Written Evidence Submitted by Mavenir (UKT0038)

Mavenir supports the Committee's Inquiry and welcomes the opportunity to make this submission. The Committee's examination of vendor diversity and domestic capabilities comes at a critical juncture for the UK.

Mavenir agrees that 5G provides a massive opportunity for the UK. It also agrees that the advanced use cases of 5G make network security ever more critical. Mavenir also understands the Government and stakeholders' concerns that the UK is excessively reliant on a small number of vendors, and that removing high risk vendors makes this situation worse.

Relying once more on an ever-smaller range of legacy vendors of closed systems is not, in Mavenir's view, the answer. The UK telecommunications supply chain is not just a national security issue, but also an economic one. The best solution is one that provides as secure a network as possible while also boosting the economy and providing better services for consumers. As the industry's only end-to-end cloud-native network software provider, and a pioneer of OpenRAN, Mavenir can bring a unique perspective to the Committee. Mavenir is convinced that OpenRAN can help the UK diversify its supply chain for mobile networks by bringing in a wide range of competing innovative providers.

This submission sets out:

1. **What open interfaces and specifically OpenRAN are**, and how this compares to the legacy paradigm of closed proprietary interfaces.

2. **The economic benefits from a diversified supply chain** of vendors using standardised interfaces that are open and interoperable. These allow different vendors to interoperate and compete with one another and will result in more competition, which will deliver lower cost, faster rollout and more innovation for UK operators and consumers.

3. **The security benefits of open interfaces.** Vibrant competition between vendors will not come at the expense of security: Open interfaces deliver better network security and vendor accountability.

- First, OpenRAN allows multiple independent parties to continuously test the security of the network elements and the system, making it more likely any vulnerability or threat is detected and remedied. In essence, OpenRAN thus enables suppliers to compete on their security credentials, and it limits an operator's exposure if one of their vendors were compromised.
- Second, the shift to cloud-based solutions enabled by "virtualisation" of the network elements allows several new security controls like sandboxing, containerization and network slicing that make networks more resilient.

4. **The UK is well positioned to take advantage of a paradigm shift** to "New Generation" networks based on open interfaces. Fortunately, the UK does not have to create competition from scratch as it still has several companies innovating in the 5G infrastructure space, and R&D talent and skilled workforce to support their growth. For example, CommScope, ACEAXIS, Filtronic, ip.access (a UK-based business unit of Mavenir) and Altiostar.

5. **The policy support required** for open interfaces to act as a catalyst for the above economic and security benefits:

- To establish and maintain genuinely open standards that allow existing and new vendors to compete in the supply of interoperable network equipment.
- To support testbeds and trials of innovative solutions.
- To provide funding for sizable upfront investments required to develop generation 1 products while standards are still being developed.
- The DTI initiative in launching (1985) GSM project demonstrates value of strategic partnerships between Government and industry in the mobile space.

We would be particularly keen to appear (virtually) in front of the Committee to give an oral submission and to answer any questions it might have. In addition, we are aware Mavenir has been mentioned in previous hearings, and we are happy to provide the Committee with any more detail that it would wish.

1. Open interfaces vs Legacy networks

Traditionally, mobile networks have been built with closed, proprietary software and purpose-built hardware, which has led to vertical silos and technological lock-in. Although the current 3GPP standard was supposed to be open, key interfaces are closed and vary between the three main vendors (Nokia Ericsson and Huawei). The standard setting bodies are controlled by the largest suppliers, so the process is skewed in favour of closed solutions.[1]

But today, mobile networks can be disaggregated and based on open interfaces that are interoperable on the basis of open standards and are technically and operationally more efficient.[2] By standardizing these interfaces, and incentivising implementation of open standards, "Next Generation" networks can be deployed with a more modular design without being dependent upon a single Vendor. There are a variety of groups working to develop standards for these interfaces as well as the management and orchestration of networks. Figure 1 illustrates the difference between legacy and Next Generation networks.

