A 6G VISION
WHAT WILL 6G OFFER TO VERTICAL INDUSTRIES & FUTURE PERSPECTIVES

ICS
HOME OF 5 AND 6GIC

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Our Mission

5GIC: World's first 5G Centre
6GIC: UK first 6G Centre

ART OF POSSIBLE

ROYAL ACADEMY OF ENGINEERING

Winner of Royal Academy of Engineering (RAEng) 2021 for best Industry-Academia Collaboration

IMT 2030 (6G): Integrated Communications & Sensing

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UNIVERSITY OF SURREY

WHY

- Environment
- Society
- Economy

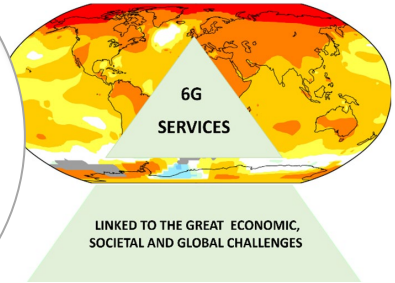
HOW

- Ultra High Energy Efficiency
- Reliability Privacy & Trust
- Digital Divide

- Full 5G Capability
- Clear Use Case
- Clear Business Case

WHAT

- 4D Video (Teleportation)
- Intelligent Surfaces
- Sensing
- Net of Networks



* R. Tafazolli, Future Wireless World, TEDx 2015

Integrated Communication and Sensing (ICS)

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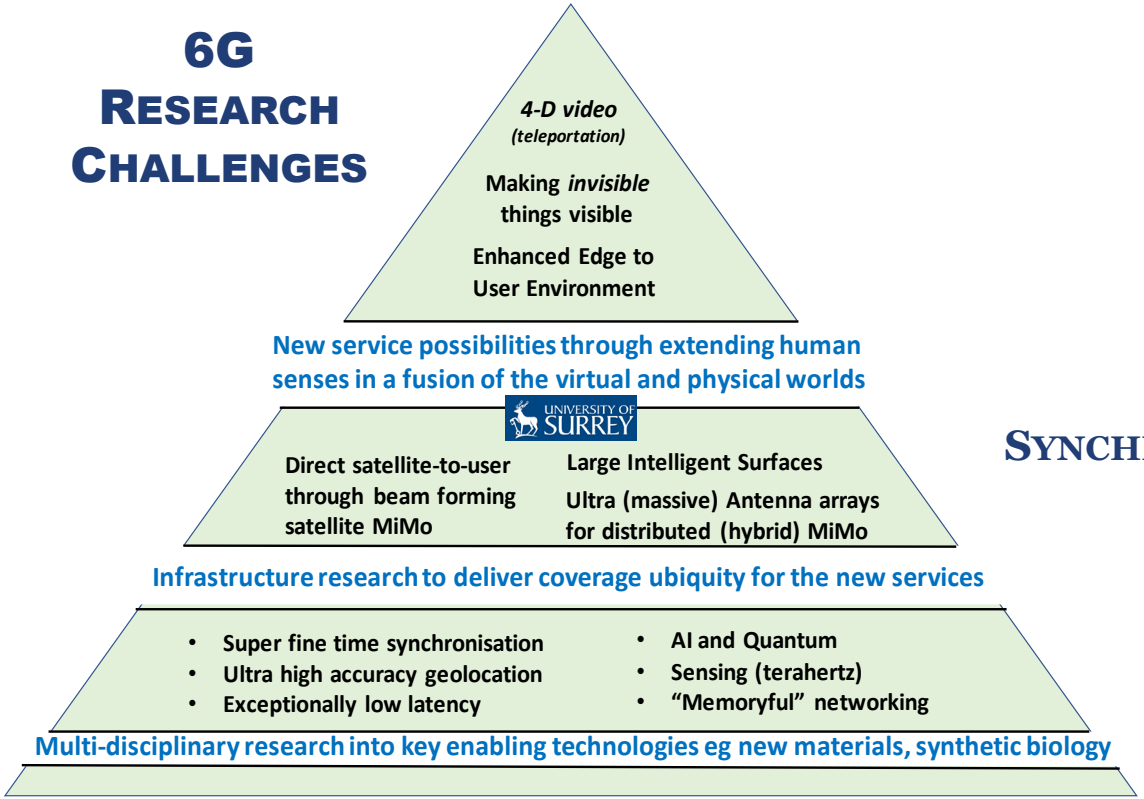
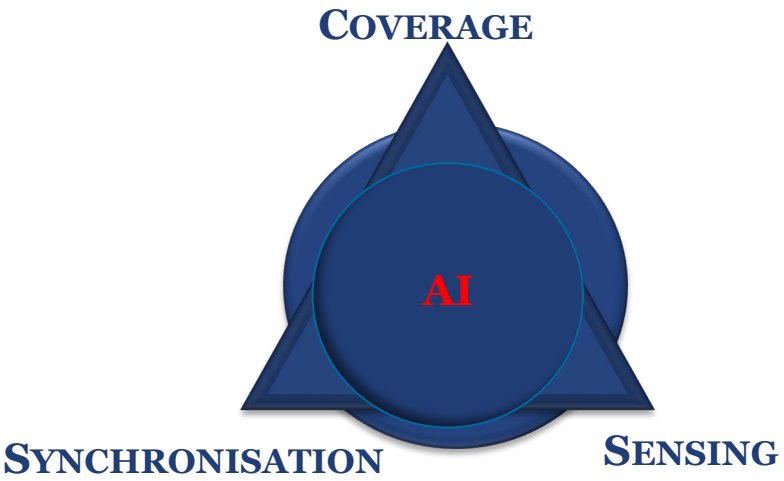
Figure 1: 6G vision supported by new cross-functional research and development programme

