Notes from INCA seminar:

Full fibre & 5G

London, 12 July 2017

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Introduction

With the Government's full fibre and 5G mantra set out by Minister of State for Digital, Matt Hancock MP, in his speech to the World Broadband Forum in October 2016, the focus is now on how to best deliver fibre all the way to the premises and ensure world class 5G coverage across the UK.

Point Topic attended a seminar run by INCA, the Independent Networks Cooperative Association and sponsored by esri UK and 3-GIS, on 12 July 2017 aimed at exploring developments, issues and the actions that need to be taken by both industry and Government in order to deliver on this vision.

The following set of notes provides a basic account of the presentations given and discussions that followed. It does not form a comprehensive record but rather gives a flavour of what was presented. Slide packs accompanied most of the presentations and are available here.

Tommy Siniard, 3-GIS

See slides.

3-GIS provides intelligent geographic information system (GIS) software to plan, design, and manage networks. It operates on the esri ArcGIS Server platform. The platform combines all information on streets, population, addresses etc into one format.

Four to five years ago 3-GIS began to work with Google as it began rollout of fibre. Google pushed 3-GIS on the design phase which was lengthy. So a lot of effort went into designing a system which could be as fast and accurate as possible. Cell tower planning which took three days was reduced to one hour; FTTH planning for 500 homes went from five days to one day.

The system allows clients to scale production without increasing staff. It has been used to plan over four million homes and is currently being used to manage over 25 million miles of fibre. Clients include Level 3 and Crown Castle.

Planning and analysis – this includes possible paths, relationship factors, existing infrastructure, budgetary costs, signal budgeting. It also calculates potential loss.

Once complete the system also allows review – costs, what would work better, what infrastructure can be reused. The architecture may be multiple types; premises can be multiple types.

The system generates a complete bill of materials. Customers in Norway and Denmark need to obtain this before even bidding on projects and 3-GIS is seeing this increasingly in Europe.

Other features:

- Automation construction packages – over the last 18 months 3-GIS has been working on this – prints, splicing, labelling. It is trying to automate as much possible and in some cases is seeing 85-95% automation
- As-built accuracy – the system has tightly integrated mobile tools – for the first design construction write out when the actual build is compared with the plan. The system can create connections to new destination points

- An engineering firm does not get paid until they bill. So they need to know how much fibre is in, so this is an accurate way of recording that
- Once the network is complete, the system becomes a tool in the cloud that in most cases can be shared with others, that can be used to do other information tracing and plan build outs from that point onwards.

Stewart Kemsley, Head of Broadband Infrastructure Policy, Telecoms Directorate, DCMS

See slides.

The UK Government's Local Full Fibre Networks (LFFN) programme background:

- Announced initially in Autumn Statement 2016 and then updated in the Spring Budget 2017 to support investment in rolling out full fibre networks
- Intended to be cross UK approach, with local authorities using levers such as co-ordinating public sector demand, stimulating business demand, reducing cost of deployment
- £200m has been allocated from the National Productivity Investment Fund. DCMS will be inviting bids from a broad range of local bodies for projects in their area that will stimulate commercial deployment of full fibre networks
- Before that it is looking at testing in a focused way with a small number of projects starting in 2017 – a formal bid process for a Challenge Fund for local bodies is opening later this year with later bidding rounds planned. There will be an Expression of Interest opportunity for all local bodies shortly.

There were many positive responses to the DCMS Call for Evidence: Extending Local Full Fibre Broadband Networks in December 2016/January 2017.

Four delivery methods have been identified for the LFFN:

- Public sector anchor tenancy
- Full fibre upgrades for public sector sites
- Reuse of existing public sector infrastructure assets
- Gigabit connection vouchers scheme.

DCMS is also working with Crown Commercial Services and Health and Social Care Network as well as individual local authorities to explore how their existing projects can be adjusted to fit with the scheme.

LFFN next steps:

- Looking to write to local authorities regarding the Challenge Fund programme
- Get local authorities to consider how to differentiate themselves on their approach to highways / street works / narrow-trenching / wayleaves etc to help them towards examples of best practice
- Working with Department of Transport to support improvements in street works.

Other support:

- Digital Infrastructure Investment Fund (DIIF) underwritten with £400m of Government funding
- Telecoms Infrastructure Bill passed committee stage last Monday – this will enable 100% business rates relief on new lit fibre installed since April 2017. This 100% rate relief for new full fibre infrastructure in England will apply for five years and be backdated to 1 April 2017.

