BROADBAND IN SUFFOLK

BRIEFING PAPER

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Executive Summary

Scope and Purpose

This briefing paper on '***Broadband in Suffolk***' is intended for the seven Members of Parliament whose constituencies lie within the county of Suffolk ('the Suffolk MPs'), and for the members of Suffolk's local authorities, agencies and fora, who are all engaged in promoting the widespread availability and take-up of high-speed broadband services across the county.

The paper aims to provide an ***independent, authoritative, evidence-based*** review of:

- the county of Suffolk – its geography, population, economy, social demographics and unique characteristics relevant to broadband,
- the growing importance of broadband access to the Internet, and its increasing contribution to the future sustainability and growth of the economy,
- the major alternative technologies for broadband access, their relative economics, and the role that each are likely to play in fulfilling mainstream demand,
- the current deployments in Suffolk of current-generation broadband networks and services, and the announced plans of commercial operators for the future deployment of next-generation, high-speed broadband ('Superfast Broadband'),
- the likely 'gaps' in the coverage of 'Superfast Broadband' in Suffolk (the under-served and un-served areas of the county) that announced plans will leave, particularly in rural areas, and a high-level indicative range for the costs of plugging those 'gaps',
- a summary of announced Government initiatives for extending broadband and 'Superfast Broadband' beyond the levels of penetration likely to be achieved through private sector investments by commercial operators alone.

The paper also offers some ***conclusions*** and ***key recommendation*** on what more needs to be done.

The ***objective*** of the briefing paper is to help build a consensus around the facts of the current situation with regard to the current, and likely future, availability and take-up of commercial high-speed 'Superfast Broadband' services in Suffolk, in order to provide a 'jumping off point' for developing a coherent, agreed approach to tackling the sizeable 'gaps' which are likely to be beyond the reach of purely commercially-funded deployments.

Summary of Key Points in the Briefing Paper
(these key points are extracts from the full briefing paper, which can be read in full, starting on page 11)

On Suffolk:

Nearly one-third (~224,000) of the population of Suffolk live in the larger towns along the A14 road corridor from Felixstowe in the South East, Ipswich (the county town), Stowmarket, Bury St Edmunds and Newmarket in the West, and other significant towns including Lowestoft, Beccles and Mildenhall in the North, and Sudbury and Haverhill in the South. The other two-thirds of the population of Suffolk (~492,000) live in the other small towns, and in the villages, hamlets and farms of rural Suffolk (42%). 86% of Suffolk parishes have a population of less than 1,000. It is the low population density of the nearly half-a-million people living in the smaller towns and rural areas of Suffolk that makes the cost of deploying high-speed broadband to those communities economically challenging.

Over 70% of Suffolk's economic output comes from the services sectors (£8,803m (2007)). As the services sectors are likely to benefit most from Superfast Broadband, the availability of high-speed broadband services will be critical to the sustainability and growth of the Suffolk economy.

A major risk in the deployment of high-speed broadband services in Suffolk is the creation of a two dimensional 'Digital Divide' (geographic, demographic) between those that 'have' high-speed broadband (and use it) and those that 'have not' (and do not).

On the Development of Current Generation Broadband:

All current-generation broadband services (up to 8Mbps or 24Mbps) rely on the use of new technology overlays to extend the capabilities of existing networks that were originally designed to carry voice telephony (for BT's fixed network, and the mobile networks) or TV channels (for Virgin Media's cable TV network) – see Figure 4 on page 14.

By Q1 2009, the UK household penetration of current-generation fixed broadband services had risen to 65% – 17.3 million homes, including over 6 million unbundled lines with a choice of provider. Virgin Media had 3.7m broadband connections on its cable TV network. Around 12% of UK households had a mobile broadband connection in Q1 2009; three-quarters of which also had a fixed broadband connection, indicating that, for many, mobile broadband is a complement to, rather than a substitute for, fixed broadband. However, around 2 million homes (11%) cannot get 2Mbps, and ~160,000 homes are unable to get broadband at all.

On Current Generation Broadband in Suffolk:

The average broadband speed experienced by Suffolk consumers in 2009 was 4.1Mbps, although this masks the wide variations in speed experienced across the county: while almost a quarter of Suffolk residents may experience at least 6Mbps (up to 8 Mbps) and a further third will experience between 4Mbps and 6Mbps, around a quarter experience broadband speeds of between 2Mbps and 4Mbps, around 19% are likely to experience less than 2Mbps, and some lines (in all areas) cannot support a broadband connection at all - see Figure 5 on page 16.

Of the 128 BT exchanges serving Suffolk, just 16 of those exchanges have been unbundled by one or more competing operators, serving nearly one-third of the population (~224,000) in Suffolk's main towns; the remaining 112 exchanges serving around two-thirds of the population of Suffolk (~492,000) have no competitive provision beyond BT – see Figure 6 on page 16.

BT plans to roll-out ADSL2+ to reach 66% of the UK population by the end of 2010/11. So far, BT have announced 13 exchanges in Suffolk that will be upgraded to ADSL2+ (up to 24Mbps) during 2010/11.

Virgin Media covers around one in eight (13%) Suffolk households (~82,000), offering speeds up to 50Mbps, although coverage is tightly focussed around Ipswich, Newmarket and Felixstowe - see Figure 7 on page 16.

Mobile broadband is provided by all the major operators using 3G/HSPA offering up to 7.2Mbps to around 87% of the population. However, the low population density in Suffolk means that geographic coverage is very much lower (3G coverage is largely confined to towns and major trunk road routes in Suffolk), indoor coverage can be patchy or non-existent in many places, and there are considerable variations in the coverage by operator, location by location.

On Superfast Broadband:

The volume of data traversing the Internet is growing year-on-year at an exponential rate, not just because the number of users and usage is growing, but also because of the increasingly rich content

that is being exchanged over the network. These trends are increasing the pressure on current-generation broadband capabilities, and driving the demand for ever higher-speed broadband.

Superfast Broadband requires substantial investments in new networks specifically designed to handle the higher speeds and growing volumes of Internet traffic.

BT announced a £1.5bn investment in Superfast Broadband in July 2009 with the aim of serving 40% of UK households by 2012 with a deployment of (mostly) FTTC (with some FTTH). In May 2010, BT announced an increase in its investment to £2.5bn, with the aim of reaching 66% of UK households by 2015.

In 2009, Virgin Media completed the upgrade of the broadband capability on their cable TV network to DOCSIS3, which increased broadband speeds to up to 50Mbps. Future planned enhancements to the DOCSIS standard would enable broadband speeds of up to 400Mbps over a cable TV network.

However, the phenomenal growth in mobile data traffic will require mobile operators to start to plan to deploy the fourth generation (4G) of mobile technology known as Long Term Evolution (LTE), offering up to 100Mbps. UK mobile operators are likely to start to deploy LTE networks within the next 2 - 3 years, depending upon the availability of new radio spectrum (at 800MHz and 2.6GHz) required to provide additional coverage and capacity (respectively) to support higher mobile broadband speeds, as well as a regulatory agreement on the re-farming of 2G spectrum at 900MHs/1800MHz and 3G spectrum at 2100MHz.

It is important to realise that mobile broadband networks are not a substitute for fixed broadband networks (nor vice versa): rather, they are complements of one another.

The economics of the underlying technologies of both fixed and mobile networks are driving optical fibre deeper into the networks (outwards from the core and backhaul network, into the access network) leaving three main types of interface for the networks to connect to end-users devices: a fixed (or 'tethered') connection, a mobile cellular radio connection and/or a short-range wireless connection (commonly known as 'WiFi').

For the mainstream of users and uses, Superfast Broadband will be delivered by fixed networks based on optical fibre being progressively deployed ever deeper into the networks towards the customer (FTTC/FTTH) with WiFi 'untethering' the final fixed connection in the home/office, complemented by mobile networks migrating towards 4G/LTE, with intelligent devices offering a 'Seamless Mobility' experience for users across delivery platforms – see Figure 9 on page 22.

Based on current announced plans, and the economics of deployment, Superfast Broadband is likely to reach around two-thirds (66%) of UK households (one-third in Suffolk) by 2015. Further deployments to the 'Final Third' (two-thirds in Suffolk) of households in less-densely populated areas remain uncertain.

There are a number of alternative technologies (eg Satellite, Fixed Wireless, etc) that could be considered. However, while these alternative technologies may have a role to play to temporarily infill gaps in coverage in small selected areas ahead of mainstream deployments, or to provide longer-term niche solutions in situations that mainstream deployments may never be able to serve, they are unlikely to play a major role in the mainstream deployment of 'Superfast Broadband' – see Figure 10 on page 22.

On the Prospects for Superfast Broadband in Suffolk:

Beyond the existing deployments of, and planned future upgrades to, current-generation broadband, announcements by commercial operators about any deployments of Superfast Broadband in Suffolk have been limited.

So far, BT has announced just one exchange area in Suffolk for FTTC/FTTH deployment to start during 2010/11: Bury St Edmunds. Pending further announcements from BT about further areas that may be deployed in the later years of their Superfast Broadband programme, it seems reasonable (given BT's declared target of 66% of UK households by 2015) to assume that BT would target the most densely populated exchange areas in Suffolk, where there is established competition (from Virgin Media and the 'unbundlers'), for FTTC/FTTH deployment, ie between 10 - 17 exchange areas, serving around one-third of Suffolk households.

Some alternative operators have also shown interest in deploying Superfast Broadband within the county.

However, current announcements by operators still leave around two-thirds, or nearly half a million, of Suffolk's population with no certain prospects of access to Superfast Broadband for the foreseeable future (ie beyond 2015). Most of the un-served, or under-served, households lie in the smaller towns, and in the villages, hamlets and farms across rural Suffolk.

The indicative total incremental ***cost*** of enabling nearly two-thirds of Suffolk's households/premises (~223,000 households/premises, serving a population of ~492,000)), that are beyond the likely reach of Superfast Broadband funded by commercial operators with only private sector investment, is around ***£100m*** for a fixed-only solution, rising to around £200m for complementary fixed/mobile solutions. Some form of public intervention would be required to leverage any additional private sector investment required at an assumed rate of around 50%, ie ~£50m of public sector intervention for fixed-only, rising to ~£100m for complementary fixed/mobile.

These indicative costs compare well with the known costs of other Superfast Broadband projects of a similar scale (for example, the recently-announced project in Cornwall.

However, recognising the likely difficulties of accessing this scale of public intervention for broadband in Suffolk in the present economic climate, a basic level of availability and take-up of Superfast Broadband targeting the hardest to serve parts of the county (around one-third) could be delivered with a more focussed investment of around ***£25m*** (~£12.5m of public sector intervention, matched by ~£12.5m of further commercial investments), and using a ***trigger scheme*** (operated according to transparent, objective criteria) to help to identify how much public intervention would be required to 'tip' the business case for covering an area from unviable to viable, helping to match any available public funds to areas of potential extended coverage.

We envisage one-third of Suffolk being covered by announced deployments by commercial operators working alone, with a further one-third of the hardest to serve parts of the county through the £25m matched-funded intervention, leaving a 'middle' one-third to be filled-in over time by a mix of extended commercial deployments and further public sector/matched interventions, as required. We have dubbed this ***The Suffolk Three-Thirds Broadband Plan***.

The substantial investments (both private and public) that would be required to enable most/all of Suffolk with Superfast Broadband need to be set against the potential loss of economic benefit to the county's economy of a prolonged period of 'Digital Divide' (geographic and demographic)

between those that are likely to be within or beyond the reach of commercial deployments. The widespread availability of Superfast Broadband could help to grow the Suffolk economy by over ***£2bn***.

On Governmental Initiatives on Broadband/Superfast Broadband:

The new Conservative-Liberal Democrat Coalition Government's announced policy in relation to the recommendations from the Digital Britain report is to support the 2Mbps Universal Service Commitment (USC), but to delay the target for completion from 2012 to 2015; to support public subsidy of Superfast Broadband to the 'Final Third', but to scrap the proposed 50p levy on all fixed lines in favour of using funding left over from the Digital TV Switchover (DSO) Help Scheme (~£250m); while the Direction to Ofcom to reform and liberalise mobile spectrum remains (at the time of writing) pending; and the Digital Participation Scheme is underway, bringing together a number of organisations to co-ordinate a range of initiatives to tackle digital exclusion and drive take-up.

However, the total figure for UK public spending available for Superfast Broadband over the next two years (including regional/local funding) is ~£300m. This figure stands in stark contrast to the estimates for the cost of extending Superfast Broadband to the 'Final Third' of UK households beyond the reach of announced commercial deployments (~£10bn - £20bn), and even the indicative costs of doing so in Suffolk alone.

