

EUROPEAN COMMISSION

INFORMATION SOCIETY AND MEDIA DIRECTORATE-GENERAL

Amdocs Response to the European Commission's Questionnaire for the Public Consultation on the Open Internet and Net Neutrality in Europe

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Introduction

Amdocs is pleased to provide its responses to the European Union's Questionnaire for the Public Consultation on the Open Internet and Net Neutrality in Europe.

Amdocs provides software, IT services, consulting and managed services that help all types of Europe's leading service providers (wireless, wireline, broadband, cable, satellite) manage their own operations. We have been providing these services for 25 years and as such have a broad perspective of the issues and opportunities within the telecommunications, cable and satellite industries.

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About Amdocs

Amdocs is the market leader in customer experience systems innovation. The company combines business and operational support systems, service delivery platforms, proven services, and deep industry expertise to enable service providers and their customers to do more in the connected world. Amdocs' offerings help service providers explore new business models, differentiate through personalized customer experiences, and streamline operations. A global company with revenue of \$2.86 billion in fiscal 2009, Amdocs has more than 18,000 employees and serves customers in more than 60 countries worldwide. For more information, visit Amdocs at www.amdocs.com.

Amdocs' Forward-Looking Statement

This document includes information that constitutes forward-looking statements made pursuant to the safe harbor provision of the Private Securities Litigation Reform Act of 1995, including statements about Amdocs' growth and business results in future quarters. Although we believe the expectations reflected in such forward-looking statements are based upon reasonable assumptions, we can give no assurance that our expectations will be obtained or that any deviations will not be material. Such statements involve risks and uncertainties that may cause future results to differ from those anticipated. These risks include, but are not limited to, the effects of general economic conditions, Amdocs' ability to grow in the business segments it serves, adverse effects of market competition, rapid technological shifts that may render the Company's products and services obsolete, potential loss of a major customer, our ability to develop long-term relationships with our customers, and risks associated with operating businesses in the international market. Amdocs may elect to update these forward-looking statements at some point in the future, however the Company specifically disclaims any obligation to do so. These and other risks are discussed at greater length in the Company's filings with the Securities and Exchange Commission, including in our Annual Report on Form 20-F for the fiscal year ended September 30, 2009, filed on December 7, 2009 and in our quarterly 6-K forms furnished on February 8, May 13 and August 9, 2010.

Overview of Amdocs' response

The open internet and the end-to-end principle:

- While there are some very public examples where openness seems at risk in areas in Europe, the mere fact that these examples receive public attention and usually a public backlash, coupled with significant consumer choice, illustrates that the market is largely self-regulating
- Bottlenecks exist both in fixed and mobile networks, and will not only continue to exist, but will become dramatically more acute over the next 5 years, at least
- The problem can be addressed very well by the existing regulatory framework along with the already extremely competitive marketplace within which European service providers operate

Traffic management/discrimination

- Traffic management is necessary from a service provider's point of view and indeed is inherent in many decisions around building networks in the first place. Many innovative technologies are involved in traffic management, as well as a host of business practices not only within telecommunications service providers that are ipso facto forms of traffic management
- If it is easier for consumers to understand what they are getting from service providers, it will significantly allay concerns about net neutrality, as long as this transparency is arrived at through broad principles rather than detailed guidelines
- Broad principles of traffic management apply to both fixed and mobile networks, but further regulation is unnecessary due to the likely complexity of implementing and monitoring it
- In order to preserve innovation in the marketplace, it is desirable to avoid limiting service providers' ability to enter into exclusive agreements with other content providers

Market Structure

- It is important for the functioning of the overall marketplace that service providers be given the freedom to innovate and manage their networks as they see fit with the goal of improving consumer value

Consumers – quality of service

- Moves towards minimum quality of service should be introduced with caution and only in a broad sense. Service providers may lose the flexibility to innovate with consumer propositions and alternative business models
- Monitoring quality of service should be in the domain of the end consumer, empowered with clear information about what they are buying

The political, cultural and social dimension

- The existing European Union constitutional framework, and those of the individual member states, are sufficient to govern the wider issues raised by the net neutrality debate
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Section 1: The open internet and the end-to-end principle

Question 1: Is there currently a problem of net neutrality and the openness of the internet in Europe? If so, illustrate with concrete examples. Where are the bottlenecks, if any? Is the problem such that it cannot be solved by the existing degree of competition in fixed and mobile access markets?

Amdocs Response:

It is important from the outset to distinguish the net neutrality debate in Europe from that of the United States, where the net neutrality debate has taken on a highly emotive flavour. In an open market such as the bulk of the EU member states where consumers have real choice and where switching providers has been made possible through market regulation, the rather dystopian vision of unconstrained traffic management as it is described in the United States is not likely to come to pass, and the limited examples seen to date of certain companies blocking content do not indicate a significant ‘problem’ that cannot be solved through existing degrees of competition in access markets.

Examples highlighting a potential ‘problem of net neutrality’:

One example in France has been the blocking of the social networking site Dailymotion in 2007, which was quickly followed by strong consumer backlash and the reinstatement of the service¹.

Another recent example is in the UK where there has been concern about the potential throttling of the British Broadcasting Corporation’s popular video on demand service ‘iPlayer’ for customers on basic internet packages². The debate is ongoing about this, but the basic principle in question has not been throttling as such, but instead the means of communicating such network management processes to customers in a transparent way.

