

An assessment of alternative solutions for UK number portability

Consultation

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Contents

Section		Page
1	Summary	2
2	Background	4
3	Regulatory Impact Assessment	8
4	Short and longer-term issues	26
5	Responding to this consultation	31
Annex		Page
1	Ofcom's consultation principles	33
2	Consultation response cover sheet	34
3	Consultation questions	36
4	Estimating the likely benefits	38
5	Glossary	41

Section 1

Summary

- 1.1 Number portability is the facility which allows consumers to change their mobile or landline communications provider without having to change their telephone number. It was introduced in the UK by the former telecommunications regulatory authority, the Office of Telecommunications (OfTel), between 1996 and 2000. OfTel introduced number portability because many consumers, especially businesses, were reluctant to change their communications provider if this meant having to suffer the inconvenience and costs of a new telephone number. Millions of numbers have been transferred under the current number portability solution providing a boost to the introduction and growth of competition in the UK telecommunications market.
- 1.2 However, the failure of Atlantic Telecom in 2001¹ resulted in around 14,000 customers having to move to another provider and having to change their telephone number due to the current indirect routing solution for fixed number portability. In this solution calls generated from originating networks continue to be routed as if there was no porting. The network which holds the relevant range of telephone numbers (the donor) is required to recognise that the called number has been ported and route the call to the new network. If the donor network fails (i.e. is shut down) then porting also fails. This was considered by OfTel to be unsatisfactory in terms of meeting effective competition and consumer protection objectives. OfTel considered that portability solutions which make use of central databases (CDBs), like those implemented in the US and elsewhere in Europe, were most likely (at a technical level) to ensure that *landline* consumers can move freely between providers without losing their numbers including in situations similar to the failure of Atlantic Telecom.
- 1.3 Ofcom considers that the risk of business failure involving the loss of the network (as arose in the case of Atlantic Telecom) is likely to be higher for fixed networks than for mobile networks. The focus of this consultation is therefore on fixed number portability. However this assessment also considers implications for mobile networks.
- 1.4 In this document Ofcom builds on the outcome of a previous OfTel consultation on this issue, and draws together an economic analysis of different CDB options. Ofcom commissioned a report² produced by Mason Communications Limited ("Mason") to help inform its assessment. There are several benefits of moving to an Intelligent Network (IN) based CDB solution for number portability. These include lowering any costs to consumers caused as a result of network failure (such as those which arose when Atlantic Telecom failed) and efficiency gains in the conveyance of calls to ported numbers. But the assessment, looking over a ten year period, shows that only where extreme assumptions are used in the modelling can costs be shown to be offset by the benefits. Core assumptions show the net cost, of what is probably the most viable of the options explored in this document, the All Call Query (ACQ) solution - where all calls generated by originating networks are queried against a database and the call is routed direct to the new network - to be £200.6 million. Some

¹ The significance of the Atlantic Telecom failure (like that of Ionica some years previously) was the closure of the access network (in the case of both Atlantic and Ionica, a fixed radio access network) for which administrators, exceptionally, could not find a buyer. Usually communications businesses are bought and sold without any impact to the continuity of service to customers or any change of telephone numbers.

² A study entitled '*Costs and implementation issue of a central database for number portability*' produced for Ofcom by Masons Communications Limited dated April 2004 (available as a related item to the consultation at: www.ofcom.org.uk/consultations/)

70 similar incidents like the Atlantic failure would be required to recoup this scale of cost. The benefits do not appear to offset the significant costs of setting up and running such a solution using currently deployed circuit-switched network technology. Development in next generation networks over the next five to ten years offers an opportunity to migrate to a new solution for number portability (a CDB approach). But investment in current [legacy] network infrastructure now risks assets being stranded and made obsolete in only a few years.

- 1.5 Based on this assessment, Ofcom's initial view is that an IN-based CDB solution is highly unlikely to be cost justified and that it should not therefore be implemented as a regulatory solution to the public policy issues raised by the failure of Atlantic Telecom.
- 1.6 The main purpose of this consultation is to explain why Ofcom has arrived at this initial view, to check the robustness of Ofcom's assessment and conclusions by inviting stakeholders to provide their views, and to enable Ofcom to come to a final conclusion on the question of whether an IN-based CDB solution for number portability should be mandated.
- 1.7 The consultation also highlights and seeks stakeholder views on other practical, technical and strategic outcomes of the assessment including:
 - that Industry should collate definitive data on the extent of number portability in the UK;
 - that communications providers should consider how future Internet Protocol (IP)-based network infrastructures could support a direct routing solution and include this in their planning;
 - that Ofcom should concurrently consider a regulatory framework which allows the planning and development of a new solution for number portability as Industry moves towards next generation networks; and
 - that Ofcom and Industry should review previously proposed enhancements to the existing indirect routing solutions and carry out an assessment of these with a view to determining which option or combination of options best minimises the costs to consumers of a forced number change such as might arise in the event of business failure of a network operator.
- 1.8 Ofcom wants to hear the views of all interested parties, including communications providers (in both fixed and mobile telephony markets), consumer groups and individual consumers.
- 1.9 Responses to this document are requested by 4 November 2004.

Section 2

Background

Introduction

- 2.1 Number portability is a facility that enables subscribers, who so request, to be able to retain their telephone number(s) on the public telephone network independently of the organisation providing service.
- 2.2 It is recognised by the European Union (EU) as a key facilitator of consumer choice and effective competition in a competitive communications environment; subscribers being reluctant to consider changing their provider if this means they have to change telephone numbers(s). As such, number portability has been a requirement in respect of fixed services (land lines) under EU law since January 2000 and mobile services since July 2003.
- 2.3 The UK recognised the benefits to competition of requiring number portability in the early 1990s. Under UK regulations, landline operators were required by Ofcom to port numbers, on a reciprocal basis, from 1997 and, on a similar basis, mobile operators were required to provide mobile portability from 1999.

