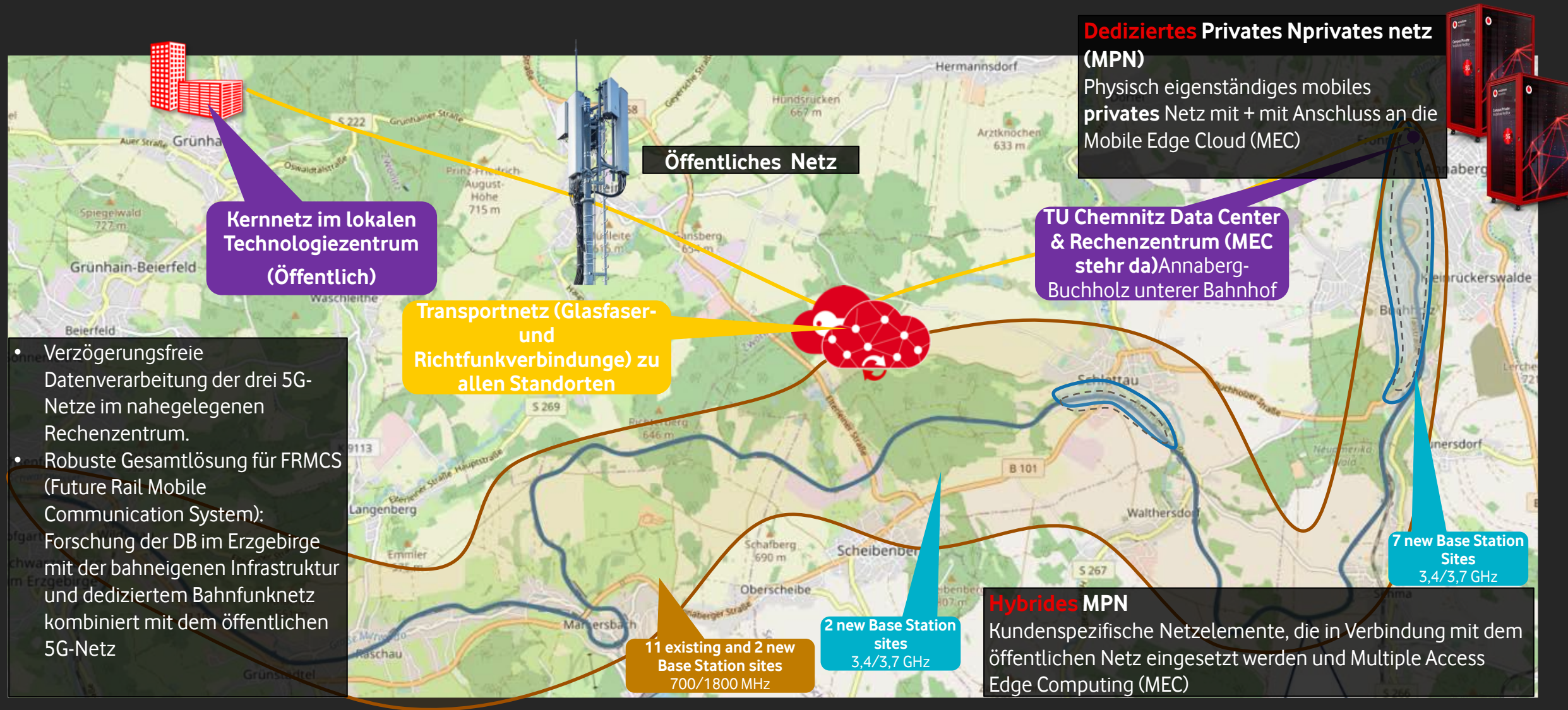
Teleoperated Train as ATO building block

Operator 5G SLICE FOR NATIONWIDE RAILWAY NETWORK

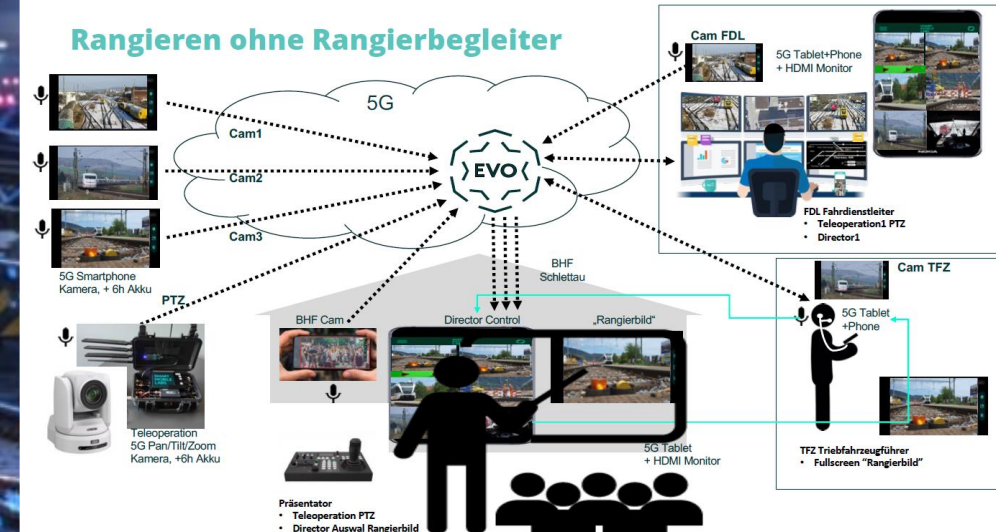
Support towards Railway 2030 Vision



Das 5G Netz für die TU Chemnitz & Smart Rail Connectivity Campus (SRCC)



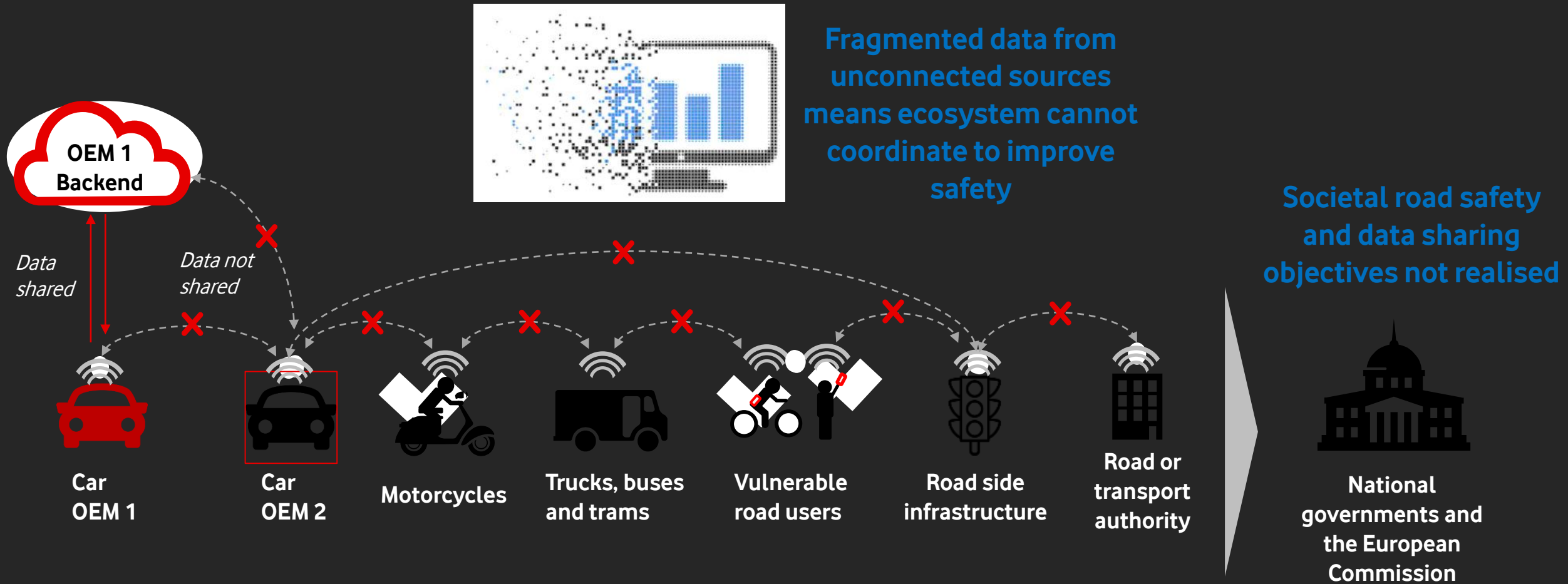
Smart Rail Connectivity Campus in Annaberg: 5G SA & MPN testbed as reference for digitalization of railways



