North East ICT Infrastructure Policy and Investment Framework Study

Technical Paper 3
NE Connectivity Demand and Targets

Final Version

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CONTENTS

1. Purpose of this Document

1.1 This document is Technical Paper 3, the purpose of which is to set out the basis on which we have assessed current and future demand for digital connectivity across the North East; and on the basis of this, set out a sequence of connectivity targets that the region will need to achieve if ICTs are to be optimised across the region.

1.2 If you have any questions or require further information, please do not hesitate to contact the authors:

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2. Framework for forecasting future connectivity requirements

2.1 A primary task for this study is to forecast future connectivity requirements across the North East. We can then match this against current and likely future supply and determine if gaps are likely to remain which public sector will need to address. This is the principal purpose of the study.

2.2 What exactly do we mean by forecasting future connectivity requirements?

It's not just about capacity

2.3 Forecasting connectivity is not just an about forecasting Mbps (e.g. capacity) It's also about forecasting sensitivity to pricing and the importance of some of the other features of connectivity such as resilience, supply in advance of demand, quality of service etc.

2.4 Essentially, two very different types of connectivity are available – public internet access and dedicated leaselines. For the strategy to be meaningful, we need to understand (and forecast) the future requirements for and differences of each:

- The primary issue for public internet access is one of capacity – namely what future capacities will be required – currently we have 1-3 Mbps across most the region; there is much talk about 'next generation broadband' that will offer 6-10 Mbps (BT are already putting 8 Mbps cards in all DSlams); and a growing lobby believe that not too far ahead, a growing proportion will need yet higher capacity internet access – 20-30 Mbps or more
- The primary issue for leaselines is not capacity – this is potentially unlimited as long as the customer is prepared to pay for it. The issue is instead one of price and hence one of the degree of competition. Evidence suggests that with effective competition, as much as 50% saving can be achieved on BT's leaseline charges. As leaselines are relatively very expensive (70-100 times more than public internet access), 50% represents significant cost savings. Competition is essential if this is to be achieved, and can be in two forms:
  - Other carrier's networks in the vicinity – strongest form of competition
  - BT lowers its prices and increases the range of wholesale services to carriers so they can provide competitive services via BT network

2.5 To understand the requirement for additional public internet access bandwidth and the importance of increasing leaseline competition, in the region, we need to understand which sorts of users require each type of connectivity and why

- All households and virtually all small businesses (except those with special needs) do not usually need the specialist features leaselines offer. All they really need is internet access. For those that need some kind of dedicated network, even this can be achieved using IP-VPN technology over the internet, at the fraction of a cost of creating a network using lease lines. So for the vast majority in the region, internet access is the issue and we need to understand what they will use this for and how, in order to understand how likely it is that user bandwidth needs will grow
- Leaselines have mainly been the preserve of large businesses and organisations, either because they need the specialist features they offer (dedicated bandwidth, burst-ability, security and other quality features) or because they only want internet

access but have a large enough operation on site to spread the high cost (e.g. a large firm/ operation, plant, site, employing 100 or more, will tend to be more easily able to justify a £70k leaseline, with the cost spread over 100 employees). We can expect, as is already being evidenced, that as higher capacity public internet access becomes available, many of the latter will terminate their leaseline contracts and migrate (in droves) to the far cheaper public internet access option. For those who do still need leaseline services (because of the special features they offer) and are prepared to pay for these, the issue of price and competition will remain. The leaseline market and its users are complex but at the risk of over simplification, we can, for the purposes of this exercise, divide them into two groups:

- IT intensive mission critical functions that require high capacity and the other features offered by leaselines
- Ordinary functions (particularly larger functions) that are part of national/ international organisations that have dedicated networks to transfer large quantities of data around

2.6 The above analysis therefore suggests that we might meaningfully consider three types of 'end-user' in the region

- IT intensive, mission critical operations – requiring high capacity leaselines
- Large firms/ operations – requiring leaseline connectivity to the wider organisation
- Remaining large firms, virtually all small firms and all households, who only really required internet access, which can be far more cost effectively achieved via a public internet access service (e.g. via ADSL over the copper network)

3. Three 'end-user' groups

3.1 From the point of view of the strategy, we therefore need to:

- Understand how the bandwidth requirements of **small firms and households** may grow and identify the extent to which these can be feasibly met through a more or less ubiquitous public internet access service
- identify the number of **large firms/ operations** in the region, and separate out those who only want internet access and can migrate to this as higher bandwidth public internet access becomes available; for the rest who will still need leaselines, we need to identify the proportion likely to benefit from full competition already (very few we think in the NE) and the number that do not and have to pay BT-related tariffs. The issue for the strategy will be the cost savings that could be achieved if full competition could be introduced
- competition and cost saving is also relevant to the much **smaller group of IT intensive mission critical users**, but for this group, issues of adequacy of service, particularly resilience and scope to increase the service (at feasible prices) to support expansion will also be important. There is anecdotal evidence from across the UK of mission critical operations that have decided not to expand or have moved because the cost of additional connectivity has been too great. This is also increasing anecdotal evidence that mission critical inward investors will not consider a site that cannot provide feasible high capacity services.

4. So, what are we trying to forecast?

4.1 It is very different for each user group:

- For IT intensive mission critical users we need to estimate the number that do not have full competition and hence are paying 'too much'; we also need to estimate the number that can feasibly scale up their connectivity should they need to expand. Related to this, we need to identify the extent to which there are other sites/ locations that can provide competitive mission critical services, to attract inward investment in this specialist arena
- For large firms/ operations that require leaselines as part of corporate networks, we need to understand the number that do not benefit from full competition and are hence paying 'too much'; similarly, we need to identify the extent to which the region provides alternative locations that can offer competitive leaseline services, as a factor in attracting inward investors
- For all remaining firms, and households, these require public internet access at consumer prices and the issue for them is the extent to which the capacity of connectivity they require will be available. We know 1-3 Mbps is now available across the region to 98% of the population. The question is will capacity requirements increase, by how much and how fast.

4.2 For this group, we really do need to know what level of bandwidth they need and how this will increase. Most of the 'bandwidth needs' research undertaken (and which we have reviewed) relates to this group because it has been (and may still be) far from certain that they can get the bandwidth they need (other than via a cost prohibitive lease line).

4.3 The first critical question for this group is how likely is it that a growing proportion will require what is commonly termed 'next generation' broadband (broadly defined as 6-10 Mbps), and if so, what proportion are likely to get this via DSL (supported by wireless).

4.4 The next critical question is to what extent might the needs of this group increase beyond that, perhaps to match the needs of larger firms (30 Mbps +), and if so, how can this be delivered via a low cost ubiquitous service (similar to but representing a major step change to DLS – which many see as an 'intermediate' stepping-stone' technology because of its capacity limitations.

5. Is place also important?

5.1 We also want to consider if demand for connectivity should be assessed in another way – with reference to place rather than individual users. This could be an alternative or cross-cutting approach.

5.2 There is much discussion in the literature and in policy contrasting the different needs of particular types of place – most notably rural as opposed to urban. The team's past research has also explored the differing needs of other types of place such as CBDs, science parks, business parks, airports and surrounding business environment, technology clusters, university campuses, strategic employment sites, corridors and zones and so on.