Bottlenecks in the provision of service to internet users:

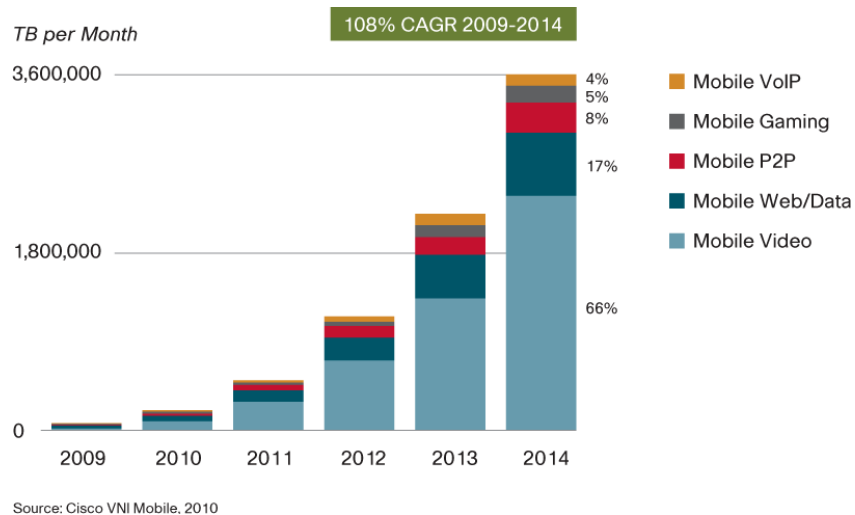
Even if these examples do not illustrate that there is a distinct problem of net neutrality, they do certainly illustrate the fact that telecommunications service providers are facing certain ‘bottlenecks’, irrespective of whether or not these relate directly to the question of net neutrality. As they currently stand, these bottlenecks

¹ See Intervention by Martin Rogard on Page 39 of the ARCEP report - LES RAPPORTS DE L’ARCEP – Neutralité des réseaux (<http://www.arcep.fr/index.php?id=8652>, accessed 22/09/2010).

² See article on iPlayer throttling at <http://news.bbc.co.uk/1/hi/technology/8077839.stm>, accessed 22/09/2010).

depend on whether we are considering fixed or mobile access, but in both cases are due to changing consumer demand over recent months and years. Both mobile and fixed networks are rapidly becoming entertainment platforms, with a significant slant towards online video, be it streaming or download. One of a great many forecasts indicates a large growth in mobile traffic, for example, with a corresponding rise in video content consumption along with other high bandwidth forms of traffic: according to Cisco, globally, mobile data traffic will double every year through 2014, increasing 39 times between 2009 and 2014³.

Within this mobile traffic, almost 66 percent of the world's traffic will be video by 2014.

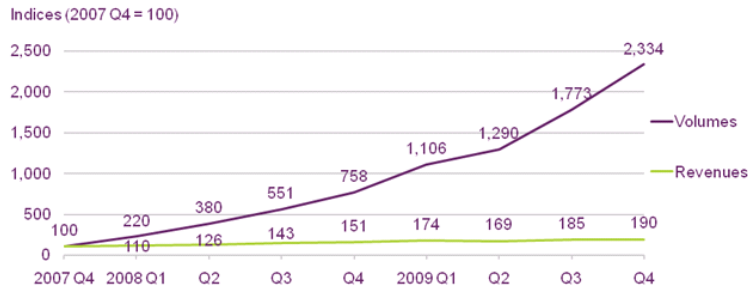


The net result of course is a familiar pattern, with a growing gap between data usage and revenues, which has been highlighted by many organizations, not least Ofcom in the UK⁴:

³ Cisco® Visual Networking Index (VNI) Global Mobile Data Traffic Forecast Update at http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html, accessed 22/09/2010

⁴ Fig 5.6 of Ofcom Communications market report 2010: UK at <http://www.ofcom.org.uk/static/cmr-10/UKCM-5.6.html>, accessed 22/09/2010

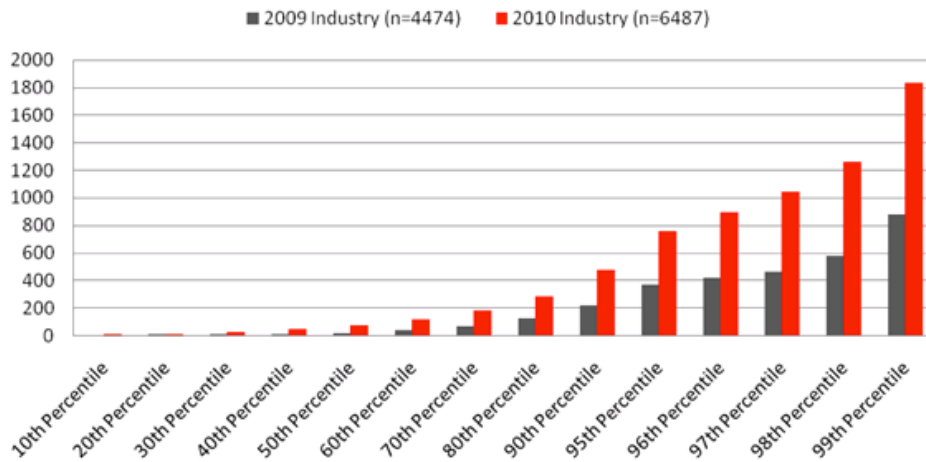
Mobile data volumes and revenues



Source: Ofcom / operators
 Note: Includes estimates where Ofcom does not receive data from operators; data revenue is likely to be understated as it excludes any data element included within standard pay-monthly tariffs.

This is dramatically illustrated in Nielsen research in the US showing that an extremely small minority of users are consuming vast quantities of data, which, it is safe to say, is also occurring across Europe. According to this analysis, the top 6 percent of smartphone users are consuming half of all data and that the average smartphone user is consuming around 298MB of data a month⁵.

