1st Japan-UK Advanced Connectivity Technologies Innovation Forum Report

Co-organised by NICT and UKRI-EPSRC with support from MIC and DSIT

11-12 December 2025 | Tokyo, Japan

Summary

This report summarises the discussions and outputs of the joint forum (interchangeably referred to as workshop in this report) held on 11–12 December 2025, co-organised by NICT and EPSRC, with support from Ministry of Internal Affairs and Communications (MIC) and Department of Science, Innovation and Technology (DSIT). The workshop aimed to foster connections between experts from academia and industry across Japan and the UK, exploring joint priority strength areas to pave the way for a bilateral partnership in Advanced Connectivity Technologies.

The sub-priority areas that were identified through structured sessions on Non-Terrestrial Networks, AI for Telecoms, and Optical Networks were as follows.

- Non-Terrestrial Networks in space for global coverage through satellite, sub-sea and high-altitude platforms.
- AI for Telecoms to enable automation, optimisation, and resilience via distributed AI resources, autonomic networks, and support third party AI applications via cloud and edge computing
- Optical Networks enabling high-capacity, resilient and energy efficient advanced communication technologies through innovations, including ultra-wide band technologies, multi-core and hollow core fibres, new optical amplifiers, digital signal processing, and physics-informed, interpretable AI, advanced optical switching technologies and integration with quantum communications.
- Cross-cutting priorities (sustainability, security, data privacy and regulation, interoperability, and globally leading standardisation) and integration of networks in space, land and sea will ensure these technologies converge to create scalable, resilient, and future-proof connectivity.

These priorities will be developed further in the upcoming workshop in 2026, and will help guide the planning and implementation of any joint research programme initiatives between the two countries.

Contents

1st Japan-UK Advanced Connectivity Technologies Innovation Forum Report 1

Summary 2

Background and purpose of the workshop 4

Workshop overview 4

Summary of key discussions 5

Sub-priority areas 6

Non-Terrestrial Networks 6

AI for Telecoms 7

Optical networks 8

Cross-cutting priority areas and synergies 9

Next steps and Recommendations 9

Background and purpose of the workshop

The workshop was convened to provide a platform for initiating connections between the UK and Japan research and innovation ecosystems – building new collaborations and strengthening existing relationships – and to share perspectives on joint areas of interest. Discussions focused on identifying potential shared priorities for future initiatives, considering both current collaborations and emerging opportunities.

The objectives of the workshop were to:

- Connect key academic and industry stakeholders from the UK and Japan's wider research and innovation ecosystem.
- Showcase research highlights within the advanced connectivity technologies landscape in both countries.
- Facilitate dialogue on major technical areas: Non-Terrestrial Networks, AI for Telecoms, and Optical Networks.
- Provide a collaborative forum for identifying shared priority areas in fundamental and applied research under these technical domains.

Workshop overview

The workshop, held on 11–12 December 2025, brought together leading experts from academia and industry in both countries (including equipment manufacturers, content providers, vendors and network operators), who contribute to research excellence and the future of connectivity. Over the two days, the workshop attracted more than 150 researchers in total. Senior leadership from MIC, DSIT, NICT and EPSRC also participated. The program featured networking sessions, keynote speeches highlighting major investments and initiatives, lightning pitch presentations and facilitated discussions on joint priority areas, cross-cutting themes, and opportunities for collaboration.

Summary of key discussions

Showcase of UK and Japan research and innovation ecosystems, including a Deep Dive on AI in Telecoms Use Cases

The talks, showcasing the research and innovation opportunities across the UK and Japan research and innovation ecosystems, emphasized a shared vision for Beyond 5G networks, highlighting the importance of optical communications, non-terrestrial networks and AI for Telecoms, international collaboration, and integration of advanced network architectures. They showcased strong industry-academia partnerships, experimental platforms for innovation, and efforts toward standardisation and interoperability. Additionally, the talks also stressed the role of AI resources, secure and resilient infrastructures, and global cooperation to accelerate research and commercialisation of next-generation connectivity.

ASPIRE Program Keynote Insights

Japan's ASPIRE Program (Adopting Sustainable Partnerships for Innovative Research Ecosystem) aims to strengthen Japan's scientific and technological capabilities by promoting large-scale, long-term international collaborative research with world-leading researchers. Through these efforts, ASPIRE seeks to accelerate international brain circulation and create a durable ecosystem in which cutting-edge research and global talent development reinforce each other.

