Digital Communications Infrastructure Strategy consultation response.

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Q1. Yes, this is broadly an appropriate role for government, although I would be slightly concerned by policy constraints imposed by previous documents on spectrum strategy and smart cities which were produced with a narrower remit.

Q2. With FTTP installation progressing at a very low rate, there is a significant opportunity for the Government to exert its combined buying power to develop a national telecommunications infrastructure, guaranteeing the physical hardware to enable the development of networks which remain internationally outstanding in the time horizon 2025-2030 and beyond.

Q3. No input offered by this respondent.

Q4. Using the technologies of today (ADSL, VDSL, 4G) disparity of broadband services is inevitable since all of these technologies are strongly distance dependent and in rural areas it is cost prohibitive to provide the same geographic density of "access points" (masts for 4G, exchanges for ADSL and curb-side cabinets for VDSL). However, in the timeframe of 2025-2030 this disparity is certainly not inevitable. The cost effective solution of fibre to the premises (less than half of the originally projected cost of HS2, assuming no re-use of existing infrastructure and including remote rural areas) has a greatly reduced length dependence, and uniform service provision over a radius of 100km from a core exchange is easily achievable even using current technologies.

Q5. For current applications, such as those listed in the consultation documents, the data volumes will continue to grow, with the gap between upload and download steadily decreasing. However, for these applications, the immediacy is less critical (actual bandwidth), content producers spend time preparing and editing a contribution, and a few extra seconds upload is of little consequence (several minutes, extending to hours of course are an issue) whilst for download, a "lagging" video is a consistent source of complaint. This would suggest that some level of asymmetry would be acceptable, although at a lower level than present. However, for potential future applications, such as home video conferencing which will be enabled by greater upload speeds, symmetry will become much more important.

Q6. In the forward to the consultation document, the ambition is clearly stated as to "be the best connected country in the world". From OECD data (http://www.oecd.org/sti/broadband/oecdbroadbandportal.htm) competitor countries with higher broadband speeds include several European countries in addition to the oft quoted Korea and Japan. Fibre connections in Sweden, Norway, Denmark and Portugal easily exceed those in the UK in Dec 2013, whilst in terms of download speed, the UK also trails Slovenia by more than 10 Mbps. There are 10 countries advertising higher mean average download speeds than the UK. In order to be viewed internationally as leading, the UK needs to enter the top 5 in several such internationally and publically available league tables. Our benchmarks should be:

For top 5: Sweden, Norway, Denmark and Portugal

For world leading: Sweden, Norway, Denmark and Portugal, Korea, Japan, Slovenia, Australia.

Q7. It is universally accepted that highest metrics are always obtained using fibre to the home, and given that there is a strong correlation between counties with higher metrics than the UK and the penetration rate of fibre, access to fibre to the home should be the single most important metric to be adopted. In the short term, mean distance to a fibre would be a suitable metric accounting for the benefits of VDSL, VFast and other copper technologies which unfortunately scale with distance. Penetration rates of different levels of fibre access would also be suitable, % of households at 0m to a fibre, less than 100m, less than 500m, less than 5km etc. As wiring within the home (with high quality cable) is oft cited as a degrading factor for broadband experience, 0 metre penetration should be the overall gaol, at least in terms of well publicised availability on request if not actual service provision.

Q8. Scenario one speculates that services will enjoy an evolution characterised by the traditional S curve of early adoption, widespread take up and saturation with a very long obsolescence period. I agree that the general principle espoused here is true and that by 2025, all current technologies in the take up phase will have entered saturation, and that very few of them will have become obsolete. However, I do not agree with the implicit assumption that new services and applications will not have emerged on this timescale, such services are likely to fuel the demand for continued bandwidth growth towards the end of the period of this Strategy. Consequently I agree that the level and capacity of services in densely populated areas will continue to grow exponentially, but that by 2025 provision of only 24 Mbps in rural areas will be as unacceptable as the current provision is now.

Q9. The technology commentary is inconsistent, since the services provided by current physical network (which will not have changed significantly) are strongly length dependent, therefore it cannot be the case that everyone will have the same level of service within any meaningful definition of service (dial up could not be considered as a minimum level of broadband access today). There is no need for UHD video to be available across all media. If the likely device size for a media (such as mobile) is insufficient for the user to benefit from UHD, better to transmit in a lower definition format. That the drivers for network evolution will be driven by cost and operator flexibility rather than consumer experience and flexibility is not an unreasonable prediction.

Q10. Increased use of fibre in the access (and 5G) network will be essential over the next 10-15 years, as peak bandwidth demands (a single download) could easily outstrip even VFast over this timescale.

Q11. Most definitely, a substantial redrawing of the network is required to minimise energy consumption. Current energy consumption per bit precludes significant increase in network capacity. The current network is designed assuming small intermittent flows for which IP is the optimum protocol; however the connection characteristics of the currently dominant applications are more reminiscent of (sometime short) phone connections. Circuit switched architecture is much more relevant in this case. To further reduce energy consumption, it is feasible that this could be readily implemented using optical switching using for examples MEMS devices.