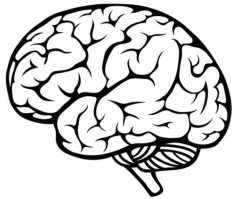




Future Networks: Basic Principle

SENSING: EYES

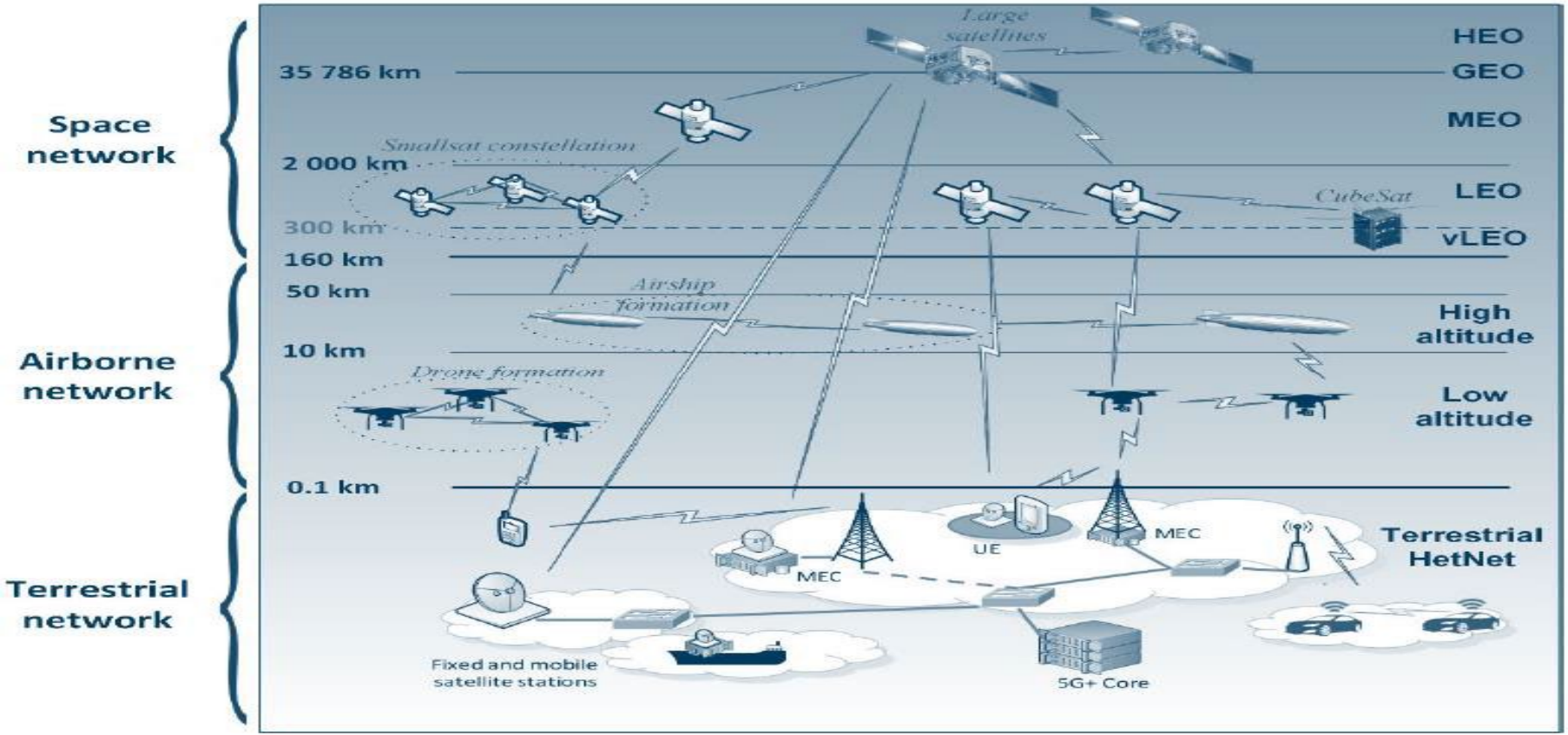
SEMANTICS & AI: BRAIN
(INFERENCE & LEARNING)