Q & A / comments

Q When does the rate relief apply until? It is from 1 April 2017 – so it self expires.

Q Any more details on the voucher scheme? We are still looking at how to design the scheme. Previous scheme sat with SMEs and was delivered via local bodies – looking at how this can be streamlined better. We are looking at a launch date later in the year.

Q Work with DoT? DoT looking at updating guidance, there is no particular timetable. Something will be out on this as soon as possible.

Scott Bailey, 5G testbed and trials programme, DCMS

See slides.

We have an ambitious set of Ministers, especially Matt Hancock. Aiming to accelerate 5G deployment in the UK, maximise employment and economic benefits as soon as possible. And maximise UK in 5G apps and services.

- Autumn Statement 2016 – the Government first announced its 5G plans as part of a £1bn package to boost the UK's digital infrastructure. Of this funding, £740m will be invested in two programmes: Local Full Fibre Networks, 5G Testbeds & Trials
- £16m investment in 5G core network capability – announcement on 6 July 2017 – three universities to develop 5G test network capability to demonstrate this new technology across a range of sectors. This is the first in a whole series of investments. https://www.gov.uk/government/news/three-universities-to-develop-16m-5g-test-network
- Spring Budget 2017 – Next Generation Mobile Technologies: A 5G strategy for the UK – Government released its 5G strategy, outlining steps needed over the next five years to be at the forefront of development and deployment of 5G.

In December 2016 the National Infrastructure Commission published its report into 5G and telecommunication technology – this includes recommendations for actions on roads and rail, and the need to think more creatively about spectrum. Focused on seven key themes in strategy:

1. Building the economic case via testbeds and trials. And think we can be doing other things including working with institutions on use cases
2. Fit for purpose regulations – hope industry will welcome changes on Electronic Communications Code. Looking at a more radical approach to planning, opening up government estates, spectrum, getting local leadership

3. Local areas' governance and capability – local areas to see if can provide funding. Housing white paper requiring local authorities to have planning policies in place to support digital infrastructure. Plans to identify best practice in local areas
4. Coverage and capacity – National Infrastructure Commission said Government needed to do more on 4G. Increasing geographic coverage, boost connectivity on road and rail – DCMS is completely in agreement. Committed to set out high quality coverage strategy at end of this year
5. Safe and secure deployment – standards work, future communications challenge group set up. In cyber security UK has an advantage now and should leverage that. Public perceptions are important
6. Spectrum actions – there are several recommendations for Ofcom. Question over how to authorise spectrum, perhaps on a regional basis
7. Technology and standards – these are global.

Key work areas for 5G testbeds and trials:

- Facilitate development and operation of testbeds for trialling applications and products to test use cases. Testbeds may be in specific vertical sectors e.g. autonomous vehicles, and several testbeds coming together into a smart region.
- Focus on how to stimulate the pipeline. 5G innovation network announced in Budget to develop a clear brand for the UK offer on 5G
- An initial investment of up to £16m to enable early development of end to end 5G testing capability
- 5G Innovation Network for UK – important that Government helps industry work together – step change in how things interoperate. To set basis of standards for people receiving funding.

We are expecting to launch a competition in the coming months to select a number of testbeds with trials for funding from 2018-19. The terms are still under development but could include:

- Testbeds focused on individual vertical industry sectors or across multiple sectors (e.g. a smart city or smart region)
- Interested parties to form consortia – could include local and public bodies, academic institutions and industry. Who will lead? Not necessarily local authority or LEP-led
- A focus on identifying the 5G use cases that will be trialled, and the inclusion of trial partners
- A requirement for consortia to bring funding to complement DCMS programme funding
- A focus on developing a business plan during the selection process for the delivery and sustainable operation of a testbed.

<u>Q & A / comments</u>

Q How many testbeds will there be? There is no firm view partly because there has been no decision from Ministers on the funding split between the two programmes – at least £200m will be spent on Stewart's programme, but there is no view on the rest of the split.

Q Linkage as 5G needs fibre? Strategy talks a lot about the 5G vision but this is also about access to dark fibre. We need to ensure the right decisions that work and recognise 5G and fibre as part of same story going forward.

