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Not rich enough in fibre

Fibre-to-the-home (FTTH) is expected to be a crucial part of meeting the European Commission's ambitious Digital Agenda targets in relation to ultra-fast broadband – but roll-out so far has been slow. What is holding back the significant investment required to turn the Commission's vision into reality? This article looks at some of the reasons why the business case for FTTH is challenging, even if the public policy case for the deployment of such networks is strong.

Perhaps the most ambitious of the European Commission's Digital Agenda (DA) targets is that by 2020 more than 50% of the population should be using ultra-fast broadband (defined as connections with a bandwidth of 100Mbps or more).¹ This implies that such services must be available to a much larger proportion of the population. Even though existing copper networks may be upgraded to achieve substantially higher download speeds than are available at present, it is far from clear if such networks can deliver the required speeds reliably, consistently and in commercial deployments, or provide comparable upload speeds. The performance of such networks tends to diminish rapidly with distance from the exchange, and it depends crucially on the quality of the actual physical copper assets. FTTH networks, by contrast, are far more capable of fulfilling the ambitious ultra-fast broadband target on a sufficiently large scale, offering both a more reliable and consistent service quality and more symmetrical speeds for up- and download.

However, FTTH coverage in Europe is currently low, and is expected to reach only slightly more than 10% of households by 2016 given current roll-out rates.² With the EU only starting on its way to achieving its target for the use of ultra-fast broadband by 2020,³ the question of what is holding back the significant investments that are in all likelihood needed to meet the DA targets⁴ is pertinent.

Certain uncertainty

Even if the policy case for the roll-out of FTTH networks is strong, the business case is challenging. The investments required to replace the existing copper access infrastructure are huge, and most of the costs incurred in laying fibre to the home are sunk (i.e. they cannot be recovered by undoing the investment). Furthermore, returns are highly uncertain. The combination of sunk costs and highly uncertain demand (both in terms of take up and willingness to pay for ultra-fast broadband services) makes these investments very risky. Investors thus have strong incentives to wait and see if demand develops, rather than invest now. Add to this the prospect of having returns constrained by regulation, and it is obvious why so far there has been no rush to push fibre into the local loop – in particular where a less costly and less risky alternative has been available in the form of gradually upgrading copper networks.

Regulators are of course aware of these concerns, and have considered what they might do to promote the roll-out of next generation access networks. The European Commission has adopted recommendations⁵ on how national regulators should deal with the fact that such networks require substantial investments, allowing inter alia the inclusion of risk premiums in any access charges for next generation networks that regulators might set. It has carried out consultations on how the costs of such networks should be measured for the purpose of establishing cost-based

¹ This is in addition to targets that require basic broadband to be available to all EU citizens by 2013, and that by 2020 services providing speeds of 30Mbps or higher should be available to all.

² Heavy Reading, "FTTH in Europe: Forecast & Prognosis, 2011-2016", White Paper prepared for the FTTH Council.

³ See the European Commission's, Digital Agenda Scoreboard Commission Staff Working Paper SWD(2012)180, 18 June 2012.

⁴ The European Investment Bank (EIB) estimates that meeting the DA broadband targets would require investment of between €143 billion and €221 billion (depending on whether prescribed target speeds are actual and symmetric access speeds or 'up to' and asymmetric).

⁵ Commission Recommendation of 20 September 2010 on regulated access to Next Generation Access Networks (NGA) (2010/572/EU).

charges,⁶ and industry bodies have commissioned research that looks at the appropriate policies for setting charges for copper-based and fibre-based access products.⁷ Even though there is no strong consensus on what regulators ought to do, the common message is that regulatory policy needs to ensure that appropriate returns are available to investors. This message is echoed in the recent statement by European Commission Vice President Neelie Kroes (the Commissioner in charge of the Digital Agenda) pointing out that “[r]egulatory policy should be an enabler not an obstacle (for investment in NGA networks)” and that in considering appropriate regulatory policy it is important to ensure that market players “[c]an invest profitably in the future connectivity of Europe, and compete on the basis of their investment”⁸.

However, looking only at regulated access charges and their impact on investment incentives misses the fact that such charges are ceilings, not floors: whether a high fibre access charge is effective in providing an appropriate return ultimately depends on what prices for fibre access are sustainable in the retail market where fibre-based access competes with legacy copper, cable networks and increasingly mobile broadband services.

Whether copper and fibre-based access are close substitutes at the retail level is an empirical matter. What seems to be clear is that from the end user’s perspective technology as such does not matter, and that therefore substitutability depends primarily on whether the connection supports the provision of specific services. Consumers may only pay a premium for fibre if it provides access to services that consumers value highly and that would not be available over copper-based networks (or would be available at a much reduced quality). Without this differentiation, the willingness to pay for fibre-based access is limited by the price of copper-based access. This in turn means that allowing higher regulated access charges for fibre than for copper-based access would not translate into a higher return for fibre investment, and that at similar regulated returns, upgrading copper networks looks to be distinctly more attractive for investors.

The undervalued benefits of fibre

At present, there is some evidence to suggest that consumers are willing to pay more for higher bandwidths when upgrading from basic to fast broadband, though not necessarily upgrading to ultra-fast broadband, and thus it is unclear whether there is a significant fibre premium.⁹

If customers are not prepared to pay a sufficient premium for fibre-based access products, this may be evidence that there is no economic case for the widespread deployment of FTTH

6 European Commission, Questionnaire on Costing Methodologies For Key Wholesale Access Prices in Electronic Communications, 3 October 2011.

7 See WIK-Consult, “Wholesale pricing, NGA take-up and competition”, prepared for ECTA, 7 April 2011; Plum Consulting, “Copper pricing and the fibre transition – escaping a cul-de-sac”, prepared for ETNO, December 2011; and Charles River Associates (CRA), “Costing methodologies and the incentives to invest in fibre”, prepared for DG Information Society and Media, July 2012.

8 European Commission Memo, 12 July 2012, Enhancing the broadband investment environment – policy statement by Vice President Kroes.