Industry MB Usage by Percentile - Smartphone Only



Source: The Nielsen Company
 Single line accounts, Q1-09 - Q1-10, National, Customer Value Metrics

Service providers’ response to increasing bottlenecks depends on the type of network. With the fixed network infrastructure the major theoretical constraint to capacity is the willingness of service providers and / or governments to invest heavily in capacity

⁵ Nielsen Report on smartphone data usage at http://blog.nielsen.com/nielsenwire/online_mobile/quantifying-the-mobile-data-tsunami-and-its-implications/ , accessed 22/09/2010

uplift. After all, a fixed infrastructure exists to the vast majority of properties across Europe, and a fixed-line infrastructure is (with few exceptions) a dedicated provision to a property, be it a business or a consumer residence. To an extent, the investment has already gone in, and what remains is to upgrade it to provide, for example, fibre-optic infrastructure and the resultant increased levels of data transfer. We have seen, for example, the commitment in the UK Digital Britain report to a universal provision of a minimum level of 2 Mbps broadband access to the UK population by 2012 and now recently pushed back by the new government to 2015⁶. We have also seen a commitment to broadband as a 'human right' in Finland where, under Finnish law, every Finn now has the right to access to a 1Mbps broadband connection and the Finnish government has vowed to connect everyone to a 100Mbps connection by 2015⁷.

Another constraint, however, is local planning: in many cases a fibre infrastructure requires a new network topology consisting of additional street furniture, not all of which is welcome to local neighbourhoods.

With mobile infrastructure, bottlenecks present themselves for different reasons. Investment, like for fixed-line infrastructure, will be a constraint, but for different reasons than for the fixed-line infrastructure, primarily because service providers themselves have largely funded network rollouts rather than relying on government intervention. However, other factors also come into play, most notably wireless frequencies which are of course regulated and which service providers have paid substantial license fees to obtain. There is a physical limitation on the amount of frequency that can be allocated, as we have seen from the LTE debate on utilization of the so-called 'digital dividend' of spectrum to be made available once digital switchover occurs across various countries.

Can the 'problem' be solved by the existing degree of competition in fixed and mobile access markets?

For fixed and mobile infrastructure, therefore, enduring capacity bottlenecks are likely to relate to the ability or otherwise of service providers and governments to commit funding to infrastructure, it is possible that funding in the future will offer analogies to road building: if capacity is provided it is immediately used, leading to an endless cycle of funding debates. Such debates, however, are a core part of the functioning of the marketplace within the European member states; the existing regulatory frameworks already provide ample guidance on how to address this, and public debate

⁶ Digital Britain Report at <http://webarchive.nationalarchives.gov.uk/20100511084737/interactive.bis.gov.uk/digitalbritain/>, accessed 22/09/2010

⁷ 'Finland makes broadband a 'legal right' at <http://www.bbc.co.uk/news/10461048>, accessed 22/09/2010

generally leads to reasonably good long term planning, largely because service providers currently have the means at their disposal, with the appropriate levels of debate, to invest in their networks, knowing that it is possible for them to achieve acceptable levels of return on investment.

With both fixed and mobile networks across Europe service providers currently use a wide variety of traffic management technologies to ensure that the bottlenecks we have described do not adversely affect services to end users. In mobile networks, even the basic network topology through the positioning of base stations and masts constitutes a *de facto* means of managing traffic.

It is highly likely that in a European context, traffic management will be largely self regulating. Consumers would likely gravitate towards service providers who offer the best packages for their individual needs, and given the amount of competition between players, this is likely to mean that service providers pay close attention to how they offer different kinds of access or usage bundles. This is especially true in Europe where subscribers have a choice of between 3 and 5 fixed providers and a similar number of mobile providers, not to mention increasingly converged offers such as cable & satellite operators providing fixed line access, and mobile operators offering broadband provision.

It could be argued that recent privacy breaches in the United Kingdom of individual consumer usage patterns, which we have seen in service providers' trials of deep packet inspection software, illustrate that there is 'a problem of net neutrality in Europe'; however, these incidents were quickly followed by a consumer backlash and a much more open approach to traffic management, accompanied by an informed media debate. The marketplace itself has largely shown itself to date to be self-regulating. Added to this, the concerns shown have *stricto sensu* been with privacy (the question of whether service providers can observe and record information) rather than neutrality (the question of whether service providers can constrain the behaviour of internet users).

Question 2: How might problems arise in future? Could these emerge in other parts of the internet value chain? What would the causes be?

Amdocs Response:

It is possible to imagine scenarios where problems with net neutrality may arise in the future, inasmuch as widespread traffic shaping may start to occur on a large scale, over and above the relatively low-profile ways in which it is used currently:

Certain types of **vertically integrated providers**, where a content proposition is offered alongside access, may be considered to have a vested interest in prioritizing their own content over that of a rival ‘over-the-top’ provider. We have seen signals of potential concern, for example, in the United States⁸.

In a similar way, service providers are under pressure to find **new revenue sources** in a consumer ecosystem increasingly driven by video and content over more traditional voice and access fees. It is not hard to imagine certain traffic being privileged if it carries more commercial potential than other sources.

The **ability to shape and manage traffic is complex** for many service providers, and without a comprehensive, real-time ability to manage volumes, types and consumer behaviours at scale, it is possible to imagine potential discrimination occurring through purely technical limitations of systems to manage such complexity.

Service providers invest heavily in network technology, and must be able to intervene in the network to **safeguard the infrastructure itself**.

In a mobile context, it is important to recognize the unique limitations of the network itself, inhibited by radio spectrum particularly. Traffic shaping already does occur on these networks for the simple reason that bandwidth is extremely hard to manage at scale.

Service providers increasingly need to be able to guarantee **certain kinds of application or 3rd parties’ access to the network**, particularly if these are, for example, healthcare or utilities parties which require constant and reliable connectivity.