The legal basis for number portability

- 2.4 Member States of the EU are required to ensure the provision of number portability to subscribers pursuant to Article 30 of the Universal Services Directive (2002/22/EU).
- 2.5 Powers to enable Ofcom to set general conditions requiring UK communications providers to provide number portability are set out in section 58 of the Communications Act 2003 (the "Act").
- 2.6 Obligations imposed on a communications provider to provide number portability to its subscribers and to provide portability to other communications providers are set out in General Condition 18. That Condition (which came into force on 25 July 2003) was set by the Director General of Telecommunications by way of a publication of a Notification pursuant to section 48(1) of the Act dated 22 July 2003 and was contained in the Schedule to that Notification³. Ofcom have powers to enforce any breach of that Condition under sections 94 to 103 of the Act. Civil liability for breach of that Condition could also arise, but Ofcom must first give a consent for the bringing of such civil proceedings under section 104 of the Act.
- 2.7 General Condition 18.2 requires communications providers to provide portability in accordance with a document called the Number Portability Functional Specification. This document specifies the technical and other principles to enable the efficient implementation and utilisation of portability and is published from time to time by Ofcom in accordance with section 60 of the Act. The current Functional Specification is Issue No. 5 dated 22 July 2003⁴.

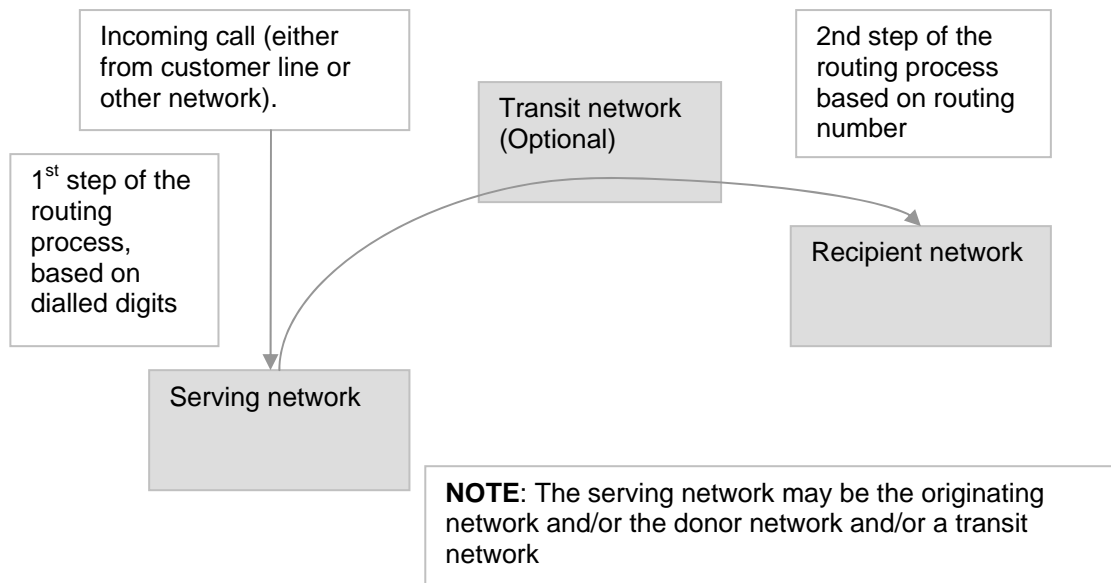
³ The Notification setting general conditions under section 45 of the Communications Act 2003 is at www.ofcom.org.uk/licensing_numbering/numbers/num_port_info/section48.pdf

⁴ The Functional Specification, Issue No.5 dated 22 July 2003 is at www.ofcom.org.uk/static/archive/oftel/publications/numbering/2003/fun_final0703.htm#b

Implemented solutions

- 2.8 The former UK regulatory authority for telecommunications, the Office of Telecommunications (OfTel), assessed the costs and benefits of implementing geographic number portability in 1994. This factored in different methods of implementation. The analysis showed that the costs of what was described as a total Intelligent Network (IN) solution significantly outweighed the benefits. Today this approach would more commonly be referred to as All Call Query (ACQ). Less costly call redirection options, which include what is commonly known as the Onward Routing approach, and call re-routing options (including the Call Drop-back approach and the Query-On-Release (QoR) option) all showed net benefits the year after implementation.
- 2.9 The chosen method of implementation, developed by Industry through the Network Interoperability Consultative Committee (NICC), was Onward Routing, with an enhancement to avoid inefficient routing for calls to ported geographic numbers originating in the recipient exchange.
- 2.10 In the case of the porting of non-geographic numbers, Industry, via the NICC, opted for a similar Onward Routing solution with a conceptually similar enhancement as that adopted for geographic portability. This is known as the Call Trap option. This enables an originating operator, at its discretion, to filter out a number which has been ported to itself. This reduces the degree of tromboning⁵ and, thereby, improves routing efficiency. Industry also identified ACQ as a future solution; migration to ACQ would require the introduction of a centralised number administration function e.g. a central database to which all providers would need to send information about changes of number status e.g. when a subscriber ports their numbers to a different provider.
- 2.11 With regard to mobile networks, calls cannot be delivered to mobile subscribers simply by means of analysing the digits dialled because a mobile can be anywhere in the mobile network or even roaming on another network. To deliver a call, a routing enquiry is made to a Home Location Register (HLR) to determine where the subscriber is located and to obtain a routing number. The solution for mobile number portability, known as the Signalling Relay Function (SRF), is that the donor network sends the routing enquiry signal addressed to a ported number to the appropriate recipient network for treatment. In this way the recipient network can provide the routing number to complete the call. Where a called party is roaming, the SRF will cause the call to be routed direct from the donor network to the roaming network and will not enter the recipient network. This creates several problems such as the raising of billing records, donor incurred delivery costs, compromised recipient functionality and donor network announcements. To overcome this, a Direct Routing Override Function (DROF) is defined which forces calls to ported numbers into the recipient network.
- 2.12 In principle, the implemented solution for mobile number portability, like those for landline portability, can be described as Onward Routing. A call to a ported number is usually delivered by the originating network to the donor network, which identifies that the number has been ported, to which network the number has been ported and subsequently "onward routes" the call to the appropriate recipient network for termination to the called subscriber. This is illustrated below.

⁵ A loop in call routing through a transit or range holder network, occupying an ingress and egress circuit for the duration of the call.



- 2.13 These technical and other principles necessary to support the provision of portability between networks are set out in Ofcom's Number Portability Functional Specification. More detailed technical service descriptions are owned and published by the NICC⁶.