5.3 Focussing on place suggests that certain parts of the region will have different types of demand for connectivity (and ergo, different solutions are required). This contrasts with the user approach which is more ubiquitous in nature as it suggests that different types of user are widely distributed across the region, hence it is less meaningful to look at demand (and supply) in terms of place than it is with reference to different types of user

5.4 After much consideration, we suggest that the most useful way forward is to combined a user-typology with a spatial typology, but because the two overlap significantly, we have included only two types of place:

- Strategic places – which compliment the user typology. Strategic places ought to offer the very best level of connectivity available (world class connectivity).
- And all other places – represented by the user typology

5.5 We carefully considered including a 'rural' category, but our research suggests that there is little evidence of a rural connectivity divide now that BT has enabled the majority of exchanges. Moreover, as we move to next generation broadband, the divide opens up again but it is not characterised so much by rural/urban as by how far you are from the local exchange, irrespective of whether urban or rural. Next generation broadband brings the digital divide back to the urban area. There will be some additional problems concerning low density and business case in rural areas, but we believe this issue will be dwarfed by the technology and distance issues associated with next generation broadband

6. Four connectivity targets

6.1 Combining the 3 user groups with one 'place-based' target gives us four connectivity targets to forecast.

Table 6-1: Connectivity targets for the North East

4 Connectivity Targets for the NE

Dimension 1: User-based

- **'High-end mission critical IT-intensive users**
  - **data centres, ISPs/ ASPs/ other data services, call centres, specialist IT functions within major companies and public sector**
  - **specialist IT intensive SMEs**
- **Large firms/ sites/ operations –**
  - **Requiring leaselines for corporate networks**
  - **Requiring leaselines to access the internet (say with 100 or more employees)**
- **All other firms and all households**
  - **accounts for 95-98% of all firms**
  - **100% of households**

Dimensions 2: Place-based

- **Strategic flagship digital locations – requiring world class connectivity**
  - **Primary - CBD, technology clusters, science parks, strategic business parks, employment corridors**
  - **Secondary – market towns, regeneration areas, other nodes**

6.2 The following matrix combines the two dimensions, showing how they intersect and overlap, as follows:

Table 6-2: Demand forecasting 'typology'

	SMEs and households	Large firms/ sites/ operations	Hi-end mission-critical IT intensive functions
Strategic flagship digital locations • Primary - Cads, technology clusters, science parks, strategic business	• SMEs and households within one of the strategic flagship locations will have the option of high capacity	• (by definition) large firms that are located within strategic flagship digital locations, will benefit from	• This will be the ideal location for high end mission critical IT intensive functions • Over time we can expect IT-intensive

parks employment corridors • Secondary – market towns, regeneration areas, other zones	internet access - this may well be far more than they need (see below)	competitive leaseline services, and much more	functions to cluster in strategic flagship digital locations
All other places • We have not distinguished between other places – rural and urban are treated as one in this demand typology	• SMEs and households not in strategic locations will rely on ubiquitous public internet access - the issue for the strategy will be to ensure that ubiquitous access with sufficient capacity is available	• Large firms/ organisations requiring leaselines will have to pay more outside of strategic flagship digital locations – the issue for the strategy will be to ensure there is leaseline competition achieving up to 50% price reductions • Those that only want leaselines to access the internet will migrate to public internet access as higher capacities become available	• Mission critical IT intensive users not in strategic flagship digital locations will have to pay more to access the high level services they need – the issue for the strategy will be to ensure there is leaseline competition achieving up to 50% price reductions

6.3 To sum up, the key issues for the largest group (small firms and households) are:

- These will not have fibre based services but will rely on the copper network for broadband. However, as 98% can access competitive entry-level broadband via the copper network, the issues are to what extent they will need high capacity services in the future and to what extent will the market provide ubiquitous competitive higher capacity services – expensive leaselines are not an option for this group. Resilience and other quality of service issues will also be important, but secondary to these primary issues.

6.4 The key issues for the other three groups are broadly similar and different to the above:

- These will already have fibre based services. The issue for these groups is instead about competition, choice and hence competitive pricing.

7. Future connectivity requirements across the NE

Dimension 1: User-based demand/need

High-end mission critical users

- These will already have a fibre-based leaseline service – hence the issue is not one of absolute capacity but price and quality
- The issues for this group are
  - The extent of competition and hence competitive pricing
  - The cost of resilience
  - The ability to expand
- The critical question for this group is what are the potential cost savings if alternative carrier networks become available enabling full competition, achieving 40-50% reductions on BT leaseline tariffs; the question for the region is to what extent are there other sites available that can feasibly offer this level of connectivity to inward investors wanting to site mission critical activities

Large firms/ plants/ offices/ operations

- These will already have a fibre spur to the site, supporting the telephone system
- Some may be using this to provide a dedicated leaseline
- Hence the issue for this group is not one of absolute capacity but price
- The issues for this group are:
  - What proportion only have leaselines to access the internet – these will migrate to far cheaper public internet access services as higher capacity becomes available
  - And for those that still need the special features of a leaseline, the issue will be the extent of competition and hence competitive pricing
- ***The critical questions for this group are:***
  - What are the potential cost savings from migrating to public internet access services and what will be the impacts of this (on the firms, on the economy)
  - And for those who still need leaselines, what are the potential cost savings if full leaseline competition is achieved (enabling 50% price reductions) and what will be the impact of this (on the firms, on inward investment, on growth, on the economy)

Small firms and households

- This group will be reliant on ubiquitous public sector internet access e.g. DSL services via copper and some will have a choice of broadband via cable – a few will not be able to access either
- The issue for this group, in contrast to the above two groups, is one of 'absolute' capacity, at affordable (consumer) prices (e.g. not leaseline prices)
- The critical question for this group is to what extent will a significant proportion need higher capacity services in the future e.g. next generation broadband; and if so, will

the copper network be able to provide this; or will alternatives have to be sought. And, what will be the impact of this (on firms, on growth, on households, on the wider community, on the environment and ultimately on the regional economy)

Dimension 2: Place-based demand/need

- This dimension comprises two types of 'place'
  - Strategic flagship digital locations
  - All other places

Strategic flagship digital locations

- These should provide leading edge, world class connectivity environments e.g. fully competitive, carrier neutral, multi technology environments. Any region should select a variety of strategic locations that should aspire to this.
- We suggest two categories (or grade) of strategic flagship digital place
  - Primary – CBDs, science parks, technology clusters, strategic business parks
  - Secondary – market town centres, regeneration areas, other nodes
- The critical questions for both types of strategic place are
  - How many and which locations are to be defined as strategic flagship digital locations across the region
  - To what extent does each fall short of the connectivity specifications required to achieve the status
  - What needs to be done to fill the gap
  - What will be the impact of this (on the occupiers, on the surrounding areas and on the economy as a whole)

Table 7-1: Demand forecasting 'typology'

	Ubiquitous (98%+) public internet access	Competitive Leaseline Services	World-class connectivity
Strategic flagship digital locations • Primary - CBDs, technology clusters, science parks, strategic business parks employment corridors • Secondary – market towns, regeneration areas, other zones	• (by definition) strategic flagship digital locations will also be able to access ubiquitous public internet access	• (by definition) large firms and IT intensive SMEs that are located within strategic flagship digital locations, will benefit from competitive leaseline services, and much more • Over time we can expect IT-intensive functions to cluster in strategic flagship	• Strategic flagship digital locations will provide world class connectivity which includes ubiquitous public internet access and competitive leaselines, but provides more

		digital locations	
All other places • We have not distinguished between other places – rural and urban are treated as one in this demand typology	• Most SMEs and households	• Large firms/ organisations – with corporate network needs; and high end mission critical IT-intensive needs • High end mission critical IT-intensive SMEs	

8. Looking closely at the needs of small firms and households

8.1 In many ways this is the most significant group because it represents 95% of businesses and all households. The primary requirement of this group will be the ability to access appropriate capacity to access the internet (IP-based services, including VPNs), at affordable prices.

8.2 Broadly speaking, the majority of businesses and households (98% plus) can access competitive entry level broadband (1-3 Mbps); the issue for this study is will this be enough, or will a growing proportion of business and households require higher connectivity in the future, to what extent will the market provide this, and where gaps are likely, what will be the importance (adverse) impact of these gaps.

8.3 The essential questions for this study therefore are to what extent will higher capacity broadband become essential and what will be the impact if it is not available. To answer this we must look at the ways businesses and households will use ICTs in the future and whether this will require higher capacity connectivity. This is a complex question involving a range of issues and a number of major unknowns. We must look at all the evidence and make our best 'informed' judgement, but recognise that it is no more than a judgement.

