# Next Generation Networks: Further consultation

Annexes

Consultation

Publication date: 30 June 2005

# Contents

## Annex A

# Ofcom's consultation principles

## Ofcom's consultation principles

Ofcom has published the following seven principles that it will follow for each public written consultation:

## Before the consultation

A.1 Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

## During the consultation

A.2 We will be clear about who we are consulting, why, on what questions and for how long.

A.3 We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened version for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.

A.4 We will normally allow ten weeks for responses, other than on dispute resolution.

A.5 There will be a person within Ofcom who will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organisations interested in the outcome of our decisions. This individual (who we call the consultation champion) will also be the main person to contact with views on the way we run our consultations.

A.6 If we are not able to follow one of these principles, we will explain why. This may be because a particular issue is urgent. If we need to reduce the amount of time we have set aside for a consultation, we will let those concerned know beforehand that this is a 'red flag consultation' which needs their urgent attention.

## After the consultation

A.7 We will look at each response carefully and with an open mind. We will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

**Annex B**

# Consultation response cover sheet

B.1 In the interests of transparency, we will publish all consultation responses in full on our website, www.ofcom.org.uk, unless a respondent specifies that all or part of their response is confidential. We will also refer to the contents of a response when explaining our decision, unless we are asked not to.

B.2 We have produced a cover sheet for responses (see below) and would be very grateful if you could send one with your response. This will speed up our processing of responses, and help to maintain confidentiality by allowing you to state very clearly what you don't want to be published. We will keep your completed cover sheets confidential.

B.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom would encourage respondents to confirm on the response cover sheet that Ofcom can publish their responses upon receipt.

B.4 We strongly prefer to receive responses in the form of a Microsoft Word attachment to an email. Our website therefore includes an electronic copy of this cover sheet, which you can download from the 'Consultations' section of our website.

B.5 Please put any confidential parts of your response in a separate annex to your response, so that they are clearly identified. This can include information such as your personal background and experience. If you want your name, contact details, or job title to remain confidential, please provide them in your cover sheet only so that we don't have to edit your response.

## Cover sheet for response to an Ofcom consultation

### BASIC DETAILS

Consultation title: Next Generation Networks:

Further consultation

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

### CONFIDENTIALITY

What do you want Ofcom to keep confidential?

| | | | |
|---|---|---|---|
| Nothing | ☐ | Name/contact details/job title | ☐ |
| Whole response | ☐ | Organisation | ☐ |
| Part of the response | ☐ | If there is no separate annex, which parts? | |

If you want part of your response, your name or your organisation to be confidential, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

### DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response. It can be published in full on Ofcom's website, unless otherwise specified on this cover sheet, and I authorise Ofcom to make use of the information in this response to meet its legal requirements. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here. ☐

Name Signed (if hard copy)

## Annex C

# Consultation questions

***Question 1:*** *Do you agree with Ofcom's proposed approach for the charges of narrowband voice SMP products provided over next generation interconnects?*

***Question 2:*** *Do you agree with the overall approach that there needs to be continuity for existing SMP products, but that it would not appropriate to continue them indefinitely?*

***Question 3:*** *Do you agree with the general criteria Ofcom has proposed for the withdrawal of legacy SMP products after an interim period?*

***Question 4:*** *Which network intelligence capabilities are likely to be associated with the underlying network where BT has SMP and cannot be independently provided by alternative providers, and why?*

***Question 5:*** *What are your views of the practical implications of applying Equivalence of Input to NGNs (eg in relation to MSAN interconnection, end-to-end quality of service, and depth of network hooks)?*

***Question 6:*** *Do you agree with the issues Ofcom has identified that need to be addressed by all communication providers as they move to NGNs and what others are there?*

***Question 7:*** *Do you agree with the policy principles Ofcom has identified for consumer protection during the move to NGNs?*

***Question 8:*** *Do you agree with the overall processes for developing 21CN obligatory products?*

***Question 9:*** *Do you believe that there is a need to co-ordinate and steer cross industry NGN issues which is not met by existing bodies and process?*

***Question 10:*** *Do you agree that there is a need to co-ordinate the planning and implementation of NGNs on an industry wide basis?*

***Question 11:*** *Is there a need for a process to address the wider consumer protection issues arising from the move to NGNs?*

***Question 12:*** *Has Ofcom identified all the correct industry processes that will be needed to deal with move to NGNs?*

***Question 13:*** *Do you agree that it appropriate for Consult 21 to continue to take responsibility for developing detail of SMP product migration and development of new products?*

***Question 14:*** *Do you agree that Consult 21 combined with bi-lateral commercial negotiation and backed-up by Ofcom dispute resolution is the best approach to the agreeing the commercial aspects of new and migrated products?*

***Question 15:*** *Do agree that NICC should continue to be responsible for standardisation of NGN interconnect, but needs to be re-constituted as an independent industry owned body?*

***Question 16:*** *What are your views on the establishment of a new multi-lateral industry group to address NGN issues, its terms of reference and governance arrangements?*

***Question 17:*** *What are your views on the establishment of a NGN operational dispute adjudicator, its terms of reference and governance arrangements?*

***Question 18:*** *Would your organisation be prepared to sign-up to such an adjudication scheme and abide by the adjudicator's decisions?*

## Annex D

# Glossary

**21st Century Network, or 21CN:** BT's 21st Century Network, its planned next generation core network

**ADSL:** Asymmetric Digital Subscriber Line. A digital technology that allows the use of a copper line to support high bandwidths in one direction and a lesser bandwidth in the other.

**Altnet(s):** Alternative fixed network operator.

**ATM:** Asynchronous Transfer Mode, a standard for high speed data communications.

**Bottleneck:** The part of a network where the economics of supplying alternative networks are such that effective competition is unlikely to emerge.

**Broadband:** An service or connection generally defined as being 'always-on', and providing a bandwidth greater than 128kbit/s.

**Broadband dial tone:** The concept that consumers will be able to plug a broadband device into their phone line and immediately be able to subscribe to broadband services just as they can turn on 'select services' today.

**BT:** British Telecommunications plc.

**Bundling:** Linking the purchase of one product or service to another, either by selling only as a package, or through the use of discounts for joint purchasing.

**Core network:** The centralised part of a network, characterised by a high level of traffic aggregation, high capacity links and a relatively small number of nodes.

**CPS:** Carrier Pre-selection. The facility offered to customers which allows them to opt for certain defined classes of call to be carried by a communications provider selected in advance (and having a contract with the customer) without having to dial a routing prefix, use a dialler box, or follow any other different procedure to invoke such routing.

**DSL:** Digital Subscriber Line. A family of technologies generally referred to as DSL, or xDSL, capable of transforming ordinary phone lines (also known as 'twisted copper pairs') into high-speed digital lines, capable of supporting advanced services such as fast internet access and video-on-demand. ADSL, HDSL (High data rate Digital Subscriber Line) and VDSL (Very high data rate Digital Subscriber Line) are all variants of xDSL.

**DSLAM:** DSL Access Multiplexor

**Equivalence:** The principle that BT's wholesale customers should have access to the same or a similar set of mandated wholesale products, at the same prices and using the same or similar transactional processes, as BT's own retail activities.

**Ex ante:** Before an event takes place.

**Ex post:** After an event takes place.

**FCC:** Federal Communications Commission. The US regulatory body that regulates all inter-state and foreign communications by wire, radio and television. Intra-state communications are regulated by state public utilities commissions.

**FRIACO:** Flat Rate Internet Access Call Origination

**IA:** Indirect Access. The facility offered to customers which allows them to opt on a call by call basis for calls to be carried by an alternative communication provider.

**IETF:** Internet Engineering Task Force

**Interconnection:** The linking of one Public Electronic Communications Network to another for the purpose of enabling the people using one of them to be able (a) to communicate with users of the other one; (b) to make use of services provided by means of the other one (whether by the provider of that network or by another person).

**Interoperability:** The technical features of a group of interconnected systems which ensure end-to-end provision of a given service in a consistent and predictable way.

**IP:** Internet Protocol. The packet data protocol used for routing and carriage of messages across the internet and similar networks.