Conclusions and Key Recommendations on What More Needs to be Done
(these conclusions and key recommendations are extracts from section 8 of the full briefing paper, which starts on page 27)

Developing a coherent, agreed approach to tackling the sizeable 'gaps' in Superfast Broadband coverage across Suffolk, which are likely to be beyond the reach of purely commercially-funded deployments, will require further discussion and agreement among key stakeholders, but here we offer some ***conclusions*** and an outline approach, including some ***key recommendations*** on what more needs to be done.

Conclusions

There is sufficient visibility of demand, and scope for at least some competition, in urban areas (UK and Suffolk) for commercially-funded Superfast Broadband deployments to lead the way.

However, commercial announcements of planned Superfast Broadband deployments suggest a limit (~66%) to UK coverage that can be achieved on normal commercial terms. There will remain about a third of the UK population (up to two-thirds in Suffolk) in less densely populated areas, for which not even a single operator could justify the investment in Superfast Broadband on normal commercial terms.

The challenge to focus upon is the excess costs of deployment in less-densely populated areas, and the ways in which those excess costs might be reduced and met.

The value to society as a whole from the widespread availability and take-up of Superfast Broadband may be greater than the revenues that can be captured by commercial operators, and greater than the costs commercial operators would incur in widespread deployment, leaving the optimal economic outcome unable to be reconciled between the supply and demand sides of a competitive

market – a situation which economists describe as a '***market failure***'. Where the societal gain is likely to exceed the cost of remedying a market failure, public intervention may be warranted.

However, ***public intervention*** in otherwise competitive markets is fraught with dangers, such as distorting competition, inaccurate targeting spoiling incentives and driving overall costs higher, and/or being inefficient and wasting scarce public funds. State Aid rules, policed in Europe by the European Commission (EC), are intended to prevent the worst excesses, but there are some ***key principles*** that should be adopted as part of any approach:

- ***Competition*** - is the proven best way to serve consumers interests in terms of lower prices, more choice and innovation, and better customer service.

- ***Contestability*** – there may only be room for at most one provider in less densely populated areas. Nevertheless, any provision of State Aid must be contestable.

- ***Equivalence*** – where any State Aid confers, or reinforces an existing, dominant position (of significant market power (SMP)) in a (local) market, regulatory obligations to deliver equivalence and a regulated rate of return should be conditions of receiving the State Aid, in order to maximise the potential for fair and effective competition in markets downstream of the physical infrastructure bottleneck.

To date, the case for a ***Broadband Universal Service Obligation (USO)*** has not been made.

Another important consideration in shaping the approach towards extending the coverage of Superfast Broadband is the ***economies of scale*** and scope inherent in communications networks. While it is clearly vital that there be local input into the provision of Superfast Broadband, this should not degenerate into numerous local 'do-it-yourself' broadband networks.

There is also a risk of ***fragmentation*** of available public funds across a wide range of governmental initiatives, potentially leaving none with sufficient resources to make any real difference.

With any public sector intervention, it is vital to ensure that such interventions are ***well-targeted***, and that any commitments made/metrics set are likely to lead towards efficient outcomes (and avoid perverse outcomes).

Perhaps the ***biggest risks*** inherent in the present situation in relation to Superfast Broadband (UK and Suffolk), is the lack of clarity about the objectives and how best to achieve them, and the limited, fragmented public resources available being consumed in many, small, un-coordinated initiatives, unable to make any real impact on significantly widening the availability of Superfast Broadband.

Key Recommendations

So, taking the wider conclusions as a whole, but particularly re-focusing on the challenge of trying to reduce, and meet, the costs of extending deployment of Superfast Broadband beyond the reach of purely commercial deployments, the following key recommended next steps should help to make real progress towards the goal of more widespread availability and take-up of Superfast Broadband. While some of these recommendations can be pursued in the context of Suffolk, some inevitably require action or co-ordination at a UK national and/or European level.

1. A Review of Governmental Broadband Initiatives

The new Government provides an opportunity for a review of governmental targets, initiatives and funding in relation to Broadband/Superfast Broadband, to ensure that they are well-targeted, coherent, efficiently using public funds, and represent value for money. Such a review should include a review of the place of Superfast Broadband within Government's overall spending priorities, to ensure that the importance of Superfast Broadband to the future sustainability and growth of the UK economy is recognised, and that the support that Superfast Broadband received reflects that.

1bis. A Review of Broadband Initiatives is Suffolk

In Suffolk, there should be a review of the roles of the local authorities, agencies and fora involved in promoting Superfast Broadband in the county, and a consolidation of the numerous existing initiatives into a more coherent programme.

2. A Review of Public Sector Intervention Options

There should be a review of the options for potential forms of public intervention to support the widespread availability and take-up of Superfast Broadband. The options could include a mix of direct public subsidy of upfront capital expenditure on deployments, fiscal measures (taxation relief) on on-going operational expenditure (eg the rateable value of lit optical fibre and/or other infrastructure assets), demand-side stimulation by leveraging other public spending on (eg) defence, education, health, transport, climate change, etc. However, what is currently possible may be limited by State Aid rules – it might be worth initiating a review of possible relaxations of some of the rules at EU level (as other Members States are facing similar issues).

3. A Study into the Economic Benefits of Superfast Broadband in Suffolk

A study into the economic benefits of Superfast Broadband in Suffolk would help to establish the benefits of public intervention to widen availability and take-up (versus the counter-factual of the impact on the Suffolk economy of no public intervention). As well as providing the evidence to support the case for public intervention, such a study would also be of benefit to commercial operators trying to assess demand.

4. A Business Case for widening availability of Superfast Broadband in Suffolk

The development of a detailed, costed business case for widening availability of Superfast Broadband across Suffolk would help to identify the optimum design, the major component costs, and the sensitivity of those costs to the key inputs and assumptions. It would also help to establish how much, and which, of the costs should be borne by commercial operators, and which should benefit from public intervention and how the public intervention should be applied. It may be possible to devise some form of '***trigger scheme***' to help to identify how much public intervention would be required to 'tip' the business case for covering an area from being unviable to viable, helping to match any available public funds to areas of potential extended coverage.

5. An Infrastructure 'Audit' in Suffolk

An 'audit' of the existing, available fixed and mobile telecommunications infrastructure, and alternative (ie electricity, water, sewerage, gas, etc) infrastructures should be undertaken, to assess the potential for re-using existing infrastructure to lower the cost of widening the deployment of Superfast Broadband.

But, perhaps the most important ingredients required in establishing how public sector intervention should help to widen Superfast Broadband availability and take-up, particularly in Suffolk, is ***political leadership*** to establish a coherent, agreed approach, ***backed by a delivery capability*** to ensure the widespread availability and take-up of Superfast Broadband and the realisation of the economic benefits.

Please note that the views expressed in this paper are those of the author, and do not necessarily represent the views of other stakeholders involved.

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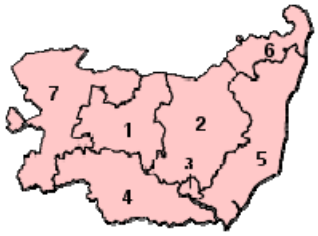

Figure 1: Suffolk Constituencies

This briefing paper on '***Broadband in Suffolk***' is intended for the seven Members of Parliament whose constituencies lie within the county of Suffolk ('the Suffolk MPs')[1], and for the members of Suffolk's local authorities, agencies and fora, who are all engaged in promoting the widespread availability and take-up of high-speed broadband services across the county.

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2. Suffolk

The county of ***Suffolk*** is the 8th largest county in England, occupying an area of 3,801 square kilometres (1,468 square miles)[2]. Suffolk lies between Norfolk to the North, Essex to the South, Cambridgeshire to the West, and the North Sea to the East, with London just over one hour away by road or rail. Suffolk is a low-lying county with few significant hills, and with soils and a climate that support arable farming in the rural parts of the county. Suffolk's natural attractions include the Suffolk Coast & Heaths area between the A12 trunk road and the North Sea coast, which is a designated as an Area of Outstanding Natural

Figure 2: Map of Suffolk

[1] The Suffolk parliamentary constituencies, and their current MPs (from the General Election, May 2010), are: 1. Bury St Edmunds (David Ruffley (C)), 2. Central Suffolk and North Ipswich (Daniel Poulter (C)), 3. Ipswich (Ben Gummer (C)), 4. South Suffolk (Tim Yeo (C)), 5. Suffolk Coastal (Therese Coffey (C)), 6. Waveney (Peter Aldous (C)), 7. West Suffolk (Matthew Hancock (C)). Source: Wikipedia.

[2] Source: UK Office for National Statistics (ONS): ONS code 42; NUTS3 code UKH14.

Beauty (AONB), and the wetland habitat in the north of the county, part of The (Norfolk) Broads. These natural attractions, together with tranquil villages and rural settings, and its proximity to London, has led Suffolk to become an increasingly popular location for second home ownership and tourism, which, during peak periods, boosts the total population by up to 50%.

Suffolk had a resident ***population***[3] of 715,700 in 2008, which had risen by 4.8% over the previous five years, and is forecast to grow by 17.9% by 2021[4]. The increasing population is due to economic migration into the county, rather than organic growth in the established resident population. There is a relatively small black and ethnic minority population in Suffolk (~94% of people in Suffolk classify themselves as 'White British'). The average population density of Suffolk is 188/km^2 (487/sq mile). However, nearly one-third (~224,000) of the population of Suffolk live in the larger towns along the A14 road corridor from Felixstowe in the South East, Ipswich (the county town), Stowmarket, Bury St Edmunds and Newmarket in the West, and other significant towns including Lowestoft, Beccles and Mildenhall in the North, and Sudbury and Haverhill in the South. The other two-thirds of the population of Suffolk (~492,000) live in the other small towns, and in the villages, hamlets and farms of rural Suffolk (42%). 86% of Suffolk parishes have a population of less than 1,000. It is the low population density of the nearly half-a-million people living in the smaller towns and rural areas of Suffolk that makes the cost of deploying high-speed broadband to those communities economically challenging. Outside of the major towns in Suffolk, the population of young adults (aged 15 – 29) is very low (compared with the UK average), while there is a large population over the age of 35, and a much larger than average retired population.

Suffolk's ***economic output***[5] (headline Gross Value Added (GVA) at current basic prices) in 2007 was £12,435m, a growth of ~35% over the previous five years. The economic output (GVA) per head of population in 2007 was £17,529 - compared with a UK-wide index (where UK=100), Suffolk's GVA per head index was 87.9. However, these figures pre-dated the economic downturn in 2008 and recession in 2009. Figure 3 shows Suffolk's GVA by industry – it is important to note, in the context of broadband, that over 70% of Suffolk's economic output comes from the services sectors (£8,803m (2007)). While broadband benefits all industries, the most transformative impact on businesses of broadband is in the delivery of services, as well as in the opportunity for new creative businesses operating online. These services businesses range from lone workers (conducting their businesses online from home), through the full range of small, medium, large and multi-national businesses (and their teleworkers working from home or while travelling/mobile). As the services sectors are likely to benefit most from Superfast Broadband, the availability of high-speed broadband services will be critical to the sustainability and growth of the Suffolk economy.

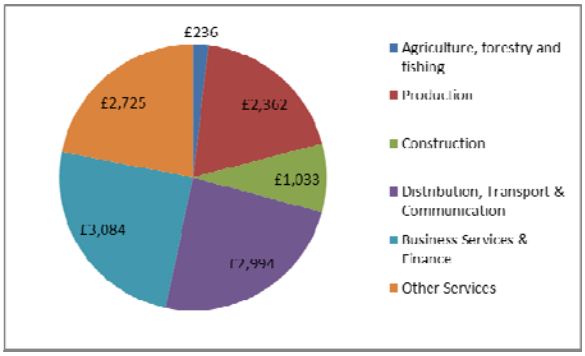

Figure 3: Suffolk GVA by Industry (£m)

Suffolk is home to a number of major ***businesses***, including Britain's largest container terminal at the Port of Felixstowe, which supports a large number of haulage and distribution firms across the UK, BT's research centre (Adastral Park) at Martlesham Heath, the EDF Energy nuclear power station at Sizewell, AXA Insurance in Ipswich, a number of food processing companies across the county and breweries in Southwold (Adnams) and Bury St Edmunds (Greene King), military bases at Mildenhall

[3] Source: UK Office for National Statistics (ONS) Mid-year Population Estimates, 2008
[4] Source: UK Office for National Statistics (ONS) 2006-based Subnational Population Projections, 2008
[5] Source: UK Office for National Statistics (ONS) Statistical Bulletin – Regional, Sub-regional and Local Gross Value Added, 2009

and near Woodbridge, the home of the horse racing industry in Newmarket, and much more besides. Suffolk has a thriving tourism industry worth £1.63bn (11% of Suffolk's economy), employing 30,000 people in around 3,000 businesses, with ~25 million tourist trips to Suffolk per year[6]. Suffolk had 25,290 VAT-registered businesses[7] at the end of 2007, including a very wide range of small and medium-sized enterprises (SMEs) driving economic output and employment (SMEs account for over half (51%) of UK GDP)[8]. Over the past 5 years, business stock in Suffolk has increased by an average of 400 businesses per year[9]. Business survival rates seem stable at around 79% surviving longer than 2 years, and 51% longer than 5 years.