8.4 Factors influencing the need for higher capacity include:

- New forms of content and services accessed via the internet
- The extent to which these become essential, to businesses (if they are to remain competitive, grow or even just survive), and the extent to which these become 'must-haves' for households
- Linked to this is the issue about 'barriers to take-up and utilisation of broadband'. The region will hardly need high capacity broadband if that currently available is only partially taken-up.
- The extent to which compression and other technologies mean that these services can be accessed over current broadband (1-3 Mbps)

Demand assessment methods

8.5 We have used a number of different techniques, calculations and indicators to assess the extent to which next generation broadband will become essential for a growing proportion of small businesses and households:

- Reviewed the current capacity needs of firms and households across the region, derived from a major survey (jointly purchased from Marconi by ONE NE and ADIT)
- Reviewed 'near-future' capacity needs, derived from the same survey
- Modelled the future capacity needs of the region based on the regional economic strategy's target sector/ cluster growth projections (the gold, silver and bronze economic forecasts)
- Considered the implications of the key application and service drivers for households and businesses – particularly HDTV, HD online gaming, video conferencing, increasing video content in business applications and serves and increasing content-rich specialist/ bespoke business applications and services
- Considered the issue from the perspective of keeping pace with provision elsewhere in the UK, Europe and globally

8.6 There is a full review of the evidenced and discussion of these issues in the working papers. Below are some examples of the analysis

9. Current and 'near-future' capacity needs of businesses

9.1 The following table shows current business bandwidth usage and how users of broadband expect their bandwidth requirements to grow in the next 18 months (to May 2007)

- The largest business user group is currently in the Narrow band category
- followed by the *512 kbps up to 2 mbps* which together account for nearly half of all businesses in the North East
- The vast majority of businesses do not expect to step up their requirements significantly (i.e. those cells coloured red).
- Just over one quarter of business expect their needs to grow 27,191 out of the 103,636 by May 2007, over half of this group is businesses moving up from Narrowband to first rung broad band *256 kbps up to 512 kbps.*

Table 9-1: Number of Business By Current & Future Needs

		Future Bandwidth Requirements						
		A >=10 mbps	B >= 2 mbps up to 10 mbps	C >= 512 kbps up to 2 mbps	D >= 256 kbps up to 512 kbps	E Narrow-band	F Nil Requirement	Total
Current Bandwidth	A >=10 mbps	2,584						2,584
	B >= 2 mbps up to 10 mbps	1,098	6,675					7,773
	C >= 512 kbps up to 2 mbps		3,083	17,283				20,366
	D >= 256 kbps up to 512 kbps			5,741	9,246			14,987
	E Narrowband			2,934	13,104	14,270		30,308
	F Nil Requirement					1,231	26,387	27,618
	Total	3,682	9,758	25,958	22,350	15,501	26,387	103,636

Falling B-width Needs

Rising B-width Needs

Source: Regeneris Analysis of Marconi Data jointly purchased by ONE NE & ADIT

9.2 A key qualifying point to make is that businesses may not necessarily know what bandwidth they will need in the future. Demand is led by supply is led by demand e.g. the broadband adoption process is chicken-and-egg, based on a virtual circle. Only when sufficient businesses and households can access competitive broadband will the IT industry create

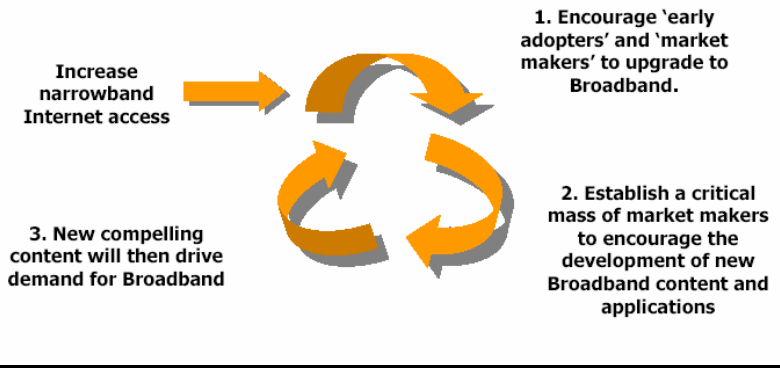
products and services to exploit this. As this happens, more and more will want broadband – as the cycle progresses many think that capacity requirements will increase and increase. The process may not be linear or smooth, with blockages and delays on the way, but many think that the world is moving towards a high capacity internet access era. Ask businesses now to predict this and they cant

9.3 The EU and our own Government recognise the critical 'chicken and egg' interrelationship between:

- The availability of affordable broadband
- The availability of a wide range of valuable broadband applications
- And demand for broadband

9.4 The process, although difficult to start, once it has reached a certain momentum, a certain critical mass, will start to accelerate, feeding itself. This has been captured in the following diagram, taken from UK broadband policy documents.

Figure 9-1: Broadband Market Cycle



Source: UK Broadband Policy Documents

9.5 We can be fairly sure that as the virtuous circle gathers momentum and increased critical mass, the scale of the impacts will increase, quite possibly exponentially

10. Bandwidth demand by company/ plant size (employees)

10.1 The following two tables together show the inter-relationship between company size and bandwidth requirements. The main message is the larger the establishment, the higher the bandwidth required.

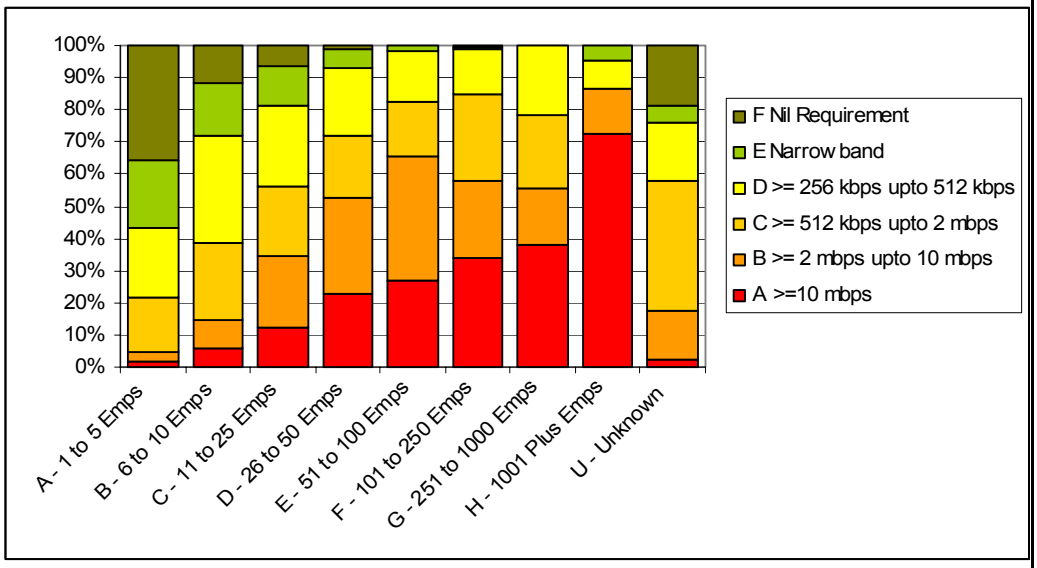
Table 10-1: The Inter-relationship between Company Size & Bandwidth Requirements

No Businesses	**Immediate Future Bandwidth Requirements**						
Employee Size Band	**A >=10 mbps**	**B >= 2 mbps up to 10 mbps**	**C >= 512 kbps up to 2 mbps**	**D >= 256 kbps up to 512 kbps**	**E Narrow band**	**F Nil Requirement**	**Grand Total**
A - 1 to 5	2%	3%	17%	22%	22%	35%	53,510
B - 6 to 10	6%	9%	24%	33%	16%	12%	8,530
C - 11 to 25	12%	22%	22%	26%	12%	7%	6,059
D - 26 to 50	23%	30%	19%	21%	6%	1%	2,435
E - 51 to 100	27%	39%	17%	15%	2%	0%	504
F - 101 to 250	34%	24%	27%	14%	0%	0%	214
G – 251 to 1000	38%	18%	22%	22%	0%	0%	147
H - 1001 Plus	73%	14%	0%	9%	5%	0%	22
U – Unknown	3%	15%	40%	18%	5%	19%	32,215
Grand Total	3,682	9,758	25,958	22,350	15,501	26,387	103,636

Source: Regeneris Analysis of Marconi Data jointly purchased by ONE NE & ADIT

10.2 Although the region has smaller numbers of large numbers, given their size they can still account for a substantial employment base requiring access to high bandwidth.