Open Source Keynote Insights

Open-source software, where source code is freely available for any purpose, now underpins 97% of the global software stack, making it a critical enabler of innovation. The UK is a recognised leader in this space, ranking in the top 5 globally for developer contributions, with £4.5m worth of collaboration via UK GitHub accounts. Japan is rapidly advancing, moving from 9th to 7th globally, and hosted five open-source conferences in December 2025, signalling growing engagement.

Key developments include:

- Model Context Protocol, an open standard originating in London, and open-source foundations in 5G, software-defined networks, and emerging AI pathways.
- Economic impact: Open-source drives 69% of business value in Japan, compared to ~54% globally.
- Patent ecosystems: Initiatives like the Open Invention Network are creating patent pools, with Japanese companies actively involved.

Post meeting note: Open source and IP to be discussed further at the follow-up workshop.

Challenges:

- Security risks, open washing (taking value without contributing), and culture gaps remain significant.
- There is a need for regulation, monetisation strategies, and investment in skills and capability building.
- Active engagement with communities and policymakers is essential to maintain leadership.

Open source can be foundational to future technologies, including AI. Strategic focus on skills, standards, and global collaboration will ensure the UK retains its leadership position.

Sub-priority areas

The workshop held facilitated sessions to discuss sub-priority areas of interests and strengths across the three technical areas of non-terrestrial networks, AI for Telecoms and optical Networks.

Non-Terrestrial Networks

The sub-topic priority areas emerging from the workshop discussions around the topic of non-terrestrial networks (NTN) were as follows.

1. Advanced NTN Technologies & Hardware

- Development and testing of new waveforms on aerial platforms.
- Software-defined radios and lightweight, low-power 6G devices.
- Optical wireless systems and embedded DSP/RFSOC solutions.
- Optical/RF hybrid link, optical MIMO, optical tracking with AI.
- Onboard beam forming, flat antenna, phased array, polarization.

2. Satellite & Quantum Communications

- Satellite-based NTN solutions and field trials
- Satellite quantum communications
- High-Altitude Platform Stations for sensing and connectivity.
- Spectrum development and harmonisation for NTN deployments.
- Satellite networks enabling connectivity using LEOs, exploring with a focus on service and application performance and on efficient routing and congestion management

3. Network Convergence, Standards & Spectrum

- Integration of NTN, landline and undersea and terrestrial networks in design and operation for scalability and interoperability.
- Spectrum optimisation, regulation, and joint policy alignment.
- Collaborative work on global standards (3GPP, IEEE).
- Supply chain technologies and resilience for critical infrastructure.
- Propagation, channel sounding, Integrated Sensing and Communication

4. AI, Digital Twins & Emerging Applications

- AI/ML for NTN optimisation, resource management, and channel modelling.
- Digital twins for traffic prediction, radio resource planning, and smart grids.
- Synchronisation of physical and cyber twins for reliability.
- AI-driven enhancements for Open RAN and NTN solutions.

5. IoT Platforms & Use Cases

- Flexible IoT platforms for ocean sensors, satellites, and embedded systems.
- Control software for integrated IoT and NTN communication.
- Development of scalable IoT solutions for diverse applications.

6. Testbeds, Trials & Demonstrators

- Shared interactive testbeds for NTN and Open RAN.
- Global field trials and joint demonstrators (e.g. video calls over NTN).
- Connecting with established test beds and trials
- Collaborative pilots for AI-enabled NTN and IoT platforms.

7. Resilience & Security

- Integration of landline, undersea and satellite network for resilient operation

- Understanding of security challenges and risks to existing and future advanced connectivity technologies
- Addressing legacy systems and supply chain vulnerabilities.

AI for Telecoms

The sub-topic priority areas emerging from the workshop discussions around the topic of AI for Telecoms were as follows.

1. **AI Architectures & Orchestration:** focus on distributed and federated AI, coordination across domains, and ensuring traceability and continuous assessment for trustworthy systems.

2. **Data-Driven, AI-Native Networks**: aim to embed AI at the core of network design, leveraging Quality of Experience/ Quality of Service (QoE/QoS) integration, semantic communications, and data-centric models.