**ISP:** Internet Service Provider. A company that provides access to the internet.

**Jumpering:** The process of physically connecting the customer's access line to the terminating equipment in the local node.

**LAN:** Local area network. A network allowing the interconnection and intercommunication of a group of computers on a single site, primarily for the sharing of resources and exchange of information (e.g. email).

**LLU:** Local Loop Unbundling. A process by which BT's exchange lines are physically disconnected from BT's network and connected to other operators' networks. This enables operators other than BT to use the BT local loop to provide services to customers.

**Local Loop:** The access network connection between the customer's premises and the remote concentrator, usually a loop comprised of two copper wires.

**MDF:** Main Distribution Frame. The equipment where local loops terminate and cross connection to competing providers' equipment can be made by flexible jumpers.

**MPLS:** Multi Protocol Label Switching, an IP technology used in many virtual private network (VPN) services.

**MSAN:** Multi Service Access Node.

**Narrowband:** A service or connection providing data speeds up to 128kbit/s, such as via an analogue telephone line, or via ISDN.

**NGN:** Next generation network

**NICC:** Network Interoperability Consultative Committee

**NTS:** Number Translation Services. Telephone services using non-geographic numbers where that number is translated to a geographic or mobile number for final delivery to the called party.

**Ofcom:** Office of Communications. The regulator for the communications industries, created by the Communications Act.

**Oftel:** Office of Telecommunications, whose functions transferred to Ofcom on 29 December 2003.

**PDH:** Plesiochronous Digital Hierarchy. A transmission standard historically used for leased line services, now being replaced by SDH.

**PPC:** Partial Private Circuit; a wholesale network access product.

**PSTN:** Public Switched Telephony Network.

**QoS:** Quality of Service

**SDH:** Synchronous Digital Hierarchy. A transmission standard widely used for leased line services

**Service provider:** A provider of electronic communication services to third parties whether over its own network or otherwise.

**SIP:** Session Initiation Protocol. An IP telephony signalling protocol developed by the IETF.

**SMP:** Significant Market Power. This test is set out in the EU Framework Directive, and is aligned with the competition law definition of ‘dominance’. It is used by Ofcom to identify those communication providers who may be required to meet additional regulatory obligations.

**TDM:** Time Division Multiplexing.

**URI:** Uniform Resource Identifier. The addressing technology for identifying resources on the Internet or a private intranet.

**Value chain:** The sequential stages in production of a product or service.

**Vertical integration:** Mergers, or co-ownership between, producers that are active in different stages in the value chain for a particular good or service.

**VoIP:** Voice over Internet Protocol. A technology that allows users to send calls using Internet Protocol, using either the public internet or private IP networks.

**Voice over Broadband:** A Voice over Internet Protocol service provided over a broadband connection

**VPN:** Virtual Private Network. A technology allowing users to make inter-site connections over a public telecommunications network that is software-partitioned to emulate the service offered by a physically distinct private network.

**WLR:** Wholesale Line Rental. A regulatory instrument requiring the operator of local access lines to make this service available to competing providers at a wholesale price.

## Annex E

# Summary of responses to initial consultation

## Introduction

E.1 This annex provides a summary of key issues raised in response to the initial consultation “Next Generation Networks - Future Arrangements for Access and Interconnection”. It identifies issues raised by the respondents to the consultation based on a number of broadly defined themes.

## Ofcom’s role

E.2 BT’s position regarding Ofcom’s role was that they are disappointed by potential for micromanagement and intervention demonstrated in the consultation, which they claim does not seem consistent with the TSR approach of focusing on economic bottlenecks.

E.3 A common view of all the respondents was that Ofcom should provide clarity and certainty on regulatory principles for the move toward NGNs. A number of respondents believed that Ofcom’s role should be to intervene proactively to ensure that negotiations remain on track and that proposals should be made at an early stage if progress is not being made. One communication provider proposed that Ofcom create a 21CN transition team to develop, plan and rigorously review BT’s proposals. Another provider also supported a more involved role for Ofcom, stating that there is a need for a Cost Benefit Analysis (CBA) for key proposals and that the transition to 21CN should be regulated through market reviews and the application of SMP conditions, including specification of migration requirements and timescales.

## Where is competition feasible

E.4 Amongst some alternative providers LLU was regarded as the deepest level at which regulation should take place, as they considered that the enduring economic bottlenecks were the underlying media (i.e. ducts, fibre and copper) and not bitstream and managed services. However, it was pointed out that LLU is not a competitive constraint for all geographies. It was proposed that BT’s pricing for downstream access products should be based on standard LLU pricing.

E.5 One communication provider believed that in principle the migration to NGNs should not lead to a reduction in the number of points of interconnection compared to the number currently provided for interconnection at the DLE. They considered that the effect of withdrawal of DLE interconnection could be to extend BT’s natural monopoly from the copper local loop into the trunk network.

E.6 Some respondents drew attention to the importance of considering other forms of access and interconnect. The Welsh Assembly stated that access and interconnect at the street cabinet is also important and Telewest stated that the evolution of radio technologies will leave few geographic areas in the UK uncovered.

## Equivalence/Equality of access

E.7 BT's position was that nearly all aspects of equivalence for 21CN should be deferred to their TSR response. It was their provisional view that supporting "equivalence of inputs" in respect of Operational Support Systems (OSS) should not prove to be insurmountable.

E.8 A common view of all respondents, with the exception of BT, was that "equivalence of inputs" and equality of access to enduring economic bottlenecks should be assured. They believed that this is a fundamental requirement to ensure that BT does not gain advantage from the internal relationship between BT Wholesale and BT Retail. It was stated that Ofcom should ensure that BT develops 21C, from the start with the view that its downstream arm purchases identical products and services as it competitors.

E.9 Opposing views were given by two alternative providers as to whether the foundation of equality of access in BT's 21CN should be based on LLU. One view was that it is premature to state, unequivocally, that BT should be required to commit to build the 21CN on the foundations of the existing LLU products. The opposing view stated that the 21CN should be based on the existing LLU products and processes.

## Regulatory withdrawal

E.10 BT stated their belief that in relation to regulatory withdrawal the principles of the TSR are the way forward. They believed these would result in substantial deregulation for all but a small number of access bottlenecks. Except in clear cases of persisting SMP or bottlenecks, they assumed that downstream products will be free of SMP obligations.

E.11 The view of several respondents was that withdrawing regulation should not be hasty or before the impacts of Next Generation Networking, on current and future products, is known.

E.12 There was some support for the idea of regulatory withdrawal through convergence. Energis believed that ultimately a single bitstream service could replace voice origination, WLR, Datastream, etc. In the absence of a competitive market for bitstream based on LLU inputs, bitstream would have to be treated as a bottleneck service from the point of view of regulation. One equipment vendor stated that they believe that NGNs allow for the simplification of regulation of access products. They believed that NGNs would provide the capability to move to a service independent model of regulation, by defining a generic form of IP access with third party QoS control and thereby reducing the need to regulate a complex set of PSTN access products. The Welsh Assembly expressed the concern that regulatory withdrawal due to convergence may result in a lack of differentiation between services.

E.13 Another alternative provider stated that they have already launched a direct competitor to the NGN bitstream service and believed this would allow withdrawal of some bitstream regulation, assuming BT's NGN is built on LLU.

## Investment climate

E.14 BT thought that is was critical that the outcome should be a regulatory regime which rewards investment and does not leave BT with a significant proportion of the 21CN investment risk, whilst distributing the investment returns across the industry.

E.15 A number of alternative providers were of the view that regulatory clarity, predictability and the application of quantifiable variables were necessary to encourage timely and efficient investment. In particular, they believed it important that interconnect issues (where, how, when and at what cost) are resolved urgently to avoid adverse impact on investment decisions. It was stated that Ofcom must be prepared to implement decisions in a speedy and decisive manner.

## Broadband dial-tone

E.16 BT took the position that it is premature to speculate on the potential impact of broadband dial-tone, as only a vision exists without detailed planning and design. They believed the capability to offer broadband dial-tone is the responsibility of the line owner (i.e. cable, LLUO, or BT). However, BT stated that it "will comply with its equivalence obligations".