Table 10-2: The Inter-relationship between Company Size & Bandwidth Requirements



Source: Regeneris Analysis of Marconi Data jointly purchased by ONE NE & ADIT

11. What are others doing?

11.1 In large part, the connectivity targets for the NE must be relative – relative to the rest of the world; relative to competitor regions, to the region's primary international markets and sources of collaboration.

'It's no good having a fat pipe at one end and a straw at the other'

There is no point in the region tooling up with high capacity broadband if the rest of the world does not. Worse, it would be disastrous if the rest of the world did and the North East does not. The ultimate would be if the North East can find a way of doing so first, acting as a role model and pilot for the rest of the world, and at the same time, benefiting from 'early mover advantage'.

11.2 This is very much South Yorkshire's strategy with SYNET.

Three broad options – global best practice

11.3 In summary, three broad strategies are being followed, in various forms, globally.

- 'Sweating' the incumbent's copper network – exploiting the family of DSL technologies and stimulating competition via local loop unbundling and in some cases, including local access fibre in LLU (e.g. Italy)
- Public sector gap funding of alternative 'low-cost' open access fibre networks serving key employment sites e.g. Scottish Enterprise's Project Atlas, the WDA's Fibre Speed project; or providing a low cost open access ring around a rural sub region e.g. NWDA's Project Access in Cumbria
- Fibre to the street, to the door, to the building – with the aim of providing unlimited connectivity infrastructure. This strategy, dubbed by some as 'Giga City', has been implemented in pilot projects, or across entire cities/ regions. Examples include:

1) **30 Megs – S Yorkshire proposals via ADIT**

2) **100 Megs – Holland:** Part of the Dutch Kenniswijk project – a government initiative to encourage the private and public sectors to start deploying Fibre-to-the-Home (FttH) networks for high-speed broadband – a comprehensive network of cables were laid to provide 15,000 residents (in 8,000 homes) of the municipality of Neunen, near Eindhoven, with super high-speed broadband (up to 100Mbps), telephony and TV services. The business model involves individual households joining a co-operative society which owns and funds the network, so no government funding is required and the once-prohibitive private sector investment risk is eliminated. Results were quite dramatic within a matter of months: from video consultations with family doctors to virtual interactions with bank staff, and from live transmissions of church services for the infirm to the entertainment advantages of ultra-quick movie downloads and high-definition TV.

3) **Gigabit connectivity across California –** Cailfornia has made it an explicit target to provide one gigabit or greater broadband access to every home and business by 2010. This reflects its acknowledgement of broadband as an essential enabler of both productivity and quality of life enhancements. California's universities already have access to the first 10GB Ethernet connection in the United States, allowing students and researchers to transfer data at unprecedented speeds.

12. Conclusions – future public internet access bandwidth needs of SMEs and households

12.1 What can we conclude from this?

- That incumbent's copper network, via DSL technologies, are now delivering far more connectivity to high proportions of the population, than many conceived possible.
- Moreover, it appears as though it will be feasible to deliver next generation broadband, via the copper network to a high proportion (although not all)
- But, this could be to the majority if the copper network is extended by
  - Sub loop unbundling – e.g. installing DSlams/ mini DSlams in the street – as BT is currently experimenting with
  - Wireless technologies such as WiMax – which is just being launched and looks quite promising
- In addition, there are also a growing number of pilots and entire cities/ sub regions that will have fibre to the door in place. Korea and California lead. Will they remain as islands of connectivity or will others follow. Moore's law and a consensus of opinion in the UK says yes.

12.2 Based on the above we conclude that:

- It is reasonably likely that next generation broadband (6-10 Mbps) will become the norm, globally within 3 to 5 years. It is not certain though, but taking the evidence as a whole, it suggests that it is more likely than not (say 70% probability). The implication is that those places that do not have this will be left behind.
- And looking further ahead, it is possible that 30 Mbps+ to the house, to the business, will become increasingly common, say in 5 to 7 years time. Some places have this already. The question is when will enough places have this to create a global critical mass, and, will the NE, or will it be left behind. Alternatively, will it be one of the regions that gets there first, securing 'early mover' advantage.

13. Connectivity Targets for the NE

13.1 Based on the above analysis, the region will need a combination of:

- **Place based targets** – distinguishing between
  - Strategic flagship digital location targets – ***the target will be around achieving world class connectivity and service level specifications*** - primary and secondary specifications
  - And the rest – these will not have a specific place-based target as such. Targets will be those of user groups – see below
- **User based targets**:
  - Leaseline targets[1] – for high end mission critical IT intensive functions and for larger firms/ other organisations requiring corporate leaseline services. ***The target will be around the degree of competition*** e.g. either extent of high capacity competition at the point of delivery in terms of numbers of carriers able to offer fully competitive services – this will achieve significant price reductions over standard BT tariffs and will enable much cheaper resilience (if required) or increased competition over BT network (e.g. via accelerated rollout of more competitive Ethernet-based services
  - Ubiquitous public internet access targets – ***the target will be around capacity available to % of SMEs and households at competitive consumer prices*** e.g. often termed 'next generation broadband' , replacing current 'entry-level' broadband provided over the copper network via DSL technologies.

Timetable

13.2 We suggest the following three target dates:

- Now
- 3 years time
- 5-7 years time

Targets in more detail

13.3 The following table sets out the targets for each user group.

Table 13-1: Digital Connectivity Targets fort the North East	
1) Strategic places	Primary – CBDs, science parks, technology clusters, strategic business parks, employment corridors • Chief metrics = choice of technologies and suppliers enabling competitive

1 Please note that large firms/ sites/ plants will straddle the two groups in that many will need point to point leaseline services but will also increasingly use higher capactity internet access providing IP-based services including IP-VPNs (which to a certain extent will replace the need for lease lines). Hence delivering next generation broadband for small firms and households will to a certain extent, take care of the needs of larger firms connectivity needs (but not where dedicated point to point lease line services are also essential. In such cases, effectivce lease line competition will still be required, to generate the target price reductions of 40-50%

	price and resilience
	• Technology – multi media
	  ○ Fibre, DSL, WiMax MAN, WiFi LAN
	• Targets - ASAP
	  ○ Fibre - BT+ several (or open access fibre)
	  ○ DSL – ADSL 2 & 2+, VDSL, + all new technologies
	  ○ WiMax MAN
	  ○ WiFi LAN
	Secondary – market towns, regeneration areas, other nodes
	• Chief metrics = choice of technologies and suppliers enabling competitive price and resilience
	• Technology – multi media
	  ○ Pilot/ drive ahead sub loop unbundling and WiMax to deliver next generation broadband
	  ○ Pilot wireless LANs and other new technologies
	  ○ Pilot open access fibre network around the town centre/ zone
	• Targets - ASAP
	  ○ Ubiquitous next generation broadband pilots ASAP
	  ○ WiFi LAN - ASAP
	  ○ Open access fibre network – 2-3 years