Of tel's proposals to change the framework for portability

- 2.14 The failure of Atlantic Telecom in November 2001 led to concurrent policy consultations by the Department of Trade and Industry (DTI) and Of tel: the former on options to provide continuity of service when access networks fail and the latter on alternative solutions to enable customers to be able to keep their telephone numbers when access networks fail. The DTI found all options to be too costly to consumers.
- 2.15 On the 14 June 2002, Of tel consulted on proposals to change the framework for number portability⁷ ("the June 2002 Consultation"). Of tel's main objective was to propose changes to the current implemented solutions in order to ensure that, in the event of the failure of a fixed network, consumers transferring or having already transferred to another network could retain their telephone number(s). This objective took into consideration legal requirements, and the effectiveness of, and consumer confidence in, number portability in the light of public policy concerns arising from, in particular, the failure of Atlantic Telecom.
- 2.16 The routing of calls to ported numbers is reliant upon the continued existence of the donor network to carry out the onward routing function. The loss of the Atlantic network resulted in Atlantic customers and customers of other communications providers who had ported their telephone numbers from Atlantic, losing service on their numbers. Even after these customers secured a replacement access network connection, they were unable to retain their original numbers thus incurring such costs, at short notice, as are associated with a telephone number change such as reprinting stationery and signage in the case of business customers.

⁶ ND1203:2001/12, *PNO-ISC Service Description Number 003 Geographic Number Portability* (Issue 2, December 2001); ND1207:2001/12 *PNO-ISC High Level Service Description Number 007 Non Geographic Number Portability* (Issue 2, December 2001) and ND1208:2000/03, *PNO-ISC Service Description Number 008 Mobile Number Portability* (Issue 1, March 2000)

⁷ *Consultation on proposals to change the framework for number portability* was issued by the Director General of Telecommunications on 14 June 2002. It can be found at www.ofcom.org.uk/static/archive/of tel/publications/numbering/2002/nupo0602.htm

2.17 Oftel set out two broad options in the June 2002 Consultation. These were:

- to improve the Onward Routing system by ensuring that the donor network function is performed by another network provider when a network closes; and/or
- to adopt an alternative system, which would additionally remove the other identified difficulties of implemented solutions and give greater network resilience overall.

2.18 Oftel considered that solutions which make use of central databases, like those implemented in the US and parts of Europe, were most likely (at a technical level) to ensure consumers can move freely between communications providers without losing their telephone numbers, including in situations similar to the failure of Atlantic Telecom. This type of solution is illustrated below.

Stakeholder responses

2.19 Responses from stakeholders to these proposals were summarised in Oftel's published statement on proposals to change the framework for number portability of December 2002⁸ ("the December 2002 Statement"). In brief, consumers were less concerned about particular solutions but regarded the speed of putting arrangements in place to enable their numbers to be retained should a supplier fail to be the priority. Landline providers generally rejected a central database solution believing that the benefits of such investment would not outweigh the costs and also rejected proposals to enhance the current solution for a range of technical and commercial reasons. They did however propose certain temporary measures which could be developed to help consumers manage a number change and reduce the inconvenience and costs which arise. Mobile providers supported the migration to a direct routing solution such as the one illustrated at paragraph 2.18 above although the justification for, and timing of, such a change varied between responses. They rejected any investment in the current Onward Routing solution.

Oftel's interim conclusions

2.20 Having considered the responses, Oftel felt that it had insufficient cost information upon which it could draw any early policy conclusions. It therefore announced its intention in the December 2002 Statement to collate such material as necessary in order to carry out an economic assessment of the different options. Oftel released invitations to tender for a study to calculate the likely costs and implementation issues for a central database solution for number portability in the UK in July 2003. Oftel selected Mason Communications Limited ("Mason") who made their final report to Ofcom in April 2004⁹ ("the Mason Report"). This report is available as a related item to the consultation at www.ofcom.org.uk/consultations/.

2.21 Having assumed Oftel's responsibilities in December 2003, Ofcom has proceeded to build an economic assessment drawing on the Mason Report. This economic assessment is the subject of this document.

⁸ *Statement on proposals to change the framework for number portability* was issued by the Director General of Telecommunications on 20 December 2002. It can be found at www.ofcom.org.uk/static/archive/oftel/publications/numbering/2002/nupo1202.htm

⁹ A study entitled '*Costs and implementation issue of a central database for number portability*' produced for Ofcom by Masons Communications Limited dated April 2004

Section 3

Regulatory Impact Assessment

Why is Ofcom carrying out an RIA?

- 3.1 The analysis presented in this section, when read in conjunction with the rest of this document, represents a Regulatory Impact Assessment (RIA), as defined by section 7 of the Act. Respondents should send any comments on this RIA to Ofcom by the closing date for this consultation. Ofcom will consider all comments before reaching a final conclusion.
- 3.2 RIAs provide a valuable way of assessing different options for regulation and showing why options were chosen or rejected. They form part of best practice policy-making and are commonly used by other regulators. This is reflected in section 7 of the Act, which means that generally Ofcom has to carry out RIAs where its proposals would be likely to have a significant effect on businesses or the general public, or when there is a major change in Ofcom's activities. In accordance with section 7 of the Act, in producing the RIA in this document Ofcom has had regard to such general guidance as it considers appropriate, including related Cabinet Office guidance.
- 3.3 Oftel proposed changes to the current system of number portability in the June 2002 Consultation. In particular, the June 2002 Consultation and the subsequent December 2002 Statement proposed the introduction of a centralised database to facilitate the routing of calls to ported numbers, subject to the satisfactory outcome of a Regulatory Option Appraisal (ROA). An ROA (as referred to by Oftel) and a RIA carry out a very similar function i.e. assessing the costs and benefits of different options in order to inform the policy-making process.
- 3.4 In the June 2002 Consultation, Oftel identified a weakness in the current Onward Routing system of number portability. Specifically the system potentially fails to protect the number portability rights of customers of failed networks. The concern arose from the failure of Atlantic Telecom in 2001, where a number of customers lost the right to use and port their telephone number. Consumers had to move network and take on new numbers. Even those consumers who had already ported their number away from Atlantic Telecom had to receive new numbers.
- 3.5 As a result Oftel proposed that introducing a central database (CDB) could be an effective long term solution to the problems associated with network failure or major disasters. The proposed changes to call routing for number portability were intended to ensure that, in the event of the failure of a telecoms operator, consumers could transfer to another operator and retain their original telephone number.
- 3.6 In addition Oftel noted that there may be other benefits associated with a CDB solution. Prior to the introduction of number portability, Oftel commissioned National Economic Research Associates (NERA) to assess the costs and benefits of number portability¹⁰. In this analysis Onward Routing was essentially considered an interim solution. It was assumed that a CDB solution would emerge as an efficient response to the increased volumes of traffic to ported numbers over the long term. A CDB for routing calls might be expected to provide a flexible and efficient method of routing ported numbers. A key benefit relative to the current system of Onward Routing is the potential efficiency gains in the delivery of calls to ported numbers which arise

¹⁰ A report entitled *Cost-benefit analysis of number portability* prepared for the Office of Telecommunications by NERA dated January 1994

because inefficient tromboning of traffic from the originating operator via the donor operator to the recipient operator is eliminated. However depending on the CDB solution adopted this may be at least partly offset by greater inefficiency in the handling of calls to non-ported numbers.

