Comments of Cisco Systems, Inc.
European Commission Public Consultation on the Open Internet and Net Neutrality in Europe

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Cisco Response to European Commission Consultation on the Open Internet and Net Neutrality in Europe

Introduction

Cisco Systems, Inc. is the world's largest manufacturer of networking equipment and a market leader in the provision of network management solutions and applications that require appropriate network management. Cisco welcomes the opportunity to provide comments in the context of the European Commission public consultation on the Open Internet and Net Neutrality in Europe. [1]

As a company, Cisco has long supported an open and innovative Internet and continues to do so. Many of the Internet's benefits come from its open nature and the ability of anyone to develop new and innovative devices and services that connect to it. Such innovation has created entirely new industries and has fostered competitive markets in Internet applications and equipment. Recognizing these advantages, Cisco helped produce the High Tech Broadband Coalition's "*Connectivity Principles*" in 2003[2], which were reflected in the FCC's Policy Statement of 2005.[3]

[1] http://ec.europa.eu/information_society/policy/ecomm/doc/library/public_consult/net_neutrality/nn_questionnaire.pdf

[2] High Tech Broadband Coalition Letter to Chairman Powell, CS Docket No. 02-52; GN Docket No. 00-185; CCDocket Nos. 02-33, 95-20 & 98-10 (Sept. 25, 2003) ("HTBC Letter").

[3] *See Appropriate Framework for Broadband Access to the Internet Over Wireline Facilities*, Policy Statement, 20FCC Rcd 14986 (2005) ("*Internet Policy Statement*")

Consumers, within the bandwidth limits and quality of services of their service plans should:

a) Have access to their choice of legal Internet content;
b) Be able to run applications of their choice;
c) Attach any devices they choose to their broadband Internet access;
d) And fourth and most important, receive meaningful information regarding their broadband Internet access service plans.

Similar connectivity principles have also been embedded in the revised Framework Directive, which establishes that National Regulatory Authorities (NRAs) shall promote the interests of the citizens by, inter alia, promoting the ability of end users to access and distribute information or run applications and services of their choice.[4] The new revised framework also includes a number of provisions to enhance consumer transparency.[5]

Cisco fully embraces the connectivity principles as inserted in our European framework, and the provisions to enhance consumer transparency, which we believe protect consumers from arbitrary and unnecessary limitations on their Internet usage. But we also believe an 'open' and competitive Internet must include the ability of network operators to innovate within the Internet so it must permit both network management and managed services (such as high definition video conferencing like TelePresence or HealthPresence) to offer consumers additional choice through tiering, quality of service, security services, and other network management techniques.

We believe the end-to-end principle, which the Commission describes in its consultation paper, is not a fundamentalist principle that allows no compromises. That is an unhelpful premise to start a discussion about the evolution of the internet.[6] There is already an evolution of the internet which has taken place over the past few years, which allows for new service models, and is a significant change from the original 'best effort' service model. This is, for example, about ensuring streamed audio and video, or real time bidirectional voice and video, achieve a proper performance level. In order to do so, all packets are not treated equally because different

[4] Article 8(4)g of the Framework Directive
[5] In particular, Articles 21 and 22 of the Citizen's rights Directive (Directive 2009/136/EC)
[6] For a description on the evolution of the end-to-end principle: http://www.ietf.org/rfc/rfc3724.txt

applications require differing network requirements. We explain this in more detail in our response to question 4.

In the future, this evolution should continue. Managed and specialized services, which today are mainly offered via private networks and as enterprise managed services or specialized services outside the Internet, could also be offered over the Internet, and the evolution of the Internet should allow for these new services to emerge for the benefit of the consumers. From the consumer perspective, a managed service will be a separate service from the 'best-effort' internet service.

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?
Question 2: How might problems arise in future? Could these emerge in other parts of the internet value chain? What would the causes be?
Question 3: Is the regulatory framework capable of dealing with the issues identified, including in relation to monitoring/assessment and subsequent enforcement?

We have not seen any evidence that operators are engaging in unfair discrimination or traffic management practices in a way that harms competition or consumers. There have been virtually no instances of anti-competitive discrimination, and the broadband market place is not only competitive, but its competitiveness is increasing.

