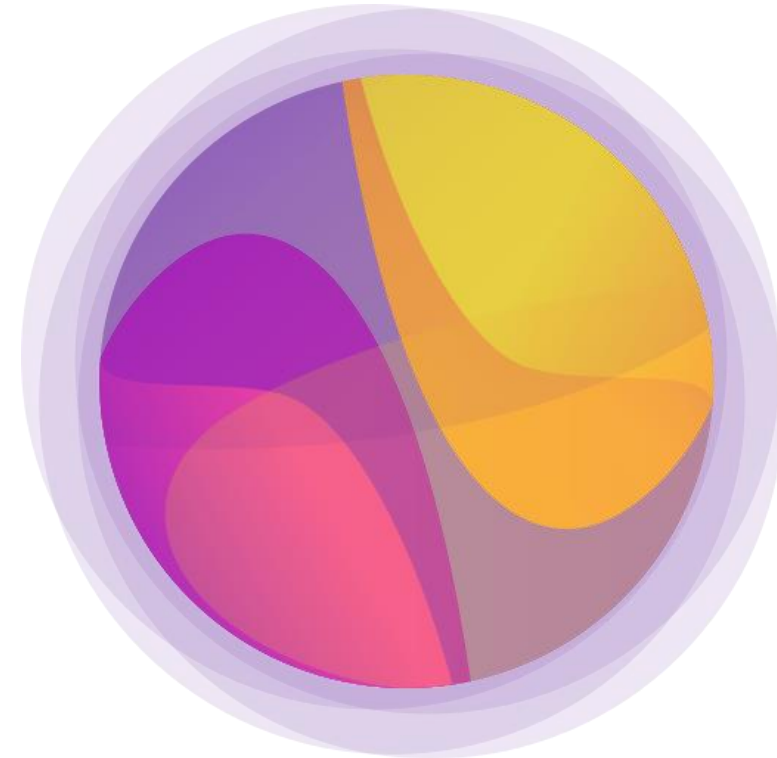


BMBF 6G Research Hub 6G-life

and

6G Future Lab Bavaria



6G-life

Prof. Dr.-Ing. Wolfgang Kellerer

Thinknet-6G Summit

October 28, 2021

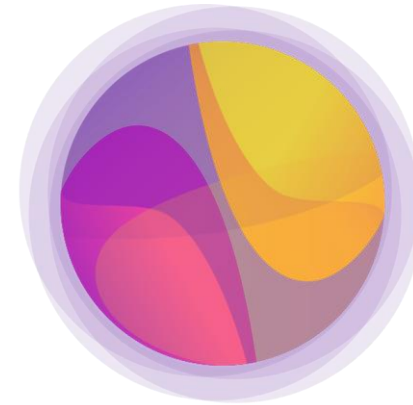
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Bavarian Ministry of Economic Affairs, Regional Development and Energy as part of the project
6G Future Lab Bavaria

Background

- Germany's federal and state governments push for a **leading role in 6G technology** at an early stage
- Novel focus on **universities and startups**
- Strong push for an early **ecosystem establishment** via 4 university research hubs – one platform – industry projects
- Important objective is **technology sovereignty**

- *BMBF Research Hub 6G-life*
- *StMWi 6G Future Lab Bavaria*

BMBF 6G Research Hub 6G-life



6G-life

- Started August 15, 2021
- 70 Million € for 4 years
- > 60 Principal Investigators

- 6G: focus is on **humans and their communication and interaction with machines** and the **virtual world** → holistic research on innovative concepts for scalable communication, novel methods, flexible software concepts and adaptive hardware
- Important fields of application: **Industry 4.0** and **healthcare**.
- Four key performance indicators: **Latency, Resilience, Security and Sustainability**
- **Digital Sovereignty**
- 10 Million € for **Start-ups**