Finally, there is a need to offer **fair access to a wide range of paying consumers**. Service providers are increasingly challenged by the fact, mentioned earlier, that a few users excessively utilize the network, to the detriment of the wider majority, who are in effect forced to shoulder the cost. Managing bandwidth to provide fair use may be perceived as discriminatory, but is also necessary; after all it is required as a

⁸ Wall Street Journal Article on Comcast’s acquisition of NBC Corporation at <http://online.wsj.com/article/SB10001424052748703579804575441723370135074.html> , accessed 22/09/2010

consequence of having to deliver service to the majority in spite of the excessive use of the minority..

However, none of these examples truly constitute problematic scenarios, in our view, especially in a European context where there is a good level of market competition and a good level of protection for competition through existing regulatory bodies. These scenarios are, rather, legitimate and real ways in which service providers may and do offer continually improving consumer propositions.

Furthermore, we take the view, similar to other respondents to this consultation⁹ that the focus on service providers misses the point and the complexity of the debate. There are many instances where other players in the internet value chain exercise considerable influence over end consumers' experience of the internet or host a very closed business model with little or no restriction or complaint. With diminished competition innovators are less likely to invest their resources in a market where a powerful actor has the power to act strategically against it. Anti-trust bodies are however starting to take an interest in the activities of such large internet players¹⁰. It has long been known, for example, that even very small changes in search paradigms on the part of the major search engines can have a significant impact on business activity, leading of course to the growth in search engine optimization technologies and businesses.

There is no issue *per se* in the innovative business models we are increasingly starting to see, from the oft-cited App Stores through to the wider reaching examples of Google branching into fibre networks¹¹ and utilities companies investing in smart meters¹². Indeed, that such experimentation takes place is critical for new business models and technologies to emerge and be successful in Europe. The kinds of experimentation and partnerships we have seen in this industry have largely occurred thanks to a buoyant wholesale market with an absence of monopolies, largely thanks to the 'light touch' regulation that already exists in Europe. Any further regulation on, for example, discrimination of traffic, risks destabilizing this innovative environment and pushing the innovation elsewhere.

⁹ See Vodafone's paper on Net Neutrality, June 2010 at http://www.vodafone.com/start/about_vodafone/eu/news/net_neutrality.html, accessed 22/09/2010

¹⁰ See 'Apple's changes won't mollify trust busters' at <http://uk.reuters.com/article/idUKLNE65D01620100614>, accessed 22/09/2010 'Google under investigation for alleged breach of EU competition rules' at <http://www.telegraph.co.uk/technology/google/7301299/Google-under-investigation-for-alleged-breach-of-EU-competition-rules.html>, accessed 22/09/2010

¹¹ See <http://www.google.com/appserve/fiberrfi/public/overview>, accessed 22/09/2010

¹² For a general overview of Smart metering in a UK context, see <http://news.bbc.co.uk/1/hi/business/8043452.stm>, accessed 22/09/2010

Question 3: Is the regulatory framework capable of dealing with the issues identified, including in relation to monitoring/assessment and subsequent enforcement?

Amdocs Response:

The regulatory framework in Europe for electronic communications, augmented with the Universal Service Directive pertaining to contents of contracts and additional information requirements, provides a good and adequate set of guidelines and principles for network access provision in the Member States. Furthermore, the revised Framework Directive highlights further principles which offer a similar level of guidelines that have been provided in 2005 by the FCC in the United States¹³.

We feel that this regulatory framework is perfectly capable of dealing with the issues identified around net neutrality.

As we have seen in incidents where there has been evidence of blocking of content, the marketplace itself is sufficiently buoyant and governed by principles of competition and consumer choice. This leads us to the conclusion that any further regulation would appear to be superfluous. Instead, the key to ensuring that potential problems of net neutrality are effectively dealt with is increased levels of transparency. Articles 21(3)(c) and (d) of the Universal Service Directive already provide for such transparency with their calls to ‘inform subscribers of any change to conditions limiting access’ and ‘provide information on any procedures put in place by the provider to measure and shape traffic so as to avoid filling or overflowing a network link’.

It is crucial that end consumers of fixed and mobile services are informed clearly and in appropriately standardized ways about the types of shaping that can occur, but only in a sufficiently clear way to enable comparison between providers and tariffs. We have seen examples of consumer concern in the UK about similar issues with advertised speeds of broadband services¹⁴.

Armed with information, consumers will arrive at informed decisions, and the marketplace will continue to be self-regulating. Any additional regulation on how service providers’ management of traffic is conducted, monitored and enforced would be superfluous and indeed excessive.

The issues involved in managing traffic, discrimination (or otherwise) and bandwidth capacity are of a complexity that does not justify regulatory intervention. Instead, the principles governing electronic communications in Europe should remain as they are, relating to how access providers relate to their end consumers. Regulation should only

¹³ See para 80 et seq at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-09-93A1.pdf, accessed 22/09/2010

¹⁴ See article on speed claims at <http://www.bbc.co.uk/news/uk-11075066>, accessed 22/09/2010

extend into defining the broad principles of full disclosure of accurate and relevant information in plain language about characteristics and capabilities of their offerings, their broadband network management, and other practices necessary for consumers and other users to make informed choices¹⁵.

We feel that detailed regulation of how companies monitor, manage and intervene in their networks would be extremely unhelpful, not to mention too complex to govern without excessive and bureaucratic processes that would only serve to detract from the end consumers' experience of network access and innovative propositions that companies would be able to offer them.

Mechanisms for monitoring and raising complaints should remain with consumers, who are after all the end users of the network, and have the ability across Europe to voice concerns either through market activity (changing provider), publicity (word of mouth, social networking) or via the local NRA (ombudsman procedures).

¹⁵For similar arguments please see <http://www.scribd.com/doc/35599242/Verizon-Google-Legislative-Framework-Proposal>

Section 2: Traffic management/discrimination

Question 4: To what extent is traffic management necessary from an operators' point of view? How is it carried out in practice? What technologies are used to carry out such traffic management?