2) Leaseline users	<u>High-end mission critical IT intensive users</u> • Chief metrics = choice (enabling competitive price and resilience) • Technology – fibre • all will have fibre feed, question is how many to enable choice and hence competition and resilience Targets • increase % with higher spec connectivity ASAP • BT fibre only – not competitive (resilience at double the cost) • BT + one – 10-15% cheaper and degree of resilience • BT+ several (or open access fibre) – 30-40% cheaper + resilient • Open access link to multi-carrier PoP = world class connectivity <u>Large firms and other organisations requiring basic leaseline service</u> Chief metrics = choice (enabling competitive price and resilience) • Technology – fibre • all will have fibre feed, question is how many to enable choice and hence competition and resilience Targets • Now: most BT fibre only – not competitive (resilience at a price) • 1-3 years: say 50% with choice • BT + one – 10-15% cheaper and degree of resilience

	• BT+ several (or open access fibre) – 30-40% cheaper + resilient • 5-10 years: majority with BT+ several (or open access fibre) – 30-40% cheaper + resilient (or in 2-3 years)

3) Ubiquitous public internet access targets	<u>SMEs and Households</u>
	• Chief metric = connectivity (Mbps)
	• Targets
	  ○ Now – 1-3 Mbps
	  ○ Next generation – 6-10 Mbps (1 to 3 years)
	  ○ Step-change – 30+ Mbps (5-10 years – or 2 to 3 years?)
	• Technology
	  ○ Now – ADSL
	  ○ Next generation – ADSL2 and 2+ (+VDSL & WiMax)
	  ○ Step-change – fibre deep in the network (to site, block, street cabinet) then v short copper loops and/or Cat 5/6

Diagrammatic illustration of (2) and (3)

Diagram 1 – Leaseline users

13.4 Diagram 1 sets out targets for leaseline users

13.5 We have assumed two principal transmission technologies – fibre to the site/ building to support a very wide range of bandwidths and services that will be required, supported by WiMax which although still being piloted, could be a feasible high bandwidth technology

13.6 All sites, because they will have at the very minimum one fibre service (commonly BT), can theoretically procure a wide range of bandwidth and services. The issues instead will be degree of choice, competition and hence pricing plus the extent to which physical resilience is enabled

13.7 We have combined these two metrics to form the menu of connectivity packages (shown on the Y axis) and the diagram indicates that

- Now, most sites will be served by BT fibre (even if only to support the phone service)
- Within 3 years, the target is that 85% of sites should benefit from a carrier neutral service (either open access or multi network architecture) enabling full choice, competition and hence competitive pricing
- Within 10 to 15 years, the table suggests that 25% of sites should also have physical resilience

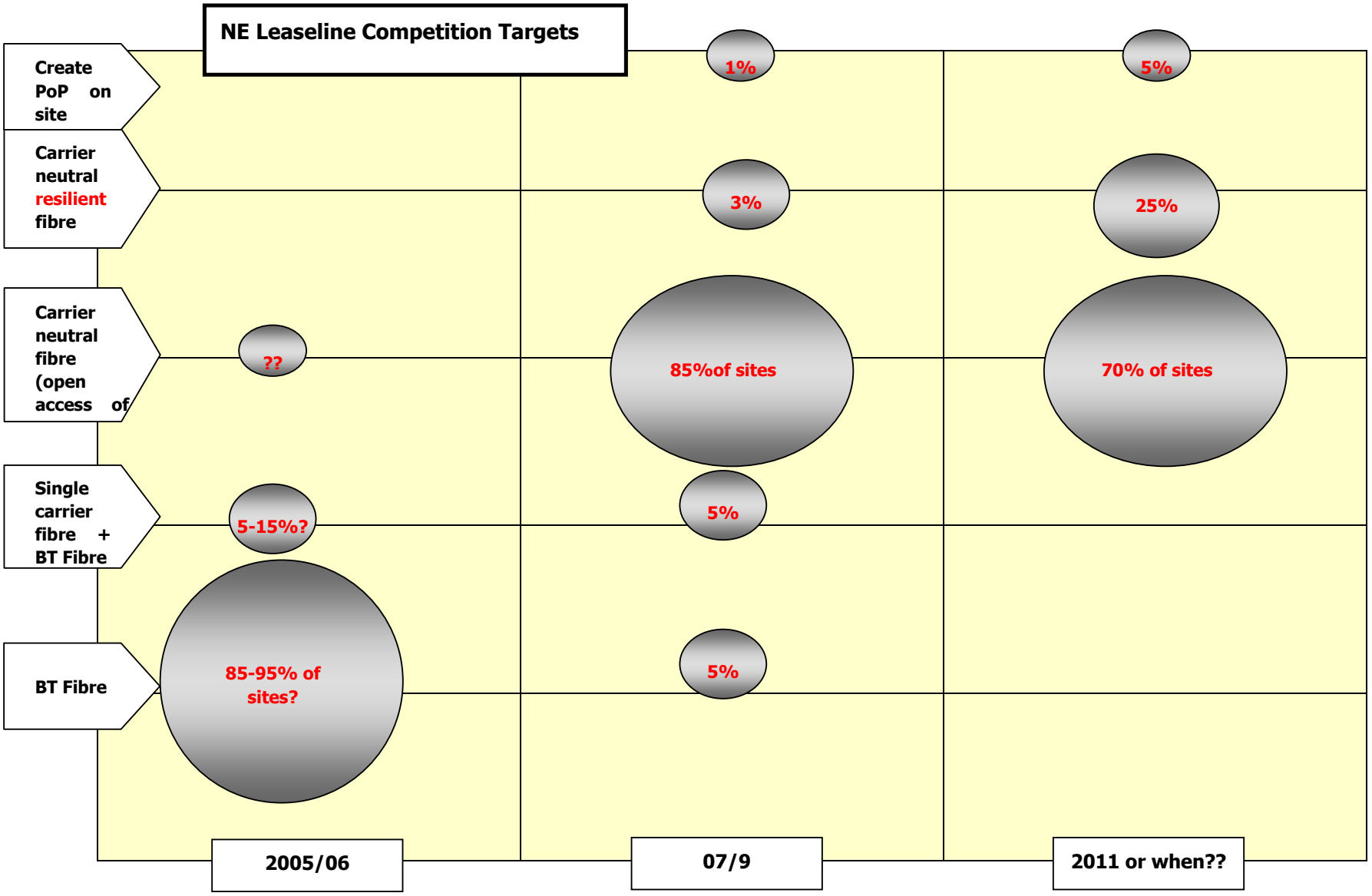
Diagram 2 – targets for 95% of businesses and all households