There were 332,100 people in ***employment***[9] in Suffolk in 2009, with 79.9% of the working age population in employment, and an unemployment rate of 4.3% (GB: 5.7%) and an economic inactivity rate of 15.1%. Self-employed people account for around 13% of the working age population. Mean gross weekly earnings for Suffolk residents[10] were £506.90 in 2009 (UK: £597.40). Total benefits claimants[11] represented 12.3% of the working age population in Suffolk in 2009, similar to the rest of the East of England region at 12.5% (England average: 15.4%). Job densities in Suffolk are highest in the major towns and within the A14/A12 trunk road corridors. The education and skills qualifications of the working age population of Suffolk in 2008[12] were: graduate or post-graduate degree-level or equivalent (NVQ Level 4 and above) 21.5%, NVQ Level 3 and above 39.9%, NVQ Level 2 and above 58.9%, NVQ Level 1 and above 76.8%, with 13.2% having no qualifications. Qualification attainment of the working population in Suffolk in 2008 was slightly lower than the East of England regional, and GB national, levels of attainment.

The average price of a residential ***property*** in Suffolk in March 2010 was £152,289[13], recovering somewhat from the low point of the downturn in the property market in late 2008.

Suffolk is generally perceived to be a ***prosperous*** county (with a relatively high proportion of the resident population in socio-economic groups A, B and C1), but there are areas of relatively high ***deprivation*** (socio-economic groups C2, D and E (with higher unemployment and lower incomes), particularly in the North of the county (Waveney) and in parts of Ipswich[14].

While it is the ***population density*** of Suffolk, particularly in the rural areas, that determines the costs of high-speed broadband *availability*, it is the demographic profile of the county that determines the *take-up* of broadband services. A ***major risk*** in the deployment of high-speed broadband services in Suffolk is the creation of a two dimensional 'Digital Divide' (geographic, demographic) between those that 'have' high-speed broadband (and use it) and those that 'have not' (and do not).

3. The Development of Current Generation Broadband

Over the last three decades, the UK has witnessed the transformation of telecommunications from the monopoly supply of fixed voice telephony to the competitive provision of fixed and mobile current-generation broadband access to the Internet (and voice telephony). Until the 1980s, BT (then the Post Office) had been a monopoly supplier of public fixed voice telephony, with some limited competition in the supply of data products to mostly (large) business customers[15]. The 1980s

6 Source: Choose Suffolk, 2010.
7 Source: UK Office for National Statistics (ONS): Annual Business Inquiry, 2008
8 Source: UK Government Department for Business, Innovation & Skills (BIS).
9 Source: UK Office for National Statistics (ONS): Business Demography, 2008.
10 Source: UK Office for National Statistics (ONS): Annual Survey of Hours and Earnings, 2009
11 Source: UK Government Department for Work & Pensions (DWP), 2009.
12 Source: UK Office for National Statistics (ONS): Annual Population Survey, 2009
13 Source: UK Land Registry, 2010.
14 Source: UK Government Department of Communities and Local Government (DCLG): Indices of Deprivation, 2007.
15 Kingston Communications remains the monopoly supplier of public telecoms services in the city of Kingston upon Hull.

saw the privatisation of BT, the liberalisation of the telecoms market, and the advent of new competition in fixed, mobile and cable TV. The first generation (1G) of (analogue) mobile phones were bulky and expensive to use - it was only with the introduction of the second generation (2G) of (digital) mobile phones, which were smaller and cheaper, and the subsequent introduction in the 1990s of pre-pay services, that mass adoption of mobile was able to develop. In the 1980s, cable TV was introduced as a number of regional franchises, subsequently consolidated (over two decades) into a single national operator[16] (Virgin Media) covering nearly half of the population, mostly in densely-populated urban areas. The late 1990s saw the growth of the residential market for internet access via dial-up fixed narrowband Internet services.

It wasn't until after the start of the new millennium (in late 2000) that the current-generation of ***'always on'*** fixed broadband access services were introduced on the BT and cable TV networks. Over the following 6 -7 years, current-generation fixed broadband access capabilities were rolled-out to all BT exchanges in the UK, and across Virgin Media's cable TV footprint. A regulatory settlement between Ofcom and BT in 2005 led to the creation of BT Openreach, and the entry of 'unbundlers' (eg Talk Talk, Sky, Cable & Wireless, O2, etc) with access to BT's local loop on equivalent terms to BT's retail and wholesale businesses, which provided more competition on broadband price, innovation and customer service. Mobile broadband access had to await the third-generation (3G) of mobile phones, and further 3G enhancements for high-speed data, and has really only started to take-off in the last couple of years with the advent of mobile 'dongles' (USB modems) for laptop PCs and smartphones (such as the Apple iPhone). Virgin Media recently completed the upgrade of its broadband access capability to support higher-speeds (50Mbps) serving nearly 50% of the population (~12.6 million homes), and BT is upgrading the exchanges serving 66% of the population to higher speeds (up to 24Mbps) during 2010/11 to match the speeds already available from the major 'unbundlers' in areas where there is competition.

All current-generation broadband services (up to 8Mbps or 24Mbps) rely on the use of new technology overlays to extend the capabilities of existing networks that were originally designed to carry voice telephony (for BT's fixed network, and the mobile networks) or TV channels (for Virgin Media's cable TV network). Figure 4 provides a comparison of the major current-generation broadband networks[17].

[16] There is another smaller cable TV company, Smallworld Media, offering services in a number of locations in the North of England and in parts of Scotland.

[17] In addition to the main providers/networks/technologies, there are a number of alternative smaller providers using different networks and broadband access technologies (eg Satellite, Fixed Wireless, etc). While these alternatives may have a role to play to temporarily infill gaps in coverage in small selected areas ahead of mainstream deployments, or to provide longer-term niche solutions in situations that mainstream deployments may never be able to serve, they are unlikely to play a major role in the mainstream deployment of Broadband and 'Superfast Broadband'. See also Section 5 and Figure 10 on page 22.

Provider	Network	Wholesale Product	Broadband Technology	Maximum Speed	Availability % pop
BT + Retail ISPs	BT fixed	IPstream	ADSL	up to 8 Mbps	99.6%[18]
(all) Unbundlers (eg Talk Talk, Sky, C&W, O2, etc)	BT ULL + own/3rd party fixed	MPF/SMPF	ADSL2+	up to 24Mbps	up to 84% (between them)
BT + Retail ISPs	BT 21CN fixed	WBC	ADSL2+	up to 24Mbps	66% (by end 2010/11)
Virgin Media	VM hybrid fibre-coax cable TV	n/a	DOCSIS3	up to 50Mbps	49%
Vodafone, O2, Orange/T-Mobile	2G mobile	n/a	GPRS	up to 384kbps	98%
Vodafone, O2, Orange/T-Mobile/H3G	3G mobile	n/a	HSPA	up to 7.2Mbps	87%

Figure 4: Comparison of Current-Generation Broadband Networks[19]

By Q1 2009[20], the UK household penetration of current-generation fixed broadband services[21] had risen[22] to 65% – 17.3 million homes, including over 6 million unbundled[23] lines with a choice of provider. Virgin Media had 3.7m broadband connections on its cable TV network. Around 12% of UK households had a mobile broadband connection in Q1 2009; three-quarters of which also had a fixed broadband connection, indicating that, for many, mobile broadband is a complement to, rather than a substitute for, fixed broadband[24]. However, around 2 million homes (11%) cannot get 2Mbps, and ~160,000 homes are unable to get broadband at all.

4. Current Generation Broadband in Suffolk

There are 115 BT exchanges[25] in Suffolk, or 128 BT exchanges serving premises in Suffolk (adding-in exchanges located outside the county, but serving some premises within the county). The number of lines served from each Suffolk exchange varies widely, from the largest in Lowestoft (~32,000 lines) to the smallest in Brandon Creek (88 lines). BT has installed Asynchronous Digital Subscriber Line (ADSL) technology in all Suffolk exchanges, which supports up to 8Mbps download speeds (and up to 800kbps upload speeds). However, the actual maximum speed experienced on a line depends upon a number of factors, including the length and quality of the line[26].

[18] Source: BT.

[19] Source: Touchstone Consulting Limited, from public operator and vendor announcements.

[20] Source: Ofcom Communications Market Report (CMR), 2009. Updated statistics to Q1 2010 will be available in the Ofcom CMR 2010, due for publication in early August 2010.

[21] Further significant growth in fixed broadband penetration will either require increasing levels of PC ownership (74% in Q1 2009) or rely on other devices in the home providing Internet access (such as games consoles, TV set-top boxes such as those planned by the BBC's Project Canvas, or smartphones (eg Apple iPhone) or tablet devices (eg Apple iPad)).

[22] Up from 58% in in Q1 2008.

[23] 84.3% of UK households are connected to an unbundled exchange and therefore have a choice of provider. However, only ~35% of BT's ~5,500 exchanges have been unbundled. Source: Ofcom CMR, 2009. The latest figure for the number of unbundled lines at the end of June 2010 was 6.91 million. Source Ofcom Monthly Bulletin, July 2010.

[24] UK consumers spent an average of 25 minutes per day using the Internet in May 2009. Source: Ofcom CMR, 2009.

[25] Source: BT

[26] Ofcom published the results of testing broadband speeds across the UK in 2009, and demonstrated that the average speed experienced by UK consumers was 4.1Mbps. Source: Ofcom: UK Broadband Speeds Report, 2009. Ofcom have recently published an updated average broadband speed of 5.2Mbps, up 25% over the last year. Source: Ofcom, Broadband Speeds Report, July 2010.

The average broadband speed experienced by Suffolk consumers in 2009 was 4.1Mbps[27], although this masks the wide variations in speed experienced across the county: while almost a quarter of Suffolk residents may experience at least 6Mbps (up to 8 Mbps) and a further third will experience between 4Mbps and 6Mbps (in the green areas), around a quarter (in the amber areas) experience broadband speeds of between 2Mbps and 4Mbps, around 19% (in the red areas) are likely to experience less than 2Mbps, and some lines (in all areas[28]) cannot support a broadband connection at all - see Figure 5[27].

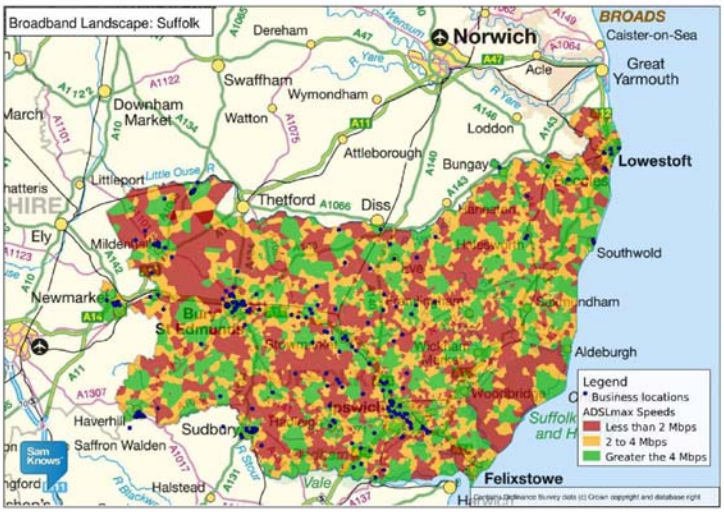

Figure 5: Predicted ADSL Performance in Suffolk by full Postcode[27]

Of the 128 BT exchanges serving Suffolk, just 16 of those exchanges have been unbundled by one or more competing operators[29], serving nearly one-third of the population (~224,000) in Suffolk's main towns. The operators present in Suffolk exchanges are BT, Cable & Wireless, AOL (now owned by Talk Talk), O2, Sky and Talk Talk. These operators have a presence in some of the 16 exchanges, but, other than BT, none are present in all 16. Indeed, just 11 of the 16 unbundled exchanges have 4 or more operators present[30] (see Figure 6[27]).