- 3.7 It seems likely that as the number of ported numbers increases there will come a point where the value of efficiency improvements for calls to ported numbers will exceed the value of efficiency losses for calls to non-ported numbers. As a result the likelihood that there will be a positive net benefit associated with the introduction of a CDB will increase (although these benefits would have to exceed the costs associated with setting up and running a CDB).
- 3.8 The key objectives of this RIA are to identify the costs and benefits of introducing a CDB system for number portability. The potential net efficiency benefits and the extent of any benefits associated with safeguarding the number of customers of failed access networks are considered and compared with the costs of introducing and running a CDB solution. These costs have been considered in the Mason Report.
- 3.9 This document considers the main costs and benefits associated with different CDB options. There are various potential technical variations on the CDB solution, three of which are considered.

Options considered by the RIA

- 3.10 This document considers the costs and benefits associated with the following options for number portability:
- Status quo: Onward Routing
 - Centralised database: Option 1, IN interrogation using All Call Query (ACQ)
 - Centralised database: Option 2, IN interrogation using Query on Release (QoR)
 - Centralised database: Option 3, a hybrid of options 1 and 2

Status quo

- 3.11 The current system of number portability in the UK is such that inbound calls continue to route to the original operator hosting the relevant number block (usually comprising 10,000 numbers and known as a 10k block). The original operator (donor network) forwards the call to the new (recipient) operator's network.
- 3.12 A weakness of this is that in the event of a network failure there is no donor network so Onward Routing collapses (unless an alternative communications provider takes responsibility for the relevant number blocks). This represents a significant cost to some consumers who have to invest in promoting their number (for example advertising and stationery) and who face loss of business as a result of having to change the number.
- 3.13 In addition there are a number of inefficiencies associated with the system of Onward Routing including the relatively inefficient process for routing each call to a transferred subscriber, the potential for congestion on a donor network if the numbers of consumers who port their number is high and the costs associated with failing networks.

Centralised database

- 3.14 It was proposed in the December 2002 Statement that the costs and benefits associated with the introduction of a new CDB should be investigated in order to address the problems associated with the current system. Broadly speaking under the CDB system all operators would submit details of ported numbers to a centralised clearing house that would have all the information on the ported numbers in a database. Under the CDB solution, originating operators would be responsible for routing calls directly to the recipient network, using information in the CDB rather than the donor network routing the calls.

Option 1: IN interrogation using All Call Query (ACQ)

- 3.15 Under this option every call - whether to a ported number or not - involves a query of a local or third party database. Generally the originating network would undertake this query but this may not always be the case. For example, calls from mobile networks to a geographic number may be routed to the appropriate 'fixed network' operator who would then perform the query. The result of the query would enable the call to be routed more directly from the originating operator to the recipient operator and would not require interaction with the donor operator.
- 3.16 Although the routing of ported calls is more efficient under ACQ than under an Onward Routing system, overall the ACQ system may be less efficient given the current level of ported numbers since all calls have to go through a database query, whether to ported numbers or not. The viability of this option will increase as the level of porting increases and so the efficiency gains on calls to ported numbers will offset the losses on calls to non-ported numbers.

Option 2: IN interrogation using Query on Release (QoR)

- 3.17 Under this option the originating operator routes a call as normal and only checks the database if it receives a signal back from another network. The donor network would normally signal that the number was ported. On receipt of this signal the originating operator would interrogate the IN database for the appropriate routing.
- 3.18 QoR may be more efficient than ACQ where the proportion of all calls which are made to ported numbers is relatively low since only those calls made to ported numbers query the CDB. However QoR does not resolve the issue of failing networks since the system requires the donor network to exist in order to inform the originating network that a number has been ported.

Option 3: Hybrid of Options 1 and 2

- 3.19 While QoR avoids routing calls via the donor network, as in the current system, and avoids an IN look-up on every call, as under an ACQ solution, it does require the donor network to remain in existence for the system to work. To overcome this, a hybrid approach could be used whereby most number blocks would work on QoR, while blocks relating to closed networks move to ACQ. Detailed costs for this option have not been developed but it may still be useful to consider its viability in terms of the potential benefits it could deliver.

Question 1: Do you agree that the three options Ofcom has chosen to consider represent the scope of technically viable IN-based CDB solutions?

Cost-benefit analysis: introduction

- 3.20 The conventional approach to assessing the net welfare effect of introducing a public policy initiative involves an assessment of the costs and benefits of introducing or extending a new policy. In such a cost benefit analysis we might expect that the introduction of a new policy will have an impact on prices and hence output. The output effect arises if the market price, preceding the policy, exceeds the price following the introduction of a policy. This would be the case if the policy were designed to enhance competition in the market. If the policy led to prices falling closer to the competitive level, the net benefits to consumers could be separated into:
- the gain in utility resulting from the lower tariff (and higher output);
 - the costs associated with the introduction of the policy (eg as a result of switching to a more efficient operator).
- 3.21 Examples of this approach can be found in the reports prepared for Oftel by NERA and Ovum on the costs and benefits of number portability in the fixed and mobile telephony markets¹¹.
- 3.22 The introduction of regulation requiring operators to introduce a CDB may have some impact on prices and output if there is increased competition as a result of stimulating consumer demand for number portability. It is suggested that this could be the case if the risk of network failure has restricted consumer demand for switching operators whilst retaining their telephone number. Moreover there may be positive effects on competition if the introduction of a CDB leads to efficiency improvements which enable prices to fall.
- 3.23 The range of likely benefits is outlined in the following sections, along with any available evidence about the magnitude of these benefits, and the cost to Industry of implementing an IN-based CDB solution.

