Department for Science, Innovation, & Technology

UKRI Engineering and Physical Sciences Research Council

Federated Telecoms Hubs

Professor Harald Haas

UNIVERSITY OF CAMBRIDGE

Federated Telecoms Hubs

Digital Futures: Communications Systems

UK Government Announces Investment in telecoms innovation and R&D

£70 million

Department for Science, Innovation, & Technology

£30 million

Innovate UK

UKRI

Application-focused challenges to accelerate market-ready solutions

Activities include:

- Small Business Research Initiative (SBRI)
- Innovation-to-Commercialisation of University Research" (ICURe)
- Analysis for Innovators (A4I)
- Fast Start

£40 million

Engineering and Physical Sciences Research Council

UKRI

Enabling UK-wide research programme

- Uplift existing Future Telecoms Hubs, including
  - Network of Networks
  - Wired, Wireless and Spectrum
  - Distributed and Cloud Computing
  - JOINER for collaborative experimentation and pilots
- Featuring "community calls" as well as enhancement of the National Dark Fibre Facility (NDFF)

Enable UK 6G Strategy
(Wireless Infrastructure Strategy)

Federated Telcoms Hubs

Establish a future communications systems early-stage

Each platform will cover:

1. Network of Networks (PI: Prof. Harald Haas, TITAN)

- Native AI, wireless, wired, non-terrestrial and quantum network innovations
- Integration and optimisation across terrestrial and satellite.
- Physical systems architectures, network interoperability and integration

2. Wireless Systems, Spectrum & Wired (PI: Prof. Dominic O'Brien, HASC)

- Radio frequency engineering
- Spectrum innovation and integration
- Optical and photonics

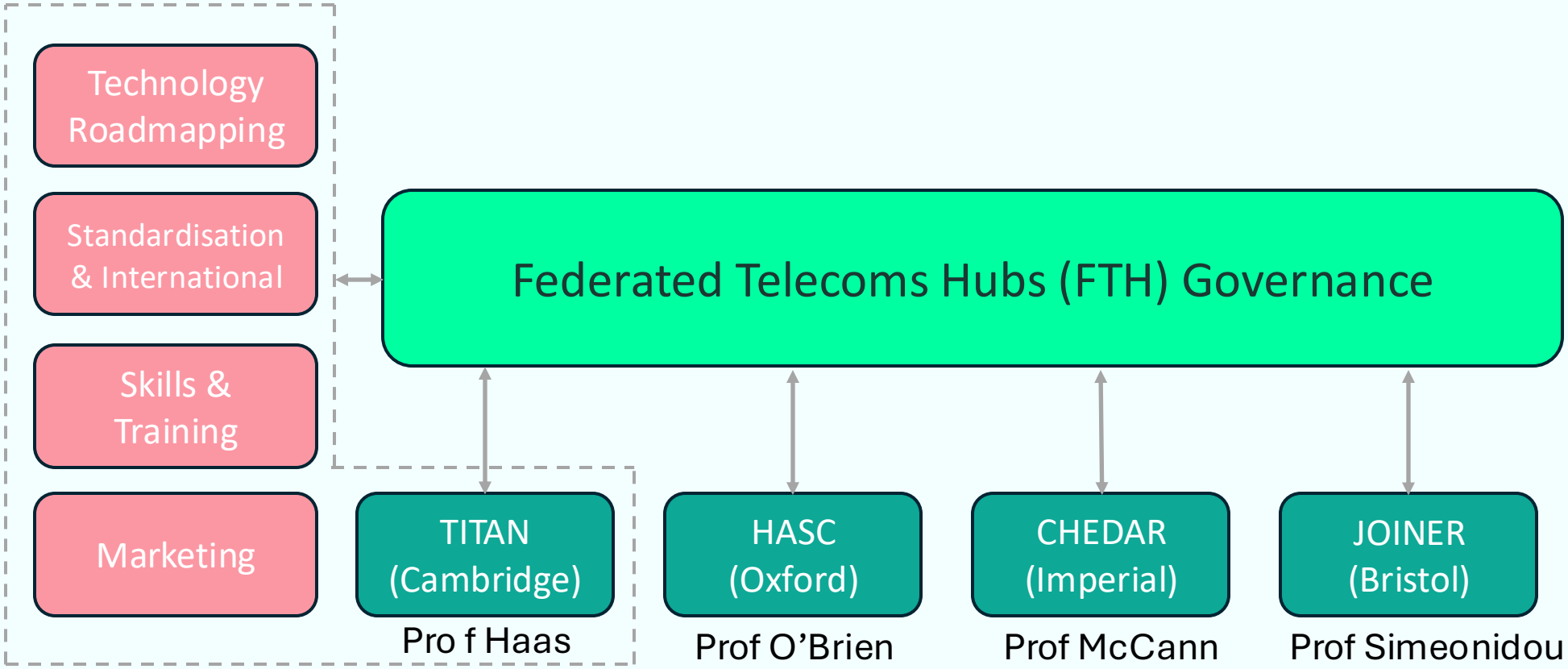
3. Cloud & Distributed Computing (PI: Prof. Julie McCann, CHEDDAR)

