

Submission to: Telecommunications (Security) Bill Public Bill Committee

Inquiry by: House of Commons

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The following inputs are based on extensive discussion and input from Photonics Leadership Group members and those working on optical communications solutions throughout the supply chain in the UK from early stage innovators and start-up companies to maturing volume UK manufacturers. We include contributions from those directly involved in the previous golden age of UK manufacture and supply of network equipment

Our inputs are constructed around the core questions that we observe have arisen in various forms during the committee stage of the Bill.

1. Will the Diversification Strategy support development of alternative suppliers and does it address barriers faced in new emergent suppliers?

- a. The Bill, and the accompanying diversification strategy, present a real opportunity to give the UK cutting edge, globally leading network providing a platform for high value global exports. Grabbing this opportunity requires focused support in maturing and scaling home grown innovation from our world leading University's through innovative manufacturing companies and driving innovation beyond current equipment capability in performance, security, energy efficiency and resilience.

However, there is a significant danger this opportunity will be missed if the focus ends up on short term measures such as qualification of alternative existing suppliers, especially when the attention of network providers is likely to be focused on replacing high risk vendors as quickly as possible and/or pressure is applied to accelerate the replacement program. Indeed there is even a risk some of these alternatives may contained less UK content within their equipment and supply chains than existing vendors.

Whilst test and qualification, e.g. via the SONIC centre identified in the strategy, is important to give network providers confidence in the capability of new equipment (including its security), it needs to be balanced with support to ensure UK equipment is emerging to put through those test centres. Without such balance, there is a risk of there being no UK made equipment for the various centres to test and ultimately network providers to select from.

- b. At £250m the level of funding is a welcome start, but just too small to develop alternative UK suppliers with sufficient scale. Growing capability to deliver solutions has been noted by network providers as essential and is costly, but is possible.

To cite just two examples, some 1 million hard drive heads are produced a day a Seagate's Northern Ireland facility- the source of ~ 30% of the worlds datacentre data storage. IQE in South Wales produce some 400,000 semiconductor wafers annually supplying a significant fraction of facial recognition sensors in consumer phones and the laser and detectors used through our telecoms network. In volumes terms this is significantly beyond the scale required even by the 5G roll out.

Designing and manufacturing to scale has also become a natural focus for UK companies in the communications supply chain, many of whom have focused in recent years on supplying networks inside datacentres where volumes are 10-100 higher than in external

communications networks (a single datacentre can contain more optical transceivers than the entire number of 5G masts required in the UK). The challenge is to capture more of the value of this capability higher in the supply chain and back into the wider area network.

- c. We need to make sure R&D is supported throughout the network, much of which is optical, not just on radio access. Other contributors have described there as being fewer security vulnerabilities in the optical equipment. However we should not be complacent as the far greater volumes of traffic aggregated into some optical layers means the impact of any vulnerability could be much greater. This is aligned with the draft Electronics communications (Security Measures) Regulations just published, which makes clear the Bill applies to all equipment carrying data no matter where it is in the network.
 - a. The diversification strategy does not detail a mechanisms for how innovation will be supported. The PLG note that it is BEIS, through UKRI, Innovate_UK and the Research Councils who have the experience of running collaborative R&D innovation programs, yet the diversification program is being run through DCMS. In delivering the diversification strategy efforts should be made to leverage existing UKRI innovation support structures, and models such as the Aerospace Technology Institute, whilst considering novel delivery mechanisms that overcoming current bottle necks in Innovate_UK's innovation funding service.

Any collaborative R&D programs emerging from the diversification need to be funded at a level that ensures high application success rates. The current very low success rates in UKRI funding applications acts to stifle innovation as some of the potentially most valuable partners are put off from applying/ participating.
 - b. The strategy correct identifies the key role in supporting open interface standards for support long term disaggregation and enabling new entrants. The disaggregating of network functions is currently taking place within the mobile industry at a rapid pace, which for the moment is focussed on OpenRAN but subsequently will be extend to other network functions such as the Open Optical Core, Open Optical Packet Transport and Open Broadband Network Gateway, etc as defined through the Telecom Infra Project (below).

2. What additional barriers are new entrants likely to experience, and how could they be overcome?

- a. Access to finance to scale to the size required by providers and go through all the qualification processes, including not least verification of security performance will continue to be a challenge. Subsidising access to test and verification facilities e.g. at SONIC and the National Cyber security Centre for UK innovators will help address this barrier. Models such as the UK A4I program which support access to NPL and other UK national facilities would be relevant.