Q12. No input offered by this respondent.

Q13. I broadly agree with this scenario, especially in that it foresees new early adopter applications. The specific application may or may not catch, but there will be something emerging on these timescales.

Q14. The predicted behaviour is a reasonable prediction, but has obvious flaws since developments will remain incremental leading to increased total costs over the lifetime of the strategy.

Q15. As indicated above, a move from electronically controlled electronic packet switches towards electronically controlled optical circuit switches is likely to be required to scale the capacity as FTTX continues to facilitate bandwidth increases.

Q16. See Q11.

Q17. No input offered by this respondent.

Q18. I strongly agree with the majority of the scenario presented here, although for energy consumption and security reasons, there may be a level of retrenchment away from the Cloud in the short term, delaying this aspect of the scenario.

Q19. I strongly agree with the technology commentary with the single caveat that UHD will be *available* for all content, but that its delivery will be platform dependent.

Q20. Again, optical circuit switching will have a key role to play in minimising energy consumption.

Q21. See Q11.

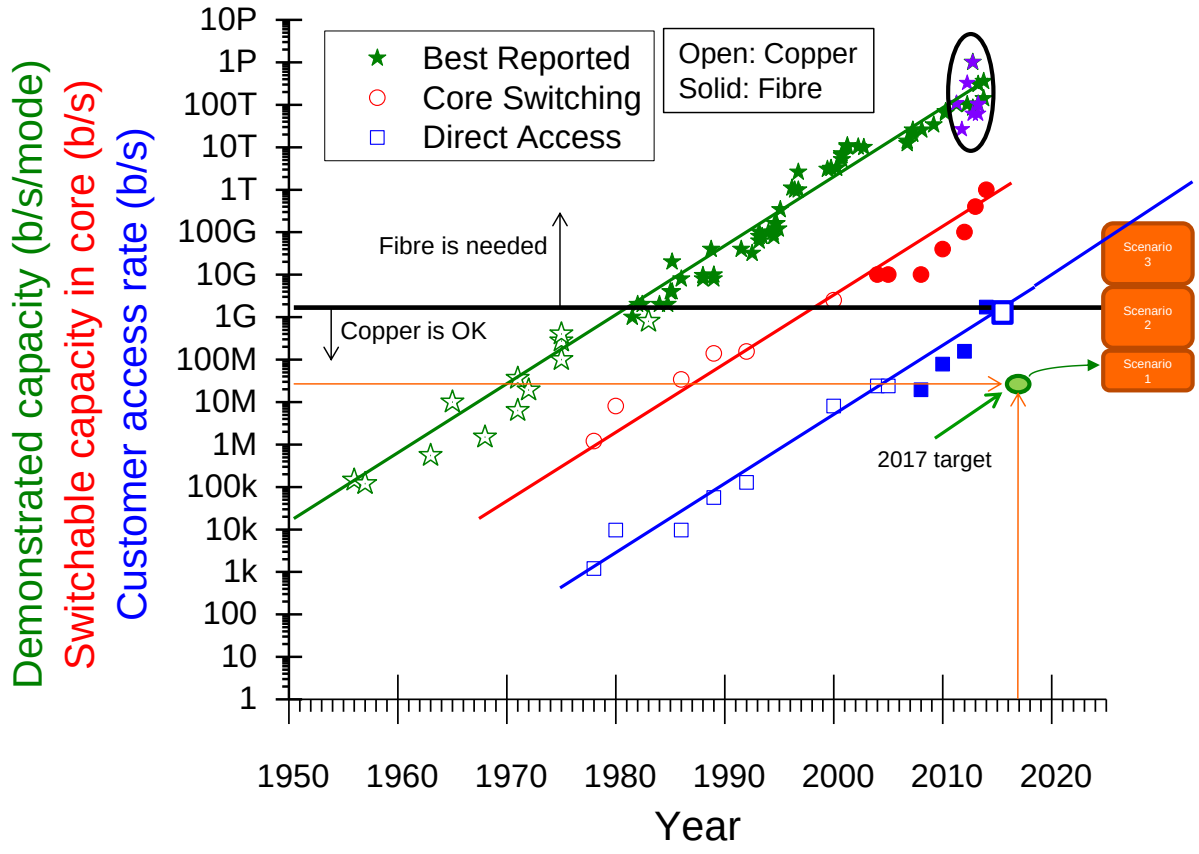
Q22. No input offered by this respondent.

Q23. Strategy documents such as this and other expressions of government ambition/expectation have been shown to have a marked influence on the delivery of network. Recently, the EU Broadband strategy has influenced several eastern European operators to scale back the deployed bandwidths in their networks so that they only marginally exceed the EU expectation. This achieves the short term objective of maximising the position of league tables such as “penetration of >24 Mbps” making the counties attractive for investment, but results in larger overall long term costs once expectations are shifted higher. An accurate government expectation and clear dissemination of this to the industry, content producers and consumers is critical to ensuring the cost effective delivery of any of the scenarios presented. Since some nations (outside the EU) already have strategies at or above Scenario 3, it is unlikely that a regulatory framework inconsistent with the deployment of FTTP would enable UK to be seen as a leading digital nation.