- Cloud, fog and edge computing
- Data science and algorithms
- AI and machine learning

4. Joined Open Infrastructure for Network Research (PI: Prof. D. Simeonidou, JOINER)

- National infrastructure for collaborative experimentation
- Cross-layer, cross-technology, at scale
- Provide experimental evidence, support TRL enhancement, attract industry engagement, deliver UK-wide 6G pilots

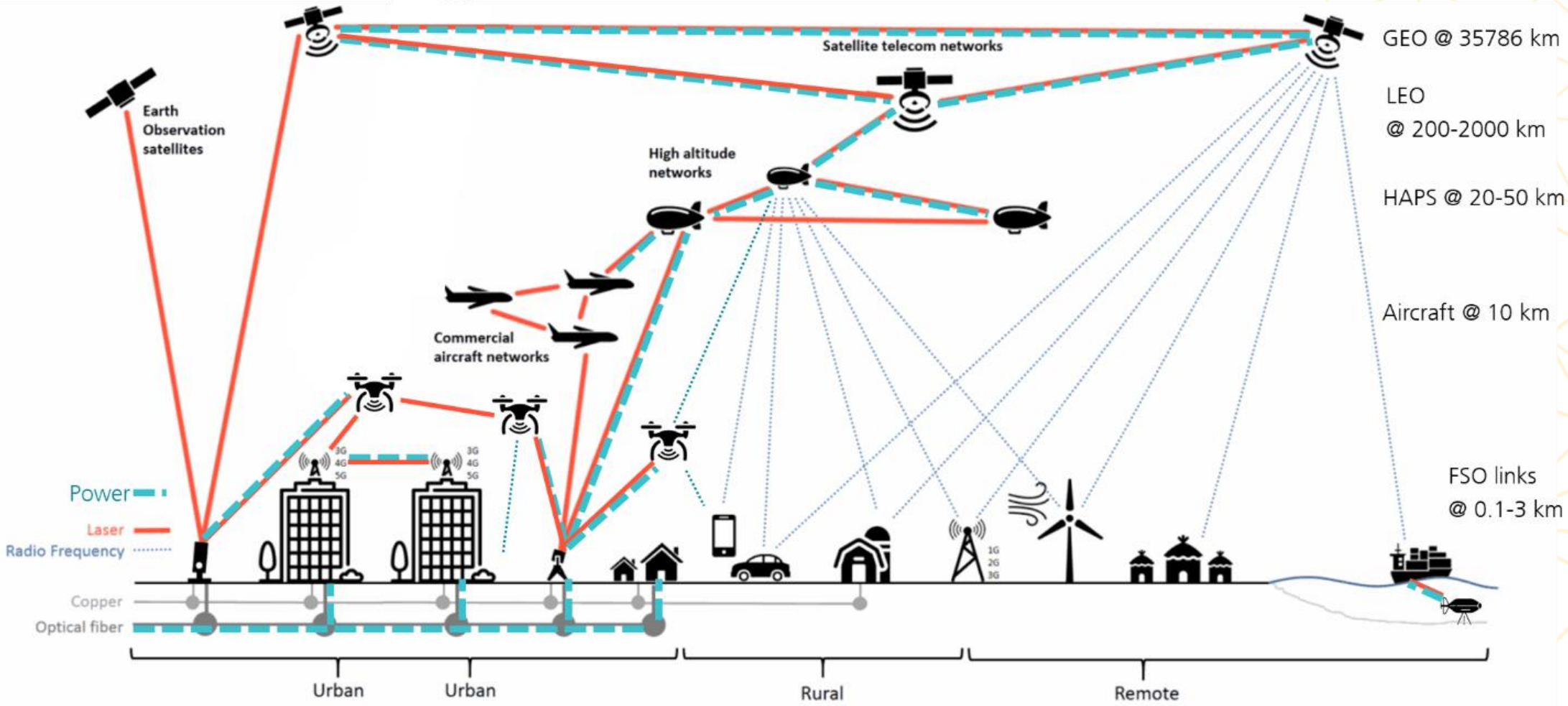
Federated Telecoms Hubs Structure



https://www.titancambridge.com/
https://allspectrumhub.org/
https://cheddarhub.org/
https://joiner.org.uk/