Connected Mobility Cars



Data fragmentation currently limits the benefits that connectivity services can bring to road safety



STEP – Safer Transport for Europe Platform

Vodafone is committed to make
European Roads safer for all

Platform to distribute, broker and validate
V2X messages in real-time leveraging 5G
and Edge Cloud

Hazard Warnings



VRU Assistance



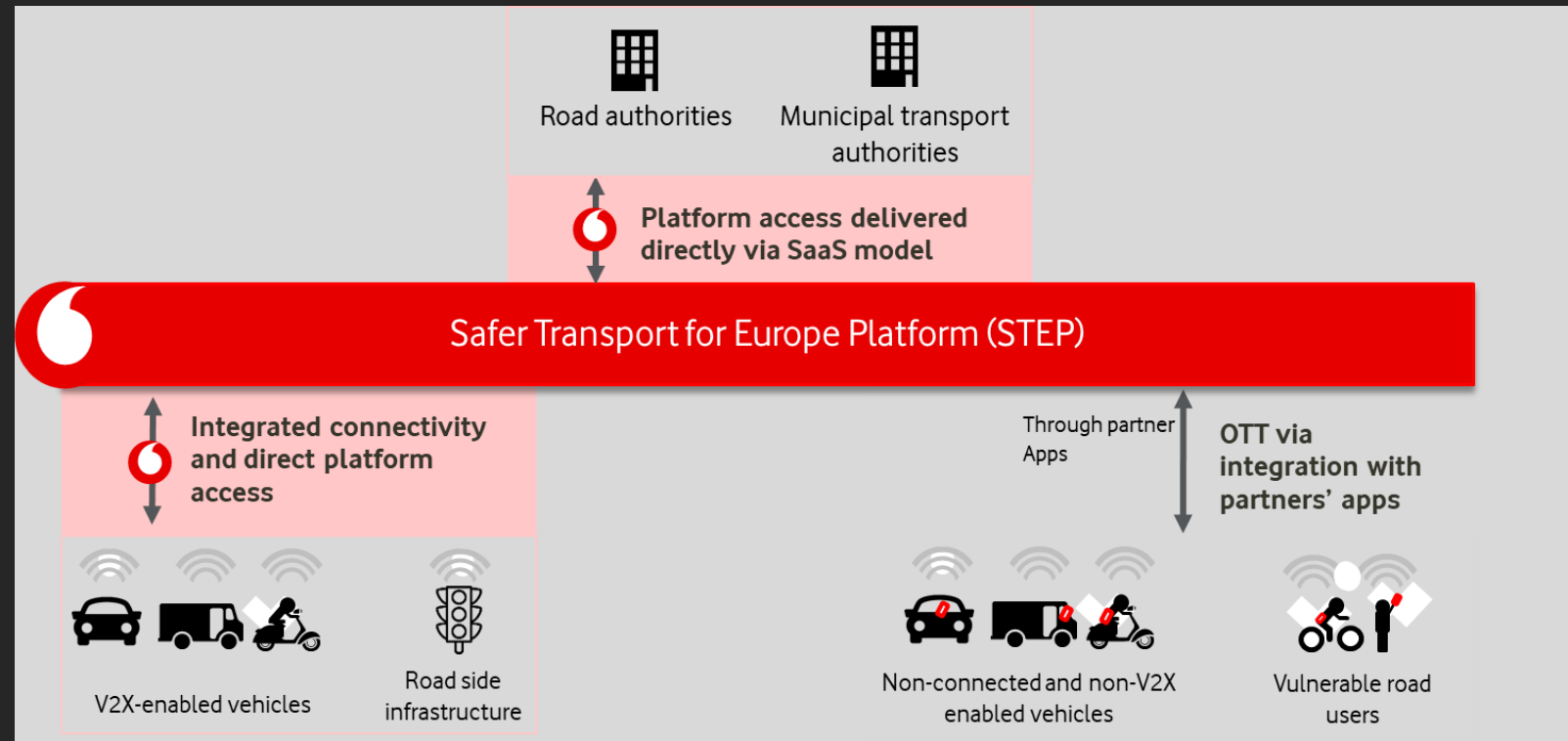
Infrastr. to Vehicle



Vehicle Probe Data



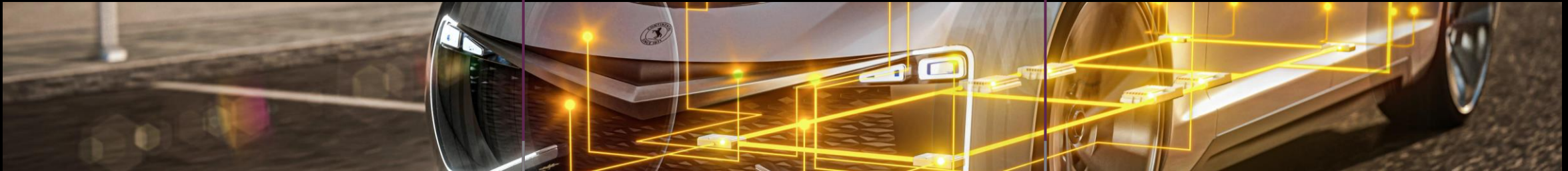
STEP aims to scale – Starting in the V2X /
Connected Mobility space and using it for all types of real-
time data broker applications



Project GAIA-X 4 AGEDA



- Vision & Objectives - The vehicles as part of the cloud ecosystem GAIA-X



Vehicle as application platform

- › Enabling seamless connectivity of the vehicle with the cloud through
 - › Cloud based development methods
 - › Safety compliant distributed computing
- › Pilot new cooperation models in practice and establish methodologies for sustainable development over the vehicle life cycle

GAIA-X compliant implementation of data-driven applications

- › Harmonize data-driven approaches and established methods of distributed computing, including data protection requirements, and implement them consistently from vehicle to cloud
- › Build concrete applications to identify missing components and implement them in a reusable way while making them openly available

Competitive advantage through cooperation: increase efficiency and added value

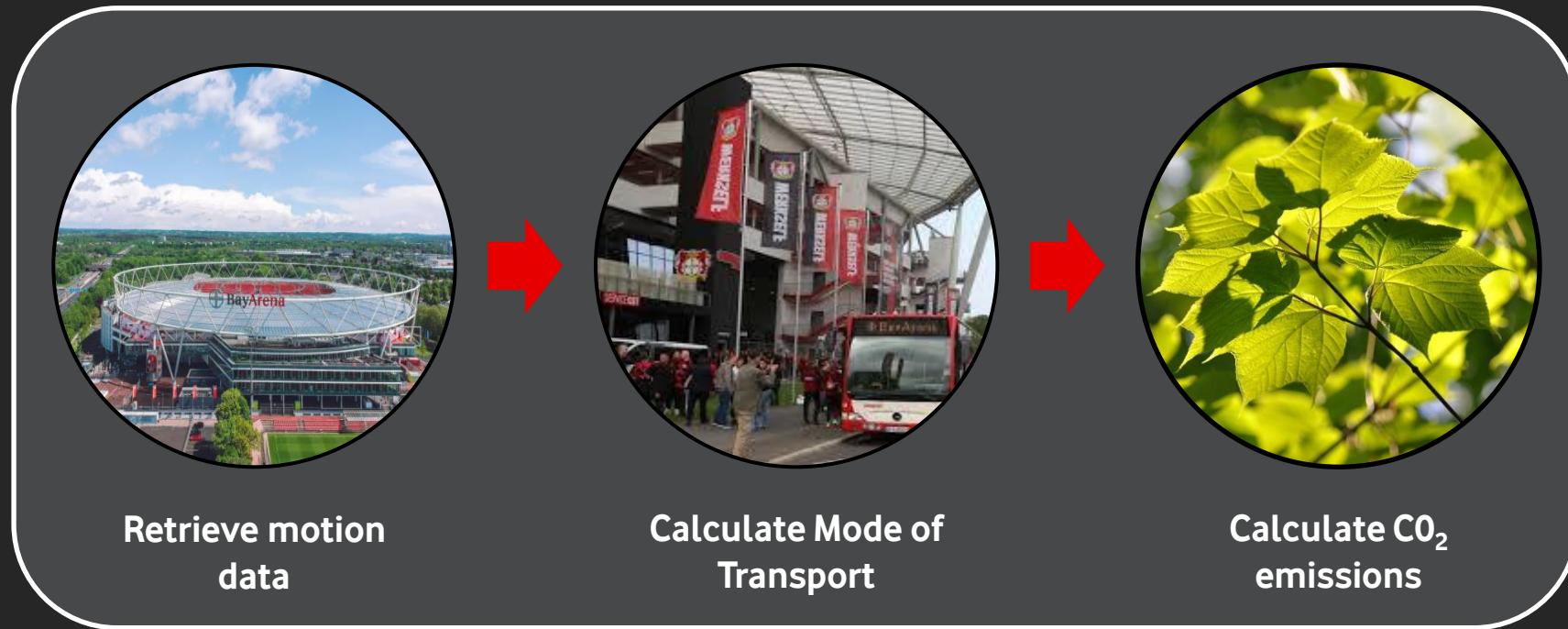
- › Enabling new value chains
- › Joining forces & tapping new competencies - bringing together best practices for non-differentiating system and SW parts