Q24. It is likely that public intervention will be required, for the same reasons as public intervention is required for the current superfast rollout. Given the same cause, the same remedy would appear appropriate (subsidy in areas with proven poor commercial return). Several studies, including those by BT, have shown that the entire build of an overlay network supporting Scenario 3 are well within the scope of a National Infrastructure project (between 1/3 and ½ of the predicted cost of HS2) and clearly need based subsidy would be substantially lower.

Q25. No input offered by this respondent.

Q26. Scenario 3 most closely aligns with my own views on the development of the network and in my opinion should be used to inform government strategy, and its use in informing this strategy should be publicised to benefit of its early and cost effective roll out. This view is supported by the historic evolution of research (green) core network products (red) and available products for consumer deployment worldwide (blue) shown in the figure below. Demand has grown exponentially over more than 50 years, pushing through transitions in technology without any significant blip. The UK strategy to 2017 (24 Mbps) is clearly approximately 10 years behind the commercial availability of products, and should at the very least avoid extending this gap (scenario 2). Maintaining, or even extending this gap, which may be the economic optimum for the first or second scenarios, would leave the UK with an access network in 2030 which was not upgradable.



Q27-28. No input offered by this respondent.

Q29. I agree that it is appropriate to review the USO and USC.

Q30-36. No input offered by this respondent.

Q37. Under scenario 3, copper networks outside the home will become obsolete. A clear statement of government policy and/or ambition for Scenario 3 would encourage new and replacement cables which adopt new access technologies ahead of consumer demand.

Q38. The government should clearly back a vision of the UK under Scenario 3 to encourage deployment of appropriate networks, development of applications and encourage user ambition.

Q39. There are clear economic and social penalties of moving too slowly and clear environmental and cost penalties of a slow evolutionary approach given that current energy consumption of just the network (ignoring connected devices) is already expressed as a few %. However, in addition to avoiding these penalties, there are clear benefits to leading the development of advanced networks. Many of the required concepts were originally developed in the UK, and there remains a highly trained and competent workforce in this industry sector, although it is beginning to erode, supported by several truly world class research institutions and Universities. As an Early Mover, the UK would be able to benefit from the high potential start-ups which would be created by this latent workforce, a re-emergence of a strong multi-national industry centred around the remaining multi-national players with a strong UK presence and UK based operators would gain valuable competitive experience enabling them to compete in overseas markets where only mature technologies are foreseen. In addition to the direct benefit within the industry itself, section 5.30 correctly identifies a wide range of benefits to the wider business community, to which should be added to ability of our world leading creative industries to maintain their significant edge as digital technologies continue to influence this sector.

The UK should expect to see investment in FTTP networks, alternative switching and routing technologies and content distribution and archiving strategies which a higher focus on reduced life cycle energy costs.

Q40. The UK appears to adopt a particularly “straight bat” with regard to its support of industrial R&D and its interpretation of state aid rules. Unlike France, Germany (and the US) it is particularly difficult for companies to directly benefit from state funded R&D projects. My evidence for this view comes from the review of many nationally funded R&D projects across Europe where the scope of the project falls squarely within the emerging product portfolio of the companies in question, and significant subsidy of staff based on company premises is common (both existing and newly hired). The available schemes impose additional burdens, especially on innovative SMEs which do not impact European competitors in the same way. This issue is particularly the case for hardware based companies, so focused R&D grants in this area would reduce the disadvantage experienced by innovative UK companies.

Q41) The UK has an international leadership position in many fields of relevance to this report. Of particular prominence is Photonics with industrial manufacture of opto-electronic devices in Ipswich and Caswell, subsystem assembly in Paignton, optical switching device manufacture in Cambridge and many more. These key industrial players are supported by world leading research groups throughout the UK University sector, but including the ORC at the University of Southampton, the AIPT at Aston University, UCL and a cluster of Scottish Universities (Glasgow, Heriot Watt, St.Andrews and Strathclyde). With world leading computer science departments, such as those at Cambridge, UCL and Nottingham, coupled with research arms of multi-national companies such as Cisco, the UK could readily achieve a world leading position in low energy switching and routing.

Q42. No input offered by this respondent.

Q43-44. There are far too many examples of development projects where cable duct is deployed without consideration for FTTH, instances of widespread road excavation where the opportunity to deploy new duct or fibre at lower cost is ignored and difficulties with wayleave. A presumption of fibre connectivity for all planning applications would impose little additional cost to the taxpayer, but would ensure that new installations are immediately compatible with state of the art access communications for years to come. Similarly, licences for private enterprise to deploy communications cables (ideally fibre) during major road excavation projects would also encourage the low cost installation of vital physical infrastructure, minimising overall cost.