Generally speaking, we believe competitive broadband markets, both retail and wholesale, are the best way to protect everyone's interests and diminish the incentives for potentially unfair discrimination. If customers have a wide choice of internet access providers, which seems to be the case in most parts of Europe, are well informed about the characteristics of their broadband plans, and are able to switch between providers without penalty subject to their contracts, the potential for unfair discrimination or traffic management resulting in consumer harm is substantially mitigated.

A provider found to be engaging in traffic degradation, blocking, or other negative behaviour for anti-competitive reasons would quickly lose customers to its competitors. This competitive pressure has been extremely effective in ensuring that providers comply with the preferences of their users – and there is no reason to doubt that it will continue to be effective in the future.

Clearly, operators should not be allowed to block or degrade any lawful traffic in a way that harms competition or consumers. However, they should be allowed to offer differentiated services and additional choice to consumers. As the Commission recognizes in its consultation document, the amended telecoms framework accepts the principle that traffic/network management can be a legitimate tool for the provision of differentiated services and in the interests of the efficient functioning of networks. Service providers already offer various broadband plans at different prices depending on the broadband speeds, monthly usage, etc. [7] In the future, new business models will emerge, and services addressed to specific needs (e.g. a specialized video streaming on gaming console service or Connected TV with 3D content or specialized delay sensitive services such as healthpresence at home) with varying pricing conditions may be launched for the benefit of consumers/citizens who are willing to pay for them. [8]

If, despite the existence of dynamic and competitive broadband markets, there were instances of unfair discrimination causing harm to consumers or competition, we believe Europe has a very robust competition and sector-specific regulatory framework which is capable of dealing with any such issues.

[7] http://www.belgacom.be/private/fr/jsp/dynamic/productCategory.jsp?dcrName=bun_nettv&detailPage=bun_nettv_feature#1; http://www.productsandservices.bt.com/consumerProducts/displayCategory.do?categoryId=CON-TOTAL-BB-R1

[8] Another example is around broadcasting. More and more television vendors are announcing High Definition TVs directly connected to the Internet, which will continue to increase the amount of traffic over the internet and put pressure on the network, requiring both higher capacities and the use of quality of service and other tools to ensure an adequate experience. http://www.electronichouse.com/article/google_tv_announcement_roundup/. These services may be free of charge but may also be offered for an additional price.

In Europe, regulatory authorities have direct authority over the provision of electronic communications services and networks, including the provision of broadband services. As outlined by the Commission in its consultation document, the revised telecoms framework has also introduced a new set of specific provisions to ensure an open internet, including the connectivity principles, enhanced transparency requirements and a reserved power for regulators to intervene by setting minimum quality of services in order to prevent a possible degradation of service quality for consumers. [9] Besides which competition rules always apply.

Given all these tools and safeguards, we believe there is no need to introduce new rules or specific net neutrality regulation.

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?

The essence of traffic management is to provide a better consumer experience. The growing demands placed on broadband networks threaten the user experience and the value of the network, and enhanced network management offers a viable, intelligent and tailored means of addressing those demands.

Internet usage is increasingly driven by high-bandwidth applications including online gaming, video over IP, voice over IP, and peer-to-peer (P2P) file exchange services. Cisco forecasts that annual global IP traffic will increase by a factor of four from 2009 to 2014, and the various forms of video (TV, VoD, Internet Video, and P2P) will exceed 91 percent of global consumer traffic. By 2014, global online video will approach 57 percent of consumer internet traffic (up from 40 percent in 2010). [10]

[9] Article 22.3. of the revised citizen's rights Directive (Directive 2009/136/EC)
[10] http://www.cisco.com/en/US/netsol/ns827/networking_solutions_sub_solution.html#~forecast.

Network operators deploy tools to ensure that packets associated with latency- and jitter-sensitive applications arrive on time, and that the end user's experience is not disrupted by network congestion. Different applications will require differing network requirements and, as a result, the optimal network will adapt in order to be 'fit for purpose.'