Strong government support for new vendors, and active fostering of much greater vendor mix, potentially mandated by government, will help define a more accessible addressable market. However to be successful in attracting investment companies must address international markets. Participation and driving standards into directions aligned with international requirements e.g. on open standards is essential to support the global market access that is vital to attract investment
- b. At the highest, tier 1 full service supplier level, the market is very mature and very hard to enter and achieve sufficient scale. Network providers are also naturally cautious and with the requirements of the Bill likely to become more so in their choice of vendors. These present significant and potentially increasing barriers to new entrants. It is easier to enter the supply chain at lower tiers and with innovation leaders. Indeed the UK has its greatest and established strengths lower in the component supply chain.
- c. Asking for diversification is not the same as network providers placing orders. Providers have noted in previous evidence that whilst they would like to have more vendors to choose from they prefer to place orders with only two. This opens the question off what happens to the

ones that are not selected and how to insure they are still present for future procurement rounds. In essence, how do we avoid repeating past preferred vendor selection processes that drove the lack of supplier choice we have today.

The diversification strategy therefore needs to foster alternative disaggregated business models that support a much greater diversity of vendors and multi-source agreements that are now common place in the market for internal datacentre network equipment.

The draft Electronics communications (Security Measures) Regulations appears to exclude single sourcing. Consideration should be given to how much better dual sourcing really is and whether a much broader multi-sourcing approach can be fostered and even mandated. However, there is a compromise as the greater the market is split between suppliers the less attractive investing in any single supplier becomes and the harder it is for them to achieve critical scale.

- d. The lack of a tier 1 integrated network supplier in the UK has broken the connections between network providers and the deeper supply chain. Providers are often not aware of deeper local UK capability and potential suppliers do not have visibility of specifications or value of the opportunity. Bridging these gaps will vital to accelerating new UK solutions and attracting private investment.

3. What interventions beyond those in the current diversification strategy would best guarantee the long-term security and resilience of the UK telecom network?

- a. Collaborative research and development that brings together the complete supply chain to increase knowledge of capability and specific demand requirements and integrated open interface architectures and software with UK made hardware. The joint hardware software composition is essential – operators, vendors and suppliers alike have emphasised to us that one can not advance, demonstrate and mature trusted UK capability in one without the other.
- b. Enhancing the linkage with UK Universities and industry will help with the commercialisation of existing technologies for our 5G network, but also facilitate newer innovative approaches to the next generation of telecom/communication networks
- c. Direct procurement is one method potentially modelled on the UK's Small Business Research Initiative (SBRI) enabling equipment to be purchased with much reduced risk and placed with providers to foster confidence and experience with new suppliers, especially in disaggregated networks. The generation of invoiceable orders within this makes a material difference to raising private investment and is a direct way of plugging specific gaps left by removal of high risk vendors with UK made solutions.
- d. Direct investment into companies where appropriate especially where the only alternative sources of finance are outside the UK. Hardware and communications propositions have correctly been already identified in evidence as having difficulty raising funds, not due to weakness in their long term prospects, but due to perceptions of the time to deliver return and level of investment required. This is especially true of those focusing on communications where earlier evidence of providers indicates a 5-7 year timescale to develop and bring a new supplier on board. Such timescales have previously caused new companies to focus on more dynamic markets such as datacentre equipment.
- e. Scale, as has been highlighted by many contributors is vital. To be able to deliver solutions at scale therefore requires investment not just in maturing core innovation but also in manufacturing processes, manufacturing scale-up, test and measurement and use of large data analytics. However as noted previously the volume required by UK (and international) communication networks are well within the capability of British industry.

4. What role should the UK play in setting and supporting technical standards?

- a. The UK should lead from the front and be part of setting standards especially on new open interfaces

- b. Standards interaction should not be confined to OpenRan, which is an example of just one layer, but on open interfaces throughout telecom equipment. These are being defined through international collaboration with global providers in the Telecomm Infra Project (TIP) <https://telecominfraproject.com/>, addressing standards for Open Optical Core, Open Optical Packet Transport and Open Broadband Network Gateway (OpenBNG). The Department of International Trade is already actively engaged in TIP as are a number of UK operators and innovators.
- c. Participation in such bodies is time and resource intensive. In previous evidence UK network providers noted they often draw on the participation from their international parent companies. This presents a barrier to engagement from new emerging UK suppliers whose collective participation in standards bodies should be supported by government.
- d. Formal, international agreed standards can often take many years to finalise and lag behind technology development. In other fast moving network markets, e.g. datacentre transceivers, this has led to the emergence of multi-supplier agreements (MSA's) where commercial companies collaborate to agree a common 'standard' that enables customers to source cross-compatible solutions from multiple vendors. The UK should support participation in MSA's where formal standards lag market innovation.