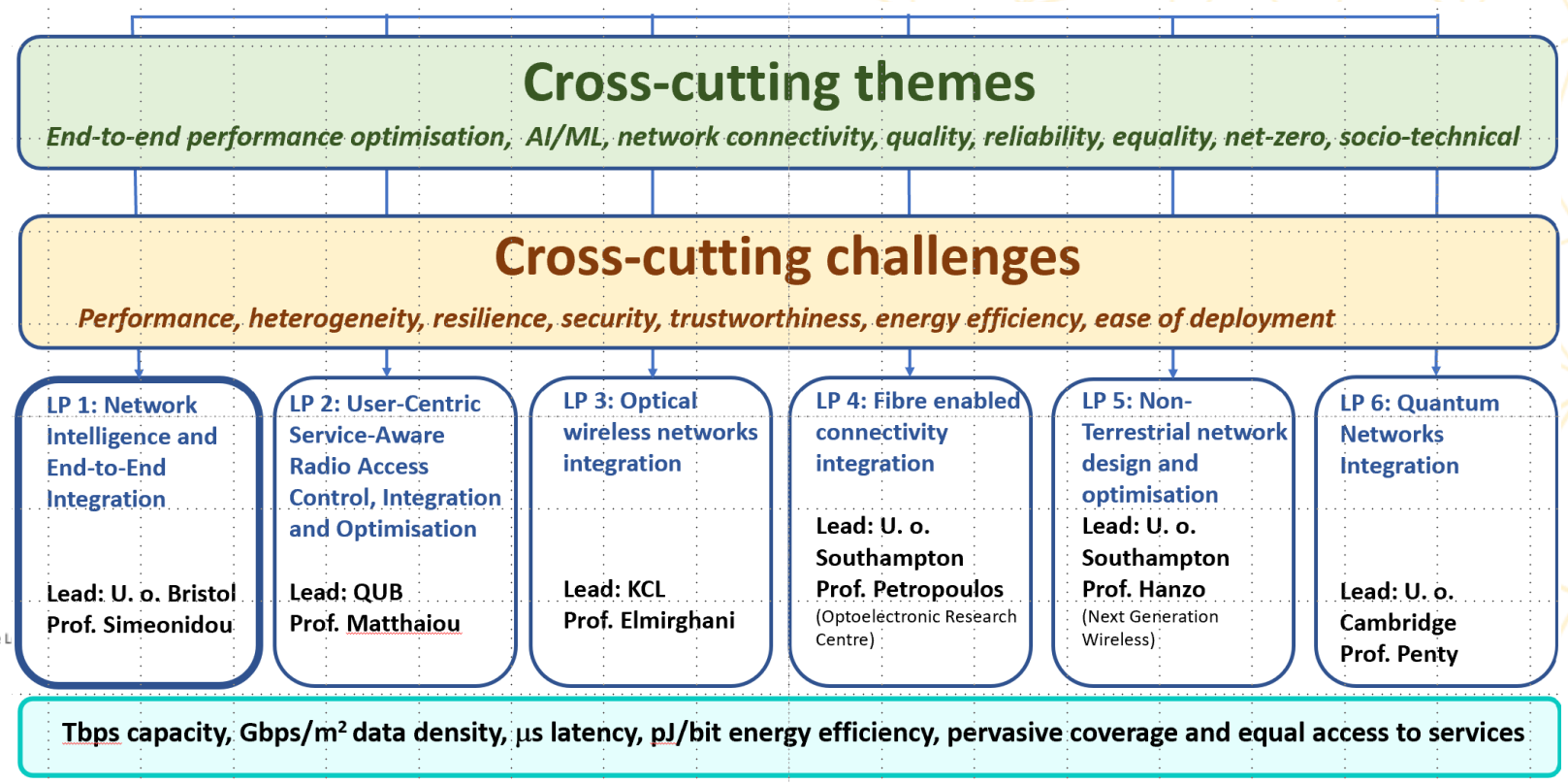
Federated Telecoms Hubs

TITAN (Network of Networks) Vision



Courtesy: Dr. Henning Helmers, Fraunhofer ISE, GreenCom project

UK Hub on Network of Networks



- 20 Partner Universities
  - 47 Co-Is
  - 44 PDRAs
  - 38 Mini-projects (MPs)
- 4 Research Institutes