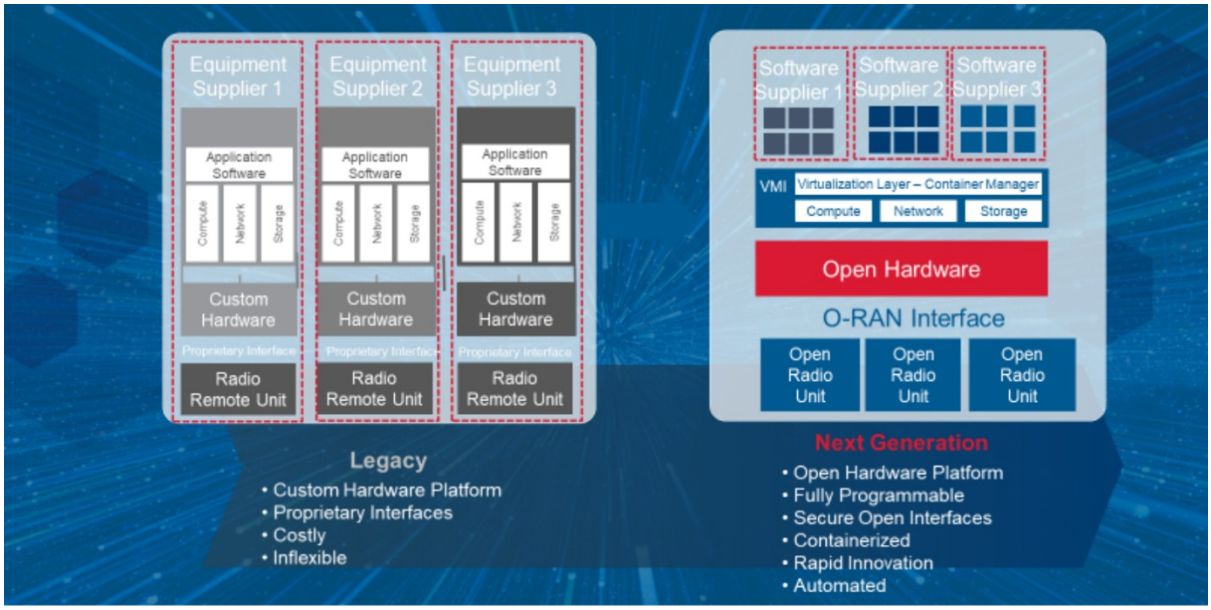

Figure 1: Legacy vs Next Generation networks

The forward-looking OpenRAN concept is an example of such open and interoperable interfaces. Under OpenRAN, radio networks are comprised of hardware and software components from multiple vendors operating over network interfaces that are completely open and interoperable. Fundamentally, the OpenRAN concept is about building networks using a fully programmable software-defined radio access network solution

---

[1] See for example the findings in Centre for American Progress (2020) "There is a solution to the Huawei challenge".

[2] For the avoidance of doubt, '**open interfaces**' refers to interfaces that are publicly available and interoperable. **OpenRAN** refers to disaggregated RAN functionality built using open interface specifications between elements. It can be implemented in vendor-neutral hardware and software-defined technology based on open interfaces and community-developed standards.
O-RAN refers to the O-RAN Alliance or designated specification. O-RAN Alliance is a specification group defining next generation RAN infrastructures, empowered by principles of intelligence and openness.
vRAN refers to an implementation of the RAN in a more open and flexible architecture which virtualizes network functions in software platforms based on general purpose processors. vRAN utilizing open interfaces is one component of OpenRAN.

based on open interfaces – radios, base stations, etc. – that runs on commercial, off-the-shelf hardware (COTS) with open interfaces.

2. THE ECONOMIC BENEFITS FROM A DIVERSIFIED SUPPLY CHAIN

5G is expected to deliver immense economic benefits to the UK,[3] which will be particularly important for communities that lack good access to digital services, thus helping Government's ambition to "level-up" across the regions.

Given the potential benefits at stake, the UK Government has justifiably become increasingly concerned that the supply chain for 5G has become excessively reliant on a small number of vendors.

Heightened security concerns have effectively reduced the choice available to UK operators to a de-facto duopoly (Nokia and Ericsson), as Samsung has struggled to gain a foothold in the European market due to its limited presence in 2G and 3G markets and not very strong commitment to Network infrastructure manufacturing.

New challengers prospering from adoption of OpenRAN would help create skilled jobs, potentially in all regions of the UK. Furthermore, more R&D and manufacturing of high-tech OpenRAN solutions in the UK would also contribute to productivity growth.