Q Long term sustainably? Will testbeds morph into live infrastructure? Slightly too early to know but Ministers are clear that funding is for long term commercialisation.

Q Could local authority build infrastructure to serve in the future? We are still at the testbed stage so small scale. Testbed testing of 5G use cases so we are not yet talking about massive deployment of infrastructure.

Cristina Data, Director in spectrum group, Ofcom

See slides.

Ofcom's role is to ensure spectrum is not an inhibitor to rollout. The question is could we use a different authorisation of spectrum? We need to be more creative about spectrum.

Mobile data has been increasing for some time. Chicken and egg – new technologies drive new services and then new technologies are required for augmented reality and other new services.

5G is being designed as a solution and is clearly defined as a wireless rather than a mobile technology – it comprises enhanced mobile broadband (eMBB), massive machine type communications (mMTC), ultra-reliable and low latency communications (uRLLC).

The ITU has set a very low latency target. There are applications in healthcare and autonomous vehicles. Low latency allows you to think in a different way.

Revolution yes, but 5G is also an evolution. There is a lot of technology out there. It needs to be deployed on the 4G network and then the 5G solution. On top of that there are a lot of technologies in the IoT world such as mMTC so will 5G be a replacement or an evolution for those?

Ofcom activities – the Radio Spectrum Policy Group – November 2016 published recommendations for several bands for 5G in Europe:

- Low frequency 700MHz, this is already there. This very small band has becomes available and allows for better widespread coverage
- Mid-range 3.4 to 3.8GHz also as a primary band; 18 EU member states are identifying options to make this available for mobile
- Millimetre wave cells 26GHz – enabling the use of very high range frequency not used before for wireless communications. EU has agreed on 26GHz as the pioneer band for 5G technologies. It's a more targeted solution for high demand areas.

Ofcom published its Update on 5G spectrum in the UK in February 2017. It gives an early indication of bands. On 11 July 2017 Ofcom published 2.3 to 3.4GHz auction statement – it plans to run an auction in the autumn https://www.ofcom.org.uk/about-ofcom/latest/media/media-releases/2017/ofcom-sets-rules-for-mobile-spectrum-auction

Next steps:

- Summer 2017 Ofcom will publish a CFI on access to 26GHz having committed to this in February and a roadmap identifying further bands for 5G – what is the demand, models and services that could be deployed and who is interested and how much spectrum is required?
- Will shortly publish confirmation of its decision to make 3.6 to 3.8GHz available for mobile and its proposed approach
- Will work with Government on points identified in its 5G strategy to ensure that spectrum is not an inhibitor to 5G rollout.

Authorisation of spectrum at 26GHz is being considered because there may be different ways in which spectrum can accessed. There are a range of different tools to authorise spectrum – dedicated national licences, dedicated local licences, shared, licence exempt such as wifi. What is going to be the best? Should it be hybrid? Ofcom is keen to know from the industry.

Q & A / comments

Q We recognise there is demand for lower frequency spectrum, so one of the possible areas is 3.8 to 4.2GHz which is used by satellite stations and fixed links. A consultation in April 2016 was published with maps showing that in much of the country this is available. We are still keen to hear on geographic sharing and database driven access. We have not received much response so it has been left to industry to let us know if it is interested. 3.4 to 3.8GHz has been identified as a critical band for 5G being best for citizen and consumer for national allocation because it can be deployed on a cell structure and can be widespread.

Q UK versus Europe – is there divergence? We need globalisation if we are to benefit from economies of scale. Ofcom has been innovative ahead of Europe on this.

Q Spectrum is messed up when chunks are taken out – so welcome Ofcom's approach not to do this.

Stuart Revell, 5G Innovation Centre, University of Surrey

See slides.

Background:

- 5G Innovation Centre in Surrey has been built on years of IoT experience– involves large operators, government organisations, supply chain companies. It is truly the largest 5G open innovation space in world. There are R&D centres that are bigger but this is open to all. There is also a SME programme.
- It is part of the hub announcement of the first £16m tranche of a new envelope of funds [mentioned above]. The University of Surrey has partnered with the University of Bristol and Kings College London – all three institutions have years of research and want to pool this to come up with a national approach.

The ITU published its draft specification on 5G in February 2017. This is very important as there are no more questions about what 5G is or is trying to do. This specification starts the process. The details are now under evolution but solidifying.