New partners (after project call in April):

- Satellite Applications Catapult,
- UCL,
- University of Hertfordshire,
- Northumbria University,
- Glasgow Caledonian University

TITAN Research and Experimentation

TITAN
PLATFORM DRIVING THE ULTIMATE CONNECTIVITY

LP 1: Network Intelligence and End-to-End Integration

- New open architectures for E2E
- Intelligent Multi-access controller
- AI-native networks
- Network optimisation using AI/ML

LP 2: User-Centric Service-Aware Radio Access Control, Integration and Optimisation

- Cell-free, high-density wireless networks
- Energy-efficient wireless networks
- Spectrum sharing architectures
- Massive and holographic MIMO
- Reflective Intelligent Surfaces (RIS)
- Sub-THz

LP 3: Optical wireless networks integration

- Net-zero data links
- New device technologies
- Terabit/s optical wireless
- Satellite and underwater networks
- Communication and sensing – LiFi-Lidar

LP 4: Fibre enabled connectivity integration

- Hollow-core and multi-core fibre for low latency data links
- Dynamic spectrum management
- Integration of sensing techniques for network monitoring

LP 5: Non-Terrestrial network design and optimisation

- Optimum resource allocation for low latency links
- Satellite data link optimisation using AI/ML
- Interference and spectrum mgmt
- Aerial platforms / HAPS integration
- Reliable high-speed link from ground to satellite

LP 6: Quantum Networks Integration

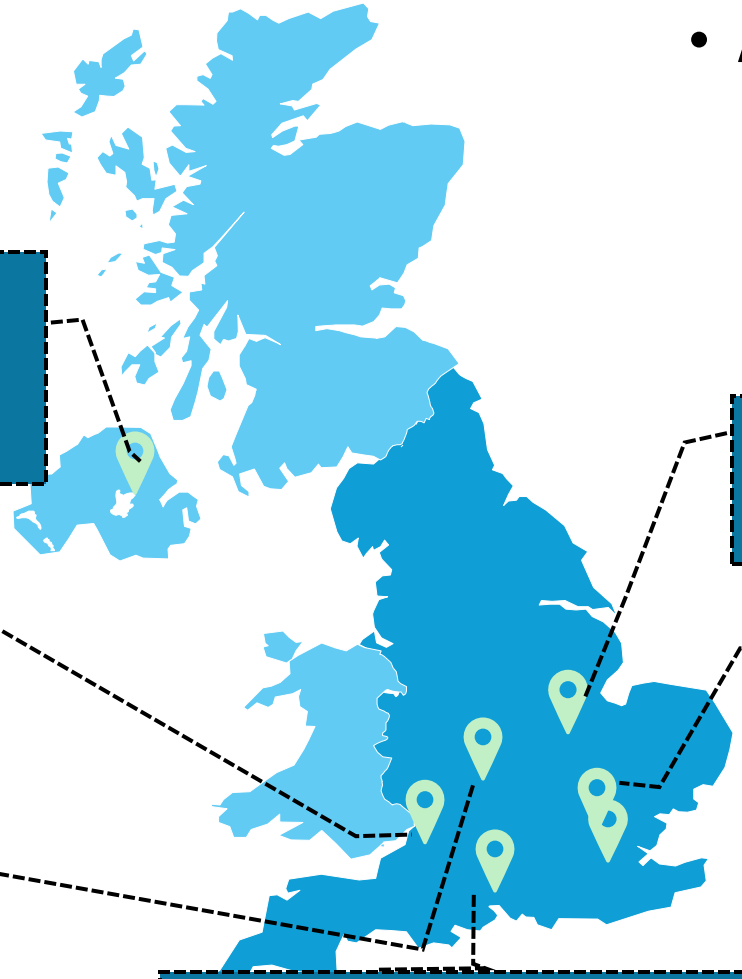
- New architectural solutions for combining quantum and classic communications
- E2E physical layer security / crypto
- Quantum router
- Distributed computing and sensing