E.17 A number of respondents were in broad agreement that broadband dial-tone is an issue that makes it harder for LLUOs to win business from BT, due to that fact that equivalence does not exist. They thought that achieving 'near-equivalence' (e.g. by speeding up LLU manual processes) is not good enough. A number of alternative solutions were proposed by competitive providers. Most believed that the migration speed for broadband dial-tone should be slowed down to the same level as LLU migration, suggesting this could be viewed as "cooling off" period. There was some interest in a "copper cross connect" or "active MDF" solution, but generally scepticism about the cost. BT stated that they are favourably disposed towards considering the use of "active MDF".

E.18 The use of 'Soft LLU' was generally rejected by most communication providers as it seen as limiting innovation and per provider configuration was viewed as being too complex.

E.19 An additional issue raised by some respondents was that the broadband dial-tone splash screen should have neutral branding, and be by-passed if the customer had purchased an ISP package from a retail outlet.

## Requirements for MSAN interconnection

E.20 BT committed to examining the commercial and technical feasibility of MSAN interconnect with the industry, stating that they will ensure that any ITT decisions will retain the flexibility to offer MSAN interconnection.

E.21 Other respondents stated that it is not clear, at the moment, whether MSAN interconnect is required. Further information is needed including the costs, from BT, of the different interconnect options. One alternative provider strongly disagreed with MSAN interconnection as it felt it would undermine the whole LLU business model. Fibrenet stated that "No MSAN interconnect is going to be practical".

E.22 However, there were several supporters of MSAN interconnect, one strongly urging Ofcom to ensure MSAN interconnection, with another stating that providers want to maintain the benefit of built out networks. Vodafone's view was that regulation should be focused on access and interconnect at the MSAN. Energis stated that MSAN interconnection is required, but is unlikely to be viable in areas where LLU is not viable. In general, there were differing views on the technical level of access that should be provided.

E.23 Opposing views were given regarding the control of BT's MSANs for voice access. One alternative provider stated that BT should allow other provider's call servers to control MSANs, whilst another claimed that allowing multiple Altnets to control MSANs was too risky.

## Backhaul competition

E.24 BT's view on backhaul competition was that the number of exchanges where backhaul is a bottleneck is likely to reduce over time, but that some of them will remain as economic bottlenecks.

E.25 Some alternative providers expressed major concerns regarding the viability, cost and competitiveness of backhaul services. Two of them considered backhaul to be an enduring bottleneck in many exchanges; one of them proposed categorising exchanges based on which were bottlenecks, however this statement was qualified by the fact that this categorisation would be subjective. One equipment vendor had the view that technology such as microwave would mean that backhaul should not be an enduring bottleneck.

E.26 A number of differing views were provided regarding the role of MSAN interconnect in the development of backhaul competition. One respondent thought that investment to build out to MDF/MSANs would be encouraged by allowing voice-interconnect at the MSAN and allowing aggregation of all service types on single backhaul circuits. Another view stated that a rational communication provider is unlikely to build out to an MSAN in the future specifically to carry out voice interconnection. However, where a communications provider already has a presence, or is deploying one for access/LLU purposes, it may be desirable to pick-up non-LLU traffic streams at the interconnection for this purpose. Cable and Wireless stated that if MSAN interconnect is provided and viable for an alternative provider to use, then regulation was not required at metro nodes. However, it will be complex to identify which MSAN sites are economically viable.

## Competition in inter-metro conveyance

E.27 BT's view was that inter-metro conveyance will not be an enduring economic bottleneck and that any regulation should be focused on the first metro node. VNL and Vodafone agreed with this. However, Vodafone and another respondent stated that regulation is required in the short term until communication providers have built out to metro nodes. VNL added that BT must publish and fix the location of all metro nodes. Cable and Wireless stated that although it is generally understood that inter-tandem services are broadly competitive, it was not clear whether similar conditions would apply for metro node to core services.

E.28 Another view was that communication providers incentive to interconnect with all metro nodes will depend on interconnect pricing. BT would face incentives to reduce the value of other providers using their own transport networks between metro nodes, providing little incentive to build out even at the metro node level.

## Intelligence/Network hooks

E.29 BT believed that they should only face specific access obligations for intelligence capabilities where these give access to, or control over enduring network related bottlenecks. BT also believed that deeper hooks will not pass a cost-benefit analysis.

E.30 It was the view of other respondents that BT should face access obligations for intelligence capabilities which result from its SMP in related markets. However, few specific examples were given, although most mentioned QoS and location information.

E.31 One alternative provider stated that deeper network hooks are practical and another requested that network hooks should be at the deepest level possible.

## Operation support systems

E.32 BT's view was that for a reduced SMP portfolio, input based equivalence is feasible provided the portfolio is determined sufficiently early to inform the system design. It was also stated that their provisional view is that apply "equivalence of inputs" to the OSS should not prove insurmountable.

E.33 A general opinion expressed by other respondents was that "equivalence of input" for the OSS is needed and that BT Retail should not be in a "walled garden". Three respondents stated that scale and security issues could be overcome and/or discounted. Some concerns were expressed over the development process and whether other providers' requirements will be taken into account.

## Migration/transition to 21CN

E.34 BT stated that they recognise Ofcom's policy of encouraging infrastructure build-out, but cannot indemnify alternative providers from investment risk due to obsolescence.

E.35 Several alternative providers stressed the need for equivalence during the transition to 21CN, with some suggesting that to ensure equivalence BT should implement 21CN on the basis of the standard LLU product.

## Future wholesale broadband products

E.36 In relation to wholesale broadband products BT believed that the default position for technical and market developments should be regulatory forbearance unless there is clear evidence of market failure. Other providers generally expected improvements in wholesale broadband products, notably QoS and equivalence of inputs so that they can offer new, for example multimedia, products to compete with BT in downstream markets.

E.37 There was generally mixed support for the idea of a converged narrowband and broadband access product. Those that did support the concept tended to think that existing narrowband and broadband remedies would need to remain for a reasonable period of time.

## Next generation leased lines and dark fibre

E.38 BT stated that they will provide a response on dark fibre in their TSR response. There was general support from alternative communication providers for dark fibre access, but reservations were expressed regarding when and if this would allow downstream de-regulation of existing PPCs. Some thought it was not clear whether existing dark fibre in the ground would meet wholesale demand unless requirements include the obligation to install new fibre.

E.39 Other views were that both SDH and Ethernet services will continue to be important, but there is substantial uncertainty as to how BTs wholesale products are expected to evolve. One alternative provider stated that when appropriate, the focus for next

generation leased lines should be on QoS enabled bitstream, however, this is not required yet.

## Requirements for PSTN interconnect

E.40 BT expressed the view that in order to support service offerings to other operators, there is a requirement to specify a number of standards for the interconnection between IP and TDM, including packet loss, delay and FEC. The NICC would determine the actual requirements for PSTN interconnect.

E.41 In the period of migration to 21CN, interconnection will be required between TDM and IP based systems. In this regard, concern was expressed by some mobile and alternative providers regarding the impact of this interconnection on QoS and delay. Energis stated that QoS will require IP interconnection avoiding TDM gateways and Orange stated that QoS in the IP network, in particular latency, will impact radio system performance.

E.42 Signalling was another area of concern relating to interconnection between TDM and IP based systems. Two respondents expressed concern that BT can use proprietary signalling protocols within the 21CN, whereas alternative providers are reliant on the completion of NICC and ETSI standards. Another respondent expressed concern at the use of immature protocols for interconnection which could force the industry as a whole towards an inappropriate technology or discriminate in favour of those most able to influence the standards. A number of respondents stated that in their view, the important protocols will be SIP for signalling and H.248 for device control. However, one respondent stated that H.248 will not be robust for inter-operator signalling, but that alternative providers control of BT's media gateways will be possible using SIP and therefore provide for a basic CPS product.

E.43 There was broad support for the use of SIP-I from the respondents and BT stated that SIP-I is in development under the auspices of the NICC. Opposing views were expressed regarding the continued use of, or requirement for, IUP. Two respondents were of the view that IUP based interconnection (and emulation) must continue to be supported as the ISUP Memorandum of Understanding (MoU) is not binding. However, Ericsson stated that it is "surprised" by the continued use of IUP.