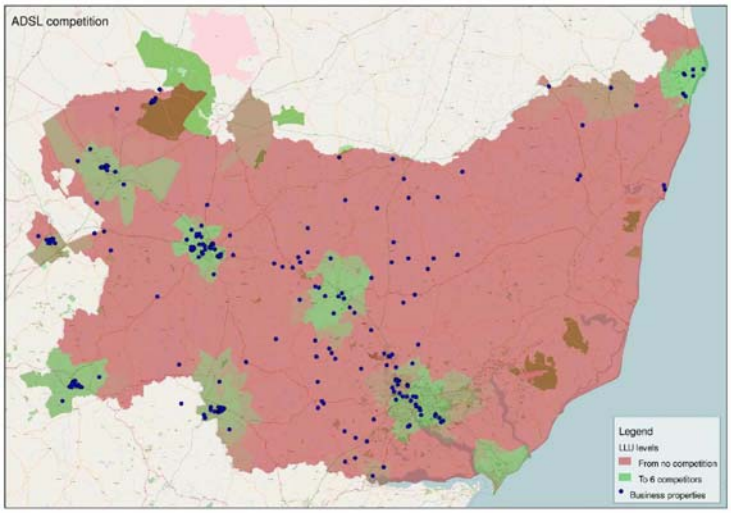

Figure 6: ADSL Competition in BT Exchanges in Suffolk[27]

Virgin Media covers around one in eight (13%) Suffolk households (~82,000) offering speeds up to 50Mbps, although coverage is tightly focussed around Ipswich, Newmarket and Felixstowe - see the red areas in Figure 7[27].

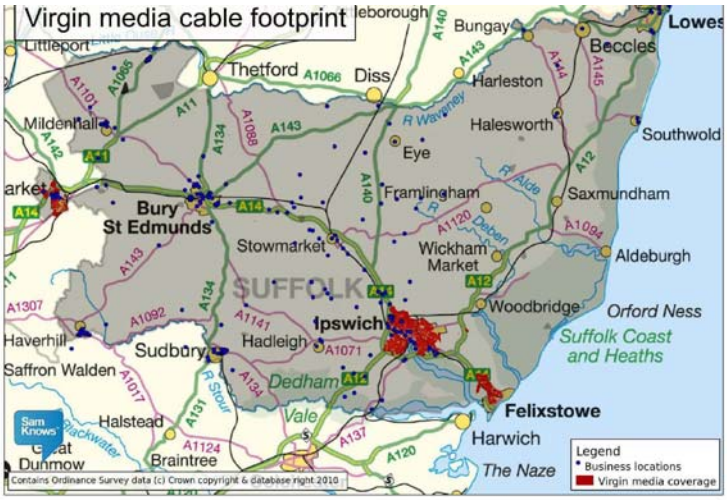

Figure 7: Virgin Media Cable Footprint in Suffolk[27]

[27] Source: Samknows Broadband Report on the County of Suffolk, available at www.samknows.com. (The (Voronoi) mapping approach that Samknows uses, based on full post code areas, tends to slightly amplify (the red) areas of poor speed performance).

[28] Note, however, that lines that are too long to support broadband are not evenly distributed across exchange areas. Some exchange areas account for a high proportion of sub-2Mbps lines, which suggests that remedies targeted at those exchanges could make a significant improvement; while other clusters of long lines span the boundaries of multiple exchange areas, which will make these much more difficult to address.

[29] The 16 unbundled exchanges are: Beccles, Belstead, Bungay, Bures, Bury St Edmunds, Felixstowe, Foxhall (Ipswich), Haverhill, Ipswich Main, Kesgrave (Ipswich), Lowestoft, Mildenhall, Newmarket, Stowmarket, Sudbury, Whitton (Ipswich).

[30] The 11 exchanges with 4 or more operators present are: Belstead, Bury St Edmunds, Felixstowe, Foxhall (Ipswich), Haverhill, Ipswich Main, Lowestoft, Mildenhall, Newmarket, Stowmarket, Sudbury.

For the purposes of assessing the amount of competition in a given area, Ofcom defines three types of geographic market in terms of the number of principle operators present (including BT, unbundled operators and Virgin Media):

- Market 1 areas – where only BT is present
- Market 2 areas – where there are 2 or 3 principle operators
- Market 3 areas – where there are 4 or more principle operators

(plus Hull, where KCOM are the only operator present). Ofcom's market areas in relation to Suffolk are shown in Figure 8[27]. There are 10 Market 3 areas[31] with sufficient competition to fully deregulate the market, and a further seven Market 2 areas where there is some competition but not a sufficiently vibrant competitive market[32]. Of the 128 exchange areas in Suffolk, the remaining 112 exchanges, serving around two-thirds of the population of Suffolk (~492,000), have no competitive provision beyond BT.

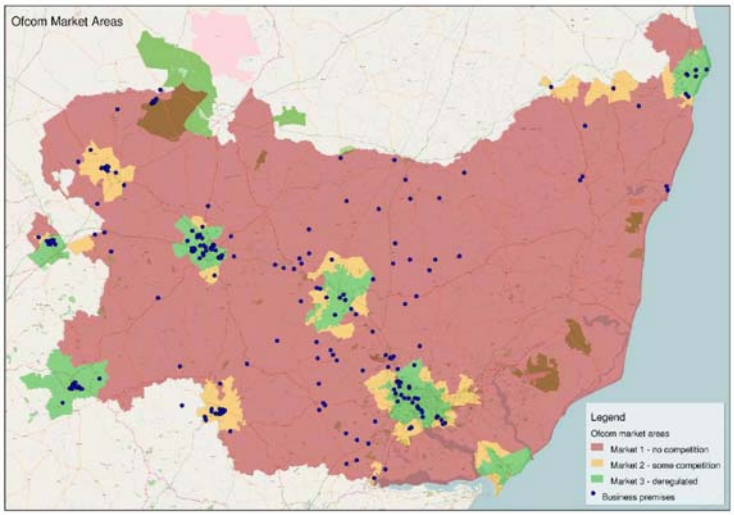

Figure 8: Ofcom Market Areas in Suffolk[27]

BT have also now announced, and started to deploy, a new version of ADSL (ADSL2+) as part of BT's 21st Century next generation Network (21CN) programme, which will offer download speeds up to 24Mbps. BT are targeting their investment in ADSL2+ towards the most densely-populated exchanges, where they face competition from the major 'unbundlers' (who have already deployed some ADSL2+). BT plans[33] to roll-out ADSL2+ to reach 66% of the UK population by the end of 2010/11[34]. So far, BT have announced 13 exchanges[35] in Suffolk that will be upgraded to ADSL2+ (up to 24Mbps) during 2010/11.

Mobile broadband is provided by all the major operators using 3G/HSPA offering up to 7.2Mbps to around 87% of the population. However, the low population density in Suffolk means that geographic coverage is very much lower (3G coverage is largely confined to towns and major trunk road routes in Suffolk), indoor coverage can be patchy or non-existent in many places, and there are considerable variations in the coverage by operator, location by location.

5. Superfast Broadband

While the deployment of current-generation 'always on' broadband access over the past decade has transformed the Internet into a new global medium for information, entertainment, communications and business[36], broadband access capabilities have barely kept up with technology advances at the edge of the network in content, applications and services, and devices that produce and consume the data that is the lifeblood of the Internet. The volume of data traversing the

[31] The 10 Market 3 areas with sufficient competition are: Belstead, Bury St Edmunds, Felixstowe, Foxhall (Ipswich), Haverhill, Ipswich Main, Lowestoft, Newmarket, Stowmarket, Whitton (Ipswich).

[32] The seven Market 2 areas where there is some competition but not a sufficiently vibrant competitive market are: Beccles, Bungay, Exning, Kesgrave (Ipswich), Manningtree, Mildenhall, Sudbury.

[33] Source: BT, Wholesale Broadband Connect (WBC) – 2010/11 Programme Update, May 2010.

[34] BT are committed to further increasing their ADSL2+ footprint to 75%[33].

[35] The following exchanges in Suffolk will be upgraded to ADSL2+ during 2010/11: Belstead, Bury St Edmunds, Felixstowe, Foxhall (Ipswich), Haverhill, Ipswich Main, Kesgrave (Ipswich), Lowestoft, Mildenhall, Newmarket, Stowmarket, Sudbury, Whitton (Ipswich).

[36] It has been argued by many that broadband access is becoming the '4th utility'.

Internet is growing year-on-year at an exponential rate[37], not just because the number of users and usage is growing, but also because of the increasingly rich content that is being exchanged over the network. These trends are increasing the pressure on current-generation broadband capabilities, and driving the demand for ever higher-speed broadband.

There is no agreed/accepted definition of 'Superfast Broadband,' but the term is most often used to describe higher-speed broadband access services than can currently be delivered by current-generation broadband networks. Superfast Broadband requires substantial investments in new networks specifically designed to handle the higher speeds and growing volumes of Internet traffic.

More specifically, in relation to BT's network, 'Superfast Broadband' means higher-speed broadband services beyond the capability of exchange-based ADSL services delivered over the copper local loop, ie speeds greater than the 'up to 24Mbps' capabilities of ADSL2+. This involves deploying ***optical fibre*** cable deeper into the network from the exchange towards the customer, with either fibre to the (street) cabinet (FTTC) with Very High Speed DSL (VDSL) over the (now much shorter) copper lines (sub-loops) from the cabinet to the premises - delivering up to 40Mbps, or fibre all the way the home (FTTH) – delivering 100Mbps or more. Because of the large capital expenditure involved in deploying optical fibre deeper into the network[38], in practise, deployments are likely to involve a mix of, initially, mostly FTTC with some FTTH, but with the capability to subsequently extend the FTTC to FTTH over time designed-in.

Another key consideration is the topology of the optical fibre deployment, the two main choices being point-to-point fibre or passive optical networks (PONs). In many ways, point-to-point fibre is the idealised solution as it provides a dedicated optical fibre cable to each home, which could be upgraded as the technology used on either end of the fibre (in the exchange and in homes) advances, and because, just like the dedicated copper local loop to each home used for current-generation broadband, it could be physically unbundled by alternative operators to provide competition at the physical infrastructure level, maximising the likely benefits of competition in terms of lower prices, more choice and innovation, and in customer service. However, point-to-point fibre involves deploying a lot more fibre and significantly higher civil engineering costs[39] (compared with the PON alternative), so most incumbent operators around the world are favouring the deployment of PONs (though, in some countries, some new entrant operators are deploying point-to-point fibre, mostly in metro city areas). In the alternative passive optical network (PON) topology, a single optical fibre emanating from an exchange is split to serve a number of homes (32 or 64, or more in future). PONs reduce the amount of optical fibre deployed and the civil engineering costs involved, but also reduce the scope for physical unbundling and innovation by competing operators. Instead, the incumbent operator deploying the PON offers 'virtual unbundling', with the competing operators picking-up the traffic from 'their' customers on the PON at the exchange, while retaining some degree of control over the quality of service experienced by 'their' customers.

BT announced[40] a £1.5bn investment in Superfast Broadband in July 2009 with the aim of serving 40% of UK households by 2012 with a deployment of (mostly) FTTC (with some FTTH). In May 2010,

[37] Between 2008 and 2009, Internet data traffic increased by 160%, and is forecast to quadruple (ie a compound annual growth rate of over 100%) to 767 Exabytes (ie 767 billion gigabytes (or 767 x 10^{18} bytes) by 2014. Source: Cisco Visual Networking Index (VNI) Data Forecast, 2010.

[38] One estimate of the capital cost of fibre deployment put the cost of a nationwide FTTC deployment at £5.1bn, and the cost of a nationwide FTTH deployment at just under £30bn. Source: Broadband Stakeholder Group, report prepared by Analysis Mason, 2008.

[39] Civil engineering costs are estimated to be around 70% of the total capital expenditure required. Source: Broadband Stakeholder Group, report prepared by Analysis Mason, 2008.

[40] Source: BT.

BT announced an increase in its investment to £2.5bn, with the aim of reaching 66% of UK households by 2015[41].

Virgin Media provides broadband services over its hybrid fibre-coax cable TV network to nearly 50% of UK households (12.6 million homes). The network involves a number of 'head-ends' (served from the core network by optical fibre) delivering services over a shared coaxial cable[42] network into homes. It is possible to draw a loose comparison between the topology of Virgin Media's cable TV network and the FTTC network BT is deploying: in this loose comparison, Virgin Media's head-ends are broadly equivalent to BT's upgraded (street) cabinets (though heads-ends typically serve bigger areas and more lines than a BT cabinet (~500 vs ~300)), the coaxial cable network (like BT's FTTC PON network) is shared (though typically among a larger number of homes), with the DOCSIS cable modem standard competing against VDSL over the sub-loop to deliver broadband access speeds[43].