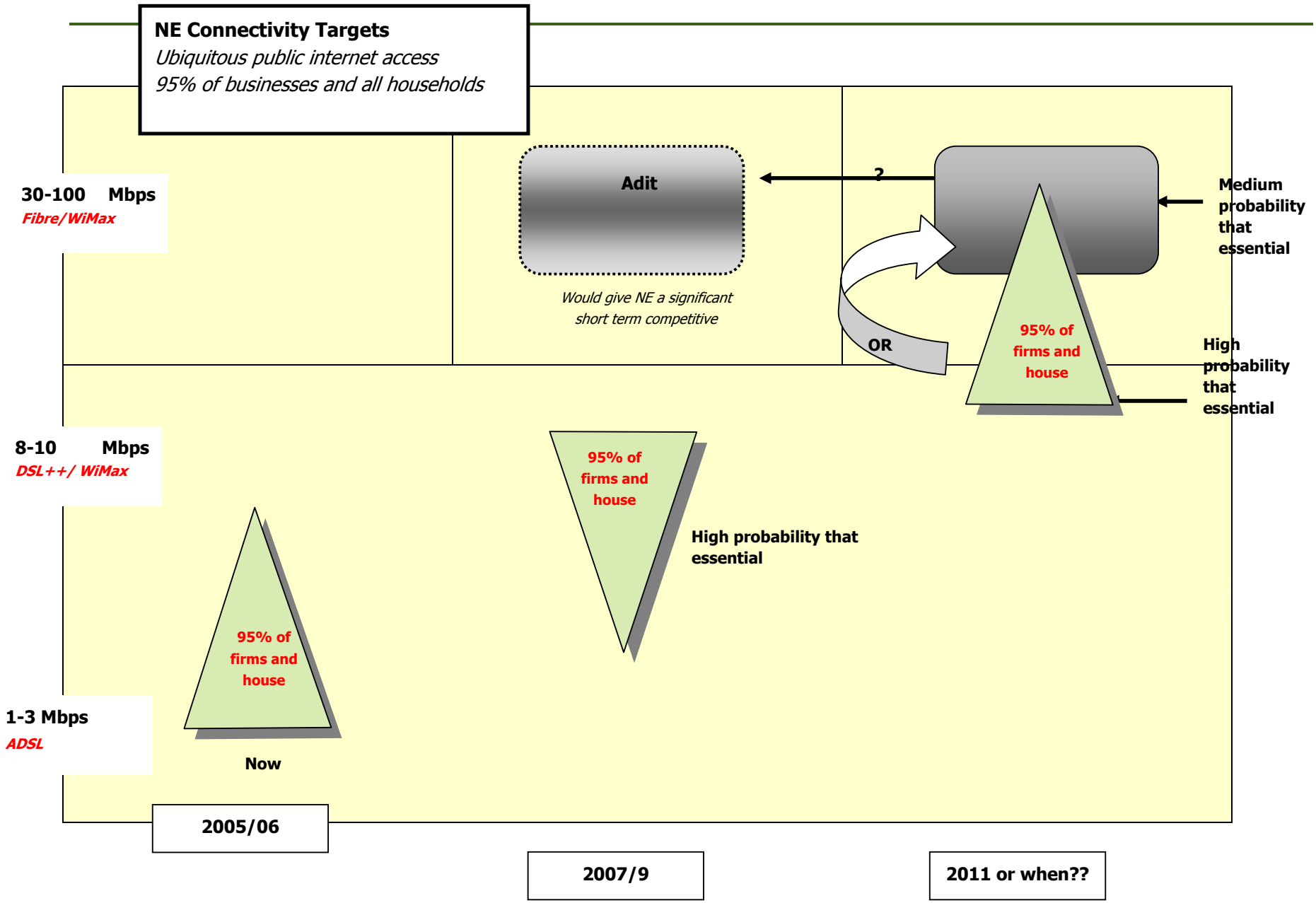
13.8 Diagram 2 sets out targets for the rest of businesses and households – circa 95% of businesses and all households

13.9 These include current and proposed employment and housing development areas; including regeneration areas and rural areas (we have not differentiated for rural versus urban at this stage, assuming that all areas should achieve these targets – using WiMax and other future access technologies feasible in rural areas)

13.10 We have chosen three capacity targets (Mbps):

- **Currently achieved** – 1-3Mbps via ADSL (and cable modem where these services are available). In reality, those more distant from enabled exchanges may not be able to receive 1Mbps – detailed analysis of the data bases will show what % of businesses and households this applies to. The 'triangle' illustrates that a proportion, located close to enabled exchanges, will be able to receive higher bandwidths, up to 8-10 Mbps
- **3 years time** – 8-10 Mbps is the standard to aim for, delivered by DSL++ supported by WiMax. Again the triangle indicates that not all will have access to this level of connectivity, but the triangle has been inverted indicating that 8-10 Mbps will be accessible by the majority, with the minority limited to 1-3 Mbps. More extensive deployment or WiMax of similar future low cost technologies may however enable virtually all to access 8-10 Mbps
- **10 years (or further)** – we have put forward two targets (scenarios)
  - that the majority can still only access 8-10 Mbps but a growing proportion can access much higher capacity services up to 30 Mbps, enabled by steadily increasing deployment of fibre-based services (supported by WiMax) to more and more 'ordinary' business locations and neighbourhoods
  - the alternative scenario is that, in line with a growing number of other regions, much higher capacities will be ubiquitous (30-100 Mbps) essentially enabled by the wide scale rollout of open access fibre network to sites, premises and street cabinets, supported by WiMax. At present, this seems only feasible via a major public sector intervention, such as that proposed for South Yorkshire by ADIT
- **3 years time** – ADIT could potentially deliver this much earlier – within 3 years perhaps (the dotted box in the diagramme). If achieved, this would put the region well ahead of the game, giving it potentially significant competitive advantage in the short (and possibly medium) term.


NE Leaseline Competition Targets
Create PoP on site
Carrier neutral resilient fibre
Carrier neutral fibre (open access of
Single carrier fibre + BT Fibre
BT Fibre
1%
5%
3%
25%
??
85%of sites
70% of sites
5-15%?
5%
85-95% of sites?
5%
2005/06
07/9
2011 or when??


NE Connectivity Targets
Ubiquitous public internet access
95% of businesses and all households
30-100 Mbps
Fibre/WiMax
Adit
?
Medium probability that essential
Would give NE a significant short term competitive
OR
95% of firms and house
High probability that essential
8-10 Mbps
DSL++/ WiMax
95% of firms and house
High probability that essential
95% of firms and house
1-3 Mbps
ADSL
Now
2005/06
2007/9
2011 or when??

Appendix A PIA Demand Assessment Methodologies

Method 1: Projecting past trends in the NE

1. This involves projecting past trends (procurement of broadband and its utilisation) forward along the trend line. We have attempted to do this with the trend data available, for two groups – businesses and households. We have also looked at particular sub-sets within each, for example distinguishing between firm size and sector; and regarding households, distinguishing between urban/ rural location and by sub region.

2. The concern regarding this approach is that the availability of broadband is very recent and there is clear evidence that demand is significantly supply-led, certain at this stage in the development of the service

Method 2: Future targets –'what Government says'

13.11 This is a very different approach, leaving behind what may have happened in the past in the region and looking to Government's views on future connectivity demand. We have reviewed the key policy documents, at UK Government level, but also OECD/EU where relevant, to identify comment or statements about likely future connectivity needs, targets or aspirations.

Method 3: Future demand - technology drivers

3. This method also leaves behind past trends and assumes that future demand will be technology driven. By this we mean it will be driven by a combination of increasing available connectivity capacity coupled with growth in connectivity-hungry content, applications and services.

4. The thinking behind this draws on Boyles Law (***SH/MP insert ref please),

5. The rationale behind this method also draws heavily on very recent experience, in the UK but from all countries in which broadband has been made broadly ubiquitously available

   - Only two years ago, so called demand for connectivity was very limited (based on dial-up) and the applications and services available were designed to run over dial-up
   - after a slow build up, two years later we reached a watershed in that a sufficient critical mass of businesses and households had signed up to entry level ADSL services, initially offering 0.5 Mbps, but soon offering 1-2 Mbps and more recently 3,4,5,6,-8 Mbps for some.
   - Close behind this, we have seen a proliferation of applications and services that utilise the connectivity and very quickly we seem to have reaching another 'capacity blockage' point with some applications and services and a growing range of content being 'too big to send'

6. In essence this represents a connectivity pull, content push iterative upward spiral, which slows when the level of connectivity available become insufficient – suggesting that the next great leap in connectivity take-up will occur in response to supply

Method 4: Future demand – technology step change

7. This approach considers the likelihood of a completely new type of ICT activity or activities, in households and within business, that require and drive demand for much higher connectivity. The most commonly cited examples are high definition TV, video on demand and video conferencing. Close behind would be on-line gaming a visual qualities recently offered by the Xbox 360 (which is HDTV standard).

Method 5: Future demand - keeping pace with global-leaders

8. An alternative approach is based on global competitiveness and maintaining a level playing field, or securing competitive advantage against competitor regions. In this approach we look to and seek to emulate other 'leading regions'. If Holland provides 30 Mbps to the kerb, we do to; if S Korea builds in infrastructure providing 100 Mbps+ to new development, we must too; if California provides gigabit connectivity, then we must follow.

Method 6: Future demand – composite 'step-change' scenarios

9. This final method seeks to draw all of the above together in order to provide the most likely, most realistic, most feasible, most sensible projections that reflect past take up on the ground, that take account of the region's sector growth targets, that are cognisant of the technology push factor and are sensitive to what competitor regions are doing.