New Services/Applications Place New Demands on the Service Provider's Infrastructure

Service/ Application	Symmetry	Bandwidth Consumption	Delay Req'ts	Packet Loss Req'ts
Voice	Symmetric	17-106kbps Constant	<150ms (1-way)	< 1%
Broadcast Video	Asymmetric	2 – 15Mbps Vari. Or Const	Consistent (< 30ms)	<.0001%
Telepresence	Symmetric	4 – 11Mbps Variable	<150ms (1-way)	<.05%
Data	Asymmetric	TCP Adapts to BW Avail. Bursty	Delay Insensitive	Drop Insensitive

Managing networks for quality of service (QoS), as explained above, not only ameliorates capacity constraints and helps to address congestion, but also allows for a growing set of consumer and business applications that offer great value to individuals and society: applications such as telemedicine, emergency alerts and real-time energy management. For these applications, it is absolutely necessary that the correct packets arrive at their destination at the correct time.

Today, these specialized or managed services are typically offered to enterprises over dedicated facilities entirely segregated from the 'public internet', or to the consumers over infrastructure

shared with broadband internet access services, but outside the internet (e.g. bundled IPTV offers over ADSL etc.). As mentioned in the introduction, in the future managed services are likely to rely on customers' own internet customer links in the last mile, to the extent those links can be provisioned to ensure sufficient quality of service.

Besides managing networks to address congestion and ensure quality of services, and enable new services, there are other valid and pro-competitive reasons why a broadband internet access provider might wish to 'manage' traffic on its network: to maintain network security, controlling the proliferation of spam, spyware, worms, and other 'malware'; to provide parents appropriate discretion over the content accessed by children; to hamper the unlawful dissemination of intellectual property.

It is clear that going forward providers will need to enhance capacity, and the Commission is rightly putting ultra high speed networks at the core of its Digital Agenda. But relying on new capacity alone to solve current bandwidth limitations is not a solution. Over-provisioning can also be difficult in the presence of the following cases:

- Denial of service attacks
- Network failure conditions
- Capacity planning failures
- Network failure situations
- Unexpected traffic demands / bandwidth unavailability

In cases such as these, without IP QoS and enhanced network management, all traffic will share the same fate and all services will be impacted. It is not either/ or. Both options, increasing capacity of the network and introducing quality of service, are therefore complementary and should be pursued in parallel.

We briefly summarize the main management network techniques below. These techniques are used to alleviate congestion, ameliorate capacity constraints and enable new services in a cost effective way.

(1) Packet Differentiation (using so called "DiffServ model)

One of the tools used to enable QoS is Packet differentiation ("DiffServ"), which allows for IP quality of service distinctions to be applied to various groupings of network traffic. DiffServ gives SPs the flexibility to have different over-provisioning factors (the ratio of offered load to available capacity) for each service class, thereby providing SLA differentiation and making more efficient use of network capacity. For example, this could allow the VoIP class capacity to be over-provisioned by a factor of at least 2 relative to the average class load, hence ensuring that the class receives low delay, low jitter and low loss service, whilst the aggregate capacity could be over-provisioned by a lower factor, such as 1.2, which is a realistic figure still giving good service. This would result in a bandwidth saving over the non-DiffServ case.[11]

DiffServ also provides isolation between different services classes; in unforeseen congestion; different services no longer need to share the same fate as DiffServ ensures that issues in one service class are isolated from impacting other classes.

(2) *IP Routing*

Internet service providers ("ISPs") rely on routing technologies to allow them to adhere to service level agreement guarantees in the face of network congestion and quality of service requirements. IP routing creates a virtual path that data will follow as it moves across a network or networks to its ultimate destination. Taken simply, within the network, data is directed, using the destination IP address in the packet header, according to forwarding tables used by routers based on a series of protocols. By employing IP routing that responds to prevailing traffic demands, broadband providers engineer traffic patterns to improve performance. IP routing technology innovations include multi-protocol label switching ("MPLS"), a data-carrying mechanism by which data packets are assigned labels and forwarding decisions are made solely

[11] According to Cisco own research the use of network management and quality of service can provide a 2.5 times increase in bandwidth on existing networks.

on the basis of these labels, without the need to examine the packets themselves. As a result, virtual links can be created between distant nodes using any protocol, further enhancing reliability.

(3) ***Filtering.***

ISPs may employ traffic filtering in order to enhance network security. Traffic filtering is a technique used to enforce access control policies in order to ensure network security and quality of service. By way of example, a network access control list can be used as a traffic filtering tool by an ISP to control inbound and outbound traffic. Such lists and more complicated filters allow an ISP to distinguish between traffic that is "safe" and traffic that is "harmful."