We see key verticals as important – this is not just about what 5G can do for mobile operators, the Centre is looking at how to define and show use cases.

- Why do we need four milliseconds? The automotive sector is where speed [latency] really matters because of safety issues. Security aspects must also be recognised. What the UK brings is system integration and security skills – we are really good at collaborating across verticals
- We are looking at a high level at 5G architecture and common interface across networks. Have been doing peering, QoS going across networks and perhaps slicing networks so we can have shared services – this is difficult to do today
- The three university project leverages all our work in 5G. The objective is to have an end to end network working by March 2018 in order to demonstrate it at Mobile World Congress. The first phase is about testbeds and getting the technology working. In 2019/20 trials we will move into a commercial version. JANET network is working with us.
- Demonstrated at last year's Mobile World Congress – worked with Jaguar Land Rover to show transport logistics as a fantastic use case for 5G – leveraging multiple communications so cars talking to cars to street furniture. We are working on the eco system to bring these things together.

We are not replacing wireless technologies; all are part of 5G. They are good for the purpose they were designed for. We are also looking at licence exempt technologies and at slicing networks. In car connected to 5G providing information on autonomy and safety and then entertainment over the same network – you could slice up the network to make them operate on an appropriate level.

Mark Thomas, Cambium Networks

See slides.

Overview:

- Broadband is essential but we still have 5% of the population with no access to decent broadband today
- FWA is the ideal technology for reaching some of the most deprived users. Where the density of people is low. Equipment is available today. And operators are already building wireless networks hampered by lack of decent spectrum.
- There is a realistic opportunity to introduce geographical licensing at the 3.4 to 3.8GHz as part of the 5G auctions. Geographical licensing will ensure that spectrum can be put into service to address the most pressing needs in each area.

Mobile operators want more cells, more bandwidth and more technology. A lot of effort goes into advancing technology but we have to keep pace with demand. There is huge demand where large numbers of people congregate – city centres, shopping malls, airports, stations.

Handset antenna gain is low and loss through foliage, buildings and obstructions significant at 3.4 to 38GHz. So this mid-band would be good as an overlay to supplement existing capacity at other frequencies. See this band as mostly useful for adding more capacity in areas of extraordinarily high demand.

FWA networks deliver internet bandwidth in areas where mobile networks are not effective. They have high gain directional antennas at the subscriber's premises; you can put antennas up high in elevated positions; they are outside so there is no building penetration loss; and you can chose a location that works by site survey. This means only 40 to 50dBs of loss compared with trying to use a handset in a house. So there is an ability to reach remote dwellings that will never be on mobile networks. Other benefits:

- FWA uses small base stations compatible with sensitive planning
- Transmits at low power
- Low cost equipment readily available
- Early adoption of advanced technology.

Why use 3.4 to 3.8GHz for FWA?

- Most FWA in the UK uses 5.8GHz but this is not ideal because of limited transmitter power, DFS for radar detection, limited bandwidth, an uncertain interference environment
- 3.4 to 3.8GHz offers higher performance and longer range, higher transmitter power, lower loss through foliage. Longer range lowers network cost of coverage and the technology is available from many suppliers.

Our request is for geographical licensing:

- Use spectrum responsibility for the greatest national benefit. For subscribers in remote or rural areas, there are farmers doing VAT returns at 3am because their ADSL is too slow. 4G does not reach these places
- Lower frequencies (up to 2GHz) are better suited to mobile networks in remote or rural areas and mobile operators will not need 3.4 to 3.8GHz to supplement capacity
- FWA operators are well placed to deliver at 3GHz
- Spectrum can be used by auctioning on a geographical basis. Government should put in reserve price to prevent it turning into a national licence as mobile operators are not incentivised to take the whole country. Maybe they can then use spectrum in these areas at a low price. Cambium Networks has made two Ofcom submissions on this.

Q For single deployment 40MHz would be fabulous and 20MHz reasonable. But ideally we would like the whole band.

Dr Wenbing Yao, Huawei Technologies (UK)

See slides.

When discussing the global development of 5G, the World Congress in Shanghai in June 2017 highlighted a few aspects to address:

- Business use case side – broadband to home (B2H) – giving better last mile household access. Leaders in this in the USA include Verizon and in Canada there are several operators using this to provide WTTx service. 5G millimetre wave frequency band. Probably the most mature case seen

- B2V connected car – all countries' governments have set autonomous vehicles as a key priority. This is going to be huge in all countries globally. Huawei participated in the 5G Automotive Association. You do not need 5G to make connecting vehicles work but there is a clear view that 5G is going play a significant role in enabling lots of new services in vehicles.