9 Rosston et al found from survey data that the representative US household has a high marginal willingness to pay (WTP) for a high speed internet service, but a low marginal WTP for a very high speed service (see Gregory L. Rosston, Scott J. Savage, and Donald M. Waldman (2010) “Household Demand for Broadband Internet in 2010”, The B.E. Journal of Economic Analysis & Policy: Vol. 10: Issue 1 (Advances), Article 79). On the other hand, Ofcom’s latest Communications Market Report (July 2012) finds that a sample of providers charge £5 to £10 a month more for faster broadband services (headline download speeds of 30-40Mbps provided via FTTC or cable) as compared to basic DSL-based broadband services. A study of 13 FTTH/B providers around the world prepared for the FTTH Council Europe by Diffraction Analysis suggests that FTTH Average Revenue Per User (ARPU) enjoyed by these players is almost 50% higher than average DSL ARPU.

Try before you buy

In the small village of Nuenen in the Netherlands, as part of an experiment subsidised by the government, residents were asked to sign up to a free FTTH service for a trial period. Most of the 8000 households took up the offer in 2004 (representing around 96% take up). Once the free trial period was over at the end of 2005, these services were charged at between €60 and €75 per month, much more expensive than basic DSL and ADSL services available, which were at the time being offered at prices of around €19.95–€29.95 per month. However, despite the significantly higher charges, 80% of Nuenen residents retained their FTTH connection.

Based on “Broadband: Towards Understanding Users” by Trevor Barr, “European telecoms - CityNet Amsterdam: Fibre-to-the-home is becoming a reality”, report by ING

networks, that pursuing the DA targets would be wasteful and inefficient, and that it would be better to dismiss them as lofty ambition.

However, there are many reasons why the limited willingness to pay for higher speeds and more consistent service quality that we observe at present may not be a true reflection of the benefits of fibre relative to legacy copper.

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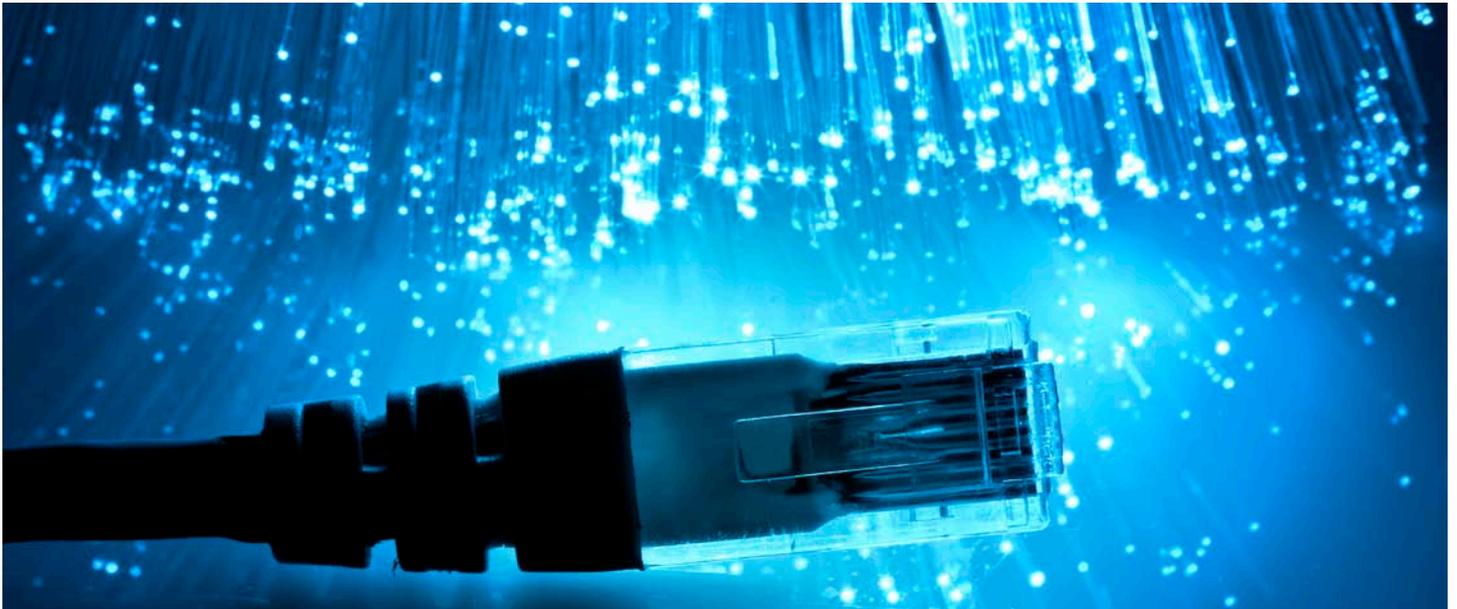
Consumer valuations may be artificially depressed or distorted for various reasons. For example, end users may not be sufficiently well informed about the difference in service quality that they should be able to expect from fibre networks and may over-estimate the quality of service they get from copper networks (even if fibre is run to the cabinet).

Objective performance metrics for access products may not always be available, and there is some evidence to indicate that the ‘up-to’ access speeds on which competition seems to be focused is rarely available to end-users, often without end users being clearly able to establish that they are not receiving what they think they are.¹⁰

This would mean that the large difference between the theoretically possible maximum download speed supported by a xDSL connection and the speeds that are actually experienced in commercial deployments have little impact on the valuation of the service, and that the fact that FTTH would do better in terms of delivering the technically possible bandwidth is not translated into higher customer valuation. The experience from pilot projects suggest that experiencing the service quality available from fibre changes consumer’s perception and increases their willingness to pay (see box above).