A joint ecosystem - vehicle and cloud
Creating the basis for new value chains in the networked mobility of the future



AI Focus for Connected Transport

Vodafone Analytics – Mode of Transport & CO₂



Predict the **mode of transport** for any moving individual to **estimate CO₂ emissions** for travel.

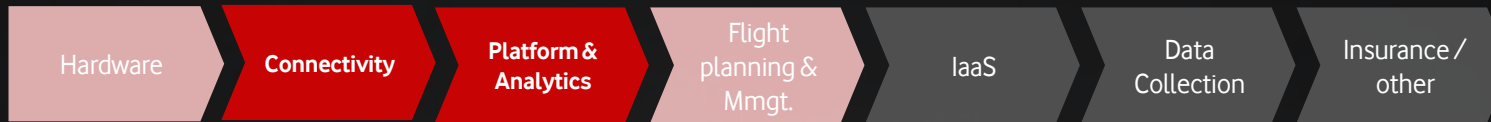
Connected Mobility

Drones



Mobile connectivity is critical for commercial drone operations, for different reasons and various use cases.

Drone Value Chain



Why is mobile connectivity critical?

Safety critical

UAV operator has to provide evidence of sufficient connectivity

Mission critical

To deliver data from any aircraft – is there sufficient broadband for mission?

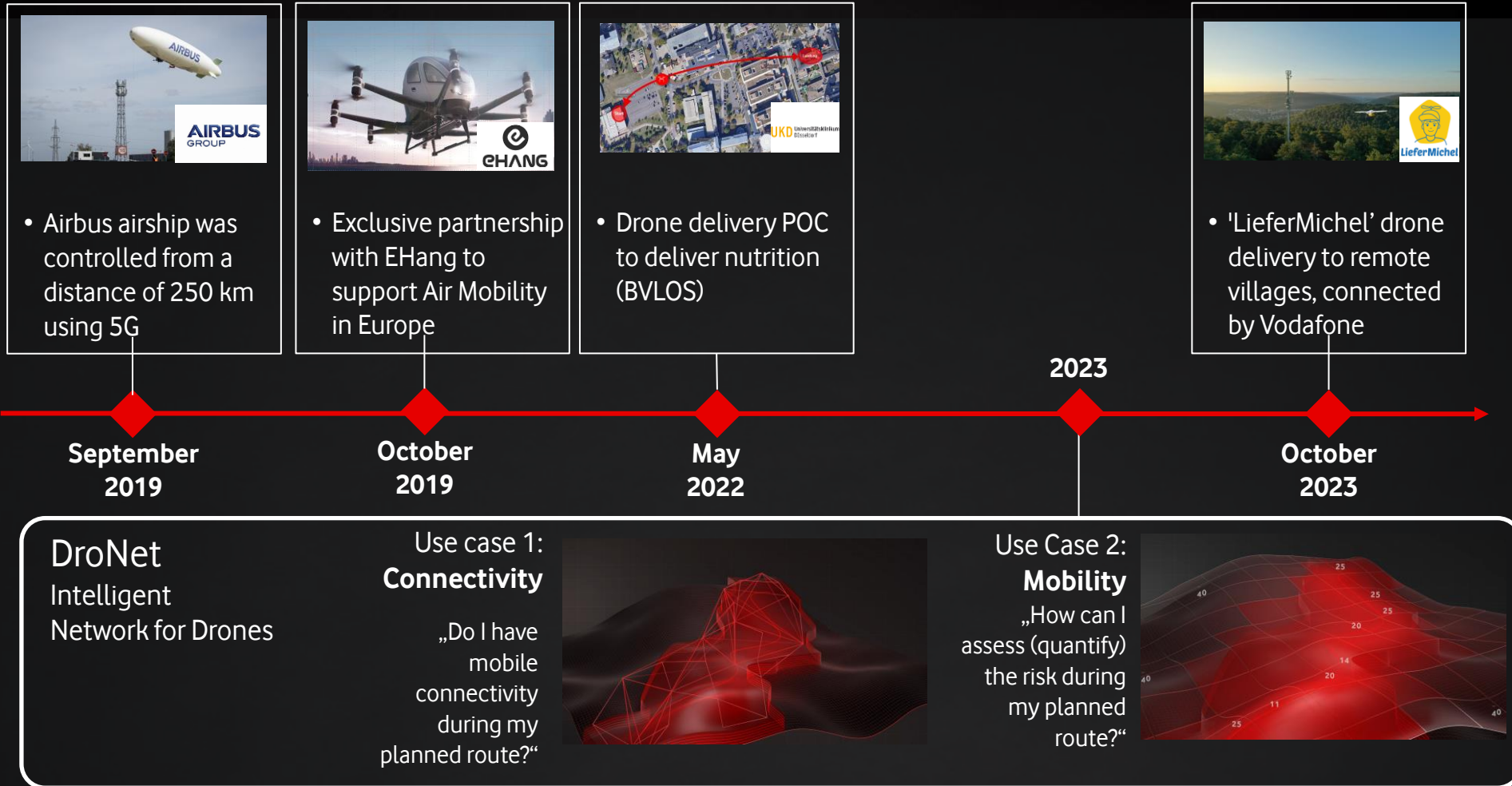
Operation critical

If connectivity is lost during flight, the drone will abandon the mission and return back to home!

Examples of BVLOS Use cases in Cellular Networks



Our vision: Make commercial drone flights in Germany safer and more efficient in the future.





Addressing Consumers through B2BC @ New Devices



What does the Metaverse mean for Vodafone?

33

We're creating a future-proof Metaverse ecosystem beyond connectivity, that enables access to cutting-edge technology, providing connectivity and performance for all.