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 effort" basis, on the other?

As mentioned earlier, we believe that competitive broadband markets coupled with enhanced consumer transparency will, in principle, be sufficient to address any potential concerns regarding the openness of the Internet.

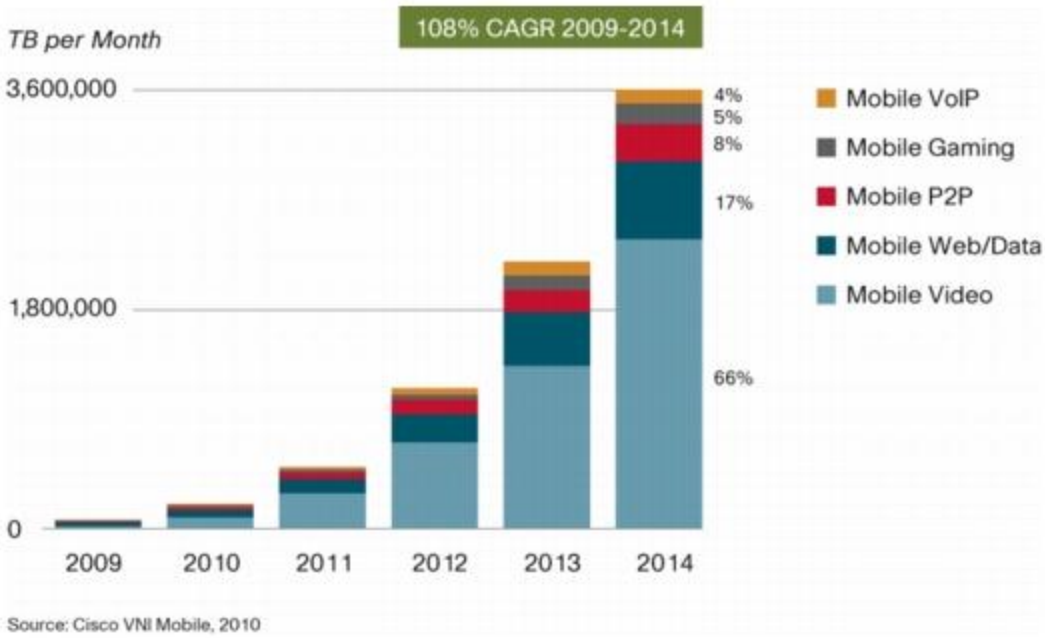
We think that managed services can develop in a way it does not interfere with the continued robustness of the internet access service as such, in particular as the deployment of next generation access networks including both up-graded cable networks and FTTH accelerates in Europe. However, it is important that consumers are informed on the technical properties of their internet access, and in particular on the way internet access potentially shares capacity resources with other specialized or managed services. It is also important to remember specialized services are an additional choice offered to consumers, and when not used, the full bandwidth capacity will become available for their internet access service. As such, the deployment of specialized or managed services provides revenue that helps pay for the investment in better access networks which improves the overall bandwidth available to consumers.