Perhaps more importantly, current willingness to pay may be limited because services that would make full use of the higher bandwidth of FTTH are not at present available. This of course creates a chicken-and-egg problem: roll-out and take-up of FTTH is limited because the services that would make full use of the network capability are not available, and such services are slow in coming because the potential target market is limited by the limited infrastructure roll-out. The

10 Ofcom found that “DSL based connections continued to deliver average download speeds that were much lower than the headline ‘up to’ speeds which are frequently used to advertise broadband services. ‘Up to’ 8Mbit/s and ‘up to’ 20/24Mbit/s ADSL connections delivered just 41% and 31% of headline speeds during the period, in line with results from previous research while cable and FTTC-based services on average delivered between 90% and 103% of headline speeds.” See Ofcom, “UK fixed-line broadband performance November 2011” Published 2 February 2012.



mutual dependency of service development and infrastructure deployment and take-up creates the need for co-ordination between network operators and service providers. Achieving effective co-ordination may require that different business models be explored – e.g. service providers contributing towards the cost of infrastructure deployment in exchange for some exclusive or preferential access to the customers who then get connected.

A helping hand

The limited fibre premium that customers are willing to pay is one of the main reasons that makes the business case for widespread FTTH roll-out challenging. Addressing the causes of the current low willingness to pay for fibre and facilitating the co-ordination between service and network development would seem to be an important contributor towards the promotion of FTTH networks, and would in any case be desirable in order to avoid distortions in the market. Therefore, any measures that address the reasons why the full value of fibre access might not be reflected in customer willingness to pay should be pursued.

These may include requirements (rather than voluntary codes) for clearer advertising of broadband services that help customers to understand the benefits of fibre, or 'try before you buy' schemes that let users experience these benefits before they decide whether paying for greater bandwidth is in their interest.

Further, given that high-bandwidth content and services will likely be the main factor driving take-up of fibre, the full value of FTTH networks may not be realised unless service providers and network operators can co-ordinate effectively. Overcoming problems that hold back the development of high-bandwidth services could potentially be very effective in driving demand for ultra-fast broadband. Exploring how providers who benefit from better connectivity may contribute towards network infrastructure investment costs thus improving the business case for investment might be a step in the right direction.

Policy makers should of course be aware that such agreements may create their own challenges and may require some concessions, for example in relation to net-neutrality (see

next article) a service provider who has contributed towards the cost of investment in FTTH network infrastructure would presumably need to be given preferential access to customers, which might mean some discrimination in relation to the traffic carried on the connections.

Such discriminatory arrangements may indeed be undesirable if considered in relation to network infrastructure that is already in place, but where new networks need to be laid, dynamic efficiency considerations come into play. Commissioner Kroes seems to be aware of this when she states that "[i]f operators can reach a commercial agreement with content and service providers, that's up to them, I'm not going to stand in their way. Different business models can then compete."¹¹

In principle, there should be nothing wrong with such agreements as long as any restrictions that the end-user will face as a result are transparent and made clear in advance. This would be consistent with policies that are aimed at providing investment incentives rather than focusing strongly on promoting retail competition on the basis of existing infrastructure, which could discourage the rollout of ultra-fast networks on a sufficient scale to meet the DA targets.

Michael Weekes is a Consultant at DotEcon.

This article is based on a report prepared by DotEcon for the Fibre to the Home Council Europe. The full report can be downloaded from the Council's web site.

11 Commissioner Kroes made this statement at a summit of industry chief executives in Brussels, as reported in the Financial Times. (see 'Croes tries to show her fibre over telecom lines', 2 October 2011).

Between a rock and a hard place: net neutrality and network management

Net neutrality is a clear concept in theory: in an open Internet, all users should be able to access all content without discrimination, and all content providers should be able to reach users in the same way. But how this translates into practice is less clear. This article looks at the issue of net neutrality and considers what a 'neutral' Internet might look like in the face of increasing demands on Internet service providers to manage the rapidly growing amount of traffic on their networks.

Demand for bandwidth is growing rapidly. More users come on-line, and they access more bandwidth-hungry services from a greater range of devices, creating unprecedented increases in data traffic.¹² This growing demand may only partially be met by traditional methods for increasing capacity (such as traffic offloading; more efficient technologies; use of more radio spectrum and fibre). This means that the issue of 'managing' Internet traffic in some way is already unavoidable for most ISPs. There are many options for doing so, from blocking capacity-hungry sites to slowing down all traffic at peak times to guaranteeing quality of service for specific sites with 'hangover' capacity for carrying all other traffic. Some of these affect all users in the same way, whilst others favour some traffic. What measures are permitted depends on how the relevant authorities decide to define the concept of net neutrality in the context of managed networks.

Why worry?

Whilst the concept of equal treatment of all traffic has some intuitive appeal, economics suggests some caution: allocating scarce resources on a first-come-first-served basis creates inefficiency and welfare losses, and giving priority to the demand from those users and service providers with the highest willingness to pay could generate substantial benefits for all. Internet service providers (ISPs) competing with each other should have good incentives to cater for the needs of different user types, offering a range of products that match the requirements of users in terms of usage intensity, guaranteed speeds, levels of access, etc.

If an ISP decided to block access to particular sites, for example, it would have to consider the impact that this would have on demand for its services, and the price it might be able to charge, given that alternative suppliers are available. Provided that customers are sufficiently well informed about the specific characteristics, they could then pick the service proposition that best suits their needs, trading off limited bandwidth

or blocked access to particular sites at particular times for a lower price, for example. To some extent, this is happening, with different usage limits being set for different broadband packages.

However, competition may not be fully effective, and there could be a number of problems that may need to be addressed through intervention.

For example, customers may not be particularly well informed about the characteristics of the services on offer, and competition may focus on particular headline parameters that are not necessarily the most important ones. For example, there is ample evidence that the 'up-to' download speeds that currently seem to feature prominently in the advertising of residential broadband packages often say little about the service that is actually available to customers, and that customers are largely unaware of these differences.



There may also be market power issues upstream in the provision of content. Some content

providers of 'must-have' content may be perceived by ISPs as 'too big to block', regardless of the bandwidth they require. Smaller content providers – and those wishing to access their services – might suffer disproportionately if there were no rules governing the behaviour of ISPs under the banner of traffic management.