E.44 Broad support was expressed for the provision of 3GPP IMS interfaces. However, it was stated that BT's support of 3GPP IMS will allow it to offer roaming across its network, which Altnets cannot emulate. It was stated that Ofcom should pay attention to 3GPP IMS interfaces.

E.45 The following factors were highlighted as requiring further consideration: transport availability/resilience, security, location for 999, division of responsibility for QoS throughout the network, call tracing, lawful intercept, national infrastructure security and data retention.

## Requirements for IP-based next generation interconnect

E.46 It was generally agreed that at some point in the future Next Generation interconnection will be solely based on IP, which should be QoS enabled. A number of points were made by alternative providers regarding the provision of QoS:

- QoS enabled interconnect will be important to enable alternative providers to provide differentiated and managed services based on applications and possibly customer demand.

- Traffic from alternative providers must be given the same priority as traffic from BT Retail and be assigned the same QoS. One respondent suggested that a standardised QoS scheme should be available to all operators.
- It would not necessarily be a requirement to support MPLS based QoS interconnection.

E.47 One respondent expressed concern about BTs strong influence in standards fora, for example the Multiservice Switching Forum. They thought this could only be matched by other operators combining together in organisations such as the NICC.

## Annex F

# Equivalence in NGNs

## Introduction

F.1 To help advance the debate on next generation access and interconnection, this annex presents a discussion of how NGNs can enable equivalence or 'equality of access'.

F.2 There are a variety of ways in which it is possible to 'cut' any network in order to unbundle specific network elements to which access is required. Some of these cuts are more natural than others, and so are more likely to deliver true equivalence. In what follows we consider this issue in more detail, firstly in relation to NGN access and interconnection, and then in relation to NGN service management capabilities.

## Network access and interconnection

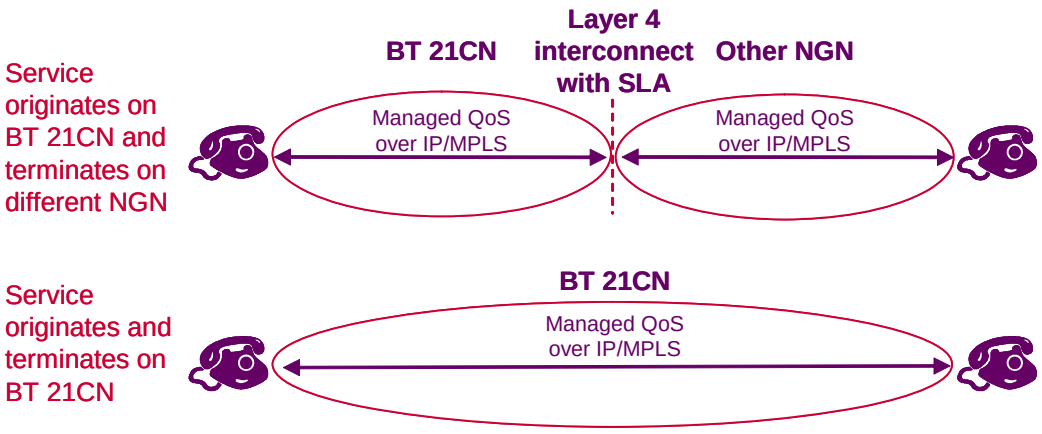
F.3 There are a number of layers at which network access and interconnection can be provided, and these are summarised in the Open System Interconnection (OSI) reference model (see Figure 1).The delivery of EoI might be more practical at some of these layers than at others - a number of examples are considered below.

**Figure 1. OSI reference model**

| | OSI layer | Example access<br>(note correspondence with OSI layer is approximate and illustrative only) |
|---|---|---|
| 7 | Application | Provision of products and services (e.g. voice calls) |
| 6 | Presentation | |
| 5 | Session | Management of sessions between users (eg SIP) |
| 4 | Transport | Transport with end-to-end QoS |
| 3 | Network | Routing of data from source to destination (eg IP) |
| 2 | Data link | Data transport between two nodes (e.g. ATM, Ethernet) |
| 1 | Physical | The transmission medium (e.g. copper, fibre) |

F.4 NGN interconnection providing unbundled access to elements of BTs network at Layers 4 or above is unlikely to deliver EoI. This includes traditional voice interconnection via for example a TDM gateway (a Layer 7 application). This is because the provision of managed QoS on an end-to-end basis is an intrinsic feature of these layers, and the standards do not yet exist to manage QoS on an end-to-end basis over multiple interconnected IP/MPLS networks (although work is underway in this area in the IETF). Although QoS can be separately managed and optimised within two independent networks with an SLA between them, this may not be equivalent to QoS provided end-to-end over a single network (eg through the establishment of a single label switched path on an end-to-end basis). This is illustrated in Figure 2 below.

**Figure 2. Non-equivalence for Layer 4 NGN interconnection**




F.5 NGN interconnection providing unbundled access to elements of BTs network at Layer 3 should be capable of delivering EoI for some services, in particular those services where there is no requirement to provide managed QoS at a higher layer of the service stack (e.g. 'best efforts' internet access). This has the advantage that commercial models and the associated technical standards for this form of interconnection already exist (IP peering and transit). However, this form of unbundled access is likely to be problematic where there is a requirement to manage QoS on an end-to-end basis, since the only facility to do this at layer 3 is the packet prioritisation provided by native IP (i.e. Diffserv). This is only likely to be effective as a means of QoS management if appropriate classification and policing procedures are put in place, and these are likely to be complex to administer.

F.6 NGN interconnection providing unbundled access to elements of BTs network at Layers 1 or 2 should be possible in general. This is because services provided at Layers 1 and 2 are local to an individual network (Layer 3 is the lowest layer of the service stack that is aware of the entire network). It should therefore be straightforward for alternative providers to purchase these in an unbundled form, and overlay their own end-to-end IP service. The main disadvantage of providing unbundled access at Layers 1 and 2 is that there is a much wider range of service presentations (copper, fibre, SDH, ATM, Ethernet etc) than at Layer 3 (where IP is dominant) and this increases the range of access products that might be required.

F.7 In addition to considering how access and interconnection should be provided, we need to consider where. The geographic location of points of interconnection constrains the way in which traffic can be routed, and this has had a significant impact on the degree of equivalence provided by some legacy services. For example, the 'tromboning' of voice traffic between a local exchange and a point of interconnection is responsible for the 'CPS local calls' problem (see http://www.ofcom.org.uk/consult/condocs/cps_option/cps_statement/?a=87101).

F.8 The problem typically arises when an alternative operator has its own core network, but either has an access network with a limited geographic extent, or no access network at all. In such circumstances, an alternative operator will typically wish to substitute their own core network for BTs (i.e. they will wish to transmit traffic via their own Metro Nodes) but they will be dependent on BT for access. We therefore need to consider what interconnection arrangements allow an alternative operator to combine their own core network with elements of BTs access network whilst maintaining EoI.

F.9 The possible options are summarised in Figure 3 and Figure 4 below. These illustrate the way in which traffic is routed for a variety of service geometries:

- services that originate and terminate on the same BT MSAN
- services that originate and terminate on different BT MSANs
- services that originate on a BT MSAN and terminate on another operators MSAN,

and for two different interconnection models:

- interconnection at Metro nodes
- interconnection at the MSAN.

F.10 A comparison is provided between the efficiency that can be obtained by BT for its own end-to-end services and the efficiency that can be obtained by an alternative provider. The comparisons assume that the alternative network provider has an NGN structured in a similar way to BT's NGN.