NEW BUSINESS MODELS

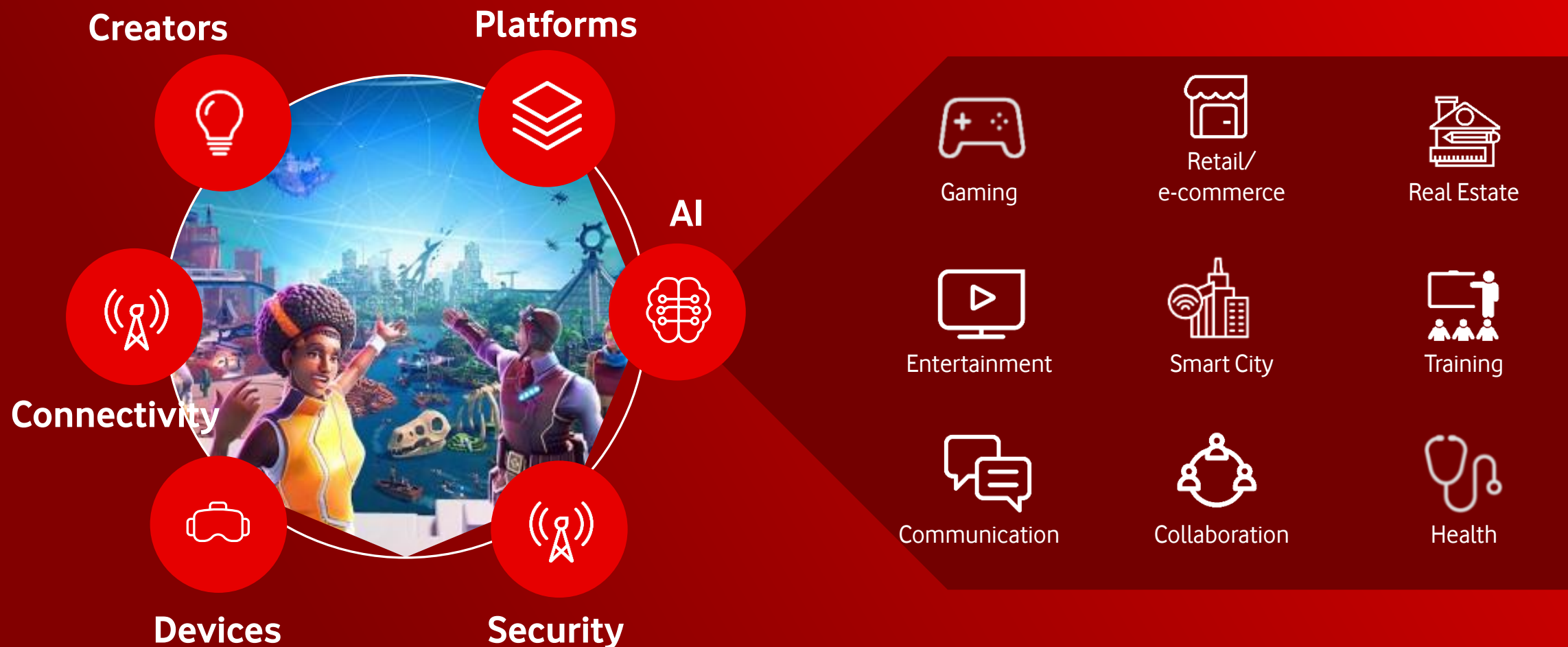


**DISRUPTIVE
POTENTIAL**



**PUSH ON
INFRASTRUCTURE**

XR & the future of communication will change the world.



Startups we've already partnered with.



**Magic Leap
One Glasses**



**Nreal Glasses
(AKA Xreal)**



**5G Stadium app with
Kinexion & DFL**



**ApoQlar
Digital Health**



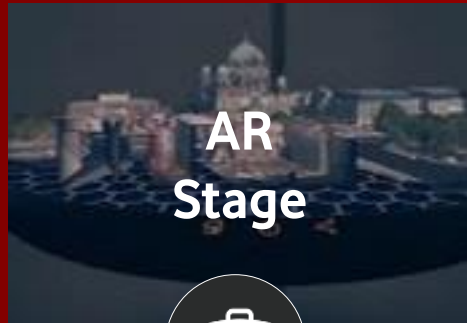
**Firefighter VR
with Northdocks**



Highlights of our XR solutions.



We craft tailored XR applications for clients,
leveraging the advantages of high-speed 5G.

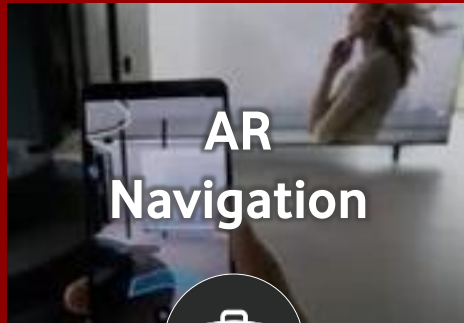


AR Stage



Experience limitless possibilities as we bring complex immersive content to life, expanding the boundaries of reality.

- Lufthansa
- Adler Immobilien
- ExpoReal fair 2023

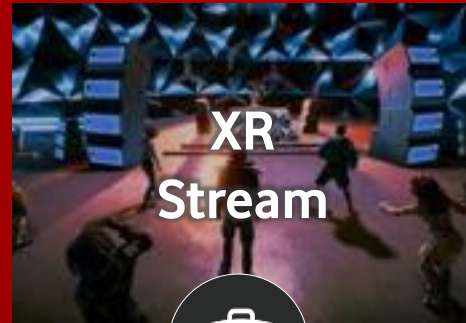


AR Navigation



Seamless AR navigation via smartphone guides users through buildings or unknown premises offer extra service insights.

- Audi Charging Hubs
- Future Floor
- Securitas



XR Stream



Empower shared virtual experiences in real-time with our cutting-edge live streaming and motion capture technology.

- Content Convention 2023



AR Event



Unveil the future of opera with AR glasses transforming into digital opera glasses on the 5G network & immersive technology.

- Deutsche Oper am Rhein



Hyper Reality Hub



Revolutionizing XR with lightweight, affordable glasses for shared immersive experiences.

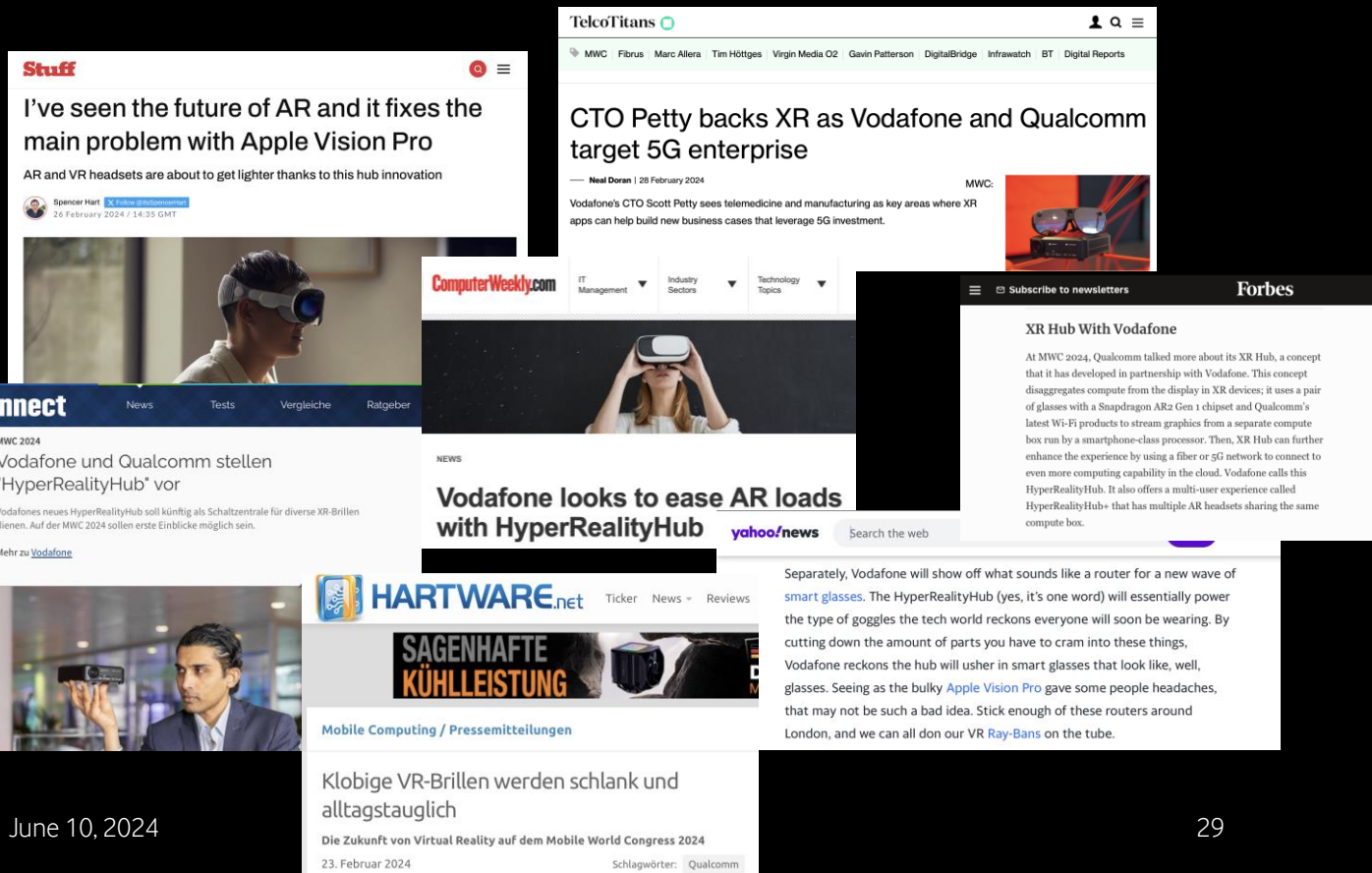
- Mobile World Congress 2024

In progress



Last but not least... HyperRealityHub

- First hardware+software+service product candidate from XR Factory
- A cloud scalable hub to offload sensor and compute off bulky HMDs, igniting an industry of lightweight, affordable XR eye-wear without compromising performance, stamina and usability
- Showcased at MWC'24 and gathered international attention & media coverage:



5G & 6G for Healthcare



6G-Health

Holistische Entwicklung
leistungsfähiger
6G Vernetzung für verteilte
medizintechnische Systeme



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Medizinische Anwendungsfelder

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KOLLABORATIVES
DATENBASIERTES
ARBEITEN



REMOTE
MONITORING



SMART HOSPITAL

6G-Health

6G-HELATH Project Partners

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6G-Health

6G HEALTH Project

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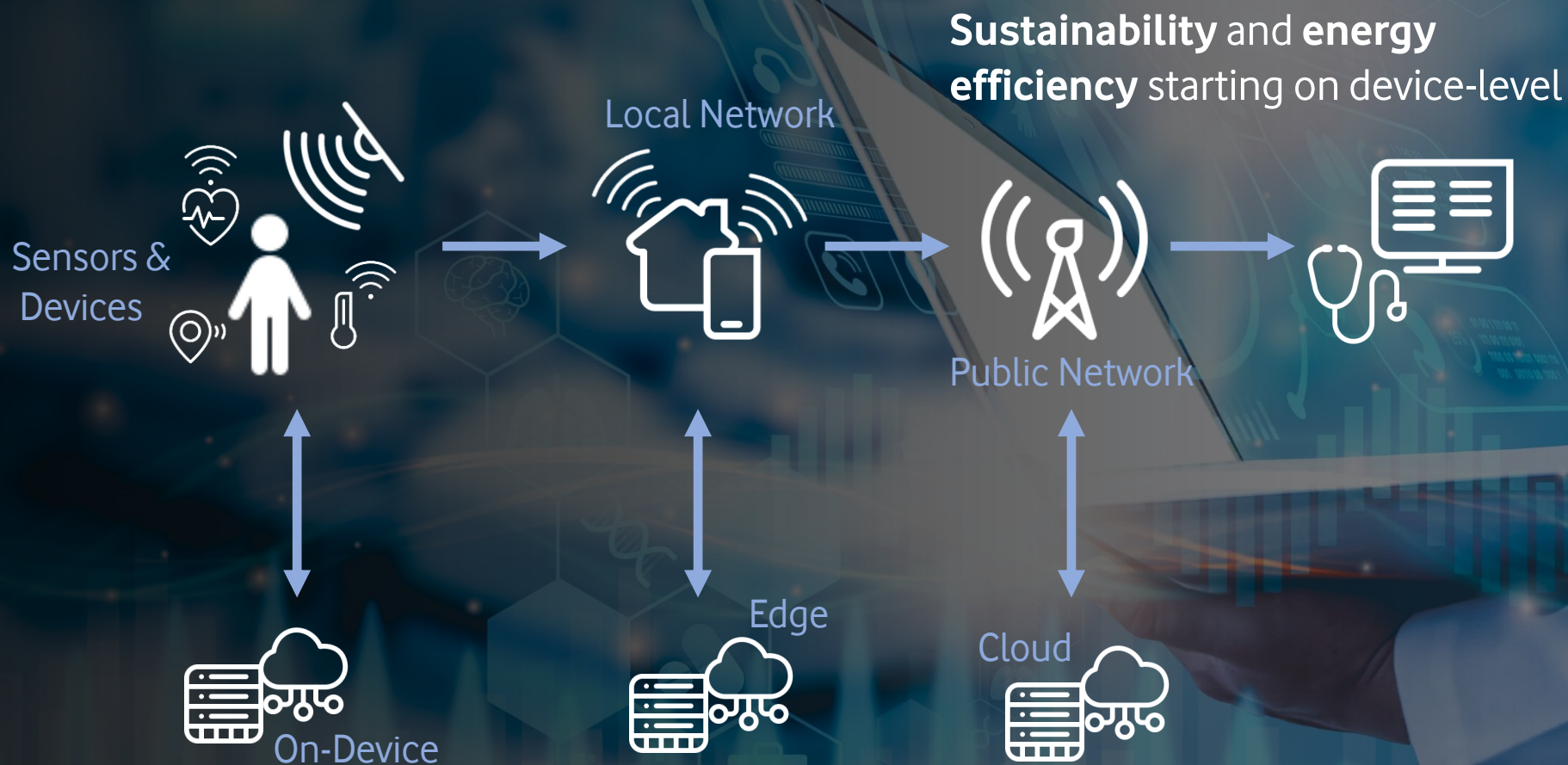
6G-Health

6G in Health

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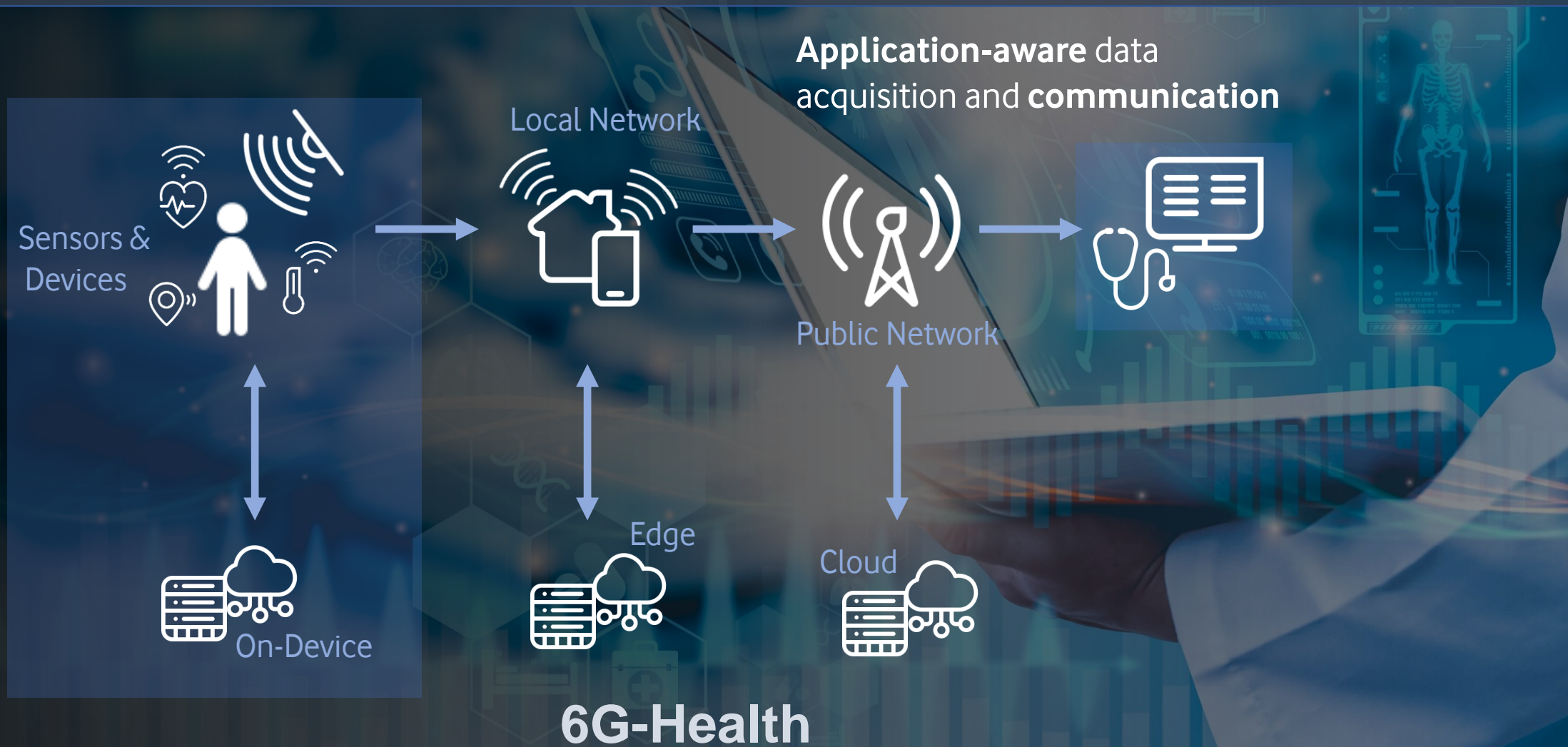
6G-Health

