Your response

Your response should include details of:

- a description of the relevant technology;
- a view of the potential impact of the technology on the sectors we regulate, preferably
- identifying the impact against the criteria listed in section 3.16 of the call for inputs;
- the current state of development of the technology, including any demonstrations of
- feasibility;
- any unresolved issues which need to be addressed for the technology to achieve full
- potential;
- references to key publications and the leading groups working on the technology; and
- whether you would be open to discussing the technology in more detail with Ofcom.

Your response

Confidential? – N

Software-Defined Radio plus Commodity Compute for Radio Access Networks

Current radio access networks (RANs) utilise ASIC and DSP based solutions. As a result of which, by their very nature, are inflexible and typically capable of supporting only a single wireless system, with major hardware upgrades necessary in order to support a new system or even a new generation of the same system. Furthermore, their highly proprietary nature results in vertically integrated solutions with a high degree of vendor lock-in, leading to increased total cost of ownership and reliance on specialist skills and support services.

The advent of low cost, single chip software-defined radio (SDR) transceiver technology, paired with commodity compute — general purpose processor (GPP) + graphic processing unit (GPU) — presents a significant opportunity to radically change the way that radio access networks are built. A shift which echoes that of the move from mainframe computing to open systems.

In this approach based on wideband SDR plus commodity compute hardware, a wireless system is delivered as an application software stack, from the physical layer upwards. The amount of application-specific hardware is thus reduced to the absolute minimum: a radio front-end (RFE) comprised of power amplifiers and filtering. Indeed, it is generally the case that that the RFE is simply band-

specific and in fact can be used with multiple wireless systems that operate within the same bands. Furthermore, subject to coverage and cost requirements, it is also possible to plan ahead and create multi-band RFE modules capable of supporting future systems and capacity requirements, that may be later enabled through over-the-air (OTA) software updates.

Enabling New Services

The approach outlined presents a significant opportunity in enabling the delivery of new services, since it opens up the radio access network stack for innovation all the way from the physical layer up. In addition to which, what are traditionally core network capabilities, together with edge compute workloads, may also be run alongside RAN functions.

Typical edge compute workloads include content caching, machine learning and Industrial IoT applications, for example.

Broadening and Deepening Access to Services

The disaggregation of radio access networks and and a move to a radically open model based on SDR and general purpose compute, will bring significant CAPEX and OPEX savings in network deployment. In addition to which, edge compute and decentralised network architectures will make service provision technically and economically viable, where it previously was not. Examples include the use of a distributed network core, with content caching and high efficiency compression at the edge, to reduce reliance upon and utilisation of, expensive satellite backhaul.

Increasing Network Performance

Reduced infrastructure and operational costs will make it possible to provide greater coverage, enabling network service to be provided where it was not previously, and increased throughput in more densely populated areas. In addition to which, it will become possible to deploy applications at the very edge of the network, thereby reducing latency and making far more efficient use of backhaul.

Lowering the Barriers to Entry

The shift from a ‘mainframe model’ to a radically open way of building radio access networks, will generate a vast array of new opportunities and provide a significantly more competitive environment, with far greater choice.

Reducing the Cost

As noted previously, costs will be significantly reduced, by being able to benefit from the economies of scale and inherently competitive nature of the commodity compute marketplace, with the opportunity for vendor lock-in greatly reduced.

Authorising and Regulating Networks

Reducing the cost of RAN technology and nurturing a much more innovative environment, will in turn drive increased demand for Shared Access spectrum,

in addition to bringing major benefits to existing spectrum licensees.

Reducing the Total Environmental Impact

Lower cost, more agile RAN technology solutions are much better suited to addressing the dynamic demands of a rapidly developing marketplace, which is increasingly poorly served by legacy macro network architectures, with their far greater costs, substantial planning requirements and longer roll-out.

Assuring Security and Resilience

SDR plus commodity compute based solutions can be delivered by domestic vendors together with trusted partners, with much greater supply chain transparency and the ability to multi-source. While reduced costs enable a higher degree of redundancy to be built into networks.

Current Status

Solutions based on the approach outlined are available now, with support currently for 2G, 4G, and 5G NR. We have been working with Digital Catapult for over 2 years in providing the solution for 5G private networks deployment and NB-IoT use cases. The concept is also the subject of trials in operator networks with Vodafone, leading the deployment of OpenRAN and CrowdCell that are based on SDR as the core technology of choice for the radio.