In 2009, Virgin Media[44] completed the upgrade of the broadband capability on their cable TV network to DOCSIS3, which increased broadband speeds to up to 50Mbps. Future planned enhancements to the DOCSIS standard would enable broadband speeds of up to 400Mbps over a cable TV network, and Virgin Media are currently trialling a 200Mbps service in Ashford in Kent.

Mobile broadband is currently delivered over 3G networks, which have been upgraded with High-Speed Packet Access (HSPA) to deliver broadband speeds of up to 7.2Mbps to 87% population coverage[45]. Note, however, that the quoted broadband speed (up to 7.2Mbps) is the total broadband capacity to an (angular) segment of a cell site, and has to be shared among the number of active users in the cell segment area simultaneously using mobile broadband access. Also note that the population coverage figure of 87% is an average among the five mobile network operators, and refers to the outdoor population coverage achieved; geographic outdoor coverage is much lower, and depends on the locations of each operator's cell sites, and indoor mobile coverage can be patchy or non-existent in many areas. The 3G/HSPA technology evolution path will enable future staged upgrades[46] to HSPA+ to provide 21Mbps, 42Mbps and 84Mbps over the next 5 -7 years.

However, the phenomenal growth in mobile data traffic[47] will require mobile operators to start to plan to deploy the fourth generation (***4G***) of mobile technology known as Long Term Evolution (***LTE***), offering up to 100Mbps[48]. LTE has been designed from the outset for mobile data (rather than voice) and uses a different wireless air interface (Orthogonal Frequency Division Multiplexing (OFDM)). LTE is a global standard, which most major operators and suppliers around the world have announced they plan to adopt, and LTE network equipment and simple devices (ie LTE 'dongles') are starting to become available this year (2010), with early deployments starting to take place in some countries (including Verizon Wireless and AT&T in the US). UK mobile operators are likely to start to deploy LTE networks within the next 2 - 3 years, though each mobile operator will need to plot their own evolution path from their existing 2G and 3G/HSPA networks to LTE/LTE Advanced – some may opt for an early migration to LTE, while others may choose to exploit the further evolution of

[41] There are some other commercial deployments of FTTH in selected areas, including Fibrecity (H2O Networks in Bournemouth and Dundee (~88,000 homes on completion), and Titanic Quarter (Redstone plc) in Belfast (5,000+ homes on completion), with a number of others being considered, planned or deployed. Source: Ofcom Communications Market Review (CMR), 2009.

[42] The coaxial cable also has 'Siamese' copper pairs (served from separate street cabinets) for the delivery of voice telephony.

[43] In the broadband speed 'race' between DOCSIS3 on Virgin Media's cable TV network (currently, 50Mbps but able to be upgraded to 100Mbps, 200Mbps and even 400Mbps) and FTTC/VDSL on BT's network (up to 40Mbps, actually typically in the range 20Mbps – 40Mbps), DOCSIS wins, which is likely to mean that BT will be driven to deploy more FTTH in Virgin Media's coverage areas in order to compete.

[44] Source: Virgin Media.

[45] HSPA has the potential to be upgraded to 14.4Mbps.

[46] HSPA+ uses dual carriers and MIMO technology to increase mobile broadband speeds.

[47] In the 2 years since the beginning of 2007, mobile Internet data volumes grew by more than 2,300%, while revenues didn't even double. Source: Ofcom Discussion Document on Net Neutrality, June 2007.

[48] An even more advanced version of LTE is on the standardisation 'drawing board': known as LTE Advanced, it may offer speeds up to 1Gbps, and is likely to be adopted first in advanced Asian countries such as Japan, Korea and China.

3G/HSPA+ before migrating to LTE later. Relevant factors affecting the mobile operators' decisions will be the future pattern of growth in demand for mobile broadband; the availability of new radio spectrum (at 800MHz and 2.6GHz) required to provide additional coverage and capacity (respectively) to support higher mobile broadband speeds, as well as a regulatory agreement on the re-farming of 2G spectrum at 900MHs/1800MHz and 3G spectrum at 2100MHz[49]; technology maturity, availability and cost – both for network equipment and devices[50]; the need to modernise and reduce the operating costs of their existing 2G/3G networks; and the risks and costs of alternative evolution paths[51].

It is important to realise that mobile broadband networks are not a substitute for fixed broadband networks (nor vice versa): rather, they are complements of one another. This fact is not only borne-out by how consumers already subscribe to, and use, both fixed and mobile current-generation broadband services[52], but also by how they are built, and by the economics of the underlying technologies.

The unique selling point (USP) of Mobile lies in the personal freedom it confers to use services in any place, and at any time, even when on the move. Mobile networks rely (increasingly, as mobile data volumes grows) on fixed networks to backhaul mobile traffic from their cell sites into their core networks, and mobile operators are increasingly looking to offload mobile data traffic onto fixed networks in order to reduce costs in their wide-area cellular networks, and to improve in-door coverage, by offering their customer femtocells[53]. Mobile networks use a wide-range of cell-sizes from macro-cells covering wide geographic, less densely populated areas (km^2) and supporting high-speed mobility (eg in vehicles), to micro-cells in more densely populated areas, and nano-cells and pico-cells in areas of heavy usage (such as on High Streets, in shopping malls, airports, etc). While the larger (macro and mini) cells will always be required for wide-area coverage and high-speed mobility, there is a clear trend in mobile networks toward ever more, smaller cells, closer to the customers to optimally re-use radio spectrum resources to deliver higher-speed mobile broadband services.

The ***economics*** of the underlying technologies of both fixed and mobile networks are driving optical fibre deeper into the networks (outwards from the core and backhaul network, into the access network) leaving three main types of interface for the networks to connect to end-users devices: a fixed (or 'tethered') connection, a mobile cellular radio connection and/or a short-range wireless connection (commonly known as 'WiFi').

WiFi is a short-range (typically up to 300m) wireless technology that enables compliant equipment to be used on a licence-exempt, shared basis in spectrum at 2.4GHz and 5GHz, supporting up to

[49] The auction of new mobile spectrum at 800MHz and 2.6GHz, and the re-farming of existing 2G spectrum at 900MHz and 1800MHz and 3G spectrum at 2100MHz, remains highly controversial and unsettled, likely requiring a Government Direction to Ofcom as to how the dispute is to be resolved. Meanwhile, the auction of the new spectrum at 800MHz and 2.6GHz required for LTE is being further delayed until 2011/12.

[50] Mobile operators will not want to repeat the experience from the introduction of 3G, when the availability of functioning mobile devices at an affordable price point lagged the availability of 3G network equipment, which slowed the take-up of 3G and stretched-out the operator's return on their sizeable investments in 3G spectrum and technology.

[51] Source: Touchstone Consulting Limited, from operator and vendor announcement at the GSM Association's Mobile World Congress in Barcelona, February 2010.

[52] As mentioned towards the end of Section 3 (on page 15), of the 12% of households with a mobile broadband service in 2008, three-quarters also had a fixed broadband service, indicating that for many mobile broadband is a complement to, rather than a substitute for, a fixed broadband service. The exception may be for deprived households, in socio-economic groups DE, 22% of which were mobile only, compared with just 8% for socio-economic groups ABC1. ABC1 households were also more than twice as likely as C2 and DE households to have a mobile broadband service. Source: Ofcom Communications Market Review (CMR) 2009.

[53] Femtocells are small mobile cellular sites that support mobile devices within the home, but backhaul the mobile traffic to the mobile operator's core network over the home's fixed broadband connection (rather than the mobile operator's wide-area cellular network).

54Mbps[54]. Unlike mobile spectrum (which is licensed for use by the mobile operators to put them in control of the quality of service experienced by their customers), licence-exempt spectrum is shared on a 'free-for-all' basis. Mutual interference between users is largely avoided by WiFi's short range mostly containing the signal within and around the home, enabling the same spectrum to be re-used in many other locations, and the capability for adjacent users to select different working channels to avoid interfering with one another. WiFi's popularity has grown[55] due to the technology's low-cost enabling it to be widely integrated into broadband (wireless) routers and end-user devices such as PCs, games consoles, smartphones, printers, etc to build home/office networks, providing 'untethered' connections between devices, and shared, simultaneous use of the broadband connection to the Internet by multiple devices.

Increasingly, end-user devices are able to support all three types of interface (fixed, mobile and WiFi), and intelligence built-in to the devices is enabling them to remain '***always best connected***' to the Internet, wherever they are presently located, according to whatever access services are available at that location, offering their users a 'Seamless Mobility' experience (with little, or no, conscious intervention by the users).

For the mainstream of users and uses, Superfast Broadband will be delivered by fixed networks based on optical fibre being progressively deployed ever deeper into the networks towards the customer (FTTC/FTTH) with WiFi 'untethering' the final fixed connection in the home/office, complemented by mobile networks migrating towards 4G/LTE, with intelligent devices offering a 'Seamless Mobility' experience for users across delivery platforms.

Based on current announced plans, and the economics of deployment, Superfast Broadband is likely to reach around two-thirds (66%) of UK households (one-third in Suffolk) by 2015. Further deployments to the 'Final Third' (two-thirds in Suffolk) of households in less-densely populated areas remain uncertain (see Section 7 for an overview of announced Government initiatives to try to tackle the 'Final Third)'.

Figure 9 provides a comparison of the capabilities of the mainstream Superfast Broadband networks (which should be compared with Figure 4 (on page 15), which showed the capabilities of current-generation broadband networks).

[54] WiFi is standardised in the IEEE 802.11 series of specifications.

[55] In Q1 2009, more than half of UK broadband households (52%) used a wireless (WiFi) broadband router.

Provider	Network	Wholesale Product	Broadband Technology	Maximum Speed	Availability % pop
BT (BT Retail, 'Virtual Unbundlers', Retail ISPs)	BT fixed	VULA/GEA	FTTC/VDSL FTTH	up to 40 Mbps 100Mbps	66% by 2015
Virgin Media	VM hybrid fibre-coax cable TV	n/a	DOCSIS3	up to 50Mbps	49% (from 2009)
Vodafone, O2, Orange/T-Mobile/H3G	3G mobile 4G mobile	n/a	HSPA+ LTE	up to 21/42/ 84Mbps up to 100Mbps	no announced plans no announced plans

Figure 9: Comparison of Superfast Broadband Networks

In addition to the mainstream Superfast Broadband technologies described above, there are a number of alternative technologies (eg Satellite, Fixed Wireless, etc) that could be considered. However, while these alternative technologies may have a role to play to temporarily infill gaps in coverage in small selected areas ahead of mainstream deployments, or to provide longer-term niche solutions in situations that mainstream deployments may never be able to serve, they are unlikely to play a major role in the mainstream deployment of 'Superfast Broadband'. Figure 10 summarises the main pros and cons of alternative technologies for Superfast Broadband.

Alternative Technologies	Variants (main)	Pros (main)	Cons (main)
Satellite Broadband Access	· Satellite, with 3G CGC. · Broadband Satellite.	· Can provide access in areas where there is no fixed or mobile infrastructure deployed (eg in developing countries, or in difficult terrain, or when only temporary access is required), where it may be the only alternative.	· Limited Broadband Satellite capacity (though some new being launched). · Expensive (relative to mainstream alternatives, where available) · Signal delay (latency, caused by the signals' round trip to satellite) can impair delay-sensitive applications
Fixed Wireless Broadband Access (FWBA)	· High-power WiFi. · Mesh Networks. · WiMAX. · Point-to-Point.	· Limited civil engineering and modest capex costs (other than for base stations, backhaul and CPE) means FWA can be deployed quickly in a local area. · May be able to better speeds available from mainstream current-generation broadband.	· History of failure. · Lacks economies of scale. · Limited suitable radio spectrum. · Subject to vagaries of terrain · Likely to be displaced by mainstream deployments. · Subsequent cost of future consolidation negates any short-term local benefits

Figure 10: Main Pros and Cons of Alternative Technologies for Superfast Broadband

6. The Prospects for Superfast Broadband in Suffolk

Beyond the existing deployments of, and planned future upgrades to, current-generation broadband, announcements by commercial operators about any deployments of Superfast Broadband in Suffolk have been limited.

Virgin Media's existing Suffolk footprint, which is tightly focussed around parts of Ipswich, Newmarket and Felixstowe, available to around 13% (~82,000) households in those towns, and offering speeds of 50Mbps, should be regarded as 'Superfast Broadband'.

With BT's announced investment of £2.5bn in Superfast Broadband to serve 66% of UK households by 2015, the exchange areas that are to be equipped with FTTC/FTTH are being announced in phases as the deployment programme proceeds. So far, BT has announced just one exchange area in Suffolk for FTTC/FTTH deployment to start during 2010/11: Bury St Edmunds[56].