By standardizing and developing open interfaces, OpenRAN can ensure interoperability across different players, lowering the barrier to entry for new innovators.[4] It is worth noting that competitors only compete at the element level – they do not have to invest in the complete end to end solution.

For example, the O-RAN Alliance considers "open interfaces as essential to enable smaller vendors and operators to introduce their own services or customise the network to suit their own unique needs. Open interfaces also enable multi-vendor deployments, enabling a more competitive and vibrant supplier ecosystem."[5]

Open interfaces enable multiple vendors to provide different portions of the RAN providing operators the freedom to manage their networks and flexibility to draw on the innovations of a variety of suppliers.[6]

An OpenRAN regime would thus allow a broad community of UK companies and other players, to bring competition and innovation into the supply of network elements by overcoming the entry barrier of closed interfaces.

---

[3] For example, a study prepared for the European Commission in 2016 estimated that in 2025 the benefits from the introduction of 5G capabilities could reach Euro 113.1 billion per year across the region. A simple pro-rata estimate on the basis of GDP suggests that the benefits to the UK will be in the region of Euro 17 billion per year (According to Eurostat, in 2018, the UK's share of EU GDP was 15.2%).
The Centre for Policy Studies' Upwardly Mobile: How the UK can gain the full benefits of the 5G revolution provides estimates of the benefits 5G will bring to the UK. Among other figures, it refers to a report by independent consultancy Policy Points, which highlights that the difference between the UK being a leader and a laggard in 5G adoption could be as much as £173 billion in incremental GDP over the coming decade, as estimated by the Future Communications Challenge Group.

[4] This does not mean that the vendor solutions themselves must be "open sourced." It is likely that there will be blended implementations, leveraging open interfaces with specialized proprietary code while other aspects may be "open sourced."

[5] https://www.o-ran.org/

[6] For example, if a vendor develops a new antenna or radio technology today, network operators would have to work through existing suppliers to have that new technology deployed. In an interoperable environment, network operators could work directly with the antenna manufacturer and radio component suppliers to upgrade their existing infrastructure with a best of breed solution. The same model would apply to hardware and software.

Entry and expansion of a range of diverse and innovative OpenRAN suppliers will lead to:

- Reduction in consumer prices, as lower 5G rollout costs (capex and opex) get passed on to consumers;
- an increase in quality, for example more testing and quality-control
- faster 5G rollout over a larger footprint: OpenRAN makes a more flexible roadmap available to mobile operators, at lower cost. Furthermore, it avoids the risk of delays if Nokia and Ericsson alone struggle to keep up with a global demand rush from operators, and a disaggregated network that address specific local network needs;
- More innovation, as vendors and operators strive to stay ahead of the competition. To date where we had 3 radio vendors before OpenRAN we now have 15 and growing. A great example of how Open RAN is stimulating investment.

3. THE SECURITY BENEFITS OF OPEN INTERFACES

There have also been security concerns raised as communications networks evolve to be more like IT infrastructure. The National Cyber Security Centre ("NCSC") has recognised the importance of diversification in the supply chain to enhance security[7] and the role of OpenRAN in cutting R&D costs and reducing operator costs related to custom hardware.[8]

In our view, the ability to have a more modular design, with different suppliers providing different network components via open interfaces, can improve - not diminish - security and vendor accountability. This is because:

- Open interfaces allow multiple independent operators to continuously test the security of the network elements and the system, making it more quickly to detect, react to replace or address suspect vulnerabilities on equipment. In essence, OpenRAN thus enables suppliers to compete on their security credentials, and it limits an operator's exposure if one of their vendors were compromised.
- Open architecture also allows operators to choose and apply up to date security patches available for Commercial Off the Shelf (COTS) components deployed in their networks (e.g., operating systems, Network Function Virtualization infrastructure, BIOS, firmware, etc.), and to address the security vulnerabilities pro-actively vs. being dependent upon individual vendors to make these updates. In the end, these developments, while different from traditional deployments, will improve network security.
- The shift to cloud-based solutions enabled by "virtualisation" of the network elements allows several new security controls like sandboxing, containerization and network slicing. These controls make networks more resilient and equally stable even at large scale, as proved by the experience of Rakuten and other operators using virtualised elements such as Deutsche Telecoms and T-Mobile.