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

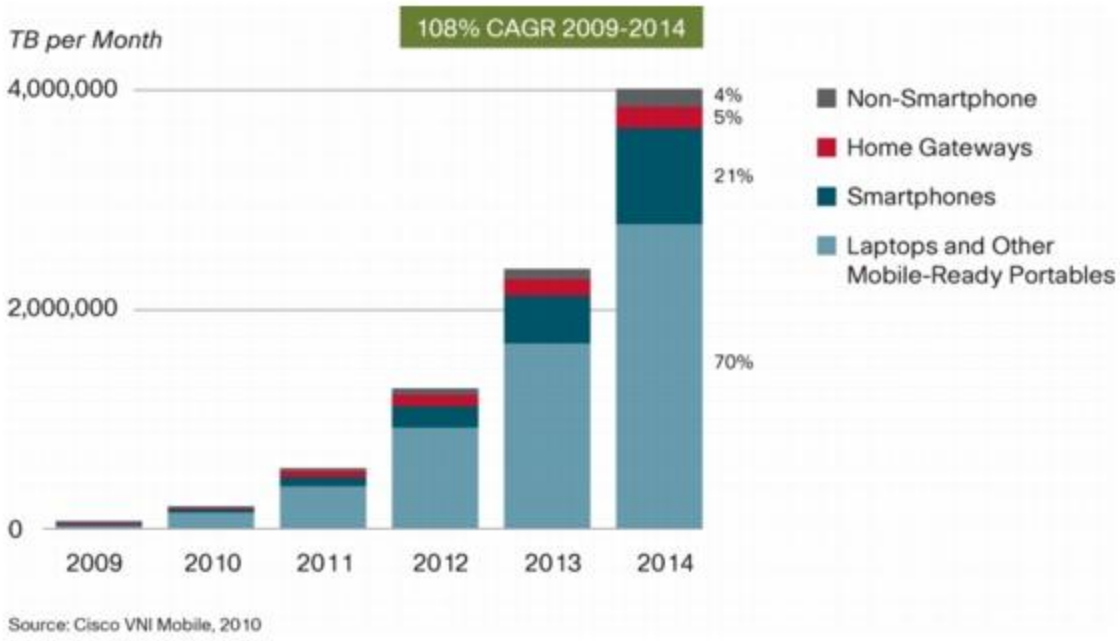
The principles should be the same, and the management tools are similar, but the way in which they are implemented may differ between fixed internet and mobile internet, and also within different types of mobile networks, e.g. GSM networks, 3G networks or LTE networks. Mobile networks have specific spectrum constraints and very different capabilities for data.

If we look at Internet traffic growth generated by consumers over the past years, essentially growth has been driven by Video over Internet using a PC or IPTV (our prediction is that traffic generated by video over IPTV will be multiplied by 15 globally between 2007 and 2011).

If we look at the mobile traffic specifically, the same trends appears : globally mobile data traffic will double every year until 2014, and mobile video will represent 66% of total mobile traffic in 2014.



Europe will represent around 32% of mobile traffic in 2013. A significant part of this mobile traffic will be handled by portable PCs or similar devices, with USB 3G key, as well as smart phones. The Apple iphone experience has clearly shown users of this type of devices are heavier users of bandwidth hungry applications.



So both mobile and fixed networks are experiencing an explosion of traffic, and will experience congestion, and you should be able to deploy similar types of network management tools to address congestion and enable quality of service and apply similar principles.

Implementation, however, may be different as you will need to take the specific features of each type of network into account, and in the context of mobile networks, spectrum and other bandwidth constraints. However, it is fair to say that one of the main obstacles to capacity on the mobile side, and hence a certain degree of the congestion problem (though not the independent quality of service issues), is spectrum constraints which could be addressed by government. It is no coincidence that the first countries to deploy commercial LTE, and hence will address some of the capacity constraints mentioned, have been those who have taken first steps to making appropriate spectrum resources available: in Sweden, Norway and Poland, and shortly Germany, Austria and the Netherlands.

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

Content providers regularly employ local caching on various 'content distribution networks' (CDNs) designed to speed delivery of their offerings to end users. These CDNs might be operated by content providers themselves such as Google or Yahoo (which have constructed their own CDN), or by third parties such as Akamai, EdgeCast or level3. Some ISPs are also trying to provide their own CDN solutions. Basically, the use of CDNs by large content providers is seeking to deliver quality of service and offset some of the problems of the "best effort" approach. To a certain degree, CDNs are complementary to guaranteed quality of services over 'edge' networks and aim to provide a better end-to-end quality of service experience to the end user.

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

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?

There are many types of managed services creating value in the European economy. Cisco is itself a leader in the provision of the tools used to provide managed services. One prominent example is Cisco's high-definition TelePresence conferencing system. TelePresence creates an experience that is almost lifelike through the use of multiple high quality cameras, directional audio, and displays at twice the resolution of HDTV (using 1080P panels). TelePresence works across an IP network using the same technology as VoIP, but requires symmetrical connections of approximately 12 Mbps. The packets carrying TelePresence traffic require a highly managed network to deliver them at the appropriate time. The public internet, largely unmanaged, is not

currently capable of providing the consistent quality of service necessary to run enterprise quality TelePresence.