3. **Autonomic Networks**: enable self-optimizing capabilities through Radio Access Network (RAN) Intelligent Controllers, Self Organising Network (SON), resource optimization, anomaly detection, and traffic prediction. This also includes measurement methodologies that can maintain up-to-date datasets (e.g. for ML training).

4. **Edge & Infrastructure Enablers:** provide the foundation for these advances through edge AI resources placement, physical computing acceleration, and digital twins for planning and control.

5. **Collaboration & Ecosystem** emphasizes multi-operator cooperation, interoperability, and shared governance.

6. **Long term enablers:** standards (including open source and open standards), sustainability, security, AI interoperability and trustworthy AI governance.

7. **Cross-cutting enablers:** inclusive and remote participation from users, assurance, trust, data privacy and regulation, standardisation, and energy efficiency to ensure robust, scalable, and future-proof networks through physics informed and interpretable AI.

Optical networks

The sub-topic priority areas emerging from the workshop discussions around the topic of Optical Networks were as follows.

1. **Optical Network Design & Performance:** focuses on designing scalable, resilient, and energy-efficient architectures on a different time and distance scales from data centres to undersea systems aided by physics informed interpretable AI for routing and network operation.

2. **Ultrawideband optical fibre technologies** including silica, multi-core and hollow-core fibres and novel amplifiers for different time and distance scale optical networks, supported by advanced, energy efficient digital signal processing. This also includes exploring high power optical amplifiers for ultrawide-band communications and related devices (sources, modulators, detectors).

3. **Advanced Optical & Wireless Integration:** to explore global-scale sensing, optical-wireless convergence, and emerging concepts All Photonics Network (APN)for end-to-end optical transmission.

4. **Quantum & Quantum safe:** to address post-quantum cryptography, quantum networks, and precise time/frequency synchronization to ensure secure and reliable operation and integration with classical optical networks.

5. **Sustainability & Efficiency:** to emphasise reducing energy consumption and complexity through the inspirations from bio-inspired networks.

6. **Interoperability & Standardisation:** covers APN technologies for mobile fronthaul, data centres, and inter-operator federation, alongside ITU-led efforts for architecture and telemetry data sharing.

7. **Resilience & Future-Proofing:** to have networks that can withstand technological shifts, diverse traffic patterns, cyber and physical attacks, and integration with space (NTN) systems and the understanding of the energy efficiency and resilience trade-offs.

8. **Cross-cutting areas:** resilience sustainability, cost reduction, and global standardisation to enable robust, future-ready optical and wireless ecosystems.

Cross-cutting priority areas and synergies

The cross-cutting priority areas and synergies emerging from the workshop discussions around AI for Telecoms, NTN and Optical Networks were as follows.

1. Skills & Capacity Building

- Skills pipeline for next-generation networks and resilience
- Collaboration/ fellowship opportunities such as but not limited to e.g. ASPIRE project, via Irish Research Centre Lero, DICE Digital Innovation and Circular Economy Network and leveraging existing international collaboration models, e.g. EPSRC UK-India Future Networks Initiative

2. Collaboration & Knowledge Sharing

- Mechanisms for knowledge exchange across academia, industry, and countries
- Dedicated funding for joint research and business involvement
- Integration of optical networks with NTN
- Network topology benchmarking and joint algorithm development

3. Technical Performance & Innovation

- Resilience, efficiency, scalability
- Exceptional user performance: low latency, energy efficiency
- Explainable, deployable and physics informed AI for reduced complexity and energy use
- Needs and requirements in the 6G and post 6G area (to be discussed further at the second workshop).

4. Societal & Sustainability Priorities

- Responsible software engineering
- Development of a society-centered digital world
- Sustainable digital society and resilient supply chains
- Technologies to decentralize internet platforms
- Use cases for rural connectivity, emergency response

Next steps and Recommendations

As a next step, it is essential to engage the wider community in sharing and shaping these priority areas. At the next workshop planned for 2026, the goal will be to identify key sub-priority areas and provide a clear rationale for each, such as complementary strengths between the two countries or shared strategic objectives in that domain. The intention for the next workshop is that UK and Japanese colleagues can seek to discuss further collaboration ideas together and co-create novel research thinking.