5. Is it realistic for the UK to develop alternative network equipment suppliers, will they be more expensive and where is the opportunity greatest?

- a. The UK is more than capable of developing alternative equipment suppliers including manufacturing hardware at the required scale. The opportunity certainly extends far beyond software, and indeed if our efforts focused only on software we would remain vulnerable to weakness in the hardware.
The UK has extensive strengths throughout optical and radio technology. Our Universities are international leaders including in cutting edge innovation such as photonics integration that provide the pathway to scaling volumes (e.g. Universities of Aston, Bristol, Glasgow, Southampton, UCL among more than 25 institutes). We are global leaders in compound semiconductor research and manufacturing with some of the largest production facilities in the world- materials which are omnipresent in both radio and optical network layers. We have leading fibre optic capability sort after by companies globally and a dark fibre network for testing solutions and of course leading software capability. Furthermore we are global leaders in test and measurement equipment with companies include Yelo, Optek Systems and Spirent often supplying unique solutions.
- b. We lack only the full service integrator at the very top of the supply chain. However new disaggregated business models that leverage open interface to support mixing of equipment from multiple vendors have the potential to disrupt the current business models and support emergence of UK vendors, especially in high value areas where UK equipment can provide differentiate performance/ security / energy consumption.
- c. Many of our members have also highlighted UK designed and manufactured solutions need not cost more than international alternatives, especially when the same levels of security, resilience, reliability and performance. UK companies have the benefit of designing for scale, leveraging innovations where the UK excels, such as photonics integration, to reduce costs and increase capability.
- d. The knowledge from former UK competence in network equipment has not been lost, but has adapted and redeployed to alternative applications from sensing to satellite to datacentres. With the right connection to providers identifying clear demand and sufficient government support highlighting those opportunities, UK suppliers will return. Indeed within the supply chain there are already many active UK companies including CST global, Effect Photonics, Lumentum, Rushmere Technologies, G&H, II-VI, Lumentum, Polatis distributed across the UK.
- e. As many have noted building alternative suppliers and full disaggregation will take time. However we already have many suppliers operating within the global communications supply

chain – often exporting the much of their output for component and system integration internationally, to be then reimported.

Short term success can therefore be measured in first assessing the UK content in current equipment irrelevant of the nationality of the tier 1 and then seeking to increase the fraction of UK content in collaboration with established suppliers. Indeed this first element is mandated in the draft Electronics communications (Security Measures) Regulations which correctly require vendors to understand and address the risks of security compromises that may arise from the supply chains of third party suppliers and understand the source of all components in their supply chain. This could be further enhanced with mandating a minimum UK sourced content.

6. Will the Bill impact the ability of companies to raise investment in the telecoms space?

- a. The depends on the focus of the diversification strategy and accompanying policy. If the focus is on short term and qualification of alternative established vendors this may hinder investment.

If the focus is on longer term strategic development and support for alternative suppliers, disaggregation and putting UK are the forefront of network capability, with strong government support, this will certainly support the leverage of additional investment

7. Will the Bill achieve the Government's aims for the security of the telecoms network and there any area of risk not covered?

- a. The Bill only covers public communications networks not private networks. Almost all data now passes through datacentres and ~10x more data traffic is transmitted between datacentres on private networks rather than on public ones. The levels of inter-datacentre traffic will only increase due to the need to synchronise data between centres to deliver a responsive real-time internet service and support data resilience. How to address the risks around this and future development of the data infrastructure are unclear, but are not confined to only the public network.

- b. Bill assumes that high risk vendors or equipment can be identified in advance. Such wisdom often only comes in hindsight, as illustrated by the identification of current high risk vendors that were previously considered preferred suppliers. This presents a risk that any vendor designation will lag the development of any emerging threat.

8. What will be the impact of the Bill on telecoms providers and infrastructure roll-out, especially 5G?

- a. Realising the full benefits of 5G takes much more than new radio access equipment, it requires new low latency high performance optical network equipment to connect that data beyond the mast.

If there is delay to the initial 5G access roll-out, it offers the opportunity to build a better network, less incumbered by legacy equipment and time to develop alternative UK suppliers. Indeed there are benefits is a more considered role out that delivers the full benefits of 5G, rather than the fastest deployment that leverages too much legacy equipment to realise the full 5G benefits.

However, this requires greater focus on fostering UK suppliers and innovation in the diversification strategy moving away from a small number of full service suppliers to a more diverse, disaggregated, innovative market model supported with open interfaces at all equipment layers.