Last but not least, ISPs may have invested in their own service offerings that compete with services provided by independent third parties. They might be tempted to use strategies that ostensibly are intended to manage traffic on their networks in order to favour their own services at the expense of third parties.

For all of these reasons some fundamental principles may be needed with which traffic management strategies need to comply.

Some national authorities have been more prepared than others to impose rules in relation to net neutrality (see box below) and the specifics of how the balance between providing unrestricted access to the Internet, managing existing capacity efficiently and creating the right investment incentives for new capacity will be struck are emerging only very slowly. Nevertheless, it is possible to identify a few basic principles with which net neutrality rules should comply.

Be clear

First, there needs to be more clarity and transparency about the services that consumers are receiving from their ISPs. One of the main concerns with traffic management strategies is

¹² For example, after only a year in the market, the users of the seemingly ubiquitous iPhone 4 became the most data-hungry users of all smartphone manufacturers as adoption of the data-hungry device made its way into the hands of the most intense smartphone users. (See Total Telecom, 'iPhone 4S is biggest network hog – study', 6 January 2012). In 2011, Ofcom found that "DSL-based connections continued to deliver average download speeds that were much lower than the headline 'up to' speeds which are frequently used to advertise broadband services. 'Up to' 8Mbit/s and 'up to' 20/24Mbit/s ADSL connections delivered just 41% and 31% of headline speeds during the period, in line with results from previous research..." (see Ofcom, "UK fixed-line broadband performance November 2011" published 2 February 2012).

Net neutrality in Europe ...

The European Commission decided against introducing legislation to protect net neutrality in April 2011, at least for the time being. It has recognised the need for traffic management in some form, but considers that effective monitoring of ISPs blocking access to certain services in combination with media scrutiny and transparency of ISP offerings should be sufficient to protect an open and neutral Internet.

However, the Commission subsequently indicated that it would assess the potential need for additional guidance on net neutrality in light of the findings of an investigation into traffic management practices that it had conducted jointly with BEREC. Based on a large scale survey, the investigation found that the most frequently reported restrictions were the blocking and/or throttling of peer-to-peer (P2P) traffic and the blocking of Voice over IP (VoIP) traffic, each affecting at least 20% of subscribers.

that they might be used in ways that short-change customers by providing services that fall substantially short of what customers believe they are getting.

This may involve providing a clear benchmark against which managed services can be compared, based on an unambiguous service definition. For example, a service that gives unrestricted access to all (lawful) sites without any attempts on the part of the ISP to manage speed or bandwidth allocated to particular sites (perhaps labelled as 'full Internet access') would be a good starting point. In its guidelines on net neutrality, UK telecoms regulator Ofcom has suggested such an approach.¹³

Any deviation from 'full Internet access' in terms of blocking or slowing down traffic to lawful sites must be clearly disclosed to customers. In the first instance, ISPs who engage in such strategies would obviously not be able to claim that they offer 'full Internet access', which would go some way towards improving transparency. However, the alternative concept of 'managed Internet access' encompasses a wide range of ISP offerings, from the use of basic traffic management techniques during peak times that may in effect render inoperable data-hungry sites to slowing down or outright blocking of websites that may compete with the ISP's own services. To give consumers enough information to make informed choices without having to incur huge costs, ISPs must be explicit about their traffic management policies, and communicate these in ways that are understandable for customers.¹⁴ This may require some standardisation of the way in which traffic management strategies are described, although too much standardisation may be counterproductive as it could focus competition on a few key parameters and give customers a false sense of comparability.

It seems therefore quite likely that the European Commission will become involved further in the net neutrality debate in the near future.

Meanwhile, the Dutch authorities adopted net neutrality legislation in May 2012 that will prevent Dutch ISPs from charging their customers for access to particular services/websites such as YouTube or Skype, or slow down or block traffic to them. This happened in response to announcements by ISPs such as KPN of plans to charge additional fees for access to services such as WhatsApp and Skype that compete with their own text messaging services and voice calls.

In contrast, UK regulator Ofcom has commented in general terms on what it views as good practice on the one hand, and worrying signs in the market for Internet service provision on the other, without setting down in regulation what sort of market behaviour will be tolerated. Whilst Ofcom has recognised that both 'best efforts' Internet access and managed services have their place in the market, it relies at present on a self-regulatory approach within the industry.

Consider competition effects

A small number of hard rules, such as rules against blocking the services of competitors and blatantly discriminatory traffic management techniques, might be appropriate – but such rules should be applied only in relation to ISPs who are in a position to affect competition, or enjoy market power and not across the board. Imposing SMP 'special responsibility' style regulatory obligations on all ISPs may unduly limit capacity-constrained ISPs in their ability to innovate (for example, by providing high-speed products with less content coverage) potentially resulting in a lack of product choice for consumers. Provided customers know what their ISP is doing, and have an alternative option, competition should be an effective constraint. On the other hand, where the number of alternative ISPs is relatively small, some protection against abusive behaviour would be needed. In this respect, the two principles of the FCC's 'no unreasonable discrimination' rule (namely preventing discrimination 'that harms an actual or potential competitor', such as providers of VOIP services, or that 'impairs free expression', such as hindering access to a blog whose message the ISP disagrees with)¹⁵ appear to set reasonable parameters for content that should not be blocked by ISPs. Beyond these rules, however, as much discretion as possible should be left with ISPs to generate their own product offerings, where their traffic management policies represent an increasingly important feature of their service, subject to an overriding requirement to communicate these policies effectively to consumers.

Support various charging models

While in many cases it may be acceptable to both ISPs and content providers that all data traffic is slowed down at peak times, there will inevitably be cases where this would lead to data speeds that are insufficient for maintaining acceptable quality of service standards for data-heavy services. In such cases, ISPs should have the discretion to offer content

¹³ Ofcom (November 2011), "Approach to net neutrality"

¹⁴ BEREC stated in its recent guidelines on transparency an effective transparency policy would be one that is accessible, understandable, meaningful, comparable and accurate (see BEREC (December 2011), "Guidelines on Transparency in the Scope of Net Neutrality: Best Practices and Recommended Approaches", BoR (11)67.