Amdocs Response:

From an operator's point of view, traffic management is increasingly necessary for the bottleneck reasons pointed out in our response to Question 1 above. Increasingly, the quality of the service for end consumers depends on the level of control the service provider has over the consumer edge device and the network itself. It should be possible for the provider therefore to determine whether or not to be able to run software and hardware to be able to monitor such usage, especially as the type of traffic dominating networks takes on technically challenging and time sensitive characteristics, e.g. video, VoIP and P2P.. Therefore, the cases where traffic management is necessary include:

- Allowing for innovation in consumer propositions and network management
- Managing congestion problems in the network to ensure fair and equitable use of their networks by end users
- Managing threats to networks and their users from, among others, worms, viruses and other malware, malicious websites and denial of service attacks
- Content inspection and filtering to protect users from unwanted communications such as spam (both incoming and outgoing) and other inappropriate content.
- To address problems of copyright infringement and illegal material.
- Compliance with regulatory and law enforcement requirements.
- Assisting in implementing one or more forms of usage-based billing moving towards usage-based pricing and new business models in a manner that benefits end-users and that takes into account the realities of the market

This in turn points to the challenges service providers will face in being able to deliver different levels of quality to end consumers. If this is to become a differentiator in the marketplace, it implies that providers will need to invest in innovative new ways to guarantee them. Given that fixed and mobile networks are increasingly becoming entertainment platforms, it will become hugely important to be able to guarantee service levels, in much the same way as satellite and Freeview networks do. Traffic management is arguably the most powerful and appropriate way for service providers to do this, pointing to the potential future consumer and economic value to be gained from forms of traffic management.

Traffic management currently deals with the following three dimensions or a combination thereof:

- **Network:** (e.g. bandwidth throttling when traffic reaches a certain volume, with no reference to the underlying application or the source/destination or subscriber)
- **Service or Application** (e.g., identifying and blocking an application, or giving some applications higher priority than others, especially in periods of congestion)
- **Subscriber** (e.g. applying limits to how much bandwidth a particular subscriber can use, regardless of the applications running)

Over and above the basic core Transmission Control Protocol (TCP) congestion control techniques (defined in the Internet Engineering Task Force (IETF) standard, RFC2581[i]), the most widely established technique used to ameliorate traffic congestion is 'over provisioning'. Put simply, links are dimensioned so that the bandwidth available exceeds the expected peak or average traffic load by a certain margin, which of course implies a certain level of investment. In a mobile context, rather akin to this is the inherent traffic management involved in positioning mobile phone masts: any decision on location automatically shapes traffic for a number of users within the base station's radius.

However several additional developments have emerged beyond this that are already widely used to help manage traffic at the level of applications and subscribers. The current trend in traffic management has been towards: Deep Packet Inspection (DPI), Deep Flow Inspection (DFI) and Policy Control.

The objective of Deep Packet Inspection is to recognize the underlying application or protocol that the packet is carrying by inspecting its contents at the seven layer Open Systems Interconnection (OSI) model for communications. How it does this is usually proprietary and often confidential, and is a core source of differentiation among vendors. DPI inspects headers, as well as relevant information in the packet payload itself, and often looks at a sequence of related packets in order to form a more complete picture for better identification of the underlying application.

Deep Flow Inspection techniques complement DPI by more accurately identifying underlying applications and protocols by overcoming conventional DPI shortcomings in its ability to recognize applications. DFI infers the application (or threat) from the behaviour of the flow of packets (behavioural analysis, heuristic analysis, pattern recognition, etc), instead of looking for protocol signatures or port usage in the packet itself. With increasing use of encryption or tunnelling through the network, DFI has gained prominence.

Policy control is a broader set of techniques that applies controls to Internet traffic flows within a structured and standardized architecture. It is usually based on the use of an automated rules engine to apply simple logical rules which, when concatenated, can enable relatively complex policies to be triggered in response to information received from networks, customers and applications. E.g.: ‘If customer A subscribes to the Gold Tier package, and if it is the weekend, then customer A may download unlimited numbers of music videos.’ These sets of conditions can clearly be extended by simply adding other terms – for example, age of the customer, previous downloads or dynamic information like customer location, device in use, network conditions at the time. In summary policy tools are more subscriber-centric than DPI tools. Though not yet widely deployed, there is growing interest in and demand for policy servers and architectures, especially among Tier 1 service providers¹⁶.

Most service providers are tending to move away from application-specific controls to subscriber- or client-specific controls, to meet their specific needs, meaning that services are potentially more valued and therefore potentially more valuable. The emphasis shifts from controlling bandwidth costs to retaining and upgrading customers.

¹⁶ Report: ISP Traffic Management Technologies: The State of the Art
<http://www.crtc.gc.ca/PartVII/eng/2008/8646/isp-fsi.htm>, accessed 22/09/2010

Question 5: To what extent will net neutrality concerns be allayed by the provision of transparent information to end users, which distinguishes between managed services on the one hand and services offering access to the public internet on a 'best efforts' basis, on the other?

Amdocs Response:

Improved levels of transparency are likely to significantly allay any consumer concerns over net neutrality. As we have seen in the limited examples of net neutrality problems in Europe, the heart of the problem has been one of communication. If end users are provided with a clear set of guidelines highlighting how service providers and packages manage traffic, it will ensure that consumer choice and market activity continue to be the driver for innovation in the internet economy.

Transparency will benefit end users' understanding of the type of internet 'service' they are buying from a service provider. The transparency guidelines should outline tariff transparency as well as clear information on possible restrictions on access to all types of content and applications. The majority of European member states now have relatively transparent means of comparing services such as basic broadband access, speed and pricing via price comparison websites such as Kelkoo, to ensure consumers have the ability to make an informed choice of their service provider.