Huawei sells to most operators so it sees use cases from their point of view – Americans are more interested in WTTx, Koreans more in virtual reality, Chinese and Japan and Asians in enhanced broadband services. European operators are conservative – there is work in advance on technology but not on use cases.

Standards on 3GPP release 15 – this was supposed to start in 2017 but Asian operators were not seeing the progress they wanted so they formed an alliance to bring the phase forward.

In terms of 5G marketing progress, we have seen a lot of trials globally. Several operators are saying 'we want to be the one to launch 5G first' (Huawei cannot make a commitment to any operator on this!). Commercial services in the USA on WTTx are being launched in 2017.

C band will be the first key 5G band worldwide. But TDD frequency is becoming sought after as it gives economies of scale. mmWave has the highest potential – 26GHz and 39GHz.

5G RAN design methodology – what are the key enablers? CloudRAN, CloudAir, Dual Connectivity – these and other technologies are enabling 5G. They support different use cases. CloudAir is an important part in this. It allows you to carve out a certain piece in the spectrum and use LTE with it. Architecture evolution from single RAN to CloudRAN means better uplink capabilities.

Network slicing – allows IoT or M2M apps to have their own carved out resource and latency adjusted to suit. Rather like adjusting the lane on a motorway.

Q Stuart – We are partnering with these organisations. Think the UK is leading on system integration and use cases and verticals. We are equal in terms of driving standards but pessimistic with communicating plans.

Wenbing – 5G is driven by mobile operators but this country has global operators so this is not shown on my slide. Since last year in the UK 5G has become more prominent as the country tries to catch up compared to Asia but the UK universities have been very active for longer compared with other countries. But we are still being asked, what is the business case? If we can prove there is new business then we will move forward.

Mark Collins, CityFibre

See slides.

Background:

- Only 2% of premises are connected in the UK today by full fibre
- CityFibre was created in 2011 so is now in its sixth year of operation and proud to be part of building Gigabit Britain

- 150km network in Edinburgh, just one of 42 cities today. CityFibre's target is to reach 100 towns and cities across UK, operating outside the M25. This would cover 60% businesses and 40% homes and 40-50% of the UK's GDP in world's fifth largest economy
- Aim is to allow anyone to get access to fit for purpose infrastructure – to bring better fibre connectivity to everyone in society, fixed or mobile.

CityFibre plans:

- £200m equity finance announced last week. CityFibre has raised half a billion and is on the way to £2bn. Plan to expand full fibre spines to 50 cities. The Government's manifesto is for over 100 cities to have major fibre points by 2022.
- Now CityFibre will commence FTTH in five cities – next year will see construction underway to 10 cities, to about one million premises as the first stop, and then to five million premises. The Government manifesto is to have 10 million premises connected to full fibre. CityFibre's aim is to deliver at least 50% of the Government target
- Also providing FTTT (fibre-to-the-tower) infrastructure for 4G/5G
- Also announced acquisition of Entanet – so combining leading competitor of BT Wholesale with largest competitor to Openreach
- CityFibre also big throughout the Northern Powerhouse. And has a bit more to do in Scotland.

CityFibre current position:

- The UK out of the OECD countries has one of the largest proportions of GDP from digital, but in digital infrastructure it ranks as one of the poorest
- Full fibre policy objective looks like CityFibre in Edinburgh. 150km network in nine months. 324 connections to public sector sites including 137 schools. Able to serve 7,000 businesses today. Potential to serve 17,000 businesses, designed to expand to FTTH.
- FTTT in Hull – 62km for fibre to the tower for Three and EE. Only part of the country where CityFibre has a working relationship with BT
- In York putting fibre into every street and home. Starting point is fibre spine which anchors the network. 1Gbps broadband to homes for just over £20 per month and fibre for 5G and small cells. Construction to commerce in five to 10 cities in 2018 – the funding announced last week is to begin this large scale rollout of FTTH.