BMBF 6G Research Hub 6G-life



**TECHNISCHE
UNIVERSITÄT
DRESDEN**

Prof. Dr. Frank Fitzek

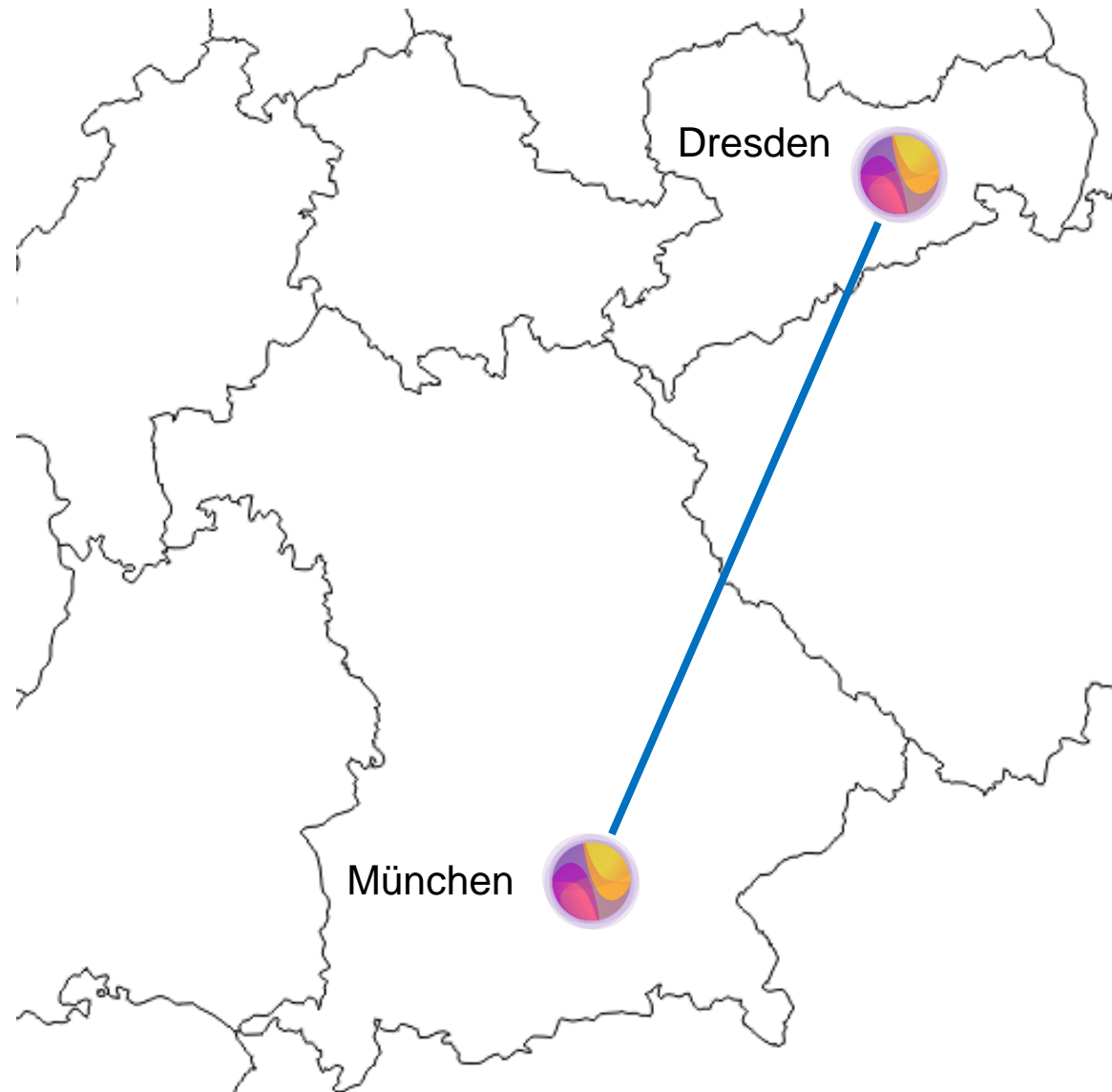
Prof. Dr. Gerhard Fettweis

Technische
Universität
München



Prof. Dr. Holger Boche

Prof. Dr. Wolfgang Kellerer



KOMMUNIKATION

Body Area Networks

Campus-Netze

Mobilfunk / HAP

Taktiler Internet

Quanten-kommunikation

Latenz

Sicherheit

Nachhaltigkeit

Resilienz

Künstliche Intelligenz

Robotik, Materialien, Sensoren / Aktuatoren

In-Network Computing

Joint Sensing, Localization and Communication

Innovation

Innovation

Betriebssysteme und Compiler

Mikroelektronik

METHODEN
Informationstheorie
Protokolle
Codecs

Anwendungen

HARDWARE

SOFTWARE

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6G-life core:
innovative methods

