

Future RAN: Diversifying the 5G Supply Chain Competition

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Case study of Future RAN Competition (FRANC), which awarded ~£36m in R&D funding to support the UK's 5G Supply Chain Diversification Strategy.

The Future RAN Competition was launched in 2021 with DSIT providing funding of £36M to 14 successful applicants which was matched with ~£36M private funding. It included over 56 organisations.

The objectives were to:

- Accelerate the development of 5G Open RAN solutions that meet UK dense urban requirements by 2025.
- Attract new 5G RAN suppliers to conduct R&D in the UK and foster professional collaboration between potential new entrants to the UK's public network.
- Contribute to the delivery of the 5G supply chain diversification strategy's objectives of disaggregated supply chains, open interfaces by default, and security being a priority in network deployment.

FRANC was the first intervention targeting a more diverse UK telecoms ecosystem launched at pace in a developing policy landscape. The market responded well with a wide selection of companies submitting high quality bids building on the partners, projects, and relationships developed as part of the 5G Testbeds and Trials Programme to support an innovative ecosystem.

All 14 projects have now concluded this case study looks to give a brief overview of the projects and what they developed through the course of the DSIT funding.

The Future Radio Access Network Competition

Proteus

- DSIT Funding: ~£3.3m
- Project dates: December 2021 - March 2024
- Main location(s): Bristol
- Partners: Parallel Wireless UK Limited, British Telecommunications PLC, University of Bristol, Real Wireless Limited, Benetel

A key technical achievement of the Proteus project was the development and implementation of a fundamentally new approach to Distributed Unit (DU), which is software that's part of a 5G network responsible for real-time radio signal processing and coordination between radio equipment and the wider network.

The project created DU software that runs on a new, universal technology platform, rather than being tied to specific, proprietary hardware. This platform is designed to support the next generation of RAN technology and act as a foundation for a new ecosystem of chipsets and RAN base stations from multiple suppliers.

Over the course of the project, Proteus progressed from an initial concept to an operational prototype product. This prototype was successfully demonstrated in a live network environment.

Key takeaways from Proteus include the technical feasibility of next-generation Open RAN architectures and exploring how software-led innovation can be used to help diversify the 5G supply chain.

For further details on the project outcomes, see the Proteus closure report.

Towards AI Powered and Secure Carrier-Grade Open RAN Platform

- DSIT Funding: ~£1.8m
- Project dates: December 2021 - January 2024
- Main location(s): Cambridge, Edinburgh
- Partners: Microsoft UK, Intel R&D UK Ltd., Capgemini, The University of Edinburgh

The Towards AI-Powered and Secure Carrier-Grade Open RAN Platform project demonstrated an Open RAN approach that separated network software from hardware. This allowed a wider range of suppliers to participate and enabled faster upgrades. The approach was strengthened by integrating artificial intelligence and cloud-based security measures.

The project developed a far-edge platform optimised for real-time performance using low-latency Linux. It incorporated Kubernetes features tailored for different vendors and APIs that could bring a new server into full operation in around thirty minutes. The platform included a marketplace-style system for installing cloud-native RAN software, AI-powered analytics for detecting network anomalies in real time, and applications for energy efficiency and interference mitigation. Additional innovations included ransomware detection and recovery tools and a dynamic service model leveraging eBPF, demonstrated in the Janus prototype.

The solution ran on real-time Linux and Kubernetes, using isolated CPUs, huge pages, virtual functions, and Azure Arc for cloud-native RAN deployment. Flexible telemetry was achieved through eBPF. Prototype and test network milestones included building a five-floor 5G test network with remotely operated devices and lab access for partners. The project staged public demonstrations at major industry events and received award recognition.

Key lessons highlighted the importance of diverse sourcing, especially amid component delays, and showed that open interfaces broaden supplier participation. Collaboration with a UK university helped develop skilled talent and informed future standards, supporting DSIT's diversification objectives.

For further details on the project outcomes, see the Towards AI Powered and Secure Carrier-Grade Open RAN Platform closure report.