**Figure 3. Routing efficiency assuming interconnection at metro nodes**

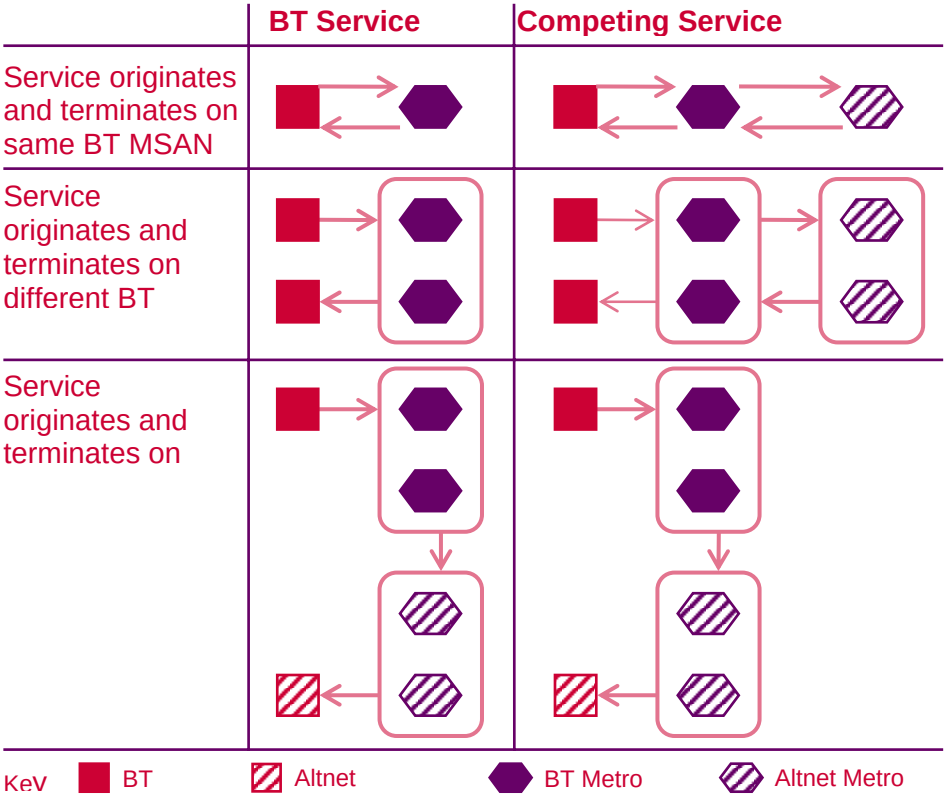
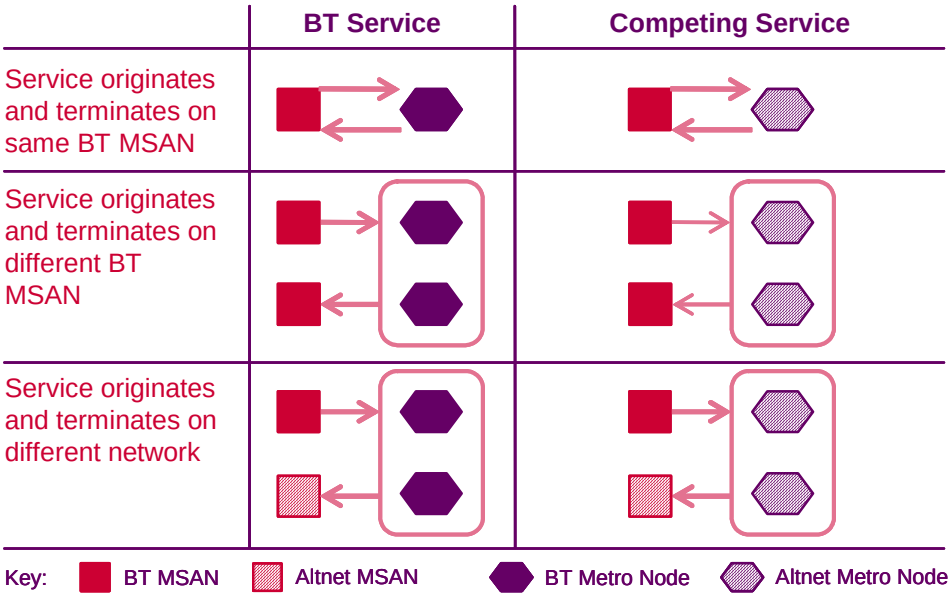


**Figure 4. Routing efficiency assuming interconnection at MSANs**




F.11 These illustrations show that interconnection at the Metro Node and interconnection at the MSAN both deliver EoI in relation to traffic that originates and terminates on different networks. Interconnection at the MSAN also delivers greater routing efficiency (since traffic only traverses a single core network), but this gain in routing efficiency may be at least partially negated by the additional cost of providing interconnection at MSANs. This increased routing efficiency is not by itself sufficient to justify the provision of MSAN interconnection.

F.12 MSAN interconnection is however likely to be necessary in order to deliver EoI in relation to traffic that originates and terminates on BTs network (either on the same MSAN or on different MSANs). Interconnection at the metro node does not deliver EoI for such traffic, but interconnection at the MSAN does. This is an important consideration, since BTs market dominance in the access network means that most traffic does originate and terminate on BTs network.

F.13 However, the costs and practicalities of providing different forms of interconnect at the MSAN will also need to be considered. For certain forms of interconnect the handover of voice traffic at the MSAN could require additional functionality to be implemented at the MSAN. This might include a router and/or session border function which would increase the costs than needed to be recovered. In an extreme case, these additional costs might mean that interconnection at the MSAN became more costly than interconnection at the metro node.

## NGN service management

F.14 BT describe the service management architecture of their 21CN using the following layers:

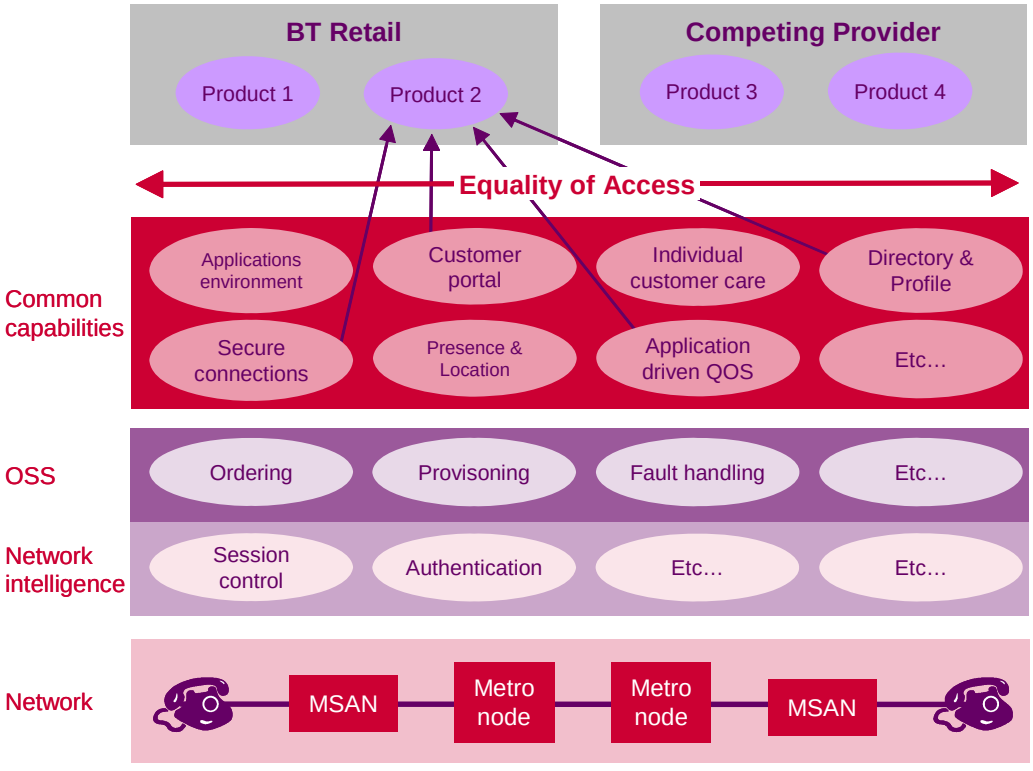
- Physical Network – The transmission network, and the electronic equipment responsible for switching / routing traffic (MSANs, Metro Nodes)
- Network Intelligence – Many of the capabilities associated with traditional networks (e.g. session control and routing of calls) are now abstracted into a distinct ‘network intelligence’ systems layer (see also Annex G)

- Operational Support Systems (OSS) – The OSS layer provides those systems necessary to support standard business processes (e.g. provisioning, fault management)
- Common Capabilities – The functionality supported by the network is made available to retail service providers in the form of a set of 'common capabilities' (e.g. 'secure connections', 'application-driven QoS'). This is a set of reusable service components that can be packaged in different ways to produce a range of retail products.