SYNCHRONISATION: HEARTBEAT

VIRTUALISATION (SOFTWARIZATION): FREEDOM

Towards Ubiquitous 3D Open and Resilient Network (TUDOR)



Sensing

- Enhances efficiency at all layers of communications: Radio, Network protocols & system
- Improves Energy & spectrum Efficiency
- Enable smarter applications

Two broad categories of Sensing:

- System (Network) Level
- User Level (Ambient Information)

System-Level Sensing & Communication

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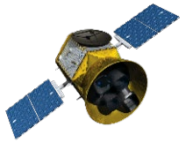
Traffic Sensing

Camera

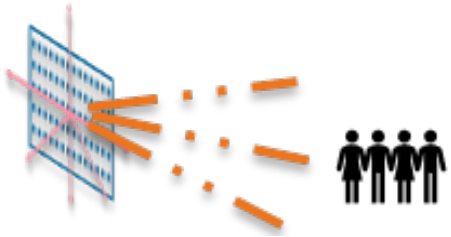
Interference Management

Earth Observation/Sensing



Various applications incl: Security

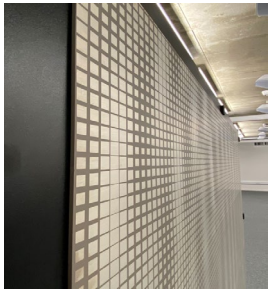
Traffic Location and Mobility Sensing



Resource Management, Beam Forming & Tracking

EM Sensing

Intelligent Surfaces with Metamaterial