Entanet purchase:

- As a regulated provider Openreach has to offer access. But there is an opportunity for competitors to provide access to BT infrastructure. A new fibre builder like us and others can build and provide the access but how do you get the eco system to access new infrastructure? How do you migrate customers across? The obvious thing is to take a key competitor at this level and expand it across
- Entanet has 1,500 CPs, and has its networks connected across to Openreach. So it has the ability to move CPs to CityFibre. Integration work is starting now. So we should see migration from Openreach infrastructure to CityFibre fibre

- Expect this to mean greater demand and take up which will in turn will fuel CityFibre's infrastructure rollout
- Ability to create national direct peering into Google, Amazon, in London and throughout the UK and internationally as Entanet has extensive direct peering.

There has been some good direction coming out of Government:

- This is one for the altnets to step up to deliver on – to have 100 towns and cities with full fibre spine networks by 2022 and FTTP to 10 million premises – no date is given in the manifesto but we expect 2025. CityFibre will do its bit
- With the National Productivity Investment Fund and £400m DIIF, there is at least a £1.7bn stimulus. We hope we can play our part and be a recipient
- The Telecoms Infrastructure Bill also shows a broader rethink on business inventives to get fibre rolled out
- Overall the situation is positive but there is a lot of work to do in fibre to homes and businesses and also to support 5G.

Paul Morris, Vodafone

We are talking today about something that does not exist to some who don't believe in it! [5G]

Started at Vodafone when there was no 4G and this has been transformed – now 4G is available to 96% of population and will reach 98% next year. We can use and enjoy 4G and are seeing data usage going up. Vodafone's investment programme has been £2bn and more to come. We have made progress and need to learn lessons.

5G is an evolution on top of 4G – it is like the transformation from copper to fibre going from 3 to 4G, so we have been through a transformative change already. Will see 5G becoming available in a number of areas, and we are running a more efficient network around network management – doing less 'man in a van' stuff in the way we manage the network.

Question is how to develop a new enterprise market to deliver revenue streams which will ultimately deliver services such as augmented reality and autonomous cars, and not just be a consumer play into the house? It is all very positive.

But until this session there has not been enough talk of fibre. Almost seen as two separate industries which do not always get on, but we need to bring them together now. If we don't have affordable fibre backhaul it [5G] will not work – this is already holding back 4G rollout in Scotland where there is not enough access to fibre backhaul. Full fibre is absolutely essential for this.

With Brexit we have got to build a network to keep that digital economy going. Will G.fast ruin investment case? I think it does. We need to make sure it is pure fibre and not this cooper hybrid which gets sucked into ultrafast.

Opening up ducts and ensuring a national network is key, but we need a third national operator. We have got to do better than plugging into each other's networks. It is too difficult to use smaller networks – it is harder to use you guys and there is a need to think about that and how that works.

We also need to think about the cost it takes to run networks. When building, maintaining and upgrading, we [mobile operators] have to buy spectrum to run the service – this needs to change – from rates or access to street furniture sites, to planning. Are these things which help or hinder? Vested interests make money out of this situation. We need to reform policy areas and to be more ambitious. We have made progress with Government at least recognising the ambition. But now we need decisions to get out of the door and to learn the lessons of 4G, in order to build out quickly and be a leader in fibre and 5G.

Alastair Davidson, Wireless Infrastructure Group

Background:

- Wireless Infrastructure Group has 120 wireless networks on its infrastructure, including Vodafone. It is building new towers e.g. a 50m tower in Scotland
- In-building systems are shared infrastructure systems with Telefonica, Vodafone and EE as customers
- Small cells is the third area – we are starting to build small cells connected by fibre. We will need 100 of 1000s of small cells in city centres and all need connecting by fibre.

Fibre is part of the wireless infrastructure and we need to incentivise investment in it. It is important for the market that there is competition at infrastructure level. We want to do in the UK what Crown Castle is doing in the USA.