¹⁵ Paragraph 75 of Federal Communications Commission (FCC) Open Internet Rules. Note that this paragraph of the FCC's Open Internet Rules also references concern with practices 'that harm end users'. In this article, the issue of protecting end users is taken into account as part of separate recommended rules.

Principles for charging content providers

In general terms, a charges to content providers for a guaranteed quality of service might be required to comply with the following principles.

- The charging regime must be transparent. Charges could be calculated on the basis of number of users of a service and average capacity required by users to generate a level of 'burden' of a service upon an ISP that can be charged for per unit of 'burden'.
- Charges must be non-discriminatory. While ISPs may opt to use a matrix of unit prices per 'burden' of a service, taking into account for example carriage at peak times and discounts for large content providers, the same rate card should be made available to all content providers wishing to guarantee the quality of their service.
- There should be a minimum level of 'burden' threshold for charging. In order not to stifle innovation, ISPs must be required to carry the traffic of content providers below a threshold level, as defined by the 'burden' they impose on ISPs, without additional charge.

Together these principles ensure simplicity of ISP charging regimes. They also provide a degree of predictability of charges for content providers, which will be necessary for strategic decision-making. Such decisions will include, for example, whether a content provider values being carried by an ISP for a given price in the first instance and whether to invest in more efficient technologies, reducing its 'burden' and cost of carriage, on an ongoing basis.

providers the option to pay to have their data carried at speeds that will allow them to maintain a guaranteed level of quality for their services. Although it would of course also be possible for end users to pay for guaranteed minimum speeds for accessing particular content, having content providers make such payments may be more efficient as it helps overcoming co-ordination issues and supports innovation. Introducing new, more data-hungry services is easier if effective delivery can be guaranteed without having to rely on potential customers individually paying for the minimum speed guarantee.

Where they offer capacity-intensive content providers the option of paying for carriage at guaranteed speeds, ISPs should set their charges in a transparent manner. ISPs who may enjoy market power should be required to offer the option to pay for such guaranteed speeds on a non-discriminatory basis, and must not be allowed to refuse carriage of traffic without extra payment, or slow down such traffic, below a certain minimum threshold.

Define a standard product as an anchor

Last but not least, it may be desirable to define a standard product (potentially based on the notion of 'full Internet access' at a minimum guaranteed speed) that all ISPs (or at least ISPs with market power) will need to offer. Such a product would provide an important safeguard and ensure that access at

reasonable speeds is available for all. High frequency, high capacity Internet users have long been catered for by ISPs through premium service offerings, and in the context of net neutrality it is the less lucrative customers of ISPs whose access to the Internet needs to be protected. Further, in the context of a charging regime for content providers, access to Internet users must also be ensured for the large number of low bandwidth content providers. The availability of such a basic product should ensure that such users do not get left behind as the possibilities brought about by the Internet and corresponding access requirements continue to grow.

What is clear is that net neutrality cannot be defined without taking into account the interests of all stakeholders, and will need to allow payments for assured quality of service from content providers generating significant Internet traffic as well as consumers for both access and high levels of usage. Looking at net neutrality as a lofty principle that guarantees unfettered access to all services at a high level of service quality for all users at all times means ignoring the economic realities of scarce capacity in a situation of growing demand, and is likely to lead to a worse experience for every Internet user.

Eimear Sexton is a Managing Consultant at DotEcon.

DotEcon implements Danish 800MHz Auction

The Danish 800MHz auction in June 2012 was implemented with DotEcon's auction system - WebBidder. The auction which started on June 18th, followed a "Combinatorial Clock Auction" (CCA) format similar to that proposed by Ofcom for the upcoming 4G auction in the UK and used in number of recent European spectrum auctions. The Danish 800MHz CCA format however included an innovative component that allowed bidders to bid for regional exemptions from the coverage obligation imposed on the 800MHz licences. The auction thus allocated these exemptions together with 800MHz spectrum itself by restricting feasible winning outcomes to those that would ensure that the coverage obligation overall would be met, a novel feature unique to the Danish 800MHz auction.

Save the date: DotEcon Auctions Workshop April 2013

Our Auction Workshop will give you an in-depth understanding of different auction designs, including combinatorial formats that have recently been used for spectrum auctions. The workshop will be held in central London and is scheduled for 17th - 19th April 2013. There will be a limited number of places - if you are interested, send an email to auctionworkshop@dotecon.com to receive updates about the event.

Pro-competitive measures in spectrum auctions

Spectrum auctions that allow bidders the flexibility to combine small spectrum lots need measures to protect competition in the downstream market. Being able flexibly to build spectrum packages that best suit the specific needs of a bidder has clear efficiency benefits, but also opens up the opportunity for bidders to buy up spectrum solely to deny their competitors access to an essential resource. A common approach is to impose spectrum caps that limit the amount of spectrum any individual bidder can buy, or to reserve spectrum for particular bidders in order to guarantee new entry. As discussed in this article, both approaches pose some difficulties, which have led to a novel way of safeguarding competition that is being considered¹⁶ for the upcoming spectrum auction in the UK.

Why do we need competition safeguards?

When allocating licences for the use of radio spectrum, whether by auction or other means, most regulators will consider the implications for downstream competition. Certainly it would not be ideal to end up with a single organisation as the sole supplier of, for example, the latest mobile telephony services for the next 15 years - monopoly prices anybody? And of course the benefits to consumers are not simply limited to lower prices – competition can also result in an increased range of products available to consumers and can encourage firms to invest in the development of new and higher quality products. This means that promoting (or at least maintaining) downstream competition is a key objective in spectrum awards.