F.15 One natural point within this service stack at which to provide EoI is at the level of the 'common capabilities'. This is because the 21CN architecture defines a boundary at this point, between BT as a network business providing a set of 'common capabilities' to BT as a retail service provider. As illustrated below, there is no reason why other retail service providers should not obtain access to these common capabilities in exactly the same manner as BT Retail.

F.16 It should be noted that the Common Capabilities as currently defined by BT include some which relate to the underlying network (e.g. application driven QoS), and may therefore relate to markets where BT may have SMP and some which do not (e.g. content repurposing). The discussion here relates only to those Common Capabilities which are derived from markets in which BT has SMP (see Annex G for further discussion).

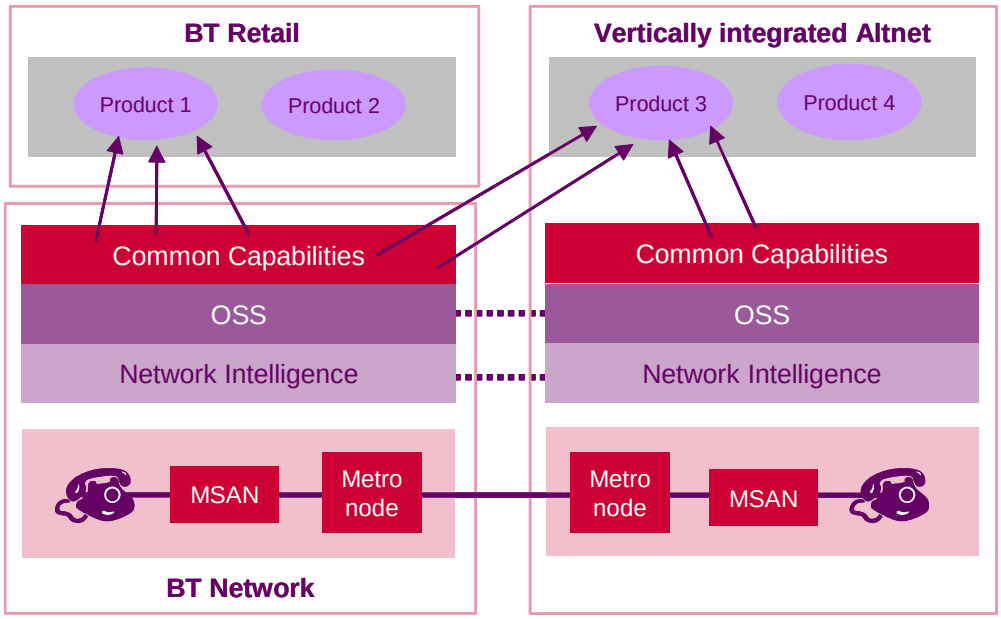
**Figure 5. Service management architecture for BT's 21CN (source: BT)**




F.17 The diagram above implies that the retail service provider does not have a network of its own, and is therefore purchasing services delivered end-to-end over BTs network. This will not in general be the case. Many competing service providers will be vertically integrated, and have a network of their own, which will interconnect with BTs network. The products offered by such providers will combine some capabilities delivered over

their own network with some common capabilities provided by BTs network. As illustrated below, such operators may need to access lower layers of the service stack, and the question that arises is whether EoI is required at these points.

**Figure 6. Access to lower layers of service stack (source: BT)**




F.18 As discussed in the first half of this annex, access and interconnection will clearly be required at the network layer, in order to support the media flow from source to destination. Additionally, some form of access may be required at the 'Network Intelligence' layer. This would take the form of a link between the two 'network intelligence' layers (shown here as a dotted line). This form of access has been described by BT as the provision of deep 'Network Hooks'. A more detailed example of deep network hooks is set out in Annex G.

F.19 This form of access might be necessary in order to provide access to functionality that is required by an interconnecting operator, but that is not exposed via the 'common capabilities'. Whether this is necessary depends in practice on the extent of the functionality provided by the common capabilities, and on the associated product wrap. If, for example, the common capability called 'Presence and Location' provides all the information required by an interconnecting operator, and does so with minimal product wrap, so that downstream services can be differentiated from one another, then it may not be necessary to provide a 'Presence and Location' network hook.

F.20 This would probably be a desirable outcome, since the application of EoI to Network Hooks might be problematic. This is because the internal interfaces within BTs network between the network intelligence layer and the higher layers of the service stack may be proprietary. Exposing these proprietary interfaces to the alternative providers, as would be required by the application of EoI, may be a complex and costly process.

F.21 Access may also be provided at the OSS layer. This would provide interoperability between the OSS systems of BT and an alternative provider for the end-to-end management of wholesale business processes (e.g. pre-ordering, ordering, provisioning, fault management, billing), probably using an XML-based interface to support zero-touch processing of transactions.

F.22 The application of EoI implies that the same XML-based OSS interface that is used between BT and an alternative provider is also used as the basis of transactions between BTs retail business and its network business. What is not currently clear is whether this is simply another 'common capability', or whether such OSS interfaces will exist in parallel with the common capabilities. Arguably this is more of a semantic than a real distinction. However this interface is labelled, Ofcom's view is that EoI must apply.

F.23 Finally, although BT's proposed architecture can be presented as a simple and very clean structure, as illustrated in Figure 5, in reality the situation is likely to be much more complicated. This is because BT, like most other communications providers has a very large number of legacy operational support systems. In general, when large IT programmes are implemented against a new architecture, and there exists a large base of legacy systems, aspects of the legacy systems continue for some time. This suggests that there is likely to be a complex transition between legacy systems and the new architecture.

## Annex G

# Network intelligence

## Introduction

G.1 To help advance the debate on next generation access and interconnection, this annex discusses the potential regulatory issues for NGN intelligence capabilities.

G.2 In our previous consultation we identified that there were potentially three ways in which access to network intelligence in next generation networks could be treated:

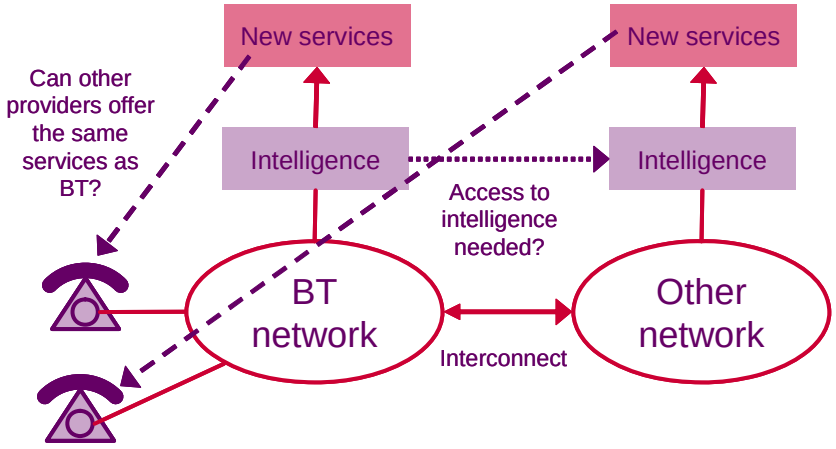
1. Where BT has control of functionality or ownership of data because of SMP in a related market there might be need for an access obligation on BT

2. Reciprocal access might be required if access to a capability is necessary to fulfil a regulatory obligation that applies to many providers