Pending further announcements from BT about further areas that may be deployed in the later years of their Superfast Broadband programme, it seems reasonable (given BT's declared target of 66% of UK households by 2015) to assume that BT would target the most densely populated exchange areas in Suffolk, where there is established competition (from Virgin Media and the 'unbundlers'), for FTTC/FTTH deployment, ie between 10 - 17 exchange areas, serving around one-third of Suffolk households.

Some alternative operators have also shown interest in deploying Superfast Broadband within the county[57].

However, current announcements by operators still leave around two-thirds, or nearly half a million, of Suffolk's population with no certain prospects of access to Superfast Broadband for the foreseeable future (ie beyond 2015). Most of the un-served, or under-served, households lie in the smaller towns, and in the villages, hamlets and farms across rural Suffolk.

The next section of this paper (Section 7) outlines current governmental initiatives (at EU, UK, national, regional, and local level) to address the 'Final Third' problem.

However, it is important to establish the likely scale of the indicative ***costs*** of plugging the 'gaps' in Superfast Broadband across Suffolk, as well as the likely scale of loss of economic benefit that may result from large areas of Suffolk remaining un-served by Superfast Broadband, in part so as to be able to judge whether or not current commercial and governmental initiatives, taken together, are likely to be adequate.

To accurately assess the true costs of plugging the gaps in Superfast Broadband coverage in Suffolk, would require an extensive survey of existing infrastructure, and detailed planning and costing of solutions. However, it is possible to establish an indicative 'ballpark' estimate of the total costs likely to be involved from the number of households/premises in Suffolk to be served, their average geographic density, and by using well-known, industry-benchmarked figures for a number of key drivers of the total cost, such as the average cost per home potentially enabled ('homes passed') for the chosen technology mix (both initial pre-deployment costs, and customer connection costs), the deployment timeframe, and the likely take-up rate of Superfast Broadband among those households

[56] Source: BT.

[57] Sources: H2O Networks, vitesse networks.

within the first few years of deployment[58]. Each of these parameters lies within a plausible range, given the characteristics of the otherwise un-/under-served areas of Suffolk, and could be refined considerably with further more detailed analysis, and used to determine a sensitivity analysis around the central estimate of the total cost.

On this basis, and using a simple model:

The indicative total incremental cost[59] of enabling nearly two-thirds of Suffolk's households/premises (~223,000 households/premises[60], serving a population of ~492,000)), that are beyond the likely reach of Superfast Broadband funded by commercial operators with only private sector investment, is around ***£100m*** for a fixed-only solution[61], rising to around £200m for complementary fixed/mobile solutions[62]. Some form of public intervention[63] would be required to leverage any additional private sector investment[64] required at an assumed rate of around 50%, ie ~£50m of public sector intervention for fixed-only, rising to ~£100m for complementary fixed/mobile.

These indicative costs compare well with the known costs of other Superfast Broadband projects of a similar scale (for example, the recently-announced project in Cornwall (in that case, supported by EU Category 1 structural funding because of the relatively deprived economy in that county), which was also estimated to cost ~£100m)[65].

However, recognising the likely difficulties of accessing this scale of public intervention for broadband in Suffolk in the present economic climate, a basic level of availability and take-up[66] of Superfast Broadband targeting the hardest to serve parts of the county (around one-third) could be delivered with a more focussed investment of around ***£25m*** (~£12.5m of public sector intervention, matched by ~£12.5m of further commercial investments), and using a ***trigger scheme*** (operated according to transparent, objective criteria) to help to identify how much public intervention would be required to 'tip' the business case for covering an area from unviable to viable, helping to match any available public funds to areas of potential extended coverage.

We envisage one-third of Suffolk being covered by announced deployments by commercial operators working alone, with a further one-third of the hardest to serve parts of the county through the £25m matched-funded intervention, leaving a 'middle' one-third to be filled-in over time by a mix of extended commercial deployments and further public sector/matched interventions, as required. We have dubbed this ***The Suffolk Three-Thirds Broadband Plan***.

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[58] While the eventual aim may be for widespread take-up of Superfast Broadband across the county, the net present value (NPV) and return on capital employed (ROCE) of an investment project is sensitive to the early cash flows from the monthly charges paid by those users that take-up the service within the first few years of the project (because of the effects of discounted cash flows (DCF)).

[59] Source: Touchstone Consulting Limited.

[60] Source BT: from the total number of exchange lines in Suffolk, minus the number of additional lines serving multi-line premises, indicating the number of households and business premises in Suffolk to be around 336,000.

[61] Based on a target for Superfast Broadband availability in the otherwise un-served parts of Suffolk of 90%+, with a target take-up rate of 80%+.

[62] The costs of deploying LTE to provide mobile broadband are comparable to the costs of deploying FTTC/FTTH, to a first order of approximation.

[63] Public sector intervention may comprise a mix of direct public subsidy upfront for capital investment, fiscal reliefs against on-going operating expenditure (eg tax waivers) and/or demand-side stimulation from other Government spending programmes.

[64] Additional private sector investment by operators, beyond their existing commitments to achieve certain levels of coverage, through their own commercial-only investments (eg BT's commitment to 66% by 2015).

[65] In Cornwall, the target availability was 90%+, the target take-up rate was 50%+, and public sector intervention (including the EU Category 1 structural funding) accounted for around two-thirds of the total costs.

[66] Based on an initial target for Superfast Broadband availability in otherwise un-served parts of Suffolk of 25%, with an assumed take-up rate of ~20%.

The substantial investments (both private and public) that would be required to enable most/all of Suffolk with Superfast Broadband need to be set against the potential loss of economic benefit to the county's economy of a prolonged period of 'Digital Divide' (geographic and demographic) between those that are likely to be within or beyond the reach of commercial deployments.

The task of estimating the cost to the Suffolk economy of a Digital Divide in Superfast Broadband is even more challenging than forecasting the indicative costs of deployment, in part because of the large number of variable parameters and their direct and indirect drivers, and also in part because it is impossible to run the experiment twice in real-time (ie Superfast Broadband to most/all of Suffolk in the next few years vs the counter-factual of no further deployment beyond the announced plans of commercial operators, measuring the difference between Suffolk's economic output between the two scenarios). The general consensus among a number of international studies into the economic benefits of the widespread introduction of Information Technology (IT) into industry over the past 20 years is around 20% improvement in productivity. If the widespread availability of Superfast Broadband has a similar level of benefit, it could help to grow the Suffolk economy by over ***£2bn***. This figure compares well with a recently reported estimate of the loss of economic benefit due to the postponement of number of major road improvement projects in the region, of ~£2bn[67], especially given the analogy between the important role of transport in the economy of the past century and the present, and the comparably important role that Superfast Broadband is likely to play in the economy going forwards.

7. Governmental Initiatives on Broadband/Superfast Broadband

The implications of Broadband/Superfast Broadband for economic sustainability and growth, and the risks of a socio-economic 'Digital Divide' between the 'haves' and the 'have not's', have prompted a number of governmental initiatives on Broadband/Superfast Broadband at European Union (EU), UK, nations, regional and local levels.

At the ***EU*** level, the European Commission have consulted widely on the subject, made a number of changes to the EU regulatory framework for communications (approved by the EU in 2009, and being implemented into UK legislation during 2010/11), and provided EU Category 1 structural funding to subsidise broadband projects in deprived areas of the European Union[68].

At the ***UK*** level, the deployment of current-generation broadband benefited from State Aid (awarded under competitive tender and OJEU procurement rules by the Regional Development Authorities (RDAs)) to deploy ADSL to the smaller exchanges which were judged, at the time, to be not economically viable for the incumbent suppliers (mainly due to uncertainty over the likely demand for broadband). The commercial model for these awards of State Aid for broadband involved a 'clawback' mechanism if the take-up in a subsidised exchange area exceeded the original forecast (up to a value no greater than the original grant at the end of the term). It is expected that rebates will be payable in respect of a number of exchange areas at the end of the initial contract terms in 2012[69].

Ofcom played a leading role in setting the regulatory framework for both Broadband, and subsequently Superfast Broadband. In 2005, a regulatory settlement with BT led to the creation of BT Openreach, with the obligation to provide access to BT's local loop to competing providers on equivalent terms to BT's retail and wholesale businesses (including regulated returns). The re-

[67] Source: Suffolk County Council announcement, July 2010.

[68] The UK areas to have benefited from EU Category 1 structural funding for broadband schemes include the Highlands & Islands of Scotland, the North East of England, Northern Ireland, and Cornwall. Source: OJEU.

[69] Source: BT.

launch of local loop unbundling (LLU) led to increased competition in broadband with lower prices, more choice and innovation, and better customer service. Following a 3-year consultation process on Superfast Broadband[70], Ofcom published[71] the regulatory framework that would apply in March 2009, which paved the way for BT's announcement about investing in Superfast Broadband in July 2009.

The UK Government's ***Digital Britain*** Report[72] in June 2009 made a number of recommendations in relation to Broadband/Superfast Broadband: to establish a Universal Service Commitment (USC) to ensure a minimum broadband speed of 2Mbps across the UK[73] by 2012, to be part funded by public subsidy; to establish a fund to subsidise the deployment of Superfast Broadband to the 'Final Third' beyond the reach of commercial deployments, financed through a 50p per month levy on all fixed copper lines; to reform and liberalise the use of existing 2G/3G mobile spectrum, clearing the way for the auction of spectrum at 800MHz and 2.6GHz required for 4G, and to establish a national plan for Digital Participation to tackle the three obstacles to digital inclusion (availability, affordability and capability). A number of other measures in the Digital Britain report were implemented in a slimmed-down Digital Economy Act just before the May 2010 General Election, but many were left on the table for the new incoming Government.

The new Conservative-Liberal Democrat Coalition Government's announced policy in relation to the recommendations from the Digital Britain report is to support the 2Mbps USC, but to delay the target for completion from 2012 to 2015[74]; to support public subsidy of Superfast Broadband to the 'Final Third', but to scrap the proposed 50p levy on all fixed lines in favour of using funding left over from the Digital TV Switchover (DSO) Help Scheme[75] (~£250m); while the Direction to Ofcom to reform and liberalise mobile spectrum remains (at the time of writing) pending; and the Digital Participation Scheme is underway, bringing together a number of organisations to co-ordinate a range of initiatives to tackle digital exclusion and drive take-up.

Rival targets from the competing political parties to get Superfast Broadband to every home in the country by 2017/2018, debated in the run-up to the General Election held in May 2010, seem to have fallen by the wayside, most likely because of the reductions in public expenditure required to tackle the historic national public debt.

Broadband Delivery UK (BDUK) held an Industry Day on 15th July 2010, where they announced a competitive bidding process for Superfast Broadband case studies in three areas (around Swansea, in Lancashire, and Scotland) to test deployments in rural areas with difficult terrain. BDUK also announced that work would commence on the competitive process for the design and delivery of the 2Mbps USC in September 2010.

At the ***nations, regional and local*** levels, there have been a wide range of initiatives in Scotland, Wales and Northern Ireland, and the Regional Development Authorities (RDAs) in England, local authorities and other fora to promote availability and take-up of Broadband/Superfast Broadband.

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[70] Superfast Broadband is also often referred to as 'Next Generation Access' (NGA). 'NGA' was the term used throughout most of Ofcom's consultation process on the subject, but the term 'Superfast Broadband' was adopted towards the end of that process, and seems to have been more commonly used since then.

[71] Ofcom Statement on Delivery Superfast Broadband to the UK, March 2009.

[72] UK Government, Department for Business, Innovation & Skills (BIS) and Department for Culture Media & Sport (DCMS), Building Britain's Future, Digital Britain, Final Report, June 2009.

[73] In Hull, KCom claim to deliver 2Mbps or more to 98% of their network area, and have committed to extend that to 100% by March 2011. Source: KCom.

[74] Jeremy Hunt, Secretary of State for Culture, Media, Sport & the Olympics, announced the delay in the target date for completion of the 2Mbps USC from 2012 to 2015 at the Broadband Delivery UK (BDUK) Industry Day on 15th July 2010.

[75] The funding for the DSO Help Scheme is collected via the TV Licence Fee and managed as a separate fund by the BBC.

Other than as points of comparison with Suffolk, the initiatives in the other nations, regions and local areas are not directly pertinent to this paper, and are not covered any further.

The UK Government's Department for Communities & Local Government (DCLG) published a report in March 2010 on the risks of local areas remaining un-served by commercial Superfast Broadband deployments, to help to inform regional and local authorities on areas they might target for any local initiatives to deploy Superfast Broadband, to avoid any potential duplication of investments by commercial operators[76].