Unfortunately, market incumbents¹⁷ generally are not too keen on effective downstream competition; they do not want to share their customers or reduce their prices. Indeed, the long term benefits of keeping competitors out of the market may generate sufficient incentives to buy up spectrum in an auction simply to deny access to this vital resource to competitors, and large incumbents often have the financial means to pursue such a strategy. If this is seen as a likely outcome, smaller players and potential entrants could be put off participating in the auction altogether. Why bother investing the necessary time and money if they have no hope of winning any spectrum?

The regulator therefore needs to take measures to prevent this kind of abusive behaviour, offering new entrants a realistic expectation that participation in the auction could be fruitful, but without overly restricting the incumbents' potential for acquiring spectrum themselves, or the flexibility to put together larger packages of spectrum that is a key benefit of using an auction with a flexible lot structure in the first place. This is where competition safeguards come in.

Spectrum caps

Spectrum caps impose upper bounds on the amount of spectrum that bidders can win. They offer a way of ensuring that the incumbents cannot buy up too much of the available spectrum and that there is sufficient left for new entrants.

Depending on the quantity and characteristics of spectrum available, there is potentially a wide variety of ways in which spectrum caps can be applied. For example, one could impose a cap across all of the available spectrum or only on a subset of the frequencies on offer. Where the spectrum can be split into categories, different caps could be applied across various subsets of the available frequencies, and we might even see some of the spectrum included for multiple caps.¹⁸

Spectrum caps may be applied on a bidder-by-bidder basis, typically to take account of existing spectrum holdings that may complement any additional spectrum won. Players with existing spectrum licences (the incumbents) will likely need to win less additional spectrum in order to roll out their services after the auction. With this in mind, tighter spectrum caps could be applied to the incumbents, offering even greater scope for entry to the market and allowing for a more even distribution of spectrum holdings post auction.

Spectrum reservations

Another common approach, setting spectrum reservations, allows for a pre-specified amount of spectrum to be allocated to bidders who satisfy certain criteria, e.g. those who qualify as new entrants. Reserved spectrum works in a similar way to spectrum caps in that it ensures that some spectrum cannot be allocated to the incumbents and is available for new entrants to compete for amongst themselves. Indeed, spectrum caps can imply an effective reservation of spectrum if the total amount that can be acquired by incumbent bidders under their caps is less than the available spectrum. One of the main differences between spectrum caps and reservations is, however, that the latter create an asymmetry between entrants and incumbents that can be abused strategically: those who can bid for reserved spectrum may be able to drive up the prices paid by those who cannot without fear of retaliation, as they can switch between reserved and unreserved spectrum, but the other bidders are prevented from doing so.

Pick 'n' mix

Of course, there are circumstances in which it might be desirable to combine the use of spectrum caps and spectrum reservations, particularly if the asymmetries between bidders are more complex than simply incumbent versus new entrant.¹⁹ Suppose a regulator has decided to reserve some of the spectrum for new entrants, but wishes to ensure that at least two new entrants (of potentially differing financial power) will have access to the amount they need. This could be achieved by imposing further restrictions, such as a cap on the amount of reserved spectrum on which each of the new entrants can bid. The addition of the cap would ensure that any differences between competing new entrants could not be abused for strategic purposes.

¹⁸ Spectrum categories would generally consist of subsets of the available spectrum, with spectrum in each of the categories being considered to be substitutable. For example, many auctions offer spectrum in several frequency bands that are the basis for defining lot categories. Other forms of categorisation might be considered if there are value differences across frequencies within a particular band, or if there is substitutability across multiple bands, for example. Specific frequencies might be included in multiple categories – the 700MHz band could form a category on its own, but also be included (in order to enforce a spectrum cap, for example) in a "Sub-1GHz" group along with the 800MHz and 900MHz bands.
¹⁹ In reality there is often no such clear-cut distinction. There may be incumbents of different sizes, where the smallest face similar risks to new entrants, or there could be an entrant with existing operations in foreign markets that give it a significant financial advantage over the smaller domestic new entrants.

¹⁶ As of August 2012.

¹⁷ For simplicity, unless stated otherwise, we generally distinguish between new entrants, who are not currently operating in the market and may face financial restrictions on their ability to compete in the auction, and incumbents, who already operate in the relevant market and hence may have an advantage due to their financial power, existing customer base, infrastructure and complementary licences for spectrum in other bands etc.

Caps and reservations - some examples

Example 1

A regulator is selling spectrum in two bands; Band A and B, each with 50MHz of spectrum split into five generic 10MHz lots. Bidders can place bids for spectrum packages, specifying the number of lots in each band they wish to acquire, allowing them to flexibly build a package that best suits their requirements. Suppose that the regulator wishes to ensure that at least five bidders can have access to some spectrum. Some (but by no means all) of the options that might be considered are:

- a cap across all of the available lots - bidders cannot win more than a total of 20MHz in both bands;
- a cap on a subset of the frequencies on offer - bidders cannot win more than 10MHz in Band A, but are free to bid for as much of Band B as they like; or
- different caps on mutually exclusive subsets of lots - a cap of 10MHz for Band A and a cap of 10MHz for Band B (note that this is different to cap of 20MHz across both bands).

Multiple caps that apply to overlapping subsets of lots - bidders cannot win more than 20MHz in total, and no more than 10MHz of this can be in Band A.

Example 2

Consider the spectrum release described in Example 1. However, suppose that there are already three operators in the downstream market, and the regulator wishes to promote the entry of at least two more. If 20MHz of spectrum is considered sufficient for a new entrant to be a viable competitor in the market, the regulator could reserve 40MHz for new entrants. This might be done by specifying specific frequencies on which the incumbents cannot bid (say, for example, the lowest 20MHz Band A and the lowest 20MHz in Band B, or the lowest 40MHz in Band A or Band B).

Example 3:

Consider the scenario in Example 2, but suppose the regulator is concerned that a "strong" new entrant will buy up the entirety of the reserved spectrum, leaving nothing for a second new entrant. In this case the regulator might:

- reserve 40MHz of spectrum for new entrants (either generic lots or specific frequencies); *and*
- prevent new entrants from bidding on more than 20MHz of the reserved spectrum.