How advances in cloud technology can enable next-gen telecoms networks: Towards AI Project Showcase

Best of British RAN Development

- DSIT Funding: ~£5m
- Project dates: December 2021 - December 2023
- Main location(s): London, Cambridge
- Partners: Telet Research (N.I.) Limited, cellXica Limited, AccelerComm Limited

The Best of British RAN Development (BoB) project set out to develop a fully UK-designed 5G small cell, increasing resilience, reducing reliance on overseas technology, and creating opportunities for domestic innovators.

BoB brought together three UK organisations Telet, cellXica, and AccelerComm to design, engineer, and manufacture the M5Q, a 5G small cell built entirely in the UK. Technical achievements included a new radio motherboard, specialised physical-layer software, hardware optimised for low power use, and prototypes tested in real-world environments. Telet also conducted trials of temporary 5G “pop-up” networks at events such as the Priddy Folk Festival and Glastonbury, demonstrating practical applications for event connectivity and operational support.

The project reached a key milestone by delivering a working 5G small cell platform, with the M5Q achieving Technology Readiness Level 6. Beta units were tested, and the platform generated interest from industry partners.

Lessons from the project included the importance of UK-controlled intellectual property, flexible collaborative development approaches, and streamlined project governance to support timely delivery. The project also contributed to UK expertise in SIM development, core network design, and radio planning.

For further details on the project outcomes, see the Best of British RAN Development closure report.

UK 5G DU-Volution

- DSIT Funding: ~£6.1m
- Project dates: December 2021 - March 2025
- Main location(s): York, Bristol, Southampton, Glasgow and Ipswich
- Partners: Adtran (Merged with ADVA early 2023), AccelerComm, BT, CommAgility (left project in early 2023, now e-space), Parallel Wireless (joined project midway through 2023), University of Strathclyde - Scotland 5G Centre, University of York

The DU-Volution project, funded through the UK Government’s Future RAN Competition (FRANC), and later developed further through the Open Network Ecosystem competition, aimed to strengthen the UK’s 5G supply chain by developing Distributed Unit (DU) technology for Open RAN.

The project developed ways to process data more quickly and reliably, including using specialised AMD hardware to improve error-checking. The DU software was adapted to run on different types of computer processors, including Intel, AMD, and ARM, making it more flexible for different network setups. A new connection card was designed to improve how the DU communicates with other network equipment and to allow multiple users to share resources efficiently. These innovations were tested in practical demonstrations, including laboratory setups and satellite-based environments, showing that the system could work in real-world conditions.

DU-Volution delivered a working DU platform tested in laboratory environments, with prototypes showing flexible CPU options, scalable radio unit support, and improved low-latency connections for future neutral host networks. The project also explored architecture evolution toward 6G, including channel estimation, uplink performance, and compute resource allocation.

Key lessons included the benefits of supporting multiple hardware vendors, the value of collaborative development, and insights for future acceleration and compute optimisation.

For further details on the project outcomes, see the UK 5G DU-Volution closure report.

Secure 5G

- DSIT Funding: ~£0.99m
- Project dates: December 2021 - June 2023
- Main location(s): Newport, Surrey, London, Shipley
- Partners: Compound Semiconductor Applications Catapult Limited, Lime Microsystems Limited, Slipstream Engineering Design Limited, Arqit Limited. Limited, Compound Semiconductor Applications Catapult Limited

Secure5G focused on separating (“disaggregating”) hardware and software components so that equipment from different suppliers could work together using open interfaces. This approach reduces reliance on single vendors and allows networks to be more easily reconfigured for different uses, such as industrial private networks or consumer mobile services.

Key technical achievements included the development of an energy-efficient broadband power amplifier for 5G base stations, alongside new control software to improve performance and reduce power consumption. Lime Microsystems and Slipstream Engineering Design created a “base-station-in-a-box” prototype, integrating radio hardware, control software, and adaptive digital pre-distortion techniques to optimise signal quality. Testing and validation were carried out using specialist facilities provided by the Compound Semiconductor Applications Catapult.

Security was a central focus. Arqit integrated its QuantumCloud encryption technology into the 5G system, demonstrating a secure method for protecting data exchanged across the network and supporting future-proofed security approaches.

The project delivered a working Open RAN-aligned 5G prototype, validated key hardware and software building blocks, and demonstrated secure, reconfigurable operation.

For further details on the project outcomes, see the Secure 5G closure report.