Benefits: safeguarding number portability when networks fail

- 3.24 Although number portability already exists, the benefits in terms of competition will be diminished if consumers risk losing their service/number in the event of supplier failure. It may be that some consumers will not switch if they are not convinced about the viability of alternative suppliers or if they have been put off as a result of other network failures such as Atlantic. Alternatively consumers may switch operator but suffer in the event of the failure of their new network. The proposed change to a CDB system is intended to safeguard the position of those consumers that have switched but should also enhance the overall contribution of number portability to competition by further eliminating barriers to switching telephone operator. As noted, adoption of a CDB system can avoid the need for Onward Routing. As a result the input required from the donor network to make portability possible is significantly reduced or removed entirely, depending on the system adopted, and the adverse effects of a network failure are substantially lower than under the current system. The intention is that by improving the effectiveness of number portability, the benefits of consumer choice and supplier competition will be maximised.
- 3.25 The benefits identified by NERA in their 1994 study are useful for this analysis in that consumers who would not have experienced the welfare gains because of the impact

¹¹ See footnote 10. A report entitled 'Economic Evaluation of Number Portability in the UK Mobile Telephony Market' produced for Oftel by Ovum Ltd and published by the Director General of Telecommunications in July 1997

of network failure may now experience some benefit. The categories NERA identified were:

- Type 1 benefits accrue to subscribers who retain their telephone number when switching operator.
- Type 2 benefits are the efficiency improvements and price reduction from increased competition.
- Type 3 benefits are other consumer savings associated with fewer number changes e.g. having to make fewer number changes.

3.26 Obviously the relevant benefits are only those which are additional to the overall benefits of introducing number portability, i.e. those associated with refining the system of number portability and reducing the risks to consumers associated with network failure. The overall size of the additional benefits will depend on two factors:

- the extent to which consumers are put off switching because of the risks associated with network failure; and
- the additional benefits which accrue to consumers who would switch anyway but who now do so under a more efficient system and who would suffer in the current system in the event of a network failure.

3.27 The benefits of the proposed changes are outlined in more detail in the following sections. However it is worth noting that the size of benefits will be partly determined by how likely it is that a network will fail as well as the costs associated with such a failure. Consequently even if the potential costs are relatively high the overall net benefit may be low if there is a small risk that a network will fail.

Type 1 benefits

3.28 Under the current arrangements, in the event of a network failure (as for example happened with Atlantic Telecom in 2001) consumers face a temporary loss of telephone service until a new service is introduced and face having to change their number under the replacement service.

3.29 The introduction of a CDB would enable consumers to retain their numbers once their service was restored, i.e. when they have switched to a new supplier, even if the network of their previous supplier was shut down altogether. This will have some benefit (over and above the Type 1 benefits already associated with number portability) because the risk of incurring costs associated with a number change as a result of network failure will reduce. However it is worth noting that these benefits would only accrue to consumers under an ACQ or hybrid CDB system since under the QoR system there is still a reliance on the donor network.

3.30 Currently the costs associated with network failure include consumer costs of changes to their number. These may be considerable if businesses have to inform all their customers of changes to their telephone number(s). Even if another network was willing to take on the number ranges of a failed network the task may be costly and complex. For example there may be no staff available at a failing network to carry out necessary technical tasks.

3.31 In addition it is possible that the reduced risk, under an appropriate CDB system, of incurring costs following a network failure will actually encourage more consumers to switch network and retain their number. As a result more consumers may benefit from the general benefits of number portability, namely the cost savings from not

changing their telephone number, from switching to more efficient operators and from having more choice. This may stimulate competition in the market generally. This would apply to both the interim and long term changes proposed.

Type 2 benefits

- 3.32 Many of the benefits that fall into this category are considered in paragraphs 3.35 to 3.42. In addition to the efficiency gains (net of efficiency losses) that may accrue to operators, there may be an impact on overall competition if the proposed changes to the system result in greater choice for consumers and increased numbers of consumers switching and retaining their numbers. As noted there may be an impact on operator's costs and as a result all telecoms users should benefit from a general increase in competition.
- 3.33 Other than the potential for efficiency gains considered in paragraphs 3.35 to 3.42 the extent of Type 2 benefits might be expected to be small since the increase in porting as a result of the reduced risk of facing problems associated with network failure is likely to be small. However it is worth noting that NERA estimated that the bulk of consumer benefits as a result of introducing number portability resulted from the effects on overall competition. Consequently even a small increase in portability as a result of introducing a CDB may result in substantial benefits.

Type 3 benefits

- 3.34 The benefits in this category are likely to accrue to general telecoms users who face fewer number changes when making calls. For example if more people port their number fewer consumers may have to ring directory enquiries and fewer people will misdial numbers. It seems likely that these benefits will be relatively small as a result of the proposed changes to the system (although, as noted, it would depend on the impact on volumes of consumers porting).

Benefits: potential efficiency gains

- 3.35 As noted a key general benefit of the introduction of a CDB (regardless of the system adopted) is the potential for efficiency gains in terms of the conveyance of calls to ported numbers. A weakness of the current system of Onward Routing is that calls are not optimally routed through the network. The associated costs are covered by an averaged porting conveyance charge from the recipient to the donor network which is recovered from consumers. Moreover Onward Routing is associated with transit costs where there is no direct interconnection between the donor and recipient networks. At least part of this cost to consumers should reduce under the proposed new arrangements given the improvements in routing, in particular the bypassing of Onward Routing by the donor network, achieved with a CDB. The direct routing of calls to the recipient network should reduce the additional conveyance costs associated with the current system.
- 3.36 A CDB could enable networks to simplify the portability process, reducing the time required to transfer a number, possibly making portability more attractive to subscribers. This may have the impact of increasing the volume of ported numbers overall, although results from Ofcom's most recent survey of consumers' use of telecoms services¹² found that only 3% of fixed residential users that had changed their number when switching supplier, said that under current arrangements, it was 'too much hassle to retain their number'. As a result the likely benefits associated with improving the process for number portability are likely to be small.

¹² Ofcom residential consumer research, February 2004.