3. Reciprocal access on a voluntary commercial basis

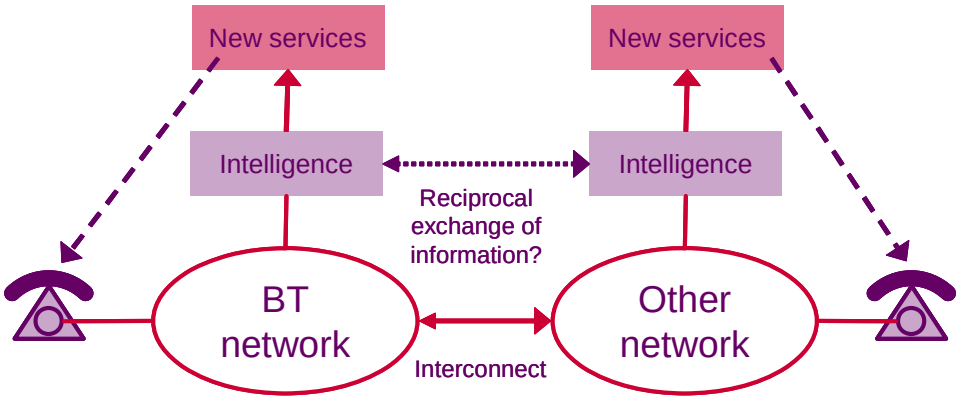
G.3 Responses generally focused on the specific obligations that BT should face and were generally in agreement in principle that BT should only face specific access obligations for intelligence capabilities where these were related to network related bottlenecks. The concern was that BT might be able to launch downstream services based on capabilities that could not be replicated by other providers, and so use its ownership of the access network to strengthen its position in downstream services. In general the questions relate to whether capabilities can be provided by third parties independently of the underlying network where BT has significant market power (see Figure 7).

**Figure 7. Access to network intelligence**




G.4 There are also questions about how network intelligence information would be exchanged between competing providers, for example the exchange of presence information relating BT retail customers and an alternative provider's customers (see Figure 8).However, it is less clear that there is potential for competition concerns relating to this, and we do not consider this aspect in detail here.

**Figure 8. Exchange of network intelligence information**




G.5 There is still a limited amount of information about network intelligence and few respondents felt able to give many detailed examples. The most commonly identified issue was the need for quality of service (QoS) control. There are also a wide range of views of what network intelligence actually consists of. BT has defined a set of what it calls common capabilities. Recognising that this area is still fluid, this annex discusses the possible regulatory issues for a number of the specific capabilities that BT has publicly presented (albeit at a high level) in order to help move the debate forward.

G.6 Although we acknowledge there is a wider discussion happening within the Consult 21 Network Intelligence working group, our role here is to facilitate progress specifically on the competition policy issues for network intelligence, ie where might be need for regulatory obligations.

G.7 For each capability we consider whether there might be a link between the provision of the capability and BT's control of the underlying access network. We also consider if there might be a link to regulatory obligations that are relevant to all providers. Note that there might additional regulatory issues, such as data protection, associated with some capabilities, but our discussion here is limited to telecoms regulatory issues.

**Presence**

G.8 Use of a presence server in a NGN can provide availability (e.g. connected, online, offline) information on a user to other similarly connected subscribers.

G.9 This capability is already widely used for instant messaging (IM) services. In that case, presence is implemented solely at the application layer. The end users presence information is generated, sent between the IM client and presence server, and potentially exchanged between different presence servers independently of the network. If a similar approach were adopted for implementation of presence on NGNs, it seems that any provider could replicate a presence capability independently of BT.

G.10 It would also be up to providers to decide to what extent they wanted to exchange presence information, although we note in the current IM world there are a number of competing providers who do not necessarily share presence information inter communities.

G.11 Alternatively it is possible to imagine circumstances where a device deployed by a network operator at the edge of the access network is capable of providing presence information, for example based on the use of intelligent terminal equipment.

**Authentication**

G.12 Authentication is the process by which a user is allowed to access, register in the network and consume network resources for which the user can subsequently be charged. There are a number of different authentication schemes used by existing services, for example, authentication by the network to which the user is connected, or solely by the service provider (as for ISPs) or a common authentication scheme (as for mobile networks).

G.13 The approach to authentication for next generation networks is not yet clear. Different authentication schemes could be deployed to support NGNs including those which rely on authentication schemes currently used within the internet and mobile networks.

G.14 To enable a user belonging to an alternative provider is be authenticated when connected to BT's network, a mutual authentication scheme may be required involving exchange of authentication data securely between networks.

**Location**

G.15 There are likely to be a number of different ways of using location information in next generation networks, each of which may raise different issues. Three types of uses are considered below.

*Emergency location*

G.16 The location of a user is already commonly used for emergency call purposes for dispatching assistance when the user is at a location which can be determined. This requirement is common to all providers (although see our consultation on New Voice Services www.ofcom.org.uk/consult/condocs/new_voice/anew_voice/) for a discussion in relation to voice over broadband services). In an NGN it is expected that the user will be capable of connecting to many different access points and to many different networks, and location capabilities will need to evolve to provide location information to the emergency services when they require it.

*Commercial location based information services*

G.17 NGN location information is likely to be used for commercial location-based information services. These types of services are already available via mobile networks, for example mobile traffic information. Fixed network operators are likely to have an incentive to expose NGN location capabilities to enable third party providers to develop innovative new location based services.

*Location enhanced communication services*

G.18 Location information may be used to support or enhance the communication service provided to the end user. Consider a user that might be connected to any point in BT's network. BT could use the information about the location of that user to route traffic to them in the most efficient way. However, an interconnecting communication provider without this information could face less efficient routing (and hence higher costs). For example, an alternative provider might end up 'tromboning' a Glasgow originated call via a BT node in London (the called party's home location), when the called party was actually in Glasgow, whereas BT could route the traffic directly.

G.19 Another example is that location information might be used to support personalisation of the communication service. In combination with a profile capability, the user might

choose to have all calls handled differently (eg diverting to voice mail) when they are in different locations.

G.20 The use of location information to support communications services might place different requirements on the information that is exposed and the way that it exposed, than other uses. This might particularly be the case where it is needed to ensure optimal routing.

**Directory**

G.21 In a NGN, it is expected that a directory will exist to provide numbering and contact information for subscribers to the service. This might include a standard (E.164) telephone number, email or SIP URI contact details which are related to an individual identity for use within a communication provider's domain.

G.22 The directory could be closely linked to profiles as the user may choose to use different modes of contact during the day and manage these dynamically by indicating which method communication is preferred (e.g. voice, email or short message). This use of a directory could be provided on per provider basis, and it seems likely that any provider could implement their own directory capability independently of the network being used.

G.23 The provision and use of directory capabilities is also potentially linked with two other policy requirements – that of number portability and directory information for directory enquiry services. In both these cases it is beneficial to have a central database(s) accessible to all providers.

G.24 This raises some potentially fundamental questions about how directory services are provided and used. One extreme would be for there to be single database and directory service for the whole industry supporting all services. However, it is not clear that it would be desirable or necessary for the information available via a central database to be the same as that used for individual provider directories. In addition, the requirements of such a directory service for customer profiles, directory information, and portability are likely quite diverse. An alternative might be for there to be a system of sharing selected information from individual provider directories to central databases for number portability and directory enquires.

**Profile**

G.25 NGNs are likely to use profile information about the customer including the capabilities of the device they are using, the service offerings to which they have subscribed and user preferences, for example over the handling of different types of calls. Currently, the profile model is perhaps seen most widely in the mobile and internet world where devices and applications announce the capabilities they support to servers such as WAP gateways and portals. Using this model, it seems that all providers would have the ability to provide profile capabilities, regardless of the network to which the user was connected.

G.26 However, it might be that on an NGN the network might be able to automatically detect the characteristics of the device (eg SIP phone versus traditional phone) rather than this being announced by the device as an application level. If this were the case, the access network provider might have some advantage over other providers, if that capability were not exposed.

G.27 In addition, for information about device capabilities and call handling to be of use, this information may need to be exchanged with other providers for inter-network calls. For example, this might be necessary so that a video call originating another provider could be routed to video capable device rather than to a standard telephone, but only if the user had chosen to support incoming video calls. We would expect there would be a mutual incentive for providers to agree to a mechanism to exchange this information based on open standards.

*Application Driven Quality of Service (ADQoS)*

G.28 Many responses to the consultation supported the view that a QoS offering is essential for NGNs to support existing TDM products and next generation applications.