The strong new entrant would then be able to acquire the spectrum it needs, without being prohibited by the (stronger) incumbents and without being able to use its own position to strategically block smaller competitors from entering the market.

Plans for the upcoming multiband auction²⁰ in the Netherlands include setting a spectrum reservation in the 800MHz and 900MHz bands for applicants who qualify as new entrants. The quantity of reserved spectrum (a maximum of 2x15MHz) will be determined based on the number of potential new entrants and preferences expressed for the 800MHz and/or 900MHz spectrum in their applications. In addition to this, the auction will impose a cap of 2x10MHz on the amount of reserved spectrum that each new entrant may acquire.

The difficulty in getting it right

The decision on exactly how spectrum caps or reservations should be set up will depend largely on the value of, and demand for, the spectrum and its potential usage in the downstream market. Suppose spectrum in Band A will allow new entrants to roll out services to compete with the incumbents, but Band B is of no use to them. Then applying a cap for Band B, or reserving some of Band B for new entrants, would be ineffective as the new entrants would not care how much of that was acquired by the incumbents. If, on the other hand, spectrum in Band A and Band B is substitutable, an overall cap or reservation might be a more sensible approach.

One must also take a realistic view on the prospect of new entry. If there are simply no organisations wanting to enter the market (even if they were given the spectrum for free), then as much as the regulator wants to promote competition, there is little they can do. It would be inefficient in that case to impose

protective measures for potential new entrants who do not exist, leading to unused spectrum that could be better utilised by the incumbents for improving their services.

It is important that the regulator gets the safeguards right, as the consequences for not doing so are potentially serious. Setting spectrum caps at the wrong level risks preventing some or all bidders from building the spectrum packages they need – if caps are too tight, it might not be possible for bidders to acquire enough spectrum to deliver high quality services; if caps are too loose, they may not provide much of a safeguard. Similarly, spectrum reservations that are not correctly balanced could either leave new entrants unable to win sufficient spectrum, or result in reserved spectrum going unsold (due to lack of demand from new entrants) when it could have been utilised by the incumbents.

Outcomes that leave firms unable to compete and/or result in valuable resources going unsold represent a serious inefficiency, leading not only to lost revenues for the government but more importantly to lower social welfare. It is important then that whoever sets the competition safeguards has a clear and realistic understanding of the downstream market and the likely demand in the auction, in terms of the number of firms likely to bid and the minimum spectrum requirements of each participant.

²⁰ As of August 2012

A novel approach

Simple spectrum caps and reservations are not the only ways of safeguarding competition. Indeed, alternative methods may provide greater flexibility for achieving pro-competitive objectives, although potentially at the cost of some additional complexity. For example, Ofcom are proposing the use of "spectrum floors" for particular bidders in the upcoming UK 800MHz and 2.6GHz auction²¹.

The basis for this approach is that the provision of LTE services (the most likely use of the spectrum) in the UK is considered to require access to a minimum amount of spectrum in certain bands (including some of the spectrum already held by some firms in the UK telecoms market). The application of spectrum floors in combination with spectrum caps not only ensures directly that, where possible, no bidder acquires too much spectrum, but also that a sufficient number of winners will end up with the necessary resources for competing effectively in the downstream market and making use of new technologies.

Spectrum floors essentially set a flexible spectrum reservation for the relevant bidders (those who have qualified and chosen to benefit from the spectrum floors), as there are different ways in which a bidder could obtain sufficient spectrum to achieve the floor. The reservation is then being applied in a way that best fits with the demand from other bidders. The objective of ensuring entry (or sustainability of existing competition) is achieved in a way that minimises the restrictions imposed on (and distortion of) the auction outcomes and the opportunity cost of not awarding the reserved spectrum to bidders not amongst those benefitting from the spectrum floors.

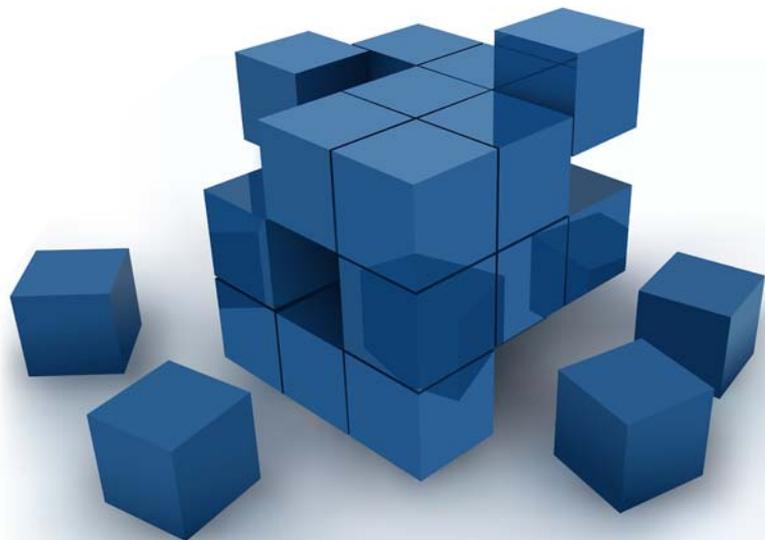
The flexibility of the model, and the way it can respond to the demand expressed during the auction, removes some of the risk of inefficient outcomes and unsold spectrum through

misspecification of simple spectrum reservations. It offers benefits to both bidders, who are less likely to face losses through an inefficient allocation, and to the regulator, upon whom the burden of setting the safeguards at the right level is significantly reduced.²² However, it adds complexity for the auctioneer, and works only with certain auction formats (in particular combinatorial auctions with a winner determination process that allows the incorporation of constraints on permissible outcomes).

Wrapping up

Competition safeguards are a way of providing incentives for smaller players and potential new entrants who might otherwise be discouraged by their limited chances of obtaining any spectrum to participate in an auction, thus promoting competition in the downstream market. These measures, however, must be carefully designed, as misjudgements could have serious and detrimental consequences, condemning the downstream market to poor quality services and limited innovation. This article attempts to give an idea of the complexity involved in some of the issues regulators need to think about when approaching these options. The trade-offs that exist and the correct choice obviously depend on the specifics of the award under consideration.