- 3.37 The current system of Onward Routing could result in network congestion if networks route ported calls through donor networks with insufficient network capacity. This could have an impact on all telecoms users, as it would increase the overall likelihood of call failure. Since a new CDB system, using the ACQ or hybrid options outlined above, would not place demands on the capacity of the donor network, potential congestion costs associated with number portability should be eliminated. The extent of this benefit would depend on the likelihood that particular networks experience congestion associated with number portability. However Ofcom is not aware of any evidence that suggests that this type of congestion exceeds normal network congestion and therefore the benefit will be relatively small.
- 3.38 In addition, under the current system, establishing new inter-operator porting arrangements can take several months. The proposed changes mean that porting arrangements could be established much more quickly, speeding up the general benefits of number portability, such as the positive impact on competition.
- 3.39 As indicated, there are a number of inefficiencies associated with the current system. This is likely to have an impact on operators' costs and hence consumer prices. If the introduction of the proposed changes leads to efficiency improvements there may be a direct impact on consumer prices. However the size of the efficiency gain would be related to the take up of number portability and the particular CDB system adopted.
- 3.40 Under a system of ACQ since all calls are essentially routed through the CDB and not just those calls made to ported numbers the time taken to set up calls made to non-ported numbers is likely to increase relative to the status quo. Under the QoR and hybrid systems the reliance on the donor network to signal to the originating operator that the number they are calling has been ported means that there may be no savings in connection quality compared with the status quo and there may be a greater time delay (post-dial delay) in establishing a connection for calls to ported numbers compared with a system using ACQ.
- 3.41 Consequently, although use of a CDB system would lead to the optimal routing of ported calls through networks and would minimise any potential problems of congestion on donor networks with limited capacity it could also be associated with introducing inefficiencies in the routing of calls to non-ported numbers or with an increase in the post-dial connection speed of calls to ported numbers or numbers issued by out-of-service networks. Certainly in the case of ACQ it seems likely that, since most calls are made to numbers which have not been ported, the efficiency gains would have to be relatively large to offset the efficiency losses.
- 3.42 As a result, although there may come a point when a CDB solution using the ACQ is the most efficient outcome in response to growth in the proportion of ported numbers, it may also be the case that this point is never reached, i.e. if the level of number portability does not increase by enough to ensure that the efficiency gains offset the inefficiencies and costs of installing the system. Also ACQ might become a redundant solution if technology were to change, for example if there is a migration to IP technology. Similarly, although a QoR system may be a more efficient response where the level of ported numbers is relatively low (compared with ACQ) inefficiencies are still introduced in terms of the connection delays for calls to ported numbers. Moreover this system is still associated with relatively large set up costs.

Estimating the benefits

- 3.43 Although the quantification of the Types 1 to 3 benefits outlined above is complex, Ofcom has a number of pieces of evidence available which might shed light on the net gains of introducing a CDB system.
- 3.44 The value of any net efficiency gains resulting from a CDB will reflect the size of the efficiency gains and losses associated with handling calls to ported and non-ported numbers respectively and the volume of calls to ported and non-ported numbers. If such an exercise were possible and showed that the gains do not currently offset the losses it is possible that at some point in the future there will be net efficiency gains from introducing a new system (and so there may be a point at which the overall benefits offset the overall costs of implementing a CDB). In other words theoretically it is possible that forecasting trends in the take-up of number portability would help to identify the point at which a CDB system is the most efficient response to market circumstances, although as noted the net benefits in terms of efficiency gains would have to offset the implementation costs of introducing a CDB solution.
- 3.45 Ofcom asked some questions about consumer switching and portability in its most recent surveys of business and residential consumers¹³. Notably Ofcom found that by February 2004 some 14% of fixed residential fixed phone users (57% of those who have switched supplier) and 5% of mobile residential users (17% of those who have switched) had ever ported their telephone number (although mobile number portability had only been available for 5 years at the time of this survey compared with 8 years in the fixed sector). The proportions of business users who ported their fixed line number was higher with some 97% of small to medium sized enterprises (SMEs) that had ever switched supplier keeping at least some of their original numbers.
- 3.46 The rate of increase in the volumes of consumers porting their number might be expected to decline or tail off over the next few years as awareness about the service peaks. NERA predicted that number portability would have a significant impact on consumer behaviour in the years immediately following legislation in 1996 followed by a deceleration in take-up as the use of number portability reaches a plateau. This slow down in the growth of number portability will partly reflect how consumers perceive the importance of number portability to their circumstances (and also the factors which drive switching behaviour), such that those who are likely to perceive any benefit to porting their number will have used the service within the first few years. However it is also likely to reflect other market developments such as Carrier Pre-selection (CPS) and Wholesale Line Rental (WLR). These developments enable consumers to switch supplier for particular call types (in the case of CPS) or to change supplier for both calls and access (in the case of WLR) without the need to change their telephone number and could well reduce the demand for number portability. It is worth noting that, in response to questions from Mason, one communications provider estimated that number portability will level out at about 20% of overall traffic due to the effect of CPS and WLR.
- 3.47 Moreover Mason found that operator perception about the numbers of subscribers who have ported their number is significantly lower than that suggested by Oftel's survey results. According to operators in response to questions posed by Mason the volume of fixed traffic to ported geographic numbers is closer to 5% of total traffic to geographic numbers. The difference in the figures may partly reflect Ofcom's assessment being based on proportions of consumers who port their numbers, rather than volume of traffic, the fact that Ofcom did not distinguish between geographic

¹³ See footnote 13. Also Ofcom business consumer research, February 2004.

and non-geographic numbers ported and possibly some inflationary affect if some consumers, who kept their original numbers, viewed Indirect Access/Carrier Pre-Select as a fixed supplier 'switch'. Mason found that the aggregate number of mobile ports in the UK is 4.5% of the current number of subscribers. This seems consistent with the figures produced by Ofcom. Mason proposes that the actual number of ported numbers in use will be lower than this because mobile numbers, in particular, are often ported more than once.