In the ***East of England*** region, under the auspices of the East of England Development Authority (EEDA), the main initiatives have been State Aid for the deployment of current-generation broadband (ADSL) to smaller exchanges (as described above); the Eastern Regional Broadband Uplift Scheme (EREBUS), which includes a web-based survey to assess demand for Superfast Broadband in the region; and EEDA's SONGBIRD (Supporting Open Next Generation Broadband in Rural Districts) project under the Rural Development Programme for England (RDPE), which plans to award up to £500,000 by the end of 2010/13 for rural broadband projects in the region. In ***Suffolk***, the Suffolk County Council has convened the Suffolk Business Forum, and the Suffolk Broadband Stakeholders Group with the aim of delivering a number of pilot Superfast Broadband schemes in candidate rural areas[77] using RDPE and matched funding.

However, the total figure for UK public spending available for Superfast Broadband over the next two years (including regional/local funding) is ~£300m[78]. This figure stands in stark contrast to the estimates[79] (~£10bn - £20bn) for the cost of extending Superfast Broadband to the 'Final Third' of UK households beyond the reach of announced commercial deployments[80], and even the indicative costs of doing so in Suffolk alone[81].

8. Conclusions and Key Recommendations on What More Needs to be Done

The ***objective*** of the briefing paper is to help build a consensus around the facts of the current situation with regard to the current, and likely future, availability and take-up of commercial high-speed 'Superfast Broadband' services in Suffolk, in order to provide a 'jumping off point' for developing a coherent, agreed approach to tackling the sizeable 'gaps', which are likely to be beyond the reach of purely commercially-funded deployments.

That approach will require further discussion and agreement among key stakeholders, but here we offer some ***conclusions*** and an outline approach, including some ***key recommendations*** on what more needs to be done.

However, first, it may be appropriate to step back to consider all the ***progress*** that has been made on broadband over the past decade, and the more recent progress on Superfast Broadband over the past year or so. While, clearly, issues remain over the speed, quality and coverage of current-

[76] Source: UK Government Department for Communities & Local Government (DCLG): 'An assessment and practical guidance on next generation access (NGA) risk in the UK', March 2010; reported prepared by Analysis Mason.

[77] The candidate rural areas being considered are: Bungay, the Alde & Ore area, the Shotley peninsula, and Haughley & Old Newton.

[78] UK Government, HM Treasury: UK Budget Statement, May 2010.

[79] Estimates for the cost of extending the deployment of Superfast Broadband to the 'Final Third' vary (depending upon the assumed technology mix and other key assumptions), but are likely to be in the region of £10bn - £20bn.

[80] The costs of extending deployment are likely to be met through joint public/private funding, so the size of the public sector intervention required will be less than the total costs (ie ~50%).

[81] See section 6 on page 24.

generation broadband, and there are concerns about the likely future extent of coverage of Superfast Broadband, particularly in less-densely populated rural areas, most of us are able to enjoy functional broadband access to the Internet, which is transforming the way we live, both at home, at work, and while on the move. This is a huge achievement, and one that very many people have played a part in.

Conclusions

The analysis presented in this briefing paper enables some ***conclusions*** to be drawn about the present situation in relation to Superfast Broadband, and the general approach that needs to be taken to ensure its widespread availability and take-up:

There is sufficient visibility of demand, and scope for at least some competition, in urban areas (UK and Suffolk) for commercially-funded Superfast Broadband deployments to lead the way. Competition between alternative physical infrastructure may be limited (to BT, Virgin Media, the mobile network operators, and potentially other players willing to invest in new infrastructure or the re-use of existing/alternative infrastructure), with further competition from the major access 'unbundlers' selling bundled services (eg Talk Talk, Sky, C&W, O2, etc), and many more retail Internet Service Providers (ISPs).

However, commercial announcements of planned Superfast Broadband deployments suggest a limit (~66%) to UK coverage that can be achieved on normal commercial terms. There may be some scope for extending commercial deployments further (as was the case with current-generation broadband, through future reductions in equipment costs, as the technology matures and global volumes and supplier competition drives prices lower, and through operational learning and innovation lowering deployment costs). However, the costs of deploying Superfast Broadband are dominated by civil engineering and deployment costs, rather than equipment costs, so the scope for further commercial coverage may be limited (~10%), or may already be factored-in to commercial operators existing coverage commitments.

What is clear is that there will remain about a third of the UK population (up to two-thirds in Suffolk) in less-densely populated areas, for which not even a single operator could justify the investment in Superfast Broadband on normal commercial terms[82]. If the widespread availability of Superfast Broadband were left entirely to the market, there is likely to be a prolonged 'Digital Divide' between those with access and those without.

The challenge to focus upon is the excess costs of deployment in less densely populated areas (over the revenue available from users in those areas, taking account of their ability and willingness to pay), and the ways in which those excess costs might be reduced and met.

The value to society as a whole from the widespread availability and take-up of Superfast Broadband may be greater than the revenues that can be captured by commercial operators, and greater than the costs commercial operators would incur in widespread deployment, leaving the optimal economic outcome unable to be reconciled between the supply and demand sides of a competitive market – a situation economists describe as a '***market failure***'. Where the societal gain is likely to exceed the cost of remedying a market failure, public intervention may be warranted.

[82] Economists would say that the Minimum Efficient Scale (MES) for Superfast Broadband deployments in the two-thirds of Suffolk that are less-densely populated is less than one (MES<1), that is, without public sector intervention there will be no deployments of Superfast Broadband in those areas under normal commercial terms. Public sector intervention is required to increase the MES to one (MES=1) to enable just one operator to deploy in those areas (further public sector intervention to raise the MES to two or more (enabling a second or third operator to deploy competitively in those areas) would be costly and inefficient).

However, ***public intervention*** in otherwise competitive markets is fraught with dangers, such as distorting competition, inaccurate targeting spoiling incentives and driving overall costs higher, and/or being inefficient and wasting scarce public funds. State Aid rules, policed in Europe by the European Commission (EC), are intended to prevent the worst excesses, but there are some ***key principles*** that should be adopted as part of any approach:

- ***Competition*** - is the proven best way to serve consumers interests in terms of lower prices, more choice and innovation, and better customer service. While it might be tempting to consider conferring temporary (local) monopolies in exchange for early/extended coverage, the ultimate costs in terms of longer-term loss of consumer benefits, and the costs involved in subsequent inevitable consolidation, is likely to vastly outweigh any short-term gains.

- ***Contestability*** – while there might be room for competition in more densely populated areas, there may only be room for at most one provider in less densely populated areas (albeit there might be room for more than one (but not more than a few) in different geographic markets across the country), who may become a monopoly, or at least a 'supplier of last resort'. Such a role may fall to the incumbent operator, who may possess natural advantages in competitively bidding for any State Aid on offer. Nevertheless, any provision of State Aid must be contestable, so as to reveal any alternative investors who may be willing to compete for it.

- ***Equivalence*** – where any State Aid confers, or reinforces an existing, dominant position (of significant market power (SMP)) in a (local) market, regulatory obligations to deliver equivalence and a regulated rate of return should be conditions of receiving the State Aid, in order to maximise the potential for fair and effective competition in markets downstream of the physical infrastructure bottleneck. Equivalence requires the infrastructure provider to provide the same product, at the same price, and using the same processes, to all downstream providers. For vertically-integrated businesses that provide both the physical infrastructure and downstream services, equivalence requires an appropriate degree of separation of the infrastructure business and downstream businesses (which may be operational or structural). Equivalence is the basis of the separation between BT Openreach and BT's other downstream businesses, but could also apply to other infrastructure providers who have SMP in specific (local) markets. The principle of equivalence is what lies behind the concept often described as 'open platforms'.

Some have called for a ***Broadband Universal Service Obligation (USO)*** to be imposed on incumbent operators, similar to the USO imposed in relation to the availability of basic voice telephony and related social services such as low-user (or social tariff) payment schemes, payphones and special services for the disabled. However, the historic USO obligations were imposed at a time when the incumbent enjoyed sufficient profits ('monopoly rents') on mainstream services that it could be obliged to bear the burden of the USO. While the historic USO remains in place, the introduction of effective competition has been eroding the basis of the 'bargain' implicit in the USO. If Superfast Broadband is mostly delivered through a competitive market, no operator should benefit from the level of excess profits that would be required for them to be able to fund a Broadband USO. USOs are a matter for the EU Communications Framework, subsequently implemented in this country in UK legislation, so any consideration of a Broadband USO would be dealt with in the first instance in Europe. Alternative arrangements for sharing USO obligations have been tried in a variety of other countries (eg reverse auctions), but there does not yet seem to be an international consensus on the best approach. To date, the case for a ***Broadband USO*** has not been made.

Another important consideration in shaping the approach towards extending the coverage of Superfast Broadband is the ***economies of scale*** and scope inherent in communications networks. While it is clearly vital that there be local input into the provision of Superfast Broadband, this should not degenerate into numerous local 'do-it-yourself' broadband networks – the total costs would be very much higher (than a more-co-ordinated deployment), and the costs and other difficulties (such as reconciling different technology choices and operational support systems) involved in the inevitable subsequent consolidation of lots of local networks into a more economically-efficient scale would be substantial[83]. There may, of course, be special cases where a local solution is the only or best option (in which case any State Aid might be accompanied by strict conditions), but such local solutions should not become widespread just because of the lack of, or a delay in, a more economically-efficient solution becoming available.

There is also a risk of ***fragmentation*** of available public funds across a wide range of governmental initiatives, potentially leaving none with sufficient resources to make any real difference. There are currently a number of Superfast Broadband trials being considered or planned at national, regional and local levels. The purposes of these trials is not always clear: whether to establish demand, test alternative technologies, learn about the design and deployment in difficult terrain, or just to demonstrate something (no matter how small) is being done. This current appetite for trials might be shaped by the limited availability of public funds, which can afford a few trials, but cannot afford to make any real progress on extending widespread availability. Much larger scale trials and deployments of mainstream Superfast Broadband solutions are already underway by the main commercial operators, leaving little new to be learnt from small-scale publicly-funded (or matched-funded) trials, apart from some short-term, local gains in coverage in some very limited areas.

With any public sector intervention, it is vital to ensure that such interventions are ***well-targeted***, and that any commitments made/metrics set are likely to lead towards efficient outcomes (and avoid perverse outcomes[84,85]).

Perhaps the ***biggest risks*** inherent in the present situation in relation to Superfast Broadband (UK and Suffolk), is the lack of clarity about the objectives and how best to achieve them, and the limited, fragmented public resources available being consumed in many, small, un-coordinated initiatives, unable to make any real impact on significantly widening the availability of Superfast Broadband.

A central planning approach to Superfast Broadband is not the answer – the market is already committed to covering two-thirds of the population, but we already know that we have a looming 'market failure' and a serious risk of a prolonged 'Digital Divide' with the 'Final Third', so a ***coherent, agreed approach*** to tackling it is needed, and is most likely to minimise any adverse effects and to do so as efficiently as possible. This is especially true in areas like Suffolk, where the proportion of people in un-served/under-served areas is much higher than the national average (ie two-thirds),

[83] There are a number of historic cases that demonstrate this point: for example, the prolonged consolidation of regionally-franchised cable TV operators (into, eventually, Virgin Media), involving considerable investment write-downs and technology incompatibilities across different areas (some of which persist to this day). We do not need to re-learn the lesson of the economies of scale of communications networks again with Superfast Broadband!

[84] One example of a poorly targeted intervention may be the proposed 2Mbps Universal Service Commitment (USC). 2Mbps was chosen by Digital Britain as the minimum broadband speed required to each home, so as to be able to support at least one HD full-screen video streaming service (which requires ~1.5Mbps) while simultaneously enabling Internet browsing/email (~0.5Mbps) and baseband voice telephony. However, nearly 2 million households (11%) in the UK get broadband speeds less than 2Mbps, in most cases because of long line lengths. The most likely solution to long line lengths in most areas is a form of FTTC/FTTH[82], but this solution would likely result in speeds much higher than 2Mbps. There isn't likely to be an economic way of providing the 2Mbps USC without in practice enabling much higher speeds. While this might lead to a good outcome for those affected, it suggests that a 2Mbps USC might not be the right target.

[85] Note, however, that planned Superfast Broadband deployments may not deal fully with the 2Mbps USC, because many of the long line lengths that cause broadband speeds to be below 2Mbps, may be served from cabinets that do not make the business case 'cut' (even though other cabinets served off the same exchange may be deployed with FTTC/FTTH).

and the future growth and sustainability of the county's economy is likely to be so dependent on Superfast Broadband.

Key Recommendations

So, taking the wider conclusions as a whole, but particularly re-focusing on the challenge of trying to reduce, and meet, the costs of extending deployment of Superfast Broadband beyond the reach of purely commercial deployments, the following key recommended next steps[86] should help to make real progress towards the goal of more widespread availability and take-up of Superfast Broadband. While some of these recommendations can be pursued in the context of Suffolk, some inevitably require action or co-ordination at a UK national and/or European level.