ORanGaN

- DSIT Funding: ~£2.3m
- Project dates: December 2021 - February 2024
- Main location(s): Newport, Newcastle, County Durham
- Partners: Inex Microtechnology Limited, Custom Interconnect Ltd, Viper RF Limited, Compound Semiconductor Applications Catapult Limited

The ORanGaN project, developed UK-based design, fabrication, testing, and packaging for gallium nitride (GaN) radio chips - small integrated circuits that generate and amplify high-frequency signals used in 5G base stations. Key technical achievements included creating a UK Process Design Kit (PDK) for chip design, prototyping high-power amplifier chips, developing plastic packaging suitable for high frequencies, and introducing new on-wafer test methods to measure performance. Tools and processes covered wafer production, thermal modelling, and automated assembly.

The consortium designed, fabricated, packaged, and tested Ku-band amplifier prototypes delivering around 7 W output. Performance was verified against commercial testing services, demonstrating that UK-made components could meet international standards.

ORanGaN established a complete UK pathway from wafer to packaged device, addressing wafer supply risks and strengthening domestic skills and facilities. The project generated interest from communications, defence, and space sectors, and showed the value of in-country packaging and testing.

Energy-efficient Cloudlets for ORAN (ECORAN)

- DSIT Funding: ~£62.3K
- Project dates: December 2021 - July 2024
- Main location(s): Leeds
- Partners: Kings College London, Ultracell Networks

The ECORAN project aimed to strengthen the UK's capability in open, interoperable mobile networks by maturing a novel, energy-efficient network architecture from early laboratory research to an operational prototype.

The project focused on Cellular Passive Optical Network (C-PON) technology. C-PON is a modular way of linking computing resources using optical connections, designed to reduce energy use and allow flexible deployment. ECORAN adapted this approach for Open RAN.

The project advanced the C-PON system from Technology Readiness Level 3 to Level 6. This included implementing key functions on commercial-grade FPGA accelerators, developing an Optical Line Manager to coordinate network resources, and building a full C-PON cell testbed in Leeds. Software innovations included reinforcement learning algorithms to intelligently steer network processing, deciding how and when computing resources should be shared. Large Language Models (LLMs) were also integrated into modelling tools to support advanced data analysis and high-demand use cases such as immersive applications.

The project delivered a validated prototype, test environment, and experimental demonstrations aligned with the Open RAN framework, alongside engagement with industry and the wider Open RAN community.

For further details on the project outcomes, see the ECORAN closure report.

Accelerating RAN Intelligence in 5G (ARI-5G)

- DSIT Funding: ~£2.4m
- Project dates: December 2021 - March 2024
- Main location(s): Newbury, Ipswich, London, Cambridge, Birmingham and Stevenage
- Partners: Telecom Infra Project TIP (lead), Accelleran, Amdocs, Attocore, British Telecommunications Plc, VIAVI

The ARI-5G project focused on implementing and testing an open standards-based RAN Intelligent Controller (RIC). The RIC is a software platform that allows applications to monitor and control parts of the radio network in near real time, improving performance and efficiency. The project developed and integrated multiple RIC applications addressing four key areas: network coverage and capacity optimisation, interference management, massive MIMO efficiency (using advanced antennas to direct radio signals more precisely), and energy management.

The consortium built and tested these applications using a combination of software platforms and real-world test environments. Accelleran provided the RIC platform, Amdocs and VIAVI developed optimisation and interference management applications, Attocore supplied a 5G core network, and BT provided laboratory facilities at Adastral Park. Network simulation tools and live testing were used to validate interoperability and performance across vendors.

The project delivered an operational RIC platform with multiple working applications demonstrated in controlled test environments. ARI-5G showed how hardware-agnostic, open platforms could support intelligent network management and multi-vendor innovation.

For further details on the project outcomes, see the ARI-5G closure report.

5G DRIVE (Diversified oRAN Integration & Vendor Evaluation)

- DSIT Funding: ~£2.9m
- Project dates: December 2021 - July 2024
- Main location(s): Reading
- Partners: Virgin Media O2, wavemobile Ltd, Cisco, Ori Industries, University of Warwick (WMG)

5G DRIVE focused on developing and validating a practical way to connect private 5G networks such as those used by businesses, campuses, or rural sites to public mobile networks.