- 3.48 Ideally proportions of numbers ported combined with the relative size of efficiency gains and losses using different CDB systems would enable Ofcom to identify whether a CDB is an efficient response to current market circumstances and, if not, to identify some point in the future where it may be the efficient outcome. For the purpose of this assessment Ofcom has not established the relative size of the efficiency gains and losses using the different options for a CDB system since it already has an indication of this. According to Cable and Wireless, in their response to the June 2002 Consultation, Onward Routing is the most efficient method for number portability where the proportion of calls to ported numbers is less than approximately 25% of all traffic since the bulk of traffic is routed efficiently. Similarly BT cited "the power of the centralised database model becomes worth the necessary investment when between 20% and 30% of the subscriber population decides to switch between service providers".
- 3.49 In addition the way in which the potential gains of safeguarding number portability against the risk of network failure are assessed needs to be considered. The size of the potential benefit will be determined by the likelihood that a network will fail and the costs associated with such a failure. These will depend partly on the extent to which consumers are put off switching because of the risks associated with network failure. If these consumers were encouraged to port their number under a system backed by a CDB they would gain from the range of benefits identified by NERA in 1994. In addition the overall benefit would reflect the additional benefits to consumers who switch anyway but now do so under a more efficient system and who would no longer suffer in the event of a network failure.
- 3.50 Ofcom collected some information on consumer behaviour which may help assess how likely it is that consumers will have been deterred from porting their number as a result of the risk of network failure. Although consumers were not directly asked about the effect of possible network failure on their actions, they were questioned about the reasons for changing their number when switching supplier. In February 2004 only 3% of residential users of fixed lines who had ever switched supplier said that it was too much hassle to arrange to port their number when they switched. Another 2% said that it was too expensive. This compared with some 23% of consumers who were given a new number automatically, because they didn't ask to port their old number. Respondents did not cite the risk of network failure as being a deterrent.
- 3.51 Ideally however it is useful to investigate the reasons for not switching operator. This is because we are interested in the number of additional people who would switch and port their number as a result of eliminating the problems associated with failing networks. In June 2004¹⁴, 7% of SMEs said that they had never switched supplier because of reliability/quality of alternative suppliers might not be as good as their current supplier and 2% said it was because other suppliers have a poor reputation. However this is likely to relate to service quality and reliability. Another 12% said there would be too much hassle or disruption. However this is not likely to be

¹⁴ Ofcom business consumer research, June 2004.

influenced by the introduction of a CDB since the consumer experience of porting is not expected to change markedly. Respondents did not cite the risk of network failure as being a deterrent to switching. It should be noted that this August 2001 survey preceded the failure of Atlantic Telecom by a few months.

- 3.52 The experience of customers of Atlantic is worth considering to help assess how likely it is that the problem of network failure will recur and if it were to recur the likely magnitude of the problem in terms of how consumers would be affected.
- 3.53 Atlantic Telecom failed in 2001. As a result of this failure Atlantic customers could not switch to an alternative provider and retain their telephone numbers. In addition consumers who had previously ported their numbers from Atlantic were not able to continue to use their ported number. Some 14,000 consumers were affected out of a UK base of 35 million lines (less than 0.1% of total lines).
- 3.54 A key concern for Oftel at the time of the failure of Atlantic was the impact on consumers, both in terms of the impact of the loss of their telephony service but also the cost and impact on businesses and residential consumers of an enforced change in number. Since porting currently requires the network originally allocated the numbers to onward route calls, porting was impossible in this case because Atlantic's network was shut down and all services withdrawn. Prior to the shut down porting would have been possible if operators had taken over entire blocks of numbers originally allocated to Atlantic.
- 3.55 Although the failure of Atlantic caused significant costs and inconvenience to customers of Atlantic (and those who had previously ported their number from Atlantic), it is worth noting that a relatively small proportion of total UK customers were affected by the network failure. Moreover it is Ofcom's view that a permanent network closure, such as occurred with Atlantic, is likely to be rare. Previous failures of telecoms companies have been on a relatively minor scale and it seems likely that the two key examples, Atlantic and Ionica, were exceptional.
- 3.56 One particular feature making failure more likely in the cases of Atlantic and Ionica was probably their relatively small size. If a network faces financial difficulties it would be likely that its assets, notably its customer base, would be purchased or the company taken over or successfully refinanced. Once established, an operator's key asset - a customer base - is likely to be attractive to other companies. This is likely to be the case with bigger, more established operators. As a result the risk to consumers of losing service from a large operator, even if the operator faces financial difficulties, is likely to be low.
- 3.57 This implies that the risk of a network operator failing is likely to be low and the number of consumers likely to be affected by failing networks (i.e. both those who ported their numbers from a network which subsequently failed and those who cannot port their number once their network fails) is likely to be relatively low. Moreover consumers do not seem to be avoiding switching supplier or porting their number because of the risk of network failure. Consequently the benefit in these terms of introducing a CDB is likely to be very low.

Question 2: *Do you agree that Ofcom has identified the relevant benefits of significance in the context of this RIA?*

Question 3: *Do you agree with Ofcom's assessment on the potential size of Type 2 benefits?*

Costs

- 3.58 NERA showed that a CDB using an IN interrogation system would cost substantially more than the expected benefits, even taking into account the efficiency gains which are associated with optimal routing of calls to ported numbers. This derived largely from the fact that there are substantial set up costs. Also the predicted gradual increase in levels of porting indicated that the breakeven point (where the benefits of an IN-based CDB solution begin to outweigh the costs) would not be attained quickly.
- 3.59 As part of the current review Ofcom commissioned Mason to examine the costs of implementing different CDB options. Mason interviewed a number of operators to estimate the costs of implementing Options 1 and 2, which are described at paragraph 3.10 to 3.18. Mason also asked operators to consider the likely savings associated with the efficiency gains of operating number portability under a CDB system. Using these and other sources of evidence to inform assumptions about call traffic and levels of porting Mason developed estimates of reasonable costs and efficiency gains to be incurred by the UK over a ten year period as a result of implementing ACQ and QoR CDB systems.
- 3.60 Mason found that there was a broad consensus among operators about the main categories of cost which are likely to be incurred as a result of implementing a CDB system, although the value of the costs varied across operators. Since Mason was concerned with providing a broad overview of the likely costs to Industry the figures can only be considered indicative. Moreover there may be a number of costs which have not been specifically identified and included, such as development costs. However the addition of any costs is likely to strengthen Mason's conclusions rather than change them.
- 3.61 Mason found that operators did not value the potential cost savings (as a result of efficiency gains) highly. Operators viewed the potential gains as largely unrecoverable since the infrastructure required to carry ported traffic across a donor network is already in place.
- 3.62 In order to estimate the value of savings Mason estimated the current level of Additional Porting Conveyance Costs (APCCs) which would be saved under a CDB system. APCCs are incurred by donor networks for routing calls that originate on another operator's network but which are intended for numbers which have been ported to different networks. By avoiding the need for donor networks to route calls to ported numbers these costs are saved under both CDB options considered. It is worth noting that there may be other efficiency effects which are not reflected in the APCCs. As noted below Mason picks up the effect of these inefficiencies in the estimates of cost. For example under ACQ, although savings are made in the more efficient routing of calls to ported numbers by bypassing the donor network, there is an inefficiency associated with routing calls to non-ported numbers through the CDB. Similarly, although under QoR operators do not incur this inefficiency they do incur additional costs on calls to ported numbers since the calls are initially routed to the donor network and then released back to the originating network.