6G in Health

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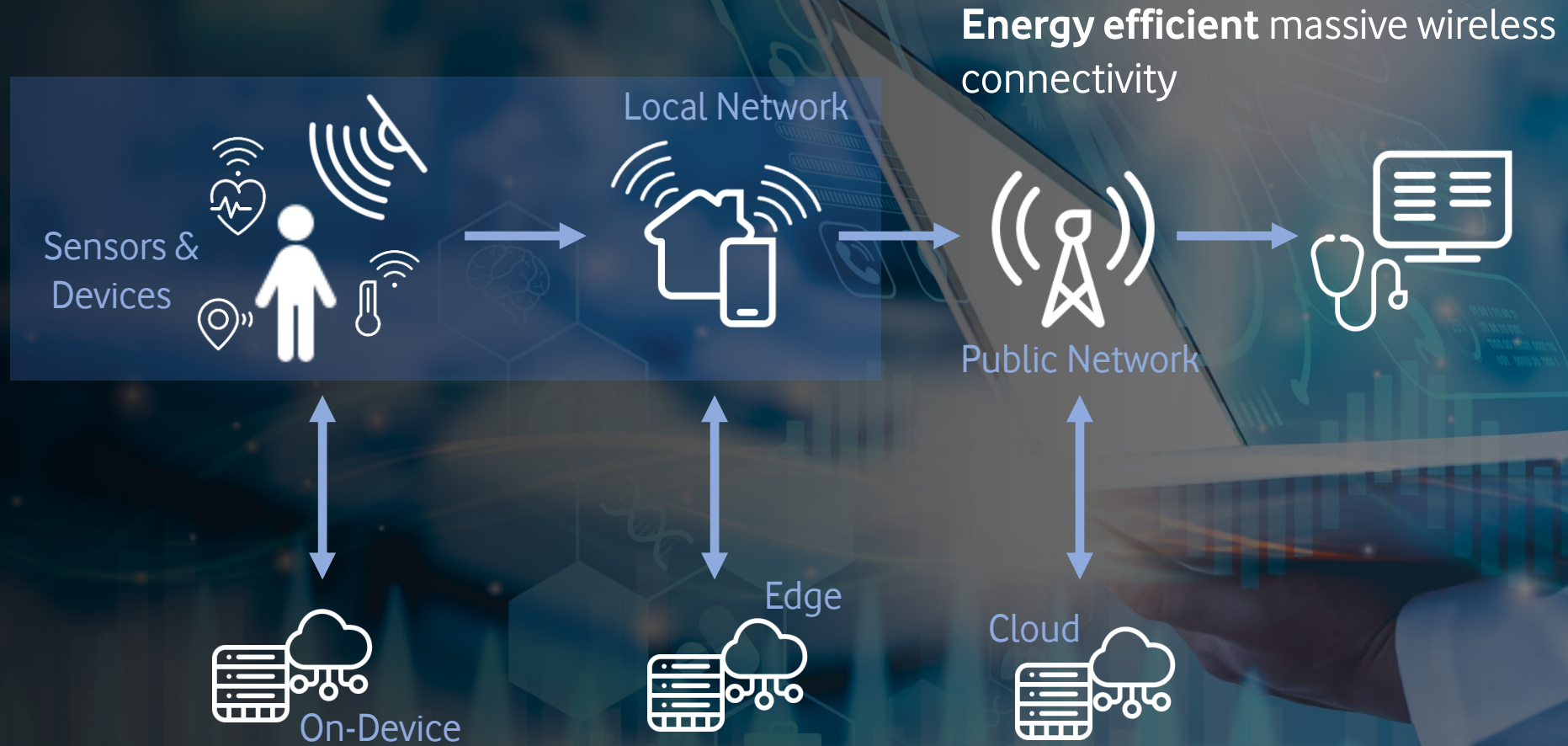