One example of improved levels of transparency is Virgin Media in the UK¹⁷. Bandwidth caps are widespread in broadband markets but are notably irrelevant to the congestion pinch point: peak time Internet usage in the last-mile network. Virgin Media imposed limits during peak time since May 2007. This has a benefit of transparency for users, who are otherwise sold 'unlimited' broadband offers that in reality are throttled. Currently though, most details of access restriction based on traffic or volume are to be found in the fine print of terms & conditions. Even though this information may be available to consumers the information is not universally easy to understand or to compare between service providers.

While it is important to provide further transparency to consumers, it is also important not to be excessively prescriptive about the mechanisms available to service providers to do this. Broad guidelines are more effective in this kind of consumer environment than detailed sets of measures. Service providers need to have the flexibility to measure, monitor and improve their networks, as well as to innovate around the business models they are able to develop with other players in other industries to ensure that valuable consumer propositions are developed. Given the difficulties inherent in defining such terms as 'managed service' and 'best efforts', we feel that the broad principle of transparency should not impose definitions onto the marketplace, and should instead allow service providers to name and categorise their

¹⁷ P. 39 in Marsden, Christopher T., Net Neutrality - Towards a Co-Regulatory Solution, London and New York, Bloomsbury Academic, 2010

services in ways that highlight benefit to end users. The risk of being excessively focused on specific types of service in regulation around transparency is that the terminology merely serves to alienate rather than to inform: given that there is still a certain ‘digital divide’ in many European countries between those who take the internet very much for granted and those for whom it is still a novelty, transparency should not be an excuse to introducing more complexity.

With a clearer view of what traffic management means, e.g. information around what kinds of traffic exist and how these are prioritized, this will not only help general public understanding, but also allow service providers to innovate more with consumer propositions. For example, instead of offering connectivity, service providers could offer specialist packages such as video calling with extra internet, or TV viewing with free downloads, and also offer levels of quality of service.

Question 6: Should the principles governing traffic management be the same for fixed and mobile networks?

Amdocs Response:

The broad principles of traffic management are not different whether the network is fixed or mobile; however, mobile networks require more leniency and more ability to manage traffic, even more so when emergency, basic and commercial services are involved in the same network.

If further regulation were to be introduced that defined what constitutes ‘reasonable’ traffic management, it would be immensely difficult to both put into practice and enforce, given the complexity of networks and of the ways in which service providers currently manage them.

At heart, managing networks is a way of allocating relatively scarce resource among competing end users, exacerbated further in the mobile network paradigm of shared base stations with transitory users. Ultimately it should be consumers who determine how networks are allocated through their behaviours, and not the wider industry or indeed regulators.

Service providers, and indeed other internet players, should be allowed to innovate, partner and experiment with consumer offers that ultimately allow the end consumer to make informed decisions about what services to purchase and consume. Consumers’ experience of their service providers should ultimately determine how companies manage their traffic, in an open marketplace where consumer choice is the true defining factor between how networks are governed.

Therefore, it is wise to maintain broad principles that govern both fixed and mobile, but these should not extend above and beyond the broad themes of, for example, the FCC ruling about lawful content, applications of choice, connection of legal devices and competition among network, application, service and content providers. Mobile networks require more flexibility than fixed in order to provide necessary and paid-for services to end consumers.

Question 7: What other forms of prioritisation are taking place? Do content and application providers also try to prioritise their services? If so, how – and how does this prioritization affect other players in the value chain?

Amdocs Response:

As we have highlighted elsewhere in this response, it is increasingly obvious that a number of internet players such as content and application providers prioritize their services, which affects other players in a variety of ways. A non-exhaustive list of these includes:

Closed business models, where applications providers are given wide access to a huge number of consumers but where guidelines are relatively restrictive on what types of applications can be developed, and which can be vetoed quickly and easily. This has the benefit of providing an extremely high quality collection of services to consumers, but at the expense of wider choice and open access.

Content Delivery Networks, where content providers can pay for caching of commonly downloaded content nearer the edge of networks physically closer to end consumers, thus avoiding excessive use of more expensive internet backhaul. The plus side for consumers is faster content downloading; the down side for service providers is that they are disintermediated from the content value chain, and see limited revenue from high bandwidth use.

Peering, where major Tier One internet service providers agree on common sharing mechanisms for large quotas of bandwidth. Increasingly internet players are part of this ecosystem, which does ensure that they are part of the same overall value chain as the major service providers, but which does mean that purely national service providers are overwhelmed by the market power of major internet companies who ultimately depend on them for local access to end consumers.

These illustrations appear to suggest that there is something inherently ‘wrong’ about prioritization, which is far from being the case. Prioritization after all is a key feature of practically all modern marketplaces. Basic public transport services exhibit prioritization when it comes to seat allocation at peak times, and dedicated traffic lanes to ensure they are not impeded by other road users (in the case of bus lanes in cities). Airlines prioritize and differentiate their offer on the basis of how much consumers can pay – flat bed seats are not offered to consumers of low cost airlines, for example.

In an internet context at its most basic, prioritization is inherent in the way in which data packets are handled. For example, a video packet must be shipped in sequence and on time with other packets that make up a video, otherwise the end result is unwatchable. Equally, the packets that make up a VoIP telephone call have to be prioritized otherwise the conversation is impossible to follow. Email, however, can be

non-sequential and is much less time-sensitive.

Prioritization therefore as a phenomenon in the internet world as well as in the wider commercial world, is already inherent in most contexts, and is indeed necessary in order to provide certain services to end users (in the VoIP and video examples above) and to encourage innovative business models and consumer propositions in the other.

Returning to the wider theme of this response, therefore, it is not desirable to limit the type or amount of prioritization that service providers can and do exercise in their day to day operations, over and above agreeing to the core principles already enshrined in the Universal Service Directive, and allowing existing competition authorities to function.