Summary of results and sensitivity analysis

- 3.63 Table 1 below shows the net present value ("NPV") of the costs and direct cost savings of the ACQ and QoR options, calculated over five and ten year periods. Both options, using the core assumptions which are deemed reasonable by Mason in section 6 of its report, result in a negative NPV over both time periods, reflecting the relatively large up-front cost incurred.

Table 1: Estimated net present values (£m)

	NPV over 5 years	NPV over 10 years
ACQ	-241.0	-200.6
QoR	-80.2	-39.9

- 3.64 3Mason found that the cost of an ACQ system would be substantially higher than the QoR system. It was estimated that introducing an ACQ system would involve one-off capital costs to the UK telecoms Industry in excess of £250 million. In addition there are ongoing annual costs of some £9 million under the core assumptions. However these are partly offset by some efficiency gains amounting to some £140 million over the ten year period. The inefficiency associated with routing all calls through the CDB rather than just those calls to ported numbers is reflected in the capital cost of the system.
- 3.65 The initial set-up costs of the QoR system are significantly lower than that of the ACQ system, estimated at approximately £100 million, with ongoing annual costs in the region of £10 million. Mason has estimated the savings associated with the more efficient routing of calls to ported numbers to be same for both systems. The inefficiency associated with the initial routing of calls made to ported numbers via the donor network is taken into account in Mason’s model by assuming there is an incremental cost associated with each call.
- 3.66 According to some operators, the ACQ option would probably be the most effective long term CDB solution despite the substantially higher net costs of ACQ compared with QoR. Mason found that operators expressed concerns about technical risk because it has not been implemented in the UK before and because of its impact on call quality due to the increased post-dial delay on calls to ported numbers. These costs to consumers and operators have not been factored into Mason’s analysis and are likely to significantly reduce the attractiveness of the option. In addition Mason noted that the cost differential between ACQ and QoR would be quickly eroded as the level of portability increases and QoR would not address the problems associated with failing networks.
- 3.67 Hence if a CDB were to be implemented Mason’s findings suggest that ACQ would be the most viable long term solution.
- 3.68 In their report Mason outline how the NPV of the number portability solutions would change as a result of sensitivity tests carried out in order to illustrate the impact on costs and efficiency gains of changing key assumptions. The impact of changing each assumption individually was considered. This is important as the results are based on a number of assumptions which are subject to considerable uncertainty. For example growth in the take up of number portability is uncertain. Although Oftel did collect data on ported numbers the information is incomplete and it is difficult to project future trends in take up, particularly since it is impossible to predict the impact of new policies on the take up of number portability. The impact of varying assumptions about take up of number portability is considered in the table below.

- 3.69 Mason used a 7% real discount rate in order to calculate the NPV of costs and efficiency savings. However since Ofcom is interested in the net cost or benefit to society of implementing a CDB it may be more appropriate to evaluate the flows of costs and savings using society's discount rate, i.e. a real value of 3.5%. The impact of this on the outcome for both options using the core values for other assumptions is minimal and does not change the outcome. The net cost of ACQ is reduced to £198.5 million and the net cost of QoR is reduced to £31.2 million over ten years.
- 3.70 In addition to the sensitivity of the key parameters, a number of different scenarios have been considered, using Mason's model. These include high and low levels of discount rate, high and low cost cases and high and low portability cases. In addition the scenarios were combined to produce an overall pessimistic case and an overall optimistic case. In the pessimistic case it was assumed that costs were relatively high and levels of porting and savings relatively low compared to the core scenario. In the optimistic case it was assumed that costs were relatively low and levels of porting and savings relatively high compared to the core scenario. Both scenarios can be considered to contain fairly extreme assumptions, which explain the wide variation in results shown in the table below. However it is worth noting that, even under the most optimistic scenario, ACQ is associated with a negative NPV over a five year period. Moreover ACQ is only associated with a positive NPV over ten years in one scenario, the most optimistic case.
- 3.71 QoR is more likely to be associated with positive returns, in the optimistic case and the high porting and low cost scenarios over ten years. This is not surprising given the lower initial costs incurred in the implementation of QoR. However as noted, if a more detailed model of costs and savings were developed it is likely that these positive values would be significantly reduced given that a number of costs have not been estimated, including the costs of technical development associated with the system and the costs associated with significantly reduced call quality.

Table 2: Results of sensitivity tests, estimated net present values (£m)

	ACQ		QoR	
	NPV over 5 years	NPV over 10 years	NPV over 5 years	NPV over 10 years
Low discount rate	-249.7	-198.5	-82.2	-31.2
High discount rate	-229.6	-200.4	-77.5	-48.2
Low porting	-256.5	-257.5	-85.4	-72.0
High porting	-198.2	-36.7	-61.8	58.9
Low cost	-92.6	-26.0	-29.3	39.2
High cost	-685.5	-781.7	-165.8	-175.5
Optimistic case	-46.5	150.2	11.6	206.4
Pessimistic case	-700.7	-836.6	-153.2	-167.3

Cost benefit analysis: summary

3.72 The table below summarises the previous section, drawing together the qualitative assessment of benefits and the costs and direct efficiency savings estimated by Mason, in order to estimate the likely net benefits or costs of introducing a CDB.

Table 3: Summary of assessment

	Option 1: All Call Query (ACQ)	Option 2: Query on Release (QoR)	Option 3: Hybrid
Benefits:			
Consumers	<p>System addresses the problems associated with network failure. Consumers able to keep their number even if their network fails or their donor network fails. Impact of this expected to be negligible given the low likelihood of failure of networks and the low numbers of people it is likely to affect.</p> <p>Potentially reduction of the risks associated with network failure could increase the number of consumers willing to port their number. This could lead to type 1-3 benefits identified by NERA. However the impact of this is expected to be negligible