10. It is important that we build in a reality check at this stage, to avoid simply being carried away by the 'me-too' approach or the geeks belief that we will all have fibre and massive connectivity

Bandwidth demand by business – further details

Bandwidth demand by all businesses

11. Table 13-2 shows current business bandwidth usage and how users of broadband expect their bandwidth requirements to grow in the next 18 months (to May 2007). The largest business user group is currently in the Narrow band category, followed by the *512 kbps up to 2 mbps* which together account for nearly half of all businesses in the North East. The vast majority of business do not expect to step up their requirements significantly (i.e. those cells coloured red). Just over one quarter of business expect their needs to grow 27,191 out of the 103,636 by May 2007, over half of this group is businesses moving up from Narrowband to first rung broad band *256 kbps up to 512 kbps.*

Table 13-2: Number of Business By Current & Future Needs

		Future Bandwidth Requirements						
		A >=10 mbps	B >= 2 mbps up to 10 mbps	C >= 512 kbps up to 2 mbps	D >= 256 kbps up to 512 kbps	E Narrow-band	F Nil Requirement	Total
Current Bandwidth	A >=10 mbps	2,584						2,584
	B >= 2 mbps up to 10 mbps	1,098	6,675					7,773
	C >= 512 kbps up to 2 mbps		3,083	17,283				20,366
	D >= 256 kbps up to 512 kbps			5,741	9,246			14,987
	E Narrowband			2,934	13,104	14,270		30,308
	F Nil Requirement					1,231	26,387	27,618
	Total	3,682	9,758	25,958	22,350	15,501	26,387	103,636

Falling B-width Needs

Rising B-width Needs

neris Consulting/ Adroit Economics analysis of ADIT/Marconi data

Bandwidth demand by company/ plant size (employees)

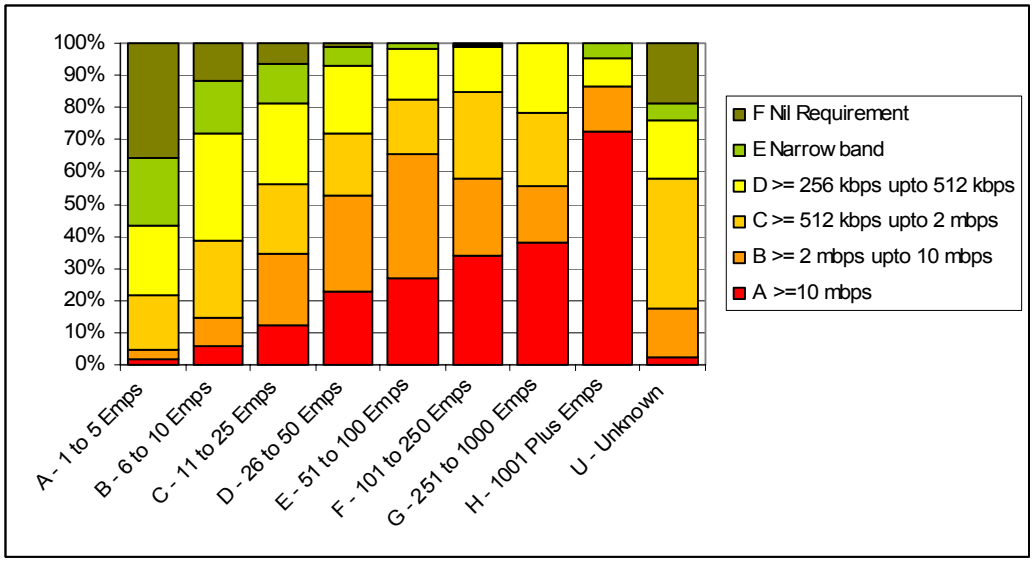
Table 13-3: The Inter-relationship between Company Size & Bandwidth Requirements

12. and Figure 13-1 : together show the inter-relationship between company size and bandwidth requirements. Fr those businesses with a know employee size base, the need for bandwidth goes up with employee numbers: bigger companies require bigger bandwidth.

Table 13-3: The Inter-relationship between Company Size & Bandwidth Requirements							
No Businesses	**Immediate Future Bandwidth Requirements**						
Employee Size Band	**A >=10 mbps**	**B >= 2 mbps up to 10 mbps**	**C >= 512 kbps up to 2 mbps**	**D >= 256 kbps up to 512 kbps**	**E Narrow band**	**F Nil Requirement**	**Grand Total**
A - 1 to 5	2%	3%	17%	22%	22%	35%	53,510
B - 6 to 10	6%	9%	24%	33%	16%	12%	8,530
C - 11 to 25	12%	22%	22%	26%	12%	7%	6,059
D - 26 to 50	23%	30%	19%	21%	6%	1%	2,435
E - 51 to 100	27%	39%	17%	15%	2%	0%	504
F - 101 to 250	34%	24%	27%	14%	0%	0%	214
G – 251 to 1000	38%	18%	22%	22%	0%	0%	147
H – 1001 Plus	73%	14%	0%	9%	5%	0%	22
U – Unknown	3%	15%	40%	18%	5%	19%	32,215
Grand Total	3,682	9,758	25,958	22,350	15,501	26,387	103,636
Source: Regeneris Consulting/ Adroit Economics analysis of ADIT/Marconi data							

13. Although the region has smaller numbers of large numbers, given their size they can still account for a substantial employment base requiring access to high bandwidth.

Figure 13-1 : The Inter-relationship between Company Size & Bandwidth Requirements



Source: Regeneris Consulting/ Adroit Economics analysis of ADIT/Marconi data

Appendix B Connectivity Targets for the NE – Further Detail

Vision

14. The most meaningfully vision is a relative one, against 'the competition.

15. In short there are two choices:

- Either settle for keeping up with competitor regions
- Or seek to achieve a move faster, securing a temporary competitive advantage

16. Our discussion with the PSG suggest the former is a given and the latter is the ambition

Timetable

17. We propose three dates:

- Now (or ASAP)
- 1-3 years
- 5-10 years

Scope of each target

18. Below, we put forward connectivity targets for each of the above time periods in the following terms:

- Chief metric – just capacity or price/ quality of service
- Primary technology – fibre, DSL and others
- For each date, target metrics for given % of population

Proposed Connectivity Targets – NE

'High-end' mission-critical users

- Chief metrics = choice (enabling competitive price and resilience)
- Technology – fibre
  - All will have fibre feed, question is how many to enable choice and hence competition and resilience
- Targets
  - Increase % with higher spec connectivity ASAP
  - BT fibre only – not competitive (resilience at double the cost)
  - BT + one – 10-15% cheaper and degree of resilience
  - BT+ several (or open access fibre) – 30-40% cheaper + resilient
  - Open access link to multi-carrier PoP = world class connectivity

Large firms, sites, plants employing 100 or more (including public services)

- Chief metrics = choice (enabling competitive price and resilience)
- Technology – fibre

- All will have fibre feed, question is how many to enable choice and hence competition and resilience

- Targets
  - Now: most BT fibre only – not competitive (resilience at a price)
  - 1-3 years: say 50% with choice
  - BT + one – 10-15% cheaper and degree of resilience
  - BT+ several (or open access fibre) – 30-40% cheaper + resilient
  - 5-10 years: majority with BT+ several (or open access fibre) – 30-40% cheaper + resilient (or in 2-3 years)

Strategic places (CBD, technology clusters, science parks, business parks, strategic employment sites, corridors and zones)

- Chief metrics = choice of technologies and suppliers enabling competitive price and resilience
- Technology – multi media
  - Fibre, DSL, WiMax MAN, WiFi LAN
- Targets - ASAP
  - Fibre - BT+ several (or open access fibre)
  - DSL – ADSL 2 & 2+, VDSL, + all new technologies
  - WiMax MAN
  - WiFi LAN