SOFTWARE

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Innovative Methods

novel methods for
communication networks
based on

- Post Shannon Theory
- AI for network control and new services
- Protocol and codec design for Human-Machine Collaboration

Robotik, Materialien,
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SOFTWARE

KOMMUNIKATION

- Body Area Networks
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- Taktiler Internet
- Quanten-kommunikation



- Robotik, Materialien, Sensoren / Aktuatoren
- In-Network Computing

- Joint Sensing and Co-Processing
- Systeme
- er

- Mikroelektronik
- Anwendungen

HARDWARE

SOFTWARE

*innovative methods
to guide novel hardware and software concepts*

KOMMUNIKATION



Robotik, Materialien, Sensoren / Aktuatoren

Joint Sensing, Localization and Communication

Mikroelektronik

HARDWARE

Flexible Software

networks and equipment are dominated by SW

- In-network computing and ORAN
- 6G application in virtual worlds (digital twins and holograms)
- Low latency and energy efficient compiler and OS design

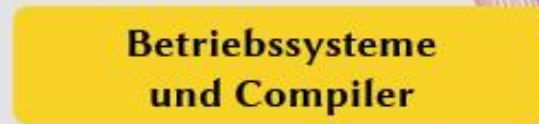
SOFTWARE

Adaptive Hardware

Novel hardware concepts for future needs and applications

- New materials for robotics and humans in virtual worlds
- Joint sensing and communication
- Flexible energy saving

KOMMUNIKATION



Innovation

HARDWARE

SOFTWARE

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In-Network Computing

Joint at

innovative methods to flexibly tune our KPIs to support 6G communication

HARDWARE

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Scalable Communication

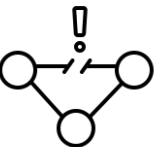
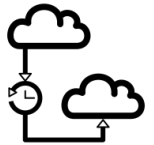
to support flexible communication network architectures including

- Cellular networks with Campus and HAP extensions
- Tactile Internet
- Quantum Communication
- Body Area Networks