Joint Open Infrastructure for Networks Research (JOINER)
First UK 6G trials

The HASC collaboration

- Original
  - Seven Partners
  - 21 Investigators

- Additional
  - Five proposals funded
  - Eight new partners



Belfast: Propagation Measurements, Spectrum Modelling, RIS mMIMO / Cell-free mMIMO, PHY Security

Bristol: E2E networks, Intelligent/programmable networking. Socio-technical (BDFI) Compound Semiconductors (SW) through the Western Gateway

Oxford: Free Space Optical Comms, QKD, optical wireless, Quantum Computing

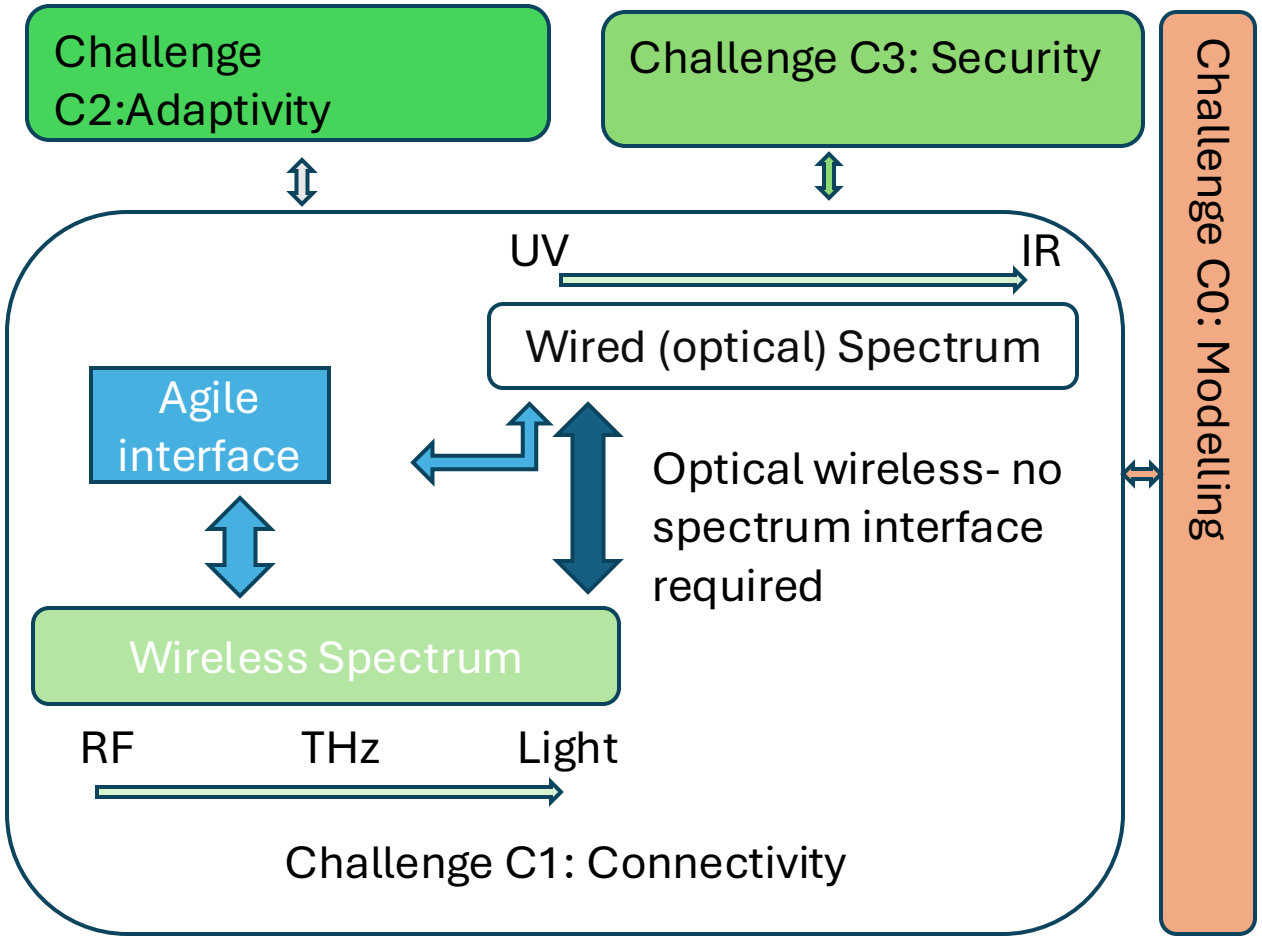
Cambridge: Quantum Comms, Photonics, RF, Optical Wireless / LiFi networks