All other businesses and all households

- Chief metric = connectivity (Mbps)
- Targets
  - Now – 1-3 Mbps
  - Next generation – 6-10 Mbps (1 to 3 years)
  - Step-change – 30+ Mbps (5-10 years – or 2 to 3 years?)
- Technology
  - Now – ADSL
  - Next generation – ADSL2 and 2+ (+VDSL & WiMax)
  - Step-change – fibre deep in the network (to site, block, street cabinet) then v short copper loops and/or Cat 5/6

	Chief metrics	Technology	Targets		
			Now (ASAP)	1-3 yrs	5-10 yrs
'High-end' mission-critical users	*choice (enabling competitive price and resilience)*	Fibre • All will have fibre feed, question is how many to enable choice and hence competition and resilience	• Increase % with higher spec connectivity ASAP • BT fibre only – not competitive (resilience at double the cost) • BT + one – 10-15% cheaper and degree of resilience • BT+ several (or open access fibre) – 30-40% cheaper + resilient • Open access link to multi-carrier PoP = world class connectivity		
Large firms, sites, plants employing 100 or more (including public services)	*choice (enabling competitive price and resilience)*	Fibre • all will have fibre feed, question is how many to enable choice and hence competition and resilience	• Now: most BT fibre only – not competitive (resilience at a price) •	• 1-3 years: say 50% with choice • BT + one – 10-15% cheaper and degree of resilience • BT+ several (or open access fibre) – 30-40% cheaper + resilient •	• 5-10 years: majority with BT+ several (or open access fibre) – 30-40% cheaper + resilient (or in 2-3 years) •
Strategic places (CBD, technology clusters, science	*choice of technologies and suppliers enabling competitive*	Multi media • Fibre, DSL, WiMax MAN, WiFi LAN	• ASAP - Fibre - BT+ several (or open access fibre) • DSL – ADSL 2 & 2+, VDSL, + all new technologies		

parks, business parks, strategic employment sites, corridors and zones)	*price and resilience*		• WiMax MAN • WiFi LAN		
All other businesses and all households	connectivity (Mbps)	• Now – ADSL • Next generation – ADSL2 and 2+ (+VDSL & WiMax) • Step-change – fibre deep in the network (to site, block, street cabinet) then v short copper loops and/or Cat 5/6	• 1-3 Mbps	• 6-10 Mbps (1 to 3 years)	• 30+ Mbps (5-10 years – or 2 to 3 years?)

Appendix C Strategic Places – detailed specifications

Two specifications

19. We put forward to specifications

- Primary – e.g. flagship sites, such as the office core and science park
- Secondary – e.g. other strategic employment sites; complexes and other key nodes

20. The following table sets out the basic minimum connectivity requirements/ specifications for each of these differentiating in terms of time between (a) now and the near future e.g. next two to three years, and (b) longer term e.g. 3 years plus. You will note therefore that the longer term column, in effect, also sets aspirational 'minimum' targets. These could certainly be varied in terms of time, say by changing the definition of what we mean by 'longer term' from 3 years down to 2 years

21. The technical specifications are presented in semi technical, but broadly lay terms and do not provide sufficient basis for formal technical specification. The specifications are instead intended as an 'in-principle' guide to the level of service and required supporting specification.

22. The technical specifications are based on current 'known' feasible technologies. It is possible, given the rate of technology change in the telecoms arena that by the time we reach the longer term (e.g. 3 years time), alternative connectivity technologies may be available. Notwithstanding this, the common view is that ground-based fibre will remain the 'bed-rock', the ideal and the benchmark form of high capacity connectivity access infrastructure. Given this, the aspiration in every case is to ensure 'fibre to the door' or if not, to the nearest feasible local distribution point

23. The final column of the table lists the benefits provided by each level of connectivity, specified in the longer term column. These comments relate to the standard performance/ service level criteria we have established

- Connection enabling high capacity service and high quality (e.g. low latency and other standard performance spec features in the SLA)
- Choice enabling competitive pricing – ideally through separate alternative physical links or via competition over one link, enabled via telecoms market regulations
- Physical resilience – e.g. physically separate backup
- Commercial resilience – e.g. instant alternative routing if the primary route suffers quality or other problems due to the poor performance/ financial difficulties of the primary supplier

Outline connectivity specifications for both primary and secondary strategic flagship sites

Table 13-4: Strategic Flagship Digital Locations – Connectivity Specifications for both Primary and Secondary strategic Flagship Sites

Types of location	Current/short term (to 3yrs) (entry-level broadband)	Longer term (3 yrs+) (higher capacity broadband)	What this provides
Primary sites (e.g. science park)	Fibre to the door BT eLocation + hopefully one additional physically	Core connectivity Fibre to the door 2 independent services + BT	choice enabling competitive pricing (wholesale or retail)

	independent service Feeding MMR, feeding neutral distribution ring around site	from two physically separate PoPs two physically separate entrance points to site feeding MMR, enabling interconnection distribution around the site via neutral resilient ring/loop Back-up/alternatives high capacity point to point wireless service, feeding MMR similar distribution via neutral loop also distribution via point to multi point (MMR direct to end users) Common areas wirelssLAN	high capacity high quality full physical resilience full commercial resilience coverage of common areas
Secondary ategic sites, complexes, clusters and other key nodes	ADSL or cable modem Wireless or satellite (nearest equivalent) for areas beyond ADSL or cable modem service areas??	Core connectivity Fibre to the door 1 fibre service (BT or another) high capacity wireless alternative feeding MMR/cabinet/local distribution point distribution around the site either via ground based (fibre or VDSL) or wireless (point to multi point) Back-up/alternatives services generally available in the area (see last row) Common areas wirelssLAN	high capacity service degree of competition wireless alternative increases competitive choice and provides intermediate physical resilience intermediate commercial resilience coverage of common areas

24. How the above physical links are procured is another question. The above table, on its own, is only part of the story. Simply listing required specifications is not enough. The issue of procurement and the alternative procurement options are vital to consider. We consider this further on.

Primary Strategic Digital Flagship Sites - Connectivity Specification in more detail

25. The 'ideal minimum specification' for a flagship site is:

Table 13-5: Primary Strategy Digital Flagship Sites Minimum Specification

Feature	Specification
Bandwidth	100 Megabits per second available to each occupier. Capacity to scale up to 622 Megabits per second.
Resilience	Physical resilience – BT plus a minimum of three other carriers offering physically separate links back to the core network. Commercial resilience – BT plus a minimum of three other commercially separate carriers.
Quality of Service	Availability Ability to provide up to 100% availability, if required. Latency Ability to provide industry standard latency levels. These are approximately a round-trip latency of 60 ms within a country, 85 ms between Western European countries and 120 ms between Western Europe and the United States. Flexible bandwidth – scope to order very high bandwidth for short 'definable' periods (termed as spikes within the industry).
Certainty	Minimum of ducting to the site and resilient on-site ducting.
Price	Ability to achieve 40-50% cost savings in comparison with BT's standard tariffs. Enabled by the ability to choose between four different telecommunications companies.

Strategic site specification in more detail

26. The ideal specification for a 'secondary strategic flagship digital location ' is:

Table 13-6: Secondary Strategy Digital Flagship Sites Minimum Specification	
Feature	**Specification**
Bandwidth	20-30 Megabits per second available to each occupier. Capacity to scale up to 155 Megabits per second.
Resilience	Physical resilience – BT plus a minimum of two other carriers offering physically separate links back to the core network. Commercial resilience – BT plus a minimum of two other commercially separate carriers.
Quality of Service	Availability Ability to provide up to 99.9% availability, if required. Latency Ability to provide industry standard latency levels. These are approximately a round-trip latency of 60 ms within a country, 85 ms between Western European countries and 120 ms between Western Europe and the United States.
Certainty	Minimum of ducting to the site and resilient on-site ducting.
Price	Ability to achieve 40-50% cost savings in comparison with BT's standard tariffs. Enabled by the ability to choose between three different telecommunications companies.