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6G in Health

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6G-Health

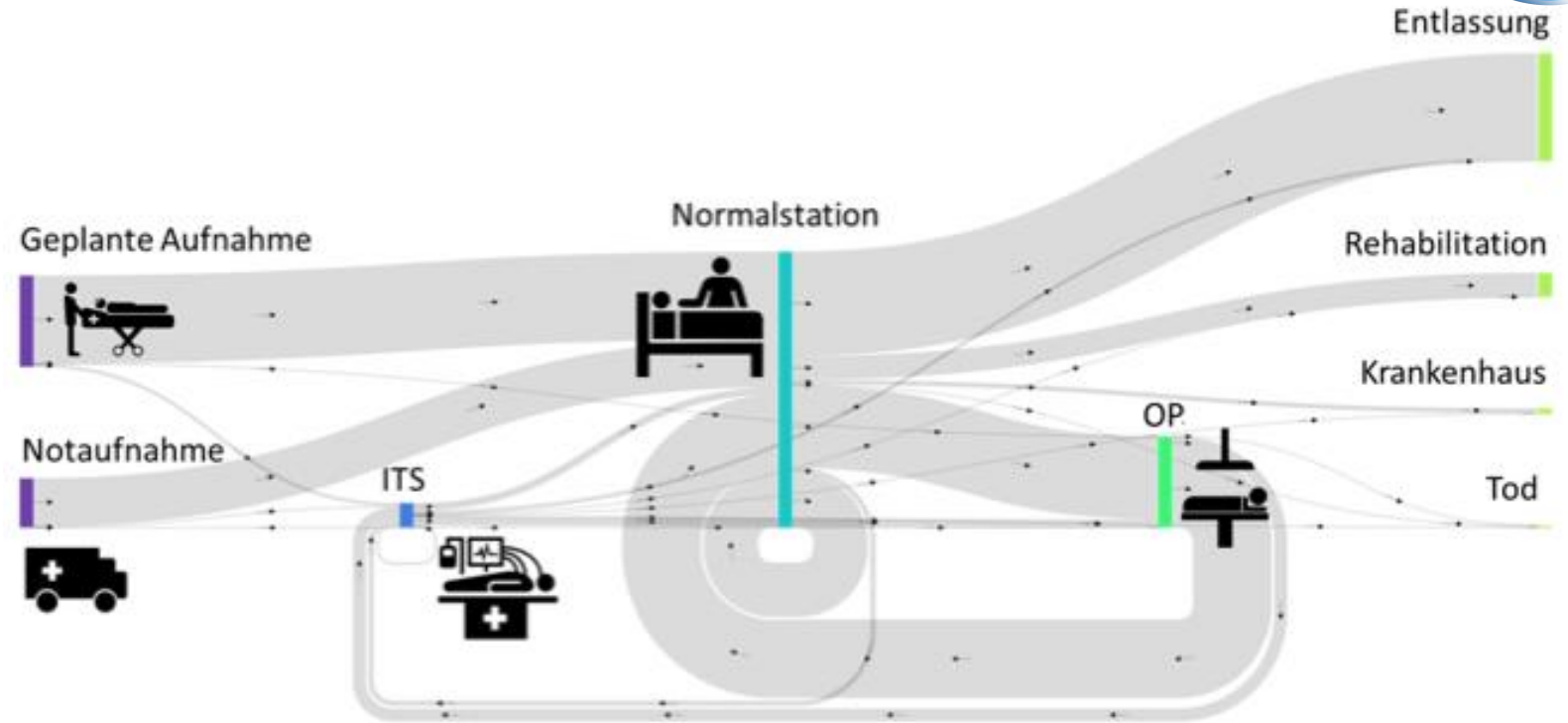
6G in Health

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6G-Health

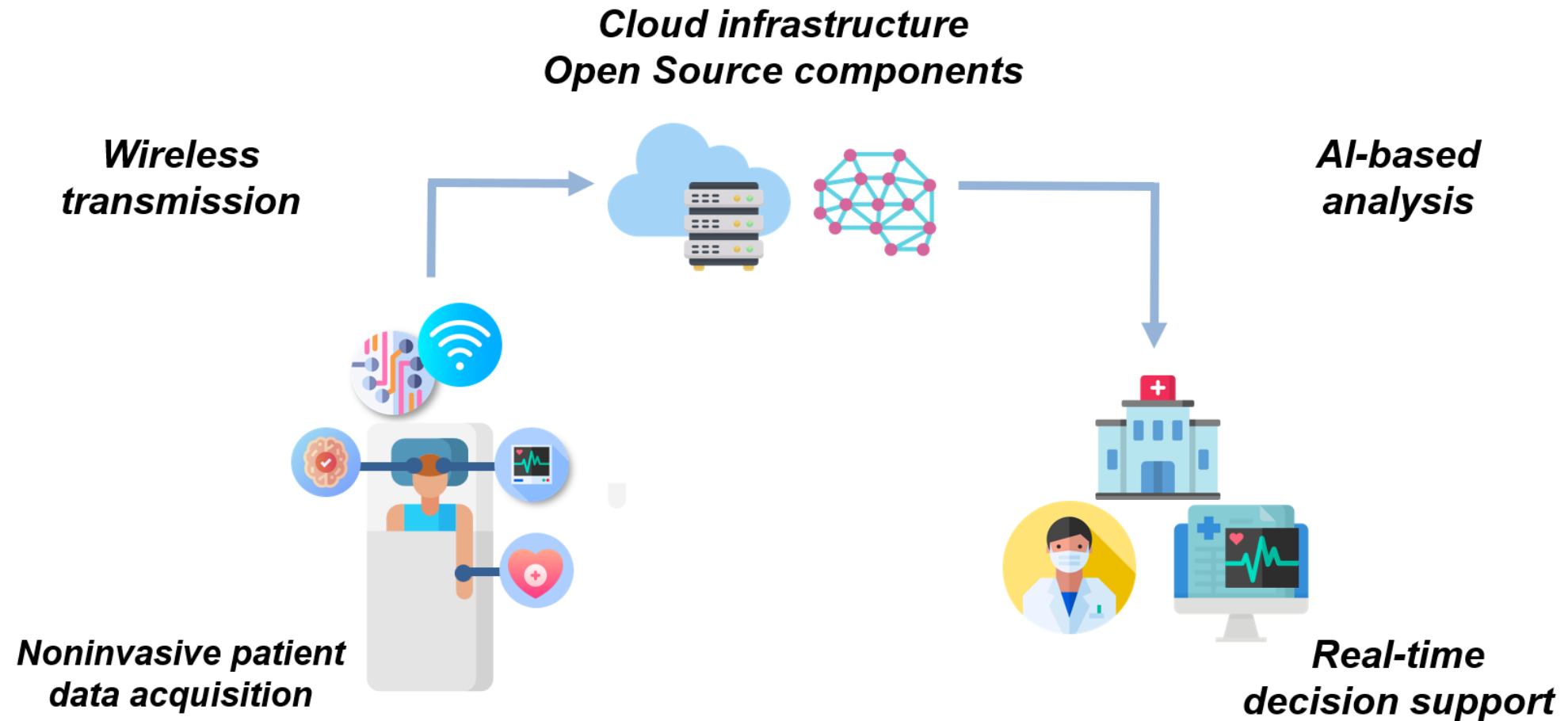
Biosignals: *Inter- and intrasectoral networking necessary!*



**Patient centered
Longterm outcome**

Time

The vision: *real-time support for the clinician!*



6G Development needs to consider regulatory environment upfront!



Mobile Funkgeräte



Direkte Wirkung

Implantate (AIMDs)

(Medizin-)Geräte

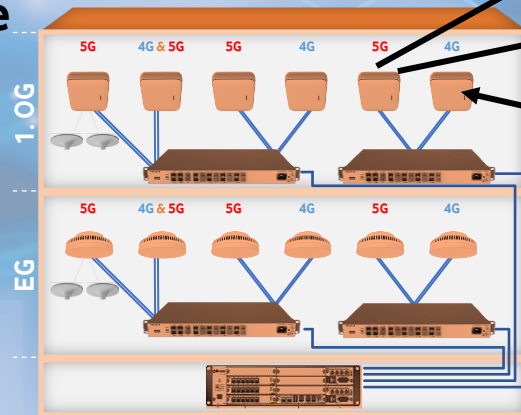
Direkte Wirkung

Implantate (AIMDs)

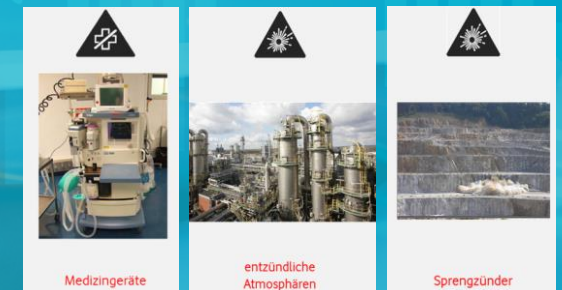
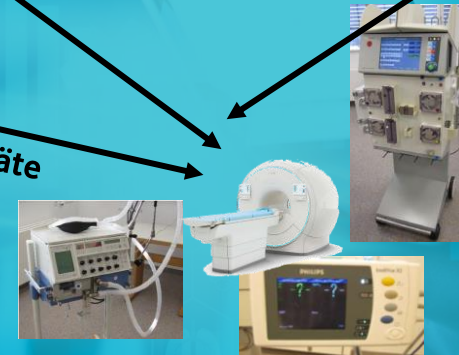
(Medizin)Geräte und -Systeme