Changes required:

- Concession model for local authorities – we are a firm supporter – gives exclusivity in a region so that you can deploy and lock in investment. But in Aberdeen for example, we are looking at a small cell fibre network with up to two years engagement – the local authority is supportive but there are five different departments with a steering group addressing the structure capacity of lampposts and where available duct goes. So it is a huge investment before we even deploy. We have confidence to invest in infrastructure but the concession model could be improved
- Policy changes should result in less focus on short term revenue and short connectivity such wifi – we need to see policy that drives longer term investment thinking and long term connectivity so the concession model needs encouragement
- We need to allow assets during a concession to endure beyond the concession – one contract gives only four weeks to remove assets or hand them over to the council. We are in the 20-year business with fibre assets yet there is talk of handing them over in seven to 10 years. We are pushing to change this model with DCMS. The National Infrastructure Commission report case studies Aberdeen
- Ducts and pole access: Ofcom celebrates this regulation as having been implemented yet it does not apply to the Wireless Infrastructure Group. I applied to BT to gain duct access and was told no because the regulation does not include for mobile. Wholesale and business activities are also not catered for by duct and pole rules. DCMS has asked Ofcom to review this in its next business connectivity market review. We would be happy to pay for that

product and engage with Openreach so that we can get a commercial product before it is regulated – we need full fibre to the 5G small cell.

Q & A / comments

Q How big does a network have to be to allow us to integrate networks access? Paul – aggregated wholesale network – we did mention this to Government but the trouble is if you are small, then the money and effort to connect to you is huge. Think we need ease of process.

Mark – one of the motivations in looking at the Entanet acquisition was its links to Openreach, Virgin Media and other fibre providers giving the opportunity to link to others. Larger consumers of infrastructure require scale. And there have been barriers historically which create a lock in or tie to incumbent infrastructure. Industry needs to work on something together.

Panel session: Fibre & wireless – are we on the right track?

- John Okas Real Wireless (chair)
- Ian Corden, Plum Consulting
- Andrew Glover, Bridge Fibre and Air Broadband
- Stuart Revell, 5G Innovation Centre
- Tommy Siniard, 3-GIS

John Okas

See slides.

Background to Real Wireless – worked on number of projects including:

- Horizon 2020 project – 5G NORMA – on new innovative technologies including slicing
- EC – socio economic benefits of 5G
- National Infrastructure Commission – 5G use cases
- Supported CTIL to win City for London Small Cell concession.
- New EC Horizon 2020 project – 5G MoNArch – economic analysis – business models and TCO.

Lot of consumption of data is indoors. Ofcom data shows that only 31% of data is on the mobile network while 69% is on wifi.

Key driver is investment and return. Demand growth – last year operators talked of 50% per annum, now saying 100%. ARPU up a bit but not hugely. It is the same for fixed. Operators are not ready to invest in 5G as they have not yet made a return on 4G.

5G is going to be an evolving change. But it is not quite just a software update. It is 4.6 to 4.7 and eventually to 5G.

Each generation of technology brings new spectrum bands, improved efficiency, network slicing enabling you to become an MVNO e.g. BMW could take a slice of network. Then there is the regulatory and policy wrapper to make it work.

Q Which use case do you think will drive 5G? Is FWA the one in the UK?

Andrew – expansion of fibre is good for all forms of wireless. Whatever form of wireless we need fibre closer to the end point. But 5G is not cheap to deploy whereas other wireless technologies have lower cost deployment.

Tommy – Google and Crown Castle are both 3-GIS customers. Google is working on small cells to the home to cut out costs of doing the drops.

Ian – It's the killer app question – the business case for 5G usually breaks the classic 3G business case. If you're talking about putting money on particular segments, then I would not choose remote surgery because of the insurance and ethics issues. Smart vehicles are an area to an extent but approach this with some caution given latency issues. Airports and transportation hubs with private LTE mobile to slice the network to share and take cost out the network – this is moving to a neutral host model.

Stuart – Rename 5G 'mind the pessimism'. We know apps cannot run on today's networks but with 5G we have a defined network and a vision to do those things. For 1G we did not know the business models and apps. The most pessimistic group are those in our industry. Key drivers are healthcare and automotive, and also Government knowing that we need more productivity and value.

Q Why does the Government not invest in a network slice for autonomous vehicles?

John – Semi-autonomous cars connected for satnav and entertainment already, the autonomous vehicle is not much more. But it is less certain government would run this.

Q Government could underwrite a network slice for autonomous vehicles? John – think that by the mid to late 2020s we will be quite far down road to fibre.

Ian – Not spots in Wales, but the private sector is not prepared to invest in areas with weak returns. And funding from the public sector is not invested either. Surely the role of government is to step in if there is a market failure and support cross sector working.

Q Could operators buy their way out of coverage commitments and then that money could be used to build a wholesale network in those areas?

Stuart – There will be different models and more public private partnerships. Government does recognise that – which is why it is doing testbeds and trials.