1. A Review of Governmental Broadband Initiatives

The new Government provides an opportunity for a review of governmental targets, initiatives and funding in relation to Broadband/Superfast Broadband, to ensure that they are well-targeted, coherent, efficiently using public funds, and represent value for money. Such a review should include a review of the place of Superfast Broadband within Government's overall spending priorities, to ensure that the importance of Superfast Broadband to the future sustainability and growth of the UK economy is recognised, and that the support that Superfast Broadband received reflects that.

1 bis. A Review of Broadband Initiatives is Suffolk

In Suffolk, there should be a review of the roles of the local authorities, agencies and fora involved in promoting Superfast Broadband in the county, and a consolidation of the numerous existing initiatives into a more coherent programme.

2. A Review of Public Intervention Options

There should be a review of the options for potential forms of public intervention to support the widespread availability and take-up of Superfast Broadband. The options[87] could include a mix of direct public subsidy of upfront capital expenditure on deployments, fiscal measures (taxation relief) on on-going operational expenditure (eg the rateable value of lit optical fibre and/or other infrastructure assets)[88], demand-side stimulation by leveraging other public spending on (eg) defence, education, health, transport, climate change, etc. However, what is currently possible may be limited by State Aid rules – it might be worth initiating a review of possible relaxations of some of the rules at EU level (as other Members States are facing similar issues).

3. A Study into the Economic Benefits of Superfast Broadband in Suffolk

A study into the economic benefits of Superfast Broadband in Suffolk would help to establish the benefits of public intervention to widen availability and take-up (versus the counter-factual of the impact on the Suffolk economy of no public intervention). As well as providing the evidence to support the case for public intervention, such a study would also be of benefit to commercial operators trying to assess demand.

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[86] Note that these recommended next steps are likely to require some funding in order for them to be delivered.

[87] Ofcom considered some of the options for the potential forms of public intervention in the development of its regulatory policy for Superfast Broadband[71].

[88] Fiscal measures were among the issues looked at by the Caio review, which subsequently fed-in to the previous Government's Digital Britain report. Source: UK Government Department for Business, Caio Report, 2008.

4. A Business Case for widening availability of Superfast Broadband in Suffolk

The development of a detailed, costed business case for widening availability of Superfast Broadband across Suffolk would help to identify the optimum design, the major component costs, and the sensitivity of those costs to the key inputs and assumptions. It would also help to establish how much, and which, of the costs should be borne by commercial operators, and which should benefit from public intervention and how the public intervention should be applied.

For example, if commercially-funded deployments reach 66% population coverage, should public intervention be used to extend coverage beyond 66% by say 10 -15 %, or should the public intervention instead be targeted at the final, hardest to reach 10 – 15%? The dilemma is that for a given amount of public intervention, the greatest increase in coverage would be achieved by extending coverage beyond 66%, rather than the much higher cost per household of tackling the hardest, last few per cent of households (towards 100%), but any investment in extending coverage beyond 66% risks duplicating investments by commercial operators, if they are able to subsequently extend the reach of their commercial business cases beyond their current commitments[89]. Other dimensions of the question about how public sector inventions should best be applied would also need to be considered (eg breadth first across the county vs depth first in selected areas, how the mix of public interventions should be used to extend different platforms (eg fixed, cable TV, mobile), etc).

It may be possible to devise some form of '***trigger scheme***' to help to identify, for each potential area of extended coverage (beyond commercial deployments), how much public intervention would be required to 'tip' the business case for covering an area from being unviable to viable, helping to match any available public funds to areas of potential extended coverage (using some decision criteria, such as weighted number of households/premises enabled per £k of matched public funds (weighted to favour certain priorities, such as ensuring coverage of deprived areas that might not otherwise make the business case 'cut')).

The development of a detailed, costed business case would require close co-operation with the major commercial operators, and access to commercially-confidential information to a trusted third-party under non-disclosure agreements (NDAs).

5. An Infrastructure 'Audit' in Suffolk

An 'audit' of the existing, available fixed and mobile telecommunications infrastructure, and alternative (ie electricity, water, sewerage, gas, etc) infrastructures should be undertaken, to assess the potential for re-using existing infrastructure to lower the cost of widening the deployment of Superfast Broadband.

Civil engineering costs are estimated to account for up to 70% of capital expenditure and deployment costs for Superfast Broadband. Extensive telecommunications networks infrastructure already exists: ducts and optical fibre are deployed in commercial operators' core and backhaul networks, and to business parks/premises, and to other public buildings, including schools (as part of the current-generation broadband 'Broadband for Schools' programme). Ofcom have conducted two surveys of BT's duct network (of BT's 'E-side'

[89] As proved to be the case in the deployment of current-generation broadband, where the number of ADSL-enabled exchanges that could viably be served increased repeatedly over time.

network[90] – the backhaul network out to exchanges and street cabinets, and of BT's 'D-side' network[91] – out from exchanges and street cabinets to homes/premises, respectively) in a number of major towns across the UK (though not in Suffolk), and found significant un-used capacity in BT's duct network, but with potential operational challenges in allowing competitive operators access to that un-used capacity. Other alternative infrastructure may also have the potential to reduce the costs of widening the deployment of Superfast Broadband, but are likely to involve similar operational and other issues.

What is needed now is a further infrastructure 'audit', focused on the potential to re-use existing telecom and/or alternative infrastructure in a specific area (ie Suffolk), to establish the extent to which it could usefully play a role in substantially reducing the cost of widening deployment of Superfast Broadband across the county.

But, perhaps the most important ingredients required in establishing how public sector intervention should help to widen Superfast Broadband availability and take-up, particularly in Suffolk, is ***political leadership*** to establish a coherent, agreed approach, ***backed by a delivery capability*** to ensure the widespread availability and take-up of Superfast Broadband and the realisation of the economic benefits.

[90] Analysis Mason: Telecoms infrastructure access – sample survey of duct access, published by Ofcom, March 2009.

[91] Analysis Mason: Sample survey of ducts and poles in the UK access network, published by Ofcom, March 2010.

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However, the views expressed in this briefing paper are those of the author, and may not represent the views of other stakeholders involved.

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Glossary of Terms

1G	First generation (analogue) mobile
2G	Second generation (digital) mobile
3G	Third generation mobile
3G CGC	3G Complimentary Ground Component (used to association with a 3G mobile satellite service)
4G	Fourth generation mobile (LTE)
21CN	21st Century Network – BT's next generation networks programme
ADSL	Asynchronous Digital Subscriber Line – a technology for conveying broadband over a copper line at speeds of up to 8Mbps
ADSL2+	Version 2+ of ADSL, which increases broadband speeds to up to 24Mbps
BIS	Business, Innovation & Skills, a UK Government department
BT	British Telecommunications plc
(C)	Conservative MP
CMR	Communications Market Review, an annual publication by Ofcom on the UK communications market
DCLG	Department for Communities and Local Government, a UK Government department
DCMS	Department for Culture, Media & Sport, a UK Government department
Digital Dividend	The radio spectrum at 800MHz and 600MHz released from DSO for other uses, including mobile broadband (4G/LTE) in the 800MHz band
DOCSIS	Data Over Cable Service Interface Specification, a technology for conveying broadband over cable TV networks
DOCSIS3	Version 3 of DOCSIS, supporting speeds of up to 50Mbps – 400Mbps
DSO	Digital TV Switchover, a programme to switchover terrestrial TV ('Freeview') from analogue to digital by the end of 2012, releasing some of the spectrum used for analogue TV for mobile broadband and other uses (the 'Digital Dividend')
DWP	Department for Work & Pensions, a UK Government department
EU	European Commission, of the EU
EEDA	East of England Development Authority, an RDA
EREBUS	Eastern Regional Broadband Uplift Scheme, an EEDA initiative
EU	European Union
FSB	Federation of Small Businesses, a trade association
FTTC	Fibre to the Cabinet, a broadband network topology, using optical fibre from the exchange to the street cabinet, and VDSL over the remaining copper sub-loop to the home, supporting speeds up to 40Mbps
FTTH	Fibre-to-the-Home (FTTH), a broadband network topology, using optical fibre from the exchange to the home, supporting speeds of 100Mbps or more

FWA	Fixed Wireless Access, a wide-area terrestrial radio technology used for access to telecom services
FWBA	Fixed Wireless Broadband Access, an FWA technology used for broadband access
GB	Great Britain
GEA	Generic Ethernet Access, BT Openreach's VULA wholesale product
GPRS	Generalised Packet Radio System, a 2G technology, supporting data at speeds of up to 384kbps
GHz	Giga Hertz, a measure of radio frequency (10^9 Hz)
GVA	Gross Value Added, a measure of economic output
HSPA	High Speed Packet Access, a 3G technology, supporting data rates of up to 7.2Mbps/14.4Mbps
HSPA+	HSPA plus, future evolution of HSPA, supporting increased data rates of 21Mbs/42Mbps/84Mbps over the next 5 – 7 years
IPstream	a BT Wholesale product for ISPs to access broadband delivered over ADSL
ISP	Internet Service Provider
KCOM	Kingston Communications, the telecoms provider in Hull
LLU	Local Loop Unbundling, competitive access to BT's copper local loop
LTE	Long Term Evolution, a 4G mobile technology
Mbps	Megabits per second, a measure of broadband speed (10^6 bits per second)
MHz	Megahertz, a measure of radio frequency (10^6 Hz)
MIMO	Multiple Input, Multiple Output, a radio antennae technology designed to take advantage of radio frequency multipath propagation to increase the speed and performance of mobile radio systems (used in LTE)
MP	Member of Parliament
MPF	Metallic Path Facility, a form of LLU where the competitive operator gains access to the whole copper line (voice telephony + broadband) from the incumbent operator
NDA	Non-Disclosure Agreement
NUTS3	ONS tables of statistics provided on a regional/local (eg county) level
NVQ	National Vocational Qualifications
OFDM	Orthogonal Frequency Division Multiplexing, a radio air interface technology used in LTE (and WiMAX)
OJEU	Official Journal of the European Union, refers to EU procurement rules that require invitations to competitive tender to be notified in the EU's official journal
ONS	Office for National Statistics, a UK Government agency responsible for providing statistical data
PC	Personal Computer
PON	Passive Optical Network, an optical network technology that shares a single fibre emanating from an exchange with multiple homes (x32, x64 or more in future)
QoS	Quality of Service

RDA	Regional Development Authority, regional authorities in England responsible for regional development (reporting to DCLG)
RDPE	Rural Development Programme for England, a DCLG/RDA initiative.
SONGBIRD	Supporting Open Next Generation Broadband in Rural Districts, an EEDA initiative
SME	Small and Medium Enterprises, a categorisation of businesses based upon their size (50 – 500 employees)
SMPF	Shared Metallic Path Facility, a form of LLU where the competitive operator gains access to the broadband part of a copper line, leaving the voice telephony part of the line with the incumbent operator
TSR	Ofcom's Strategic Review of Telecommunications, statement published September 2005
TV	Television
UK	United Kingdom
UKH14	The ONS NUTS3 code for the county of Suffolk
Unbundlers	Competitive operators (eg Talk Talk, Sky, C&W, O2, etc) who consume LLU products from BT Openreach in order to wholesale or retail (typically bundles of) voice telephony and/or broadband services
USB	Universal Serial Bus, an interface commonly used in PCs to connect to peripheral devices, eg printers, etc
VAT	Value Added Tax
VDSL	Very High Speed Digital Subscriber line, a broadband technology, used as part of FTTC, to convey broadband over the copper sub-loop between the street cabinet and the home.
VM	Virgin Media
VULA	Virtual Unbundled Local Access, a regulatory term for a class of wholesale products from incumbent suppliers of FTTC/FTTH, which competitive operators use to gain access at the exchange to the broadband traffic for 'their' customers and to control 'their' customers quality of service (QoS)
WBC	Wholesale Broadband Connect, a BT Wholesale (21CN) product to provide ISPs with access to broadband delivered over ADSL2+
WiFi	Wireless Fidelity ('WiFi'), a short-range (up to 300m) radio technology using equipment compliant with the IEEE 802.11 series of standards, using licence-exempt spectrum at 2.4GHz and/or 5GHz, to connect end-user devices together via a wireless home/office network, and which provides for shared wireless access to the Internet over a fixed broadband connection via a broadband (wireless) router
WiMAX	A rival (to LTE) wide-area broadband radio technology, which has been/is being deployed in some other countries (mostly developing countries with little or no fixed telecoms infrastructure – though Sprint-Nextel are also deploying WiMAX in the US), but lacking the same breadth of industry support among operators and suppliers as LTE.

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