Imperial: AI/ML, Signal Processing, Communication Theory, RIS, MIMO, RSMA

UCL: Terahertz Wireless Comms, Free Space Optical Comms

Southampton: Optical Fibre, Optical + Wireless comms, Integrated photonics

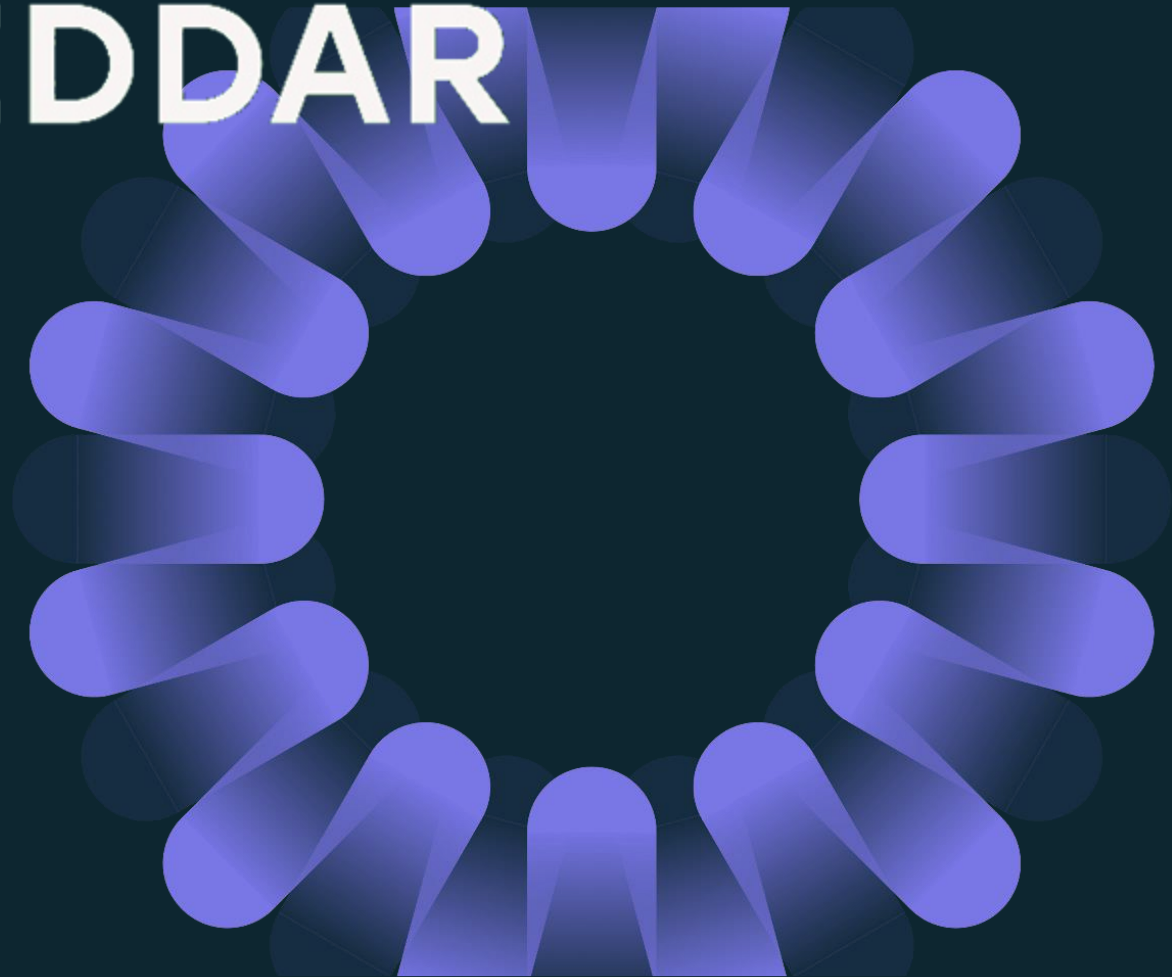
Organisation



- C0: Modelling (OXF)
  - Develop holistic model of connectivity
- C1: Connectivity (UCL)
  - Demonstration of connectivity using different techniques
- C2: Adaptivity (Bristol)
  - Networks that best use fibre and wireless together
- C3: Security (Cam)
  - QKD/Physical layer security/postquantum techniques.