Coverage Extension

Change of Environment (Channel) Sensing

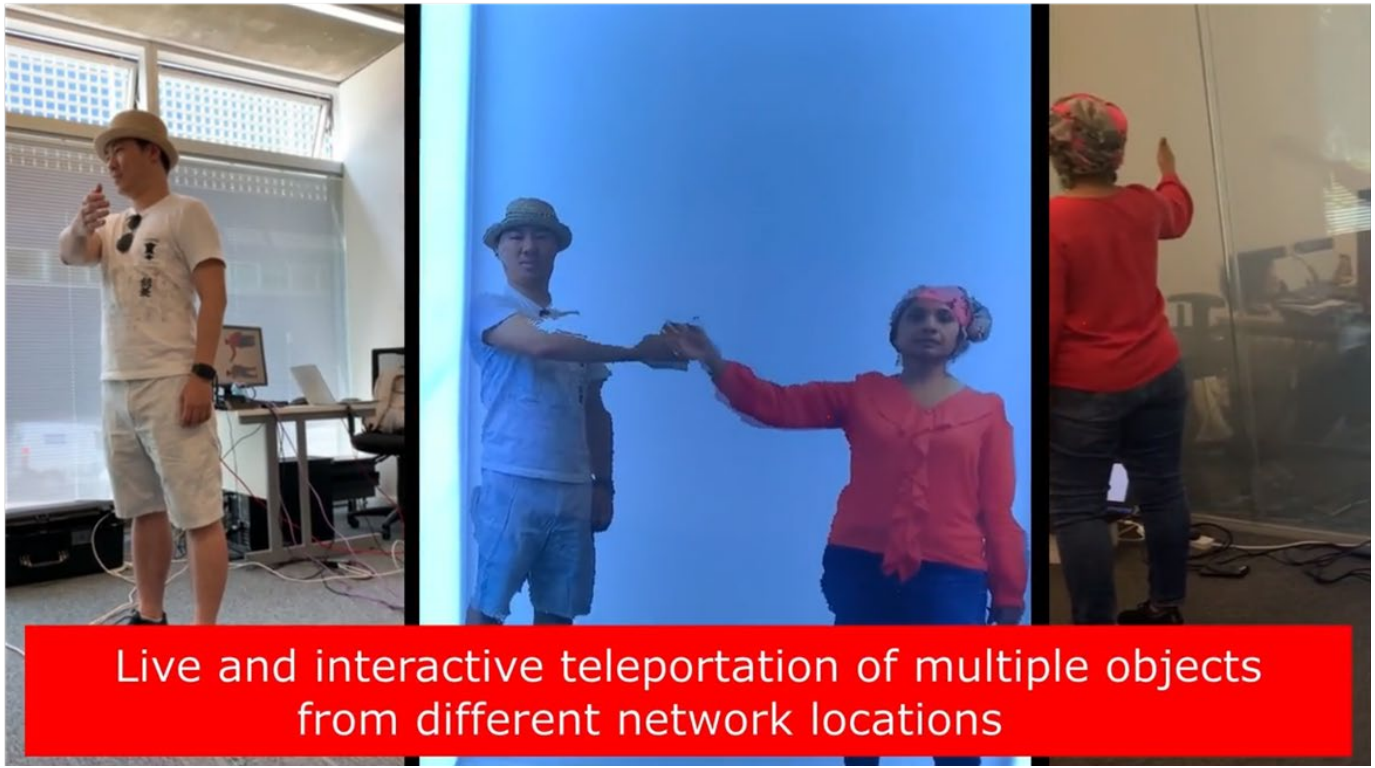
Camera
Radar/Lidar

Channel Equalization

INTERACTIVITY BETWEEN AND WITHIN

VIRTUAL AND PHYSICAL WORLDS

Interactivity in Cyber World with Ambient Senses around a User



Enabled by High Quality Time Synchronisation

New Generation of Use cases enabled with Interactivity

Enabled by Low latency and reliability

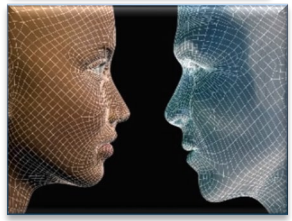
- Connected vehicles
- Manufacturing
- Games/Entertainment
- Health
- Education
- …



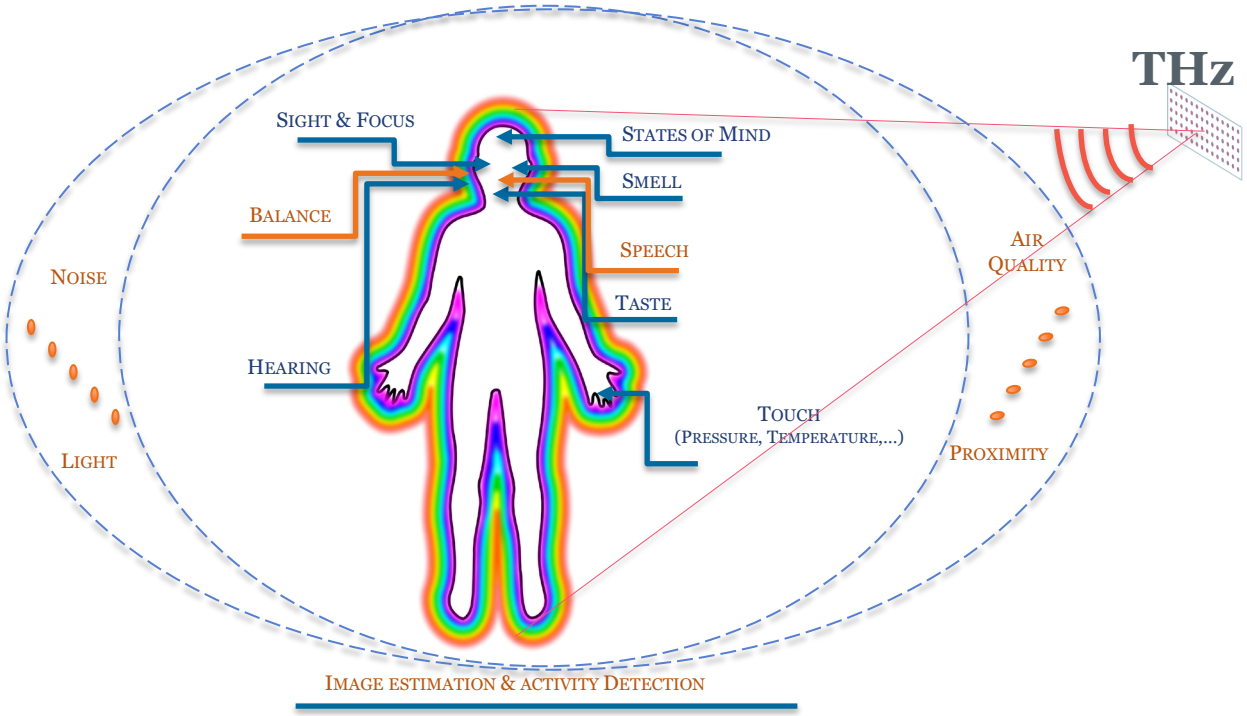

Enabled by Low latency + Time synchronisation

- High Speed Driver-Less and cooperative driving
- Interactive Cooperative Manufacturing
- Interactive Agriculture
- Interactive entertainment
- Interactive Telecare
- Interactive Tele-education
- …….