Selected 6G technology focus fields in 6G-life

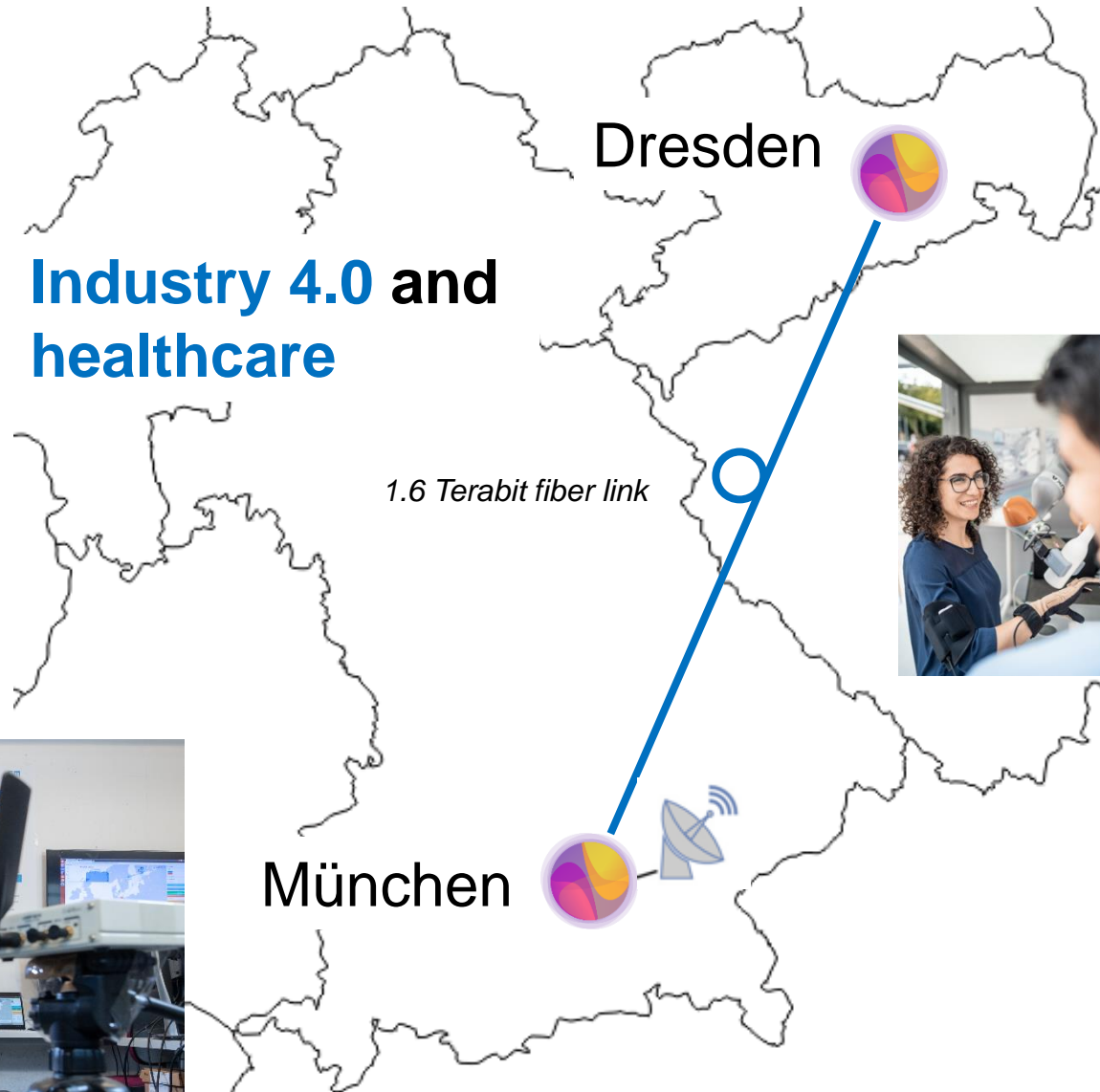


- *6G: human in the center – extension of the human intelligence and human abilities*
- *Application fields* **Industry 4.0** and **healthcare**
- Ultra-scalable 6G architecture
- AI for network control and AI support in-network
- Joint sensing and communication
- New materials, e.g. for robotics
- Post Shannon Theory
- Quantum communication
- Post-quantum security

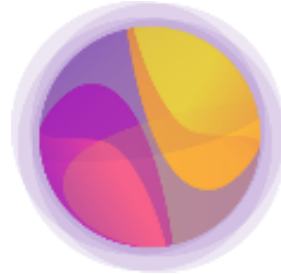


Latency
Security
Sustainability
Resilience

6G-life applications and testbed



6G-life innovation ecosystem



**TECHNISCHE
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DRESDEN**

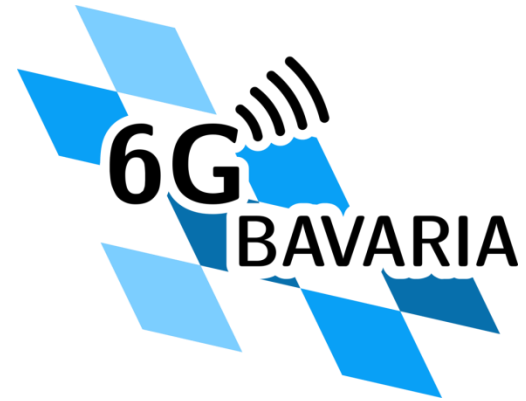
Strong support of existing Startups and university Spinoffs