The project developed a low-cost Open RAN-based integration solution. A key technical achievement was the implementation of the standard 5G N32 interface, supported by a Secure Edge Protection Proxy (SEPP). SEPP is a security function that protects data exchanged between networks by encrypting messages and preventing tampering, enabling safe interconnection between private and public 5G systems.

The solution combined flexible, software-based network management with a 5G core network and Multi-Access Edge Computing (MEC), which allows data to be processed close to where it is generated. This supported applications such as secure voice and data services, emergency calling (including 999), and local processing for advanced use cases demonstrated at project showcases. These included autonomous transport trials and immersive demonstrations highlighting how private networks could support innovative services while remaining securely connected to national networks.

Testing took place in laboratories and live environments, including the deployment of 30 small 5G radio units across rural sites in Wales, Scotland, and England.

For further details on the project outcomes, see the 5G DRIVE closure report.

Flexible, Efficient and High-Performance 5G Open RAN (Flex-5G)

- DSIT Funding: ~£4.7m
- Project dates: December 2021 - February 2024
- Main location(s): London, Surrey, Cambridgeshire, Berkshire, plus other locations across the UK
- Partners: AWTG Limited, Lime Microsystems Limited, University of Surrey, Vodafone Limited, Commscope Solutions UK Limited, Viavi Solutions UK Limited

Flex-5G successfully developed a fully Open RAN-compliant 5G network, demonstrating how software-driven and modular designs could deliver flexible, efficient, and scalable 5G services for both private and public networks.

The project created a “Network in a Box” solution: a compact, modular base station capable of operating across all 5G Frequency Range 1 bands. Hardware innovations included programmable radio chipsets, low-power software-defined radio (SDR) modules, and commodity off-the-shelf computing platforms, while software developments incorporated AI-driven spectrum and network management, Open RAN control interfaces, and security frameworks for flexible, software-defined networks. Key technical milestones included the integration of the RAN Intelligent Controller (RIC), development of near- and non-real-time management applications (xApps/rApps), and implementation of Massive MIMO technologies to improve capacity and signal efficiency.

Flex-5G prototypes were tested across multiple UK sites, demonstrating interoperability with traditional networks, rapid deployment in both private enterprise and public network scenarios, and dynamic optimisation of network performance according to traffic and spectrum conditions. The project validated software-based physical layer designs for Open RAN MIMO, enabling future cloud-based deployment and high flexibility.

Key learnings included the effectiveness of modular, software-driven approaches for cost reduction, energy efficiency, and scalability, as well as the potential of flexible deployments to support small and medium enterprises and localised coverage or capacity boosts.

For further details on the project outcomes, see the Flex-5G closure report.

BEACON-5G

- DSIT Funding: ~£1.6m
- Project dates: December 2021 - August 2023
- Main location(s): Bristol City & Ebbw Vale
- Partners: Toshiba Europe Ltd. UK, Thales UK Limited, Attocore Ltd, Coventry University, South Gloucestershire Council, Swansea University

BEACON-5G developed and demonstrated a cyber-resilient, O-RAN compliant 5G system that could be rapidly reconfigured and optimised for both private and public networks.

The project delivered a fully operational 5G network in South Gloucestershire, including a local private network at a busy junction on the North Bristol Ring Road, connected via a 4.3 km fronthaul link in band n77. This network supported a smart city vehicle recognition and monitoring application, demonstrating faster and more reliable connectivity for sensors, CCTV, and workforce communications.

BEACON-5G developed a modular hardware and software platform that separated radio, control, and core functions, allowing equipment from multiple suppliers Accelleran, Benetel, Effnet, Phluido, and Attocore to interoperate. Key innovations included a Tool Framework for cyber security and resilience, enabling automatic or semi-automatic detection of issues, secure evidence recording, and decision support for regulators or courts. Toshiba, Thales, and academic partners Coventry and Swansea Universities contributed expertise in network architecture, system integration, and cyber security.

The project demonstrated that secure, flexible, multi-vendor 5G networks could be deployed in real-world environments, offering improved traffic management, public safety, and digital services. It highlighted practical lessons for the UK 5G supply chain, including the importance of skills development for cyber resilience, scalable security frameworks, and industrialisation of secure network deployment.

For further details on the project outcomes, see the BEACON-5G closure report.