Question 8: In the case of managed services, should the same quality of service conditions and parameters be available to all content/application/online service providers which are in the same situation? May exclusive agreements between network operators and content/application/online service providers create problems for achieving that objective?

Amdocs Response:

Exclusive agreements are probably one of the biggest causes for concern in the net neutrality debate in the United States, but as we highlighted early on in this response, it is extremely important to note the difference between the debate there and here in Europe, which is a marketplace characterized by buoyant wholesale markets and wider consumer choice.

This means therefore that the argument about exclusive agreements in Europe is far less potentially threatening for the principles of net neutrality.

Exclusive agreements pose no issues in and of themselves, as long as end consumers understand that package X is being delivered at a better quality of service than package Y because a payment (either from the content provider to the carrier or end consumer to the operator) is being made, which takes us back to the need for transparency.

Indeed, it is necessary to allow the marketplace to encourage exclusive agreements between different players in the value chain, because it is critical for innovation. For a company to invest in innovative services or business models that give it an edge in the marketplace, it generally has to be able to maintain a position of leadership for a period of time while competitors catch up; after all, companies generally invest heavily in exclusivity and seek to avoid risk in doing so, as far as is possible. This is why technology patents are so competitive and fought over – they offer a mechanism to protect for a period of time a company’s potential to innovate.

If network and service providers are put into a position where they have to offer the same quality of service conditions and parameters to all content/application/online service providers, it will likely have two effects:

- It will be much less attractive for service providers to develop differentiated services that have to be offered on a wholesale or equivalent basis, because the return on investment will likely be drastically reduced
- The net effect on innovation in this very vibrant sector will be severely curtailed, leading to a position where the most innovate players will emerge in regions other than Europe.

Question 9: If the objective referred to in Question 8 is retained, are additional measures needed to achieve it? If so, should such measures have a voluntary nature (such as, for example, an industry code of conduct) or a regulatory one?

Amdocs Response:

We have argued in our response to Question 8 that it is not necessary to impose upon service providers the need to provide the same quality of service conditions and parameters to all content/application/online service providers.

In order, however, to ensure that anti-competitive practices do not occur, it may be worth considering a time restriction on any exclusive arrangements that are entered into.

Generally companies entering into such agreements seek to have them time-bound in some way, since economic or competitive circumstances evolve, but it may be necessary to have an industry code of conduct that governs a time restriction to give it some weight.

However, it is highly likely that the European Union's existing trade regulations, as well as those of the Member States, where competition commissions are a useful and valuable feature, are sufficient to regulate these practices in the online world.

Section 3: Market structure

Question 10: Are the commercial arrangements that currently govern the provision of access to the internet adequate, in order to ensure that the internet remains open and that infrastructure investment is maintained? If not, how should they change?

Amdocs Response:

As a provider of services to the communications industry, we feel it is beyond our remit to comment on the current commercial arrangements governing the provision of access to the internet.

However, the broad thrust of our response is that if regulation is needed, it should be very limited, and that the European marketplace is characterized by consumer choice and should continue to be so. In that vein therefore, we would point out that it is important for the functioning of the overall marketplace that service providers be given the freedom to innovate and manage their networks as they see fit with the goal of improving consumer value. It is only by allowing such flexibility that companies will continue to be prepared to invest considerable sums in improving the provision of networks for end consumers without excessive government intervention.

Section 4: Consumers – quality of service

Question 11: What instances could trigger intervention by national regulatory authorities in setting minimum quality of service requirements on an undertaking or undertakings providing public communications services?

Amdocs Response:

National Regulatory Authorities may consider it desirable to introduce minimum quality of service requirements for a number of pragmatic and public policy reasons.

Firstly, in the context of the ‘bottlenecks’ we described earlier in Question 2, it may be deemed necessary to allow all fixed and mobile subscribers access to basic services. If a minority is using an excessive amount of capacity, as we currently can observe, this prevents other paying subscribers from receiving adequate service without the service provider investing more in capacity. It should be possible (and indeed is at the present time) for providers to regulate usage such that the network is more fair, and can actually guarantee a minimum quality of service. NRAs may choose to control the ability of end users, be they consumers or businesses, to unbalance this fairness through excessive data use, by individuals or by automated software.

Secondly, there are various instances where a minimum quality of service may be deemed to be required for public health and safety reasons, particularly at the level of service provided to third parties who wish to have access to the network and to end consumers. It may be desirable, for example, to guarantee higher quality of service for time- and mission-critical services such as healthcare applications, security monitoring and secure e-government services. This quality of service would have to be guaranteed across the entire path of connectivity, from end device to consumer premise, which is what may in the future justify NRA intervention.

Echoing an important theme of our response, however, moves towards a minimum quality of service should be introduced with caution. If performed too prescriptively, service providers lose the flexibility to innovate with consumer propositions and alternative business models. We suggest therefore that a minimum quality of service be considered in very broad terms much as the Digital Britain report has suggested, and the Finnish government has enshrined in legislation¹⁸. After all, any minimum quality or bandwidth will be out of date and overtaken by network technology almost as soon as it is introduced. Importantly, a minimum bandwidth for mobile networks will be fraught with difficulty due to the restrictions of the networks themselves. There is, furthermore, a risk which we have already alluded to of mobile and fixed

¹⁸ See <http://webarchive.nationalarchives.gov.uk/20100511084737/interactive.bis.gov.uk/digitalbritain/> (accessed 20/09/2010) and <http://www.bbc.co.uk/news/10461048> (accessed 20/09/2010)

networks diverging considerably if additional regulation is applied in this area over and above the basic principles in question.