Over time, however, managed services –including Cisco's TelePresence – are likely to rely on customers' own internet access links in the last mile, to the extent those links can be provisioned to ensure sufficient quality of service.

As regards business models for managed services, we believe service providers should certainly be able to enter into exclusivity agreements, provided this is not done in a way that leads to an anti-competitive outcome. Exclusive agreements between network operators and content/application/on-line service could be a legitimate way for both parties to experiment with new business models and create new sources of revenue, which in turn will incentivize further investment in broadband capabilities. In this nascent environment, it will certainly be premature and counterproductive to create rules that will prevent these new business models to emerge. The appropriate policy should be to monitor the development of the market and only take action if measures are necessary to ensure the robustness of the broadband internet access. Competition rules will in any event always apply.

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?

While not perfect, the existing internet arrangements that have developed over the past years, mainly peering and paid transit, seem to be working, and the internet interconnect market is competitive and there is no evidence of market failure.

As mentioned earlier, the future business models for the broadband internet are still evolving and being tested, and clearly there is also an evolution of the internet interconnect models taking place. It is not entirely clear that the single-sided, subscriber pays a flat rate model is always in the best interest of consumers. Network providers should retain the ability to engage in 'cost sharing' models, which in some cases may imply charging content and applications providers,

which can be both more efficient and equitable, and reduce broadband costs for consumers and increase adoption. It is worth noting that in other areas of the internet there is little regulatory desire to prevent cost sharing models – such as when both end-users and advertisers are charged – which in turn reduces the cost of providing the service to the end-user.

This is a period of considerably change, and relationships in the value chain are no longer fixed, so it would be premature and counterproductive to support one part of the sector over another, or to replace what should be a purely commercial relationship between the different actors in the value chain with regulatory arbitrage, unless there is clearly an identifiable market failure, or abuse of dominant position. Nevertheless, regulators should continue to monitor closely the evolution of this complex eco-system.

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?

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

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?

Generally, we view Article 22.3 of the Citizens' Directive, granting the authority to impose minimum quality of services as a reserve power and adequate to address potential problems. This should be applied in case neither competition law nor sector specific regulation and transparency rules are sufficient to deal with instances of blocking or serious degradation which harm consumers and competition.

However, we do not believe the imposition of a minimum quality of service will deliver value at this stage. Also, if in the future regulators decide minimum quality of service requirements are

needed, these requirements should perhaps be determined in the form of European Guidelines issued by the Commission or by BEREC. Industry stakeholders should be involved and have the possibility to agree and define a set of minimum requirements or agree voluntary code of practice. Co-operation between the Commission, the NRAs, and the industry, to arrive to a common approach would be essential. It would be against the objective of a single telecoms market to have different interpretations of what minimum quality of service means across the Community.

NRAs should be extremely careful and avoid unintended consequences to the detriment of consumer choice and innovation. This would be the case, for example, if the minimum quality of services provision is interpreted in a way that does not allow operators to offer tiered quality of services, or if limited services plans would not be allowed. Consumers will have different needs and tastes. Some consumers will prefer to pay a lower fee to have access to services with no guaranteed quality of service or absent high-bandwidth using applications, but others may be willing to pay an extra fee to benefit from new services, which may require boosting the quality of service or enhanced security. Lower cost options may be an important tool in incenting increased broadband adoption, particularly among lower income populations.

Finally, we would also have reservations about any proposals regarding minimum quality of services which may narrowly define which management practices are acceptable and which ones are not, beyond general provisions to avoid blocking or degradation in an anti-competitive way. This would impose arbitrary limits in the ways networks services and applications would be offered and would not protect consumers.

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

Consumers should be entitled to accurate and relevant information in plain language about the characteristics and capabilities of their offerings, their broadband network management, and other practices necessary for them to make informed choices.

Implementing the enhanced transparency provisions which were adopted in the revised Telecom Framework will improve consumer transparency around traffic management practices. The question is to identify the appropriate level of detail that is required for consumers to be able to make an informed choice without creating too much confusion. It is also important that these requirements do not create an undue burden on industry. Simply providing large amounts of information can be ineffective or even increase consumer confusion.

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Cisco looks forward to continue working with the European Commission as it examines these challenging issues. For any questions or additional information regarding this submission, please contact:

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