Communications Hub for Empowering Distributed clouD computing Applications and Research

CHEDDAR



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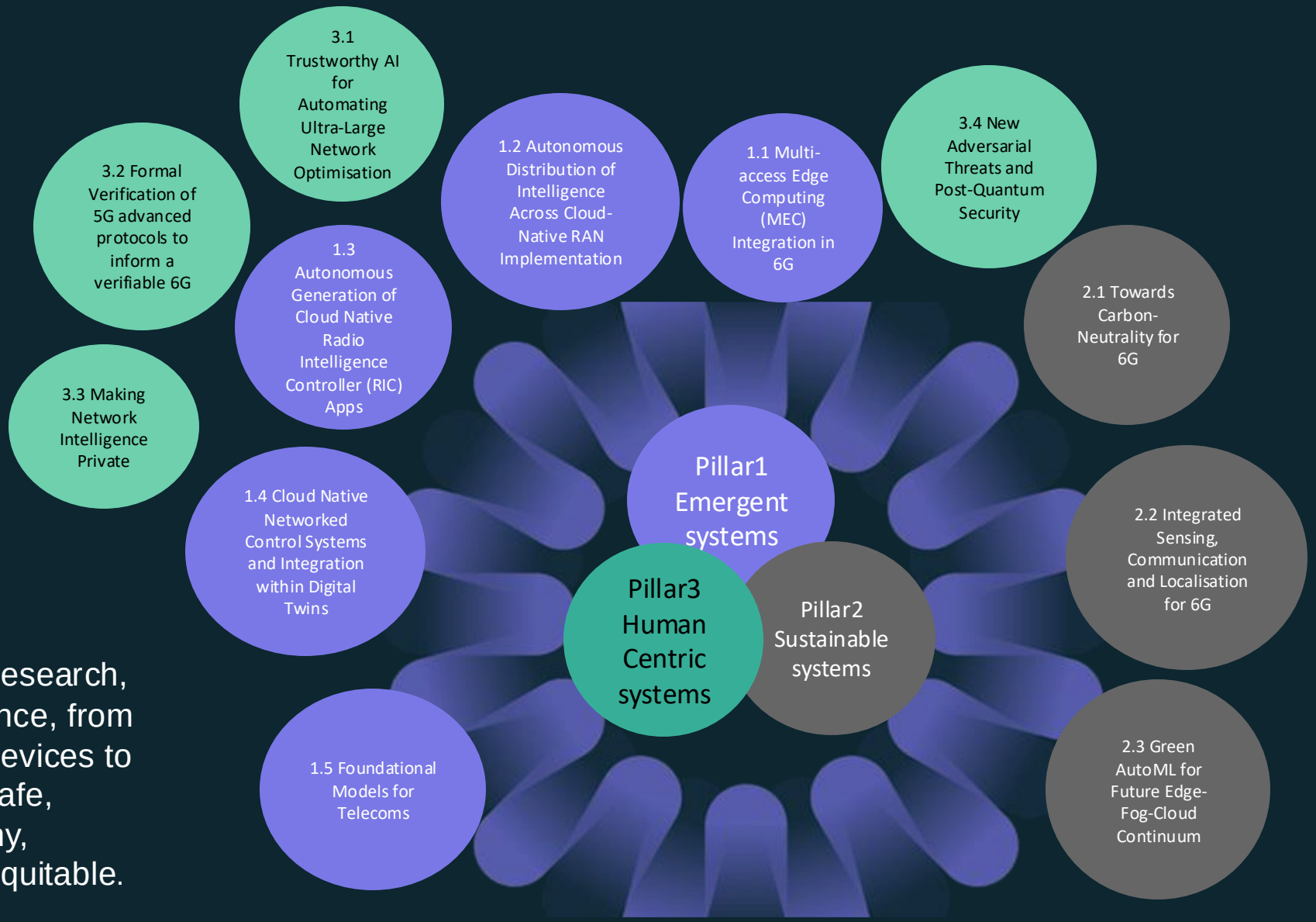
CHEDDAR

Communications Hub for Empowering Distributed clouD computing Applications and Research



CHEDDAR future communications research, connects intelligence, from the cloud to tiny devices to ensure they are safe, secure, trustworthy, sustainable and equitable.