The market for basic voice communications is an excellent example in which there is no minimum quality of service requirement. The market has been self regulating as consumers awareness increases, such that they are aware of quality standards they should receive and are therefore able to make informed choices.

Finally, if minimum standards are introduced, other types of access and quality of service should remain strictly within the domain of the service providers to innovate, collaborate with other third parties, and ultimately have the flexibility to offer the consumer more choice and variety.

Question 12: How should quality of service requirements be determined, and how could they be monitored?

Amdocs Response:

Any introduction of quality of service requirements should, as we have said in Question 11, be considered with caution. An extremely high number of stakeholders would have to be involved in determining these requirements, as we have observed in Britain with the introduction of the Digital Britain report¹⁹. A broad group of business and consumer as well as governmental bodies would have to be involved in making such decisions. Ultimately, by the time requirements are agreed and implemented, it is highly likely that they would be so diluted as to be out of date or, at worst, meaningless by the time they are introduced.

Introduction of quality of service requirements automatically implies that NRAs would have to be able to monitor them regularly to ensure compliance. Given that traffic is extremely complex to manage, and that service providers have a number of means at their disposal to do this, the technical difficulties of monitoring quality of service at a national governmental level appear extremely challenging. It also implies a level of regulatory control over service providers' abilities to run and manage their networks on a day to day basis, which is likely to be unpalatable for these companies. There is a risk, also, that companies could become so bound by day to day intervention in their operations that there would be limited scope for continued innovation and investment.

One way in which monitoring can be done, however, is via end consumers. Assuming information about minimum standards is transparent and available, European consumers will find ways of sharing information about quality of service, be it through publicly available and independent comparison mechanisms, or even by initiatives generated by service providers themselves. A recent example was the introduction by a mobile provider of a means for consumers to log network coverage issues²⁰. Monitoring in this way would empower the end user of the service and be more appropriate than directly intervening in the operational management of networks.

¹⁹ See

<http://webarchive.nationalarchives.gov.uk/20100511084737/interactive.bis.gov.uk/digitalbritain/>, accessed 22/09/2010

²⁰ See <http://vodafoneuksignal.com/>, accessed 22/09/2010

Question 13: In the case where NRAs find it necessary to intervene to impose minimum quality of service requirements, what form should they take, and to what extent should there be co-operation between NRAs to arrive at a common approach?

Amdocs Response:

As we have outlined, there may be areas where NRAs find it necessary to intervene in this domain, but this should be restricted to broad principles that do not require extensive monitoring, and should approach mobile quality standards with extreme caution.

Europe is obviously characterized by regional and cultural differences that can be extremely marked and as such, any mandated cooperation between NRAs may run into differences that are insurmountable. Given this situation, we feel that minimum quality of service requirements should be very much restricted to a local Member State context, unless of course NRAs are debating how to engage with one of the more multi-national service providers.

Question 14: What should transparency for consumers consist of? Should the standards currently applied be further improved?

Amdocs Response:

Transparency in the domain of traffic management on the internet is obviously a highly complex area where the vast majority of consumers are either largely uninformed or at best only guess at what is taking place based on stories in mainstream news.

The standards currently applied would benefit from further bolstering, but only in the context of defining broad principles, as we have already stated, and only in the context of individual cultures of Member States.

Some recent examples from public initiatives highlight some best practices around informing consumers about relatively complex issues.

- The Oyster payment method for the London Underground and the Navigo system in Paris offers consumers the ability to travel without tickets on the Underground network, provided their swipe card is either topped up or pre-paid with credit. Behind the scenes, the act of ‘touching in and touching out’ determines the fees that are deducted from the card
- The Congestion Charging scheme in Central London involved a very simple principle of having to pay a fee for driving within a restricted area in the city
- The launch of the bicycle schemes within London and Paris, where consumers purchase a subscription then pay per use for a bicycle, picking one up from one location and returning it to another, with protocols to highlight faulty machines

The common theme to these three launches is a very simple and consistent branding and message, and a consumer proposition that is distilled to a very simple process. Behind the scenes, the charging mechanisms and infrastructures are highly complex, but this is largely masked from the end consumer.

The lessons from these are that any traffic management in a communications context needs to be highly simplified, distilled and made extremely consistent.

Our suggestion for how this could be done would be for a number of consistent identifiers to be agreed between all service providers within a European Member State to highlight:

- What kind of traffic is which, and how these are treated in the network (i.e. time-sensitive flows are prioritized)

- What shaping applies to which consumer packages, to enable meaningful consumer comparison
 - Any time of day restrictions
 - Provide more hard information up-front to consumers while making the purchase or switching decision or when changes are made to the policies (privacy) or packages.
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Section 5: The political, cultural and social dimension

Question 15: Besides the traffic management issues discussed above, are there any other concerns affecting freedom of expression, media pluralism and cultural diversity on the internet? If so, what further measures would be needed to safeguard those values?

Amdocs Response:

We feel that the existing European Union constitutional framework, and those of the individual member states, are sufficient to govern the wider issues raised by the net neutrality debate, which after all go far beyond the engineering of the internet and into wider public policy and human rights issues.

Appendix: Glossary of Terms

Term	Definition
ARCEP	Autorité de Régulation des Communications Électroniques et des Postes (France)
CDN	Content Delivery Network
CoS	Classes Of Service
DDoS	Distributed Denial of Service
DFI	Deep Flow Inspection
DPI	Deep Packet Inspection
FCC	Federal Communications Commission (USA)
EU	European Union
IETF	Internet Engineering Task Force
IPTV	Internet Protocol Television
MNO	Mobile Network Operators
MPLS	Multi Protocol Label Switching
MSO	Multiple System Operator
NRA	National Regulatory Authority
OFCOM	Office of Communication (UK)
OTT	Over the top
P2P	Peer to Peer
QoS	Quality Of Service
VoIP	Voice Over IP