CoMP-O-RAN (Coordinated Multipoint Open Radio Access Network)

- DSIT Funding: ~£4.7m
- Project dates: December 2021 - September 2023
- Main location(s): Marlow, Bristol, Glasgow, Slough, London and DCMS Auto Air 5G Testbed at Millbrook Proving Ground, Bedfordshire
- Partners: Dense Air Limited, Airspan Communications Limited, Blu Wireless UK Limited, Radisys UK Limited, University of Glasgow

CoMP-O-RAN developed and demonstrated a multi-vendor 5G system designed to improve connectivity, capacity, and efficiency in dense small-cell networks.

The project introduced a Split 6 Open RAN architecture, which separates the Radio Unit (RU) from the Distributed Unit (DU) in a way that is well-suited to millimeter-wave (mmWave) fronthaul links. This allowed high-speed wireless connections between small cells, avoiding disruptive street excavation needed for fiber, while maintaining robust performance. CoMP-O-RAN implemented Coordinated Multi-Point (CoMP) and Dynamic Point Selection (DPS) algorithms to minimise interference, increase capacity, and optimise throughput in clusters of small cells.

Key technical achievements included the integration of hardware and software from multiple suppliers Dense Air, Airspan, Blu Wireless, and Radisys into a fully operational test network. The project validated mmWave mesh fronthaul technology, programmable small cells, and multi-vendor interoperability. Prototypes were deployed and tested across several sites, including Marlow, Bristol, Glasgow, and Millbrook Proving Ground, Bedfordshire, demonstrating real-world performance improvements in small-cell clusters.

Building on the results of the project, the concepts, software, and multi-vendor integration approaches were transitioned into the BEACH project, which focused on refining security, optimising software and interfaces in their project in Worthing.

For further details on the project outcomes, see the CoMP-O-RAN closure report.

O-RANOS

- DSIT Funding: ~£1.8m
- Project dates: December 2021 - June 2023
- Main location(s): Bristol
- Partners: Attocore, WeaverLabs, University of Bristol, Satellite Applications Catapult, Parallel Wireless, Cellnex telecom.

ORANOS developed and demonstrated a flexible, multi-vendor Open RAN 5G network capable of operating across both private and public domains.

The project deployed a hybrid satellite-terrestrial backhaul network, connecting private and public networks using fiber and both low-Earth orbit (LEO) and geostationary (GEO) satellites. This approach improved link availability and resilience, demonstrating that Open RAN networks can reliably operate even in challenging connectivity environments. ORANOS also implemented a cloud-based AppStore for network applications, incorporating advanced security measures including a Zero Trust model, and supported machine learning tools to optimise performance.

Key technical developments included the deployment of RAN Intelligent Controllers (RICs) to manage network applications in near-real-time, and Service Management and Orchestration (SMO) software to coordinate virtual and containerised network functions. Prototype testbeds were established across Bristol Harbour, Bristol City Centre, and the Westcott Innovation Centre, providing practical environments to validate network operation.

ORANOS explored advanced applications such as Unmanned Aerial Vehicle (UAV) operations, using real-time machine learning to predict and prevent network handover failures, ensuring reliable flight paths across multi-domain networks.

For further details on the project outcomes, see the O-RANOS closure report.

Maria Lema, Co-Founder of Weaver Labs, shares her insights on previous projects and the positive impact of the Open Networks Programme on Weaver Labs Weaver Labs

Open RAN Advanced Radio Tester (ART)

- DSIT Funding: ~£365K
- Project dates: December 2021 - June 2023
- Main location(s): Swindon, Southampton
- Partners: AceAxis Limited, MAC Limited

The project set out to design and build a practical tool that could test and validate Open RAN radio equipment. This would support new suppliers entering the market, reduce reliance on a small number of vendors, and improve confidence that Open RAN systems meet agreed technical standards.

The project delivered a first working prototype of the Advanced Radio Tester. The system combined specialist radio-frequency hardware with software that could automatically check whether Open RAN equipment behaved as expected. It helped clarify how Open RAN technical specifications should be interpreted in real deployments and translated those specifications into repeatable test cases.

<https://www.gov.uk/government/case-studies/future-ran-diversifying-the-5g-supply-chain-competition>