4. THE UK IS WELL POSITIONED TO TAKE ADVANTAGE OF A PARADIGM SHIFT

The UK had a vibrant supply base supporting the mobile industry: Nokia, Motorola, Ericsson, Marconi, all had R&D manufacturing units and an integrated supply base in the UK. Hardware development in Radio and Antennas was a UK strength and a lot of expertise in the UK still exists stemming from first class companies such as Marconi, Nokia, Motorola, STC, Nortel, ACEAXIS, ip.access, RACAL, PLESSY, GEC and their associated component suppliers.

The UK continues to have leading innovative companies, such as Commscope, ACEAXIS, Filtronic, ip.access/Mavenir, Altiostar and others. These are currently not in a very strong position but with the right policy support they can underpin the resurgence of UK industry (no need to start everything from scratch) by leveraging the UK's highly skilled labour force, R&D talent pool (in both academia and the private sector).

---

[7] See Chapter 9 of the NCSC's report *Security Analysis of the UK Telecoms Sector, Summary of Findings* (January 2020)

[8] NCSC's blog post "The future of telecoms in the UK" by Dr. Ian Levi (28 January 2020)

Such companies can revive the UK's manufacturing and R&D capability in 5G radio equipment, which has fallen in recent years as we mentioned in section 2 above. Open Interfaces will:

- create opportunities in Software development, Security test tools, Interoperability testing and Hardware development in Radio and Antennas.
- Support growth in Venture capital investment/
- Create synergies with academic research, with job growth opportunities in high tech sectors.

The growth of OpenRAN suppliers can in turn support the development of a localised supply chain, hence multiplying the benefit of OpenRAN for UK employment.

5. The policy support required

OpenRAN is still in its infancy and gaining acceptance in its product lifecycle. Getting the open standards and regulatory regime right has the potential to make the UK an incubator for next generation communications, as well the many current and emerging downstream markets that rely on it.

Policy errors will forego substantial benefits and will be costly to correct as the UK will have to play catch-up. The OpenRAN community has made great progress in producing standards that fix the gaps of 3GPP. Until there is broad global consensus to ensure standards groups produce open standards and operators purchase equipment to open standards the opportunity for closed interfaces and divergence will continue.

As could be seen from the UK Government's role in the development of GSM, strategic partnership between industry and Government can facilitate the development of an innovative technology in the mobile space.

Government can play a key role in:

1. Signalling U.K. Government support for market based, open, interoperable standards.
2. Funding research and development and promoting policy join-up by UKRI and Innovate UK, to support academic R&D and its commercialisation.
3. Supporting global deployment through Memoranda of Understanding with other countries that support of Open Standards for interoperable 5G solutions, while avoiding technology mandates and avoiding overly prescriptive solutions.
4. Providing strategic guidance to Ofcom for an objective to secure access speeds to 90% of population within five years, so that its spectrum policy supports innovation and trials.

- Remove barriers to OpenRAN adoption in 5G deployment, e.g. around interoperability testing, the security framework for virtualisation, etc.
- Lead international efforts on frequency harmonisation, while also considering additional UK- specific frequencies for local initiatives e.g. unlicensed spectrum in the US for private networks.
- Ensure sufficient bandwidth is allocated for 5G broadband wireless.
- Consider spectrum allocations to operators (without auction) to develop OpenRAN networks.

6. Concluding remarks and next steps

Taking all these issues together, we believe that changing the approach and facilitating the development of OpenRAN solutions will be of significant benefit to the UK.

- OpenRAN can bring much-needed competition and product innovation to the 5G roll-out which should lower costs to mobile network operators and result in lower prices for British consumers.
- OpenRAN can enhance security of the system and give confidence to both the government and users that their communications are secure and unseen by others. And
- OpenRAN can help lead to a revival of UK involvement in this space, by facilitating investment and jobs creation across the UK as well as a resurgence of a high-tech sector with all the benefits that can bring for the wider economy. As such, it is fully consistent with the UKs Industrial Strategy.

We look forward to engaging with UK policy makers, industry and academia, to help them create the policy conditions that allow the UK to become a world leader in OpenRAN We would be delighted to further explore the above in front of this Committee at a formal oral evidence session.

(October 2020)