Jon Coates is a Senior Consultant at DotEcon.



21 As of August 2012

22 For more information on the rules of the UK 800MHz and 2.6GHz Auction, see the Ofcom website.

Competition and regulation digest

Competition Appeal Tribunal judgement on pay TV

On 8 August 2012, the Competition Appeal Tribunal (CAT) issued a non-confidential extract from its judgement on the appeals by Sky, Virgin Media, BT and the Premier League of Ofcom's decision in the pay TV market, which required Sky to offer wholesale access to its premium sports channels. The CAT found that Ofcom's core competition concern around Sky deliberately withholding wholesale supply of premium channels was unfounded. In particular, it considered that Ofcom has misinterpreted evidence in respect of the commercial negotiations between Sky and others, and that Sky had generally engaged constructively in its negotiations. The CAT also found that evidence did not support a number of Ofcom's findings, in particular in relation to the terms of supply to Virgin Media and the impact on Virgin Media's competitiveness. The CAT has, therefore, allowed Sky's appeal and has not found it necessary to consider the other grounds of appeal raised, notably in respect of the terms of the wholesale must offer remedy imposed. The CAT is expected to publish a full judgment in due course.

DotEcon has been providing support to a media client over the course of this appeal.

Competition Commission final report on Movies on Pay TV investigation

On 2 August 2012, the Competition Commission (CC) issued a final report on its market investigation into movies on pay TV. In this, the CC concluded that there are no adverse effects on competition arising from the supply and acquisition of subscription pay TV movie rights in the first subscription pay TV window (FSPTW) of major studios or the wholesale supply and acquisition of packages including certain premium movies channels. The CC concluded that, although Sky has market power in the pay TV retail market, FSPTW content on Sky Movies is not significant to consumer choice and the content did not give Sky a significant advantage over its rivals. The CC also considered that developments such as the launch of standalone over the top (OTT) services by Netflix and LOVEFiLM and the launch of Now TV by Sky meant that, in the future, an OTT pay TV retailer could outbid Sky for FSPTW rights of at least one major studio. However, the CC did note that it expects that Ofcom will keep developments in the sector under review.

DotEcon has been providing support to a media client over the course of this investigation.

Court of Appeal overturns CAT judgement on 080 and 0845/0870 termination charges

On 25 July 2012, the Court of Appeal allowed appeals by O2, Everything Everywhere, Vodafone and H3G of the CAT judgment on Ofcom's determination of disputes relating to

BT's termination charges for 080 and 0845/0870 calls (in which the CAT had considered BT's charges to be fair and reasonable). The Court of Appeal has now concluded that the CAT had been wrong in law to reverse Ofcom's determinations, applying an incorrect approach and erring in finding that Ofcom had applied too strict a test when conducting its welfare analysis. In particular, the Court considered the CAT to have been wrong to find BT's private law contractual rights should prevail, unless it could clearly and distinctly be shown that the changes would act as a material disbenefit to consumers. The Court concluded that Ofcom had acted properly and in accordance with its duties.

DotEcon has been advising a telecommunications provider over the course of these appeals.

Ofcom business connectivity market review, and proposal for leased lines charge control

On 5 July 2012, Ofcom published proposals for new charge controls for leased lines services in which BT was found to have significant market power (SMP) in Ofcom's business connectivity market review (BCMR) of June 2012. Ofcom proposes a three-year RPI-X type control with a number of sub-caps on certain services. Where competition is more established (in the Western, Eastern and Central London Area), Ofcom proposes a safeguard cap. Ofcom has invited comments on its proposals by 30 August 2012.

DotEcon is assisting a telecommunications provider in respect of its response to Ofcom on both the BCMR review and the leased lines charge control.

CAT grants Everything Everywhere permission to appeal judgement on wholesale mobile call termination

On 7 June 2012, the CAT granted Everything Everywhere (EE) permission to appeal to the Court of Appeal against its judgment on the appeals by BT, Vodafone, H3G and EE of Ofcom's 2011 decision on the wholesale mobile voice call termination price control. The CAT concluded that EE's grounds of appeal were without merit, but accepted that there was a compelling reason why an appeal should be heard by a higher court to the extent that the CAT had reached conclusions on the institutional role and procedures of the CC when determining price control matters (within the meaning of section 193 of the Communications Act 2003).

DotEcon has been advising a telecommunications provider over the course of the appeals.

Tasneem Azad is a Director at DotEcon.



Contributors



Michael Weekes

Michael Weekes joined DotEcon in 2010. He provides support to private sector and public sector clients on projects across the fields of competition and regulation, public policy and auction design.



Eimear Sexton

Eimear Sexton is a Managing Consultant at DotEcon. She provides advice to private companies and public bodies on competition, regulation and market design.



Jon Coates

Jon Coates is a Senior Consultant at DotEcon. He provides advice and support to clients on the design and implementation of auctions, and is part of the team responsible for developing DotEcon's electronic auction system.



Tasneem Azad

Tasneem Azad is Director of competition and regulation at DotEcon. She provides competition advice to clients under investigation or to competition authorities, and regulatory advice in sectors including telecoms, water, post and media.

About DotEcon

We provide strategy and consulting advice to networked industries, offering analytical and empirical support to public sector bodies and private sector companies. The range of our services includes:

- Regulatory advice
- Design of auctions or trading mechanisms and bidder support
- Economic and market analysis in competition cases and commercial litigation
- Public policy design and impact assessments
- Demand modelling, including econometric analysis of customer data, and development of pricing tools
- Business strategy and decision support

We integrate rigorous theoretical economics with a thorough understanding of market realities to provide reliable, practicable and concise advice. Our consultants draw on a wide range of specialist skills including econometric analysis, economic and financial modelling, and the development of bespoke software tools.