our current partners

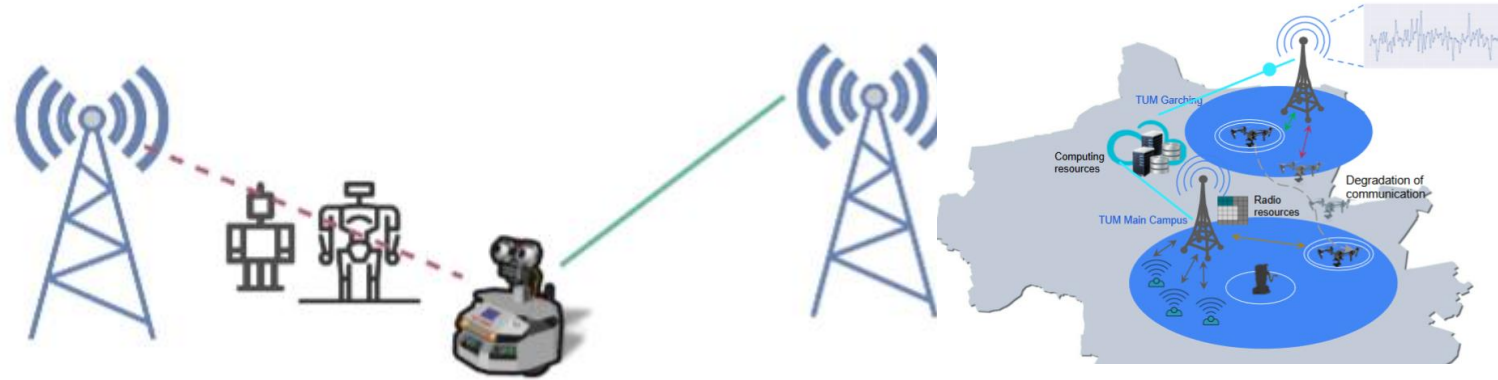
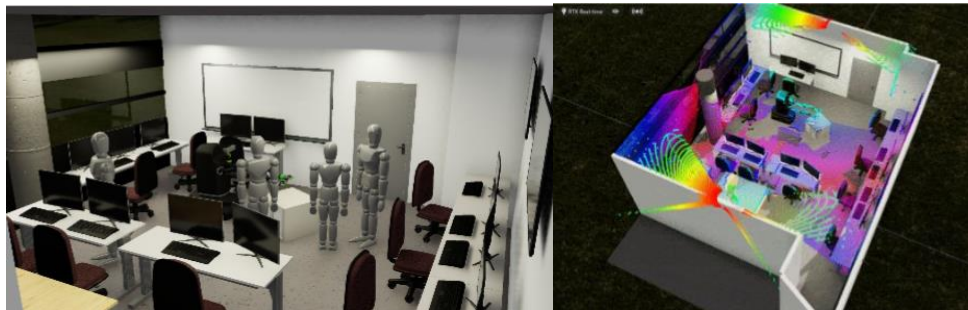
CADAMI



6G Future Lab Bavaria



- Started on May 1, 2021
- 4 Million € for 3 years
- 13 Principal Investigators in 8 Subprojects
- The lighthouse project at TUM researches on **selected fundamentals of 6G** and prepares them for further investigations, development and standardization. Research focus is on the coupling of the digital and the physical world („**Digital Twin**“), as well as on sustainability, resilience and security.

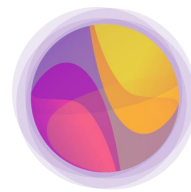


6G fundamental research - 6G experimental platform - 6G roadmap

Thank you

<http://www.6g-life.de>

<https://www.6g-future-lab.de/>



Scalable Communication

communication
network architectures
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- Tactile Internet
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applications

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- Joint sensing and communication
- Flexible energy saving

Example: Video Image information for 6G resource management

Concept

- Channel estimation based on video image processing
- AI-based estimation is performed in edge cloud
- Significant increase in throughput and reliability