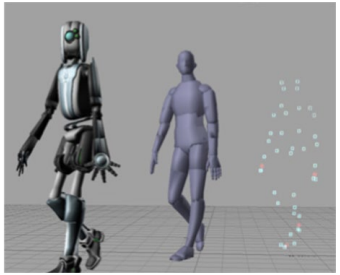




User-Level Sensing & Communications



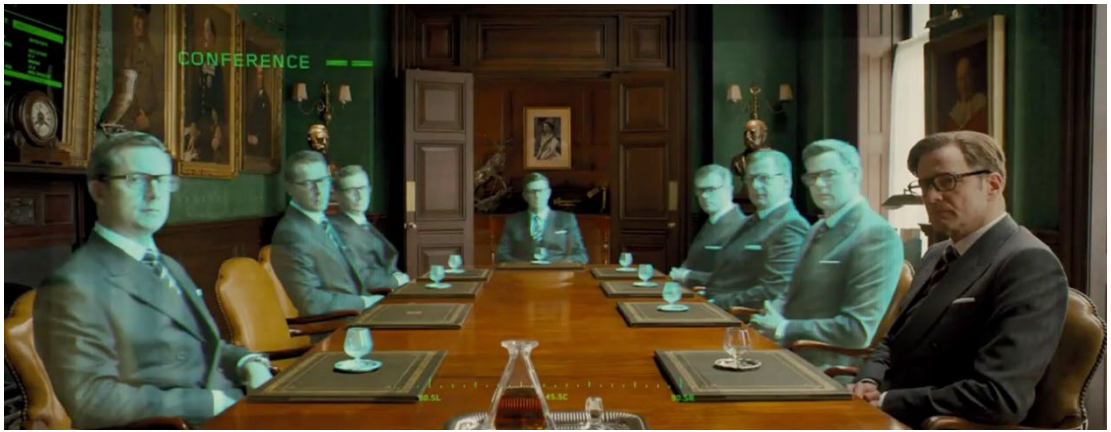
Activity detection and Location Estimation (sub-cm) and real-time Tracking



THz Imaging

Teleportation

VR + Synchronisation+ User Level Sensing Information



IMT 2030: Integrated Communication and Sensing in 3D Network of Networks

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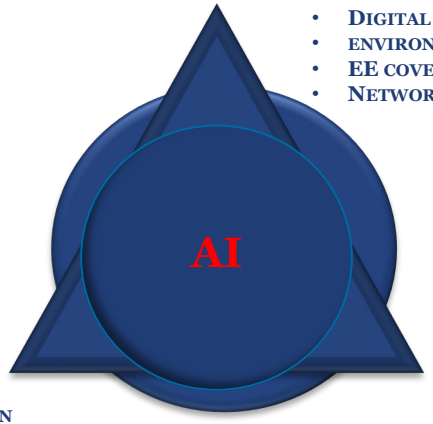
COVERAGE

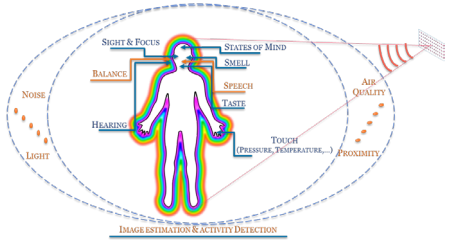
- DIGITAL INCLUSION,
- ENVIRONMENT SUSTAINABILITY
- EE COVERAGE EXTENSION
- NETWORK OF NETWORKS



Ultra Energy Efficient Coverage Extension

SYNCHRONISATION

- 4D VIDEO, PHYSICAL & VIRTUAL WORLDS INTERACTIVITY DRIVERLESS TRANSPORTATION
- INTERACTIVE E-HEALTH,....
- INTERACTIVE ROBOTICS



SENSING

(HUMAN AND ENVIRONMENT AND NETWORK SENSING)

- GEO-LOCATION
- ENVIRONMENTAL INFORMATION
- NATURAL INTERACTIVITY BETWEEN PHYSICAL & VIRTUAL WORLDS
- RESOURCES EFFICIENCY
- MANY NEW SMART SERVICES,

TELEPORTATION:

- VR + SYNCHRONISATION+ USER LEVEL SENSING

Thank You