Stationäre Funkgeräte

- aktive Systeme, z.B. Ericsson Radio Dot
- Verteilnetzwerke, passive Antennen



(Medizin-)Geräte



Medizingeräte

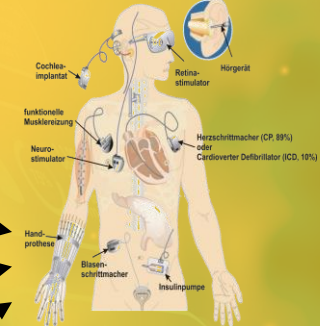
entzündliche Atmosphären

Sprengzünder

Personen mit und ohne Implantate



E,
H,
S



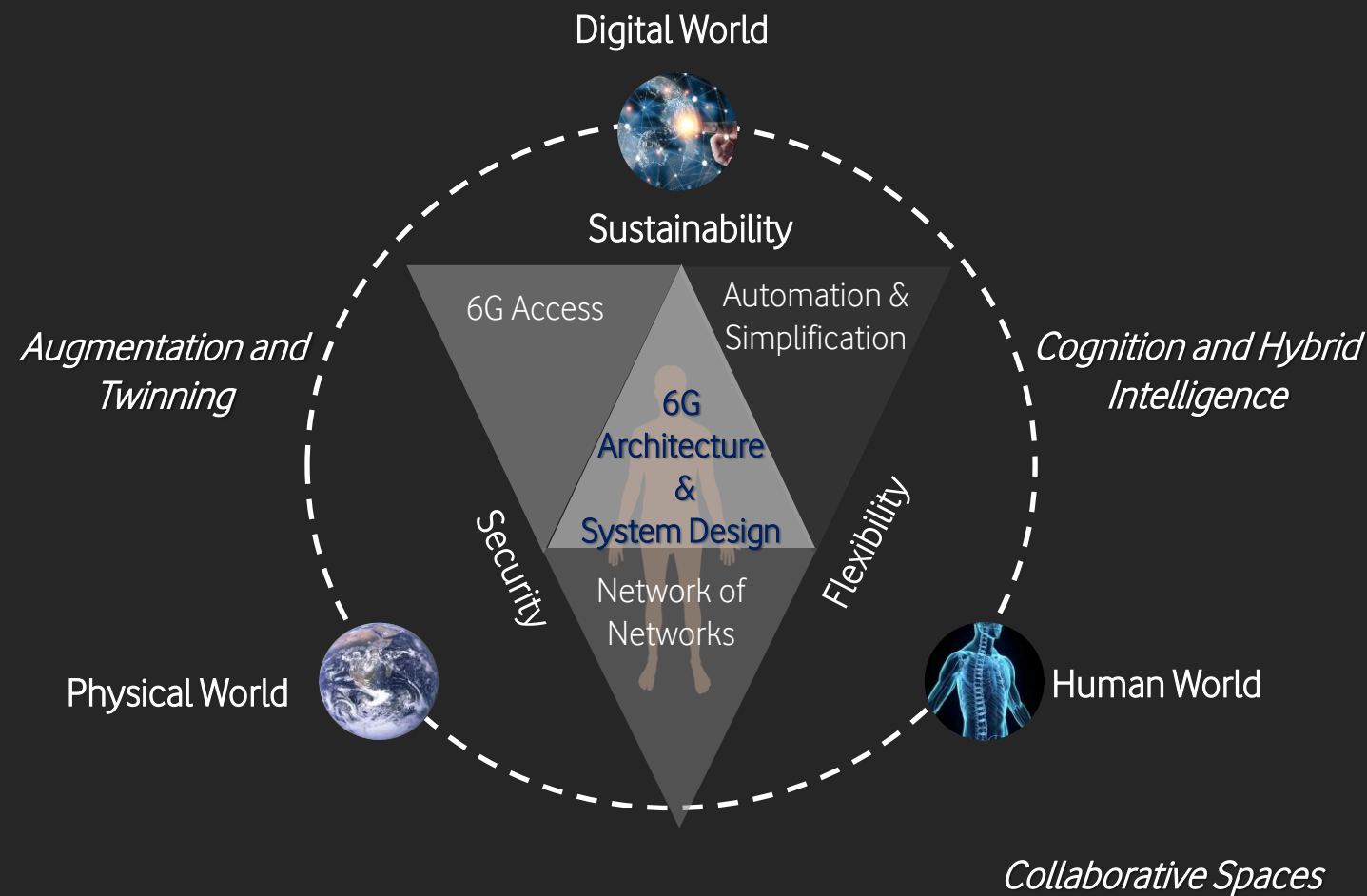
(Medizin-)Geräte



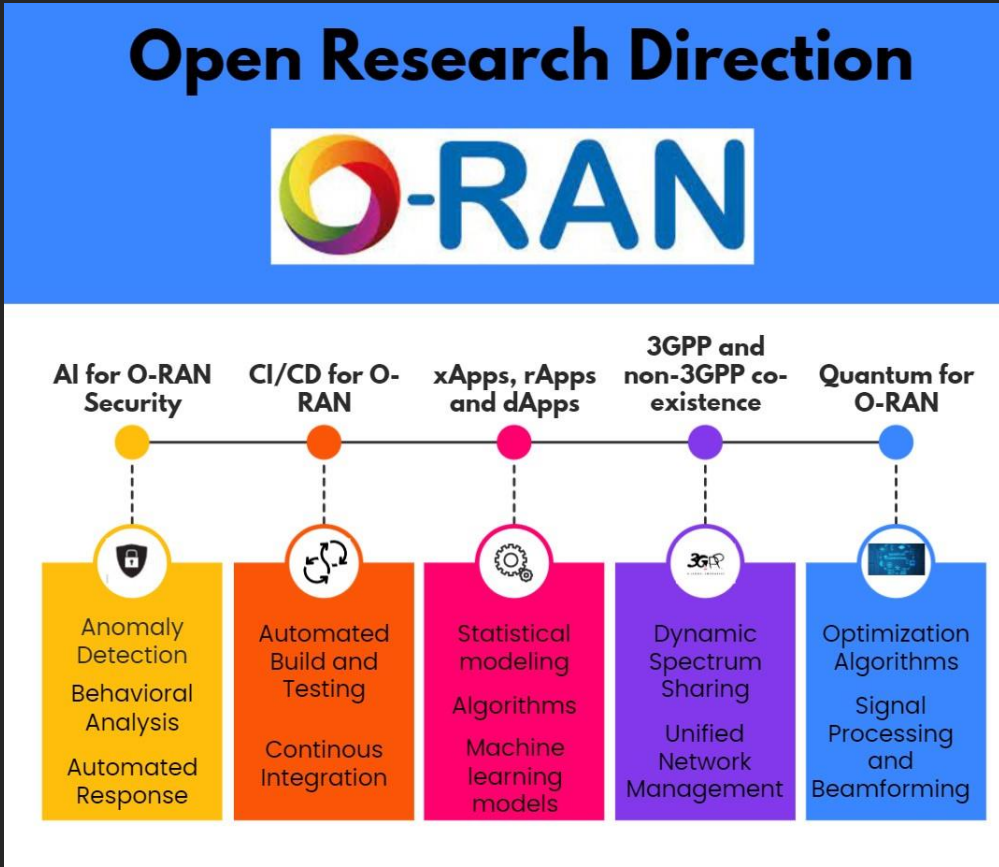
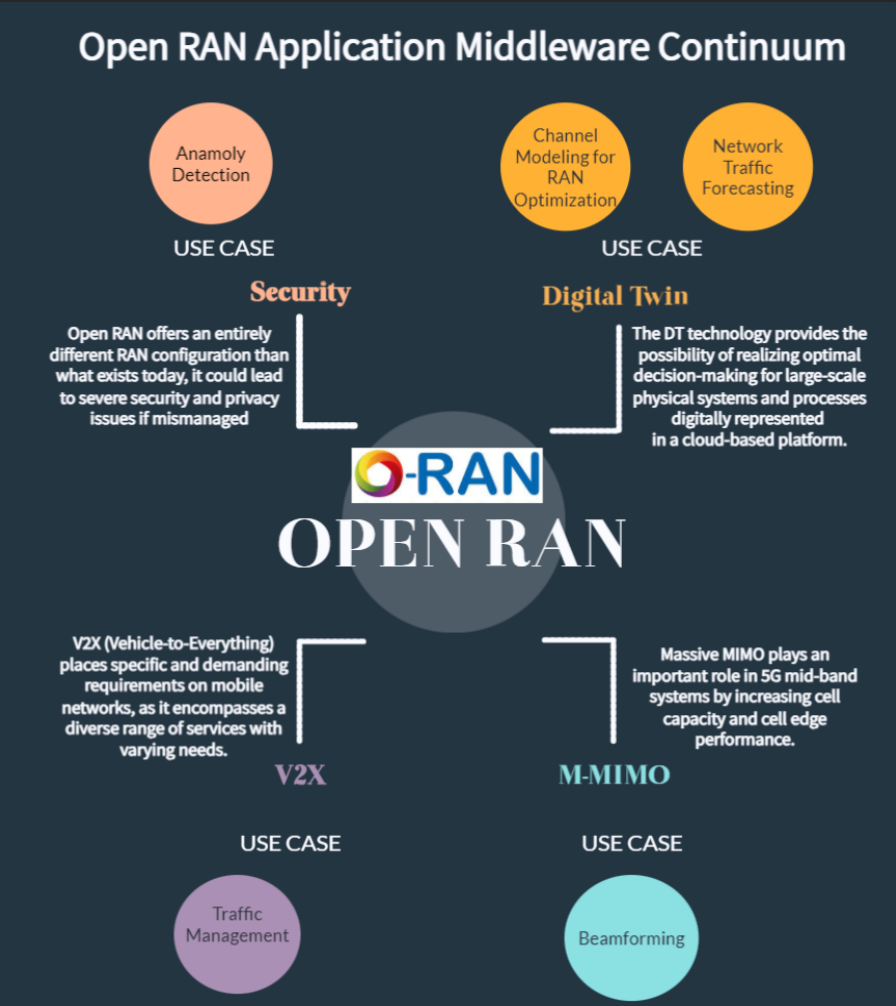
5G/6G technology as a base



6G-ANNA: Lighthouse project towards 6G



6G-ANNA project: Advancing Open RAN towards 6G by focusing on use cases



Applications Driving 5G & 6G

Engage with other industries

Testbeds with today's leading edge technology & co-creation

Understand customer requirements

Design 6G together !



Together we can