G.29 On an NGN, it is expected that applications would need to indicate to the underlying network what capacity is needed and for what period. Some parameters that could be negotiated include:

- Packet Loss
- Latency
- Jitter
- Bandwidth requirements
- Duration of requirement

This QoS requirement would need to be driven by the application and on demand, as it is unlikely to be efficient to offer the same (high) quality of service to all applications at all times.

G.30 It is also debatable whether inter-Autonomous System (AS) MPLS standards are currently mature enough to support such an approach where an end-to-end QoS can be requested by an application across multiple networks. It is therefore assumed that a communications provider wishing to offer end-to-end QoS over multiple provider NGNs would therefore use an agreed API to indicate the application requirement to the network, which would attempt to fulfil the contract against an SLA reflecting the parameters requested. However, see below for discussion of use of deeper ‘network hooks’ in this context.

**Secure Connections**

G.31 An IP network is able to support connections using Transport Layer Security (TLS) or Secure Sockets Layer (SSL) at the application layer to allow the secure exchange of data between applications. This is commonly done in both the internet and mobile networks to ensure data is delivered reliably, safely and securely. It therefore seems reasonable to assume that alternative providers could replicate a SSL/TLS based secure connection capability on an NGN. In addition, it might be possible for alternative providers to implement security operating at the IP layer using tunnelling over BT's network.

**Digital Rights Management**

G.32 Within a NGN, digital multi-media content must be protected in accordance with the owner’s requirement(s). If DRM protected content is to be transmitted between different providers’ networks, then it is assumed that the protective marking will need

to be maintained across networks boundaries. Arguably, if BT's network did not preserve or respect the DRM protective markings of content originating on others networks, then alternative providers might not be able to offer their own DRM capabilities to content providers. This might arise if they could not guarantee that their protective marking would be respected for content delivered to consumers connected to BT's NGN. Alternatively, protective marking could be carried independently of the underlying network, and DRM implemented purely at the application layer.

**Other**

G.33 There are expected to be number of other 'common capabilities' which are purely application level capabilities and can be provided independently of the underlying network. These are likely to include:

- Application Environment
- Storage
- Individualised Customer Care and Customer Portal
- Home and Office Environment

**'Depth of hooks'**

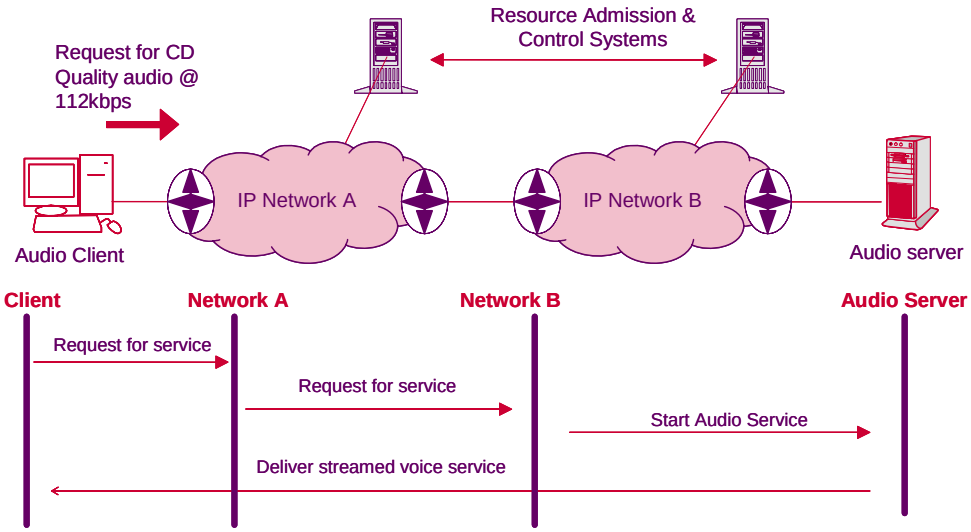
G.34 In our earlier consultation we asked about the provision of deeper network hooks to directly access intelligence capabilities. In response, BT's view was that deeper hooks will not pass a cost-benefit analysis, although there was limited detailed comment from other providers on this aspect. Annex F discussed this issue in the context of equivalence. To help advance this issue further, we consider below a more detailed illustrative example.

G.35 Consider the example where an Application Driven QoS (ADQoS) capability is used to support broadband applications such as streaming audio. The question considered is how the layer at which access is provided between BT and other networks might affect the end-to-end ADQoS capability. Two hypothetical alternative approaches are considered, with access being provided using an application layer call or via deeper network layer hooks directly between communication provider networks.

*Application layer access*

G.36 In this approach the user makes an ADQoS request remotely via an API which signals the networks to deliver the requested QoS. If network resources are available on end to end basis the request is fulfilled, if not the service request fails.

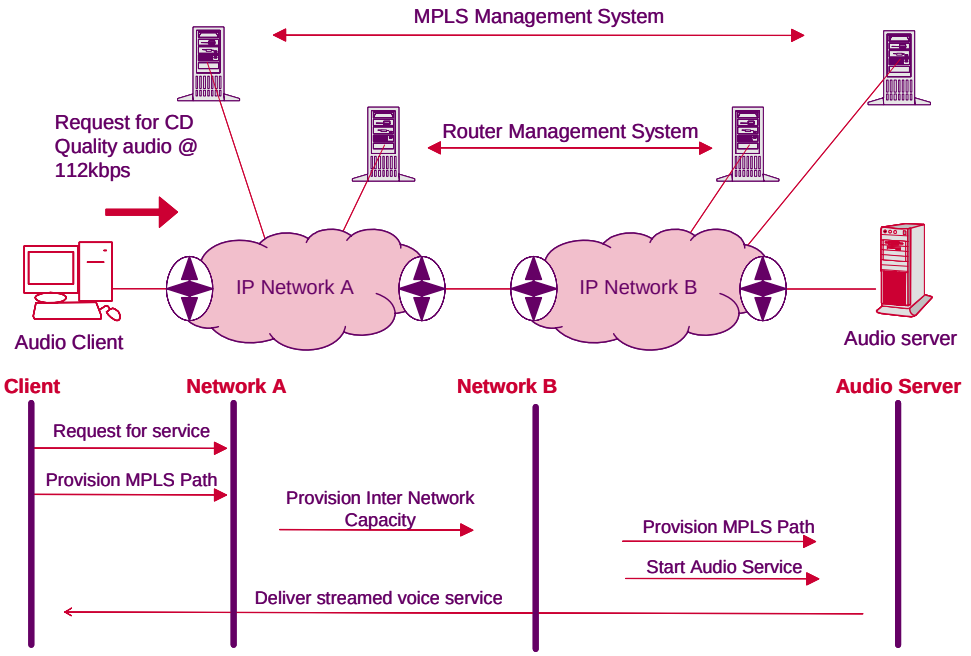
**Figure 9. Application level request for QoS**




*Network level access*

G.37 An alternative approach is for the network requesting the broadband service to have direct access to the network elements, directly or mediated on which the content is housed (a 'deeper network hook'). The network requesting the service would have pre-provisioned the necessary bandwidth on its interconnection link. This would require both networks to have appropriate trust and control mechanisms, in addition to the network to network interconnect, to allow service requests to proceed when requested.

**Figure 10. Network level request for QoS**




G.38 The network level access approach seems to present additional complexities as it requires greater cooperation between networks and must be replicated when the service is added to or modified. However, it could offer a more deterministic approach to requests for ADQoS across multiple networks and potentially more granular control of QoS capabilities that an application layer interface.

G.39 In general there seems to be a trade off between the potential for additional flexibility and functionality of a lower level interfaces, versus their additional complexity and potentially cost compared to a high level interfaces. For interfaces provided on a reciprocal basis between providers then the appropriate ‘depth’ would purely be subject to commercial discussion. However, where network intelligence is derived from BT’s SMP and the interface subject to regulation it will be important to take into account:

- The proportionality of the obligation on BT, for example taking account of the cost, complexity and potentially network integrity issues of exposing low level interfaces.
- The ability of other providers to offer equivalent capabilities if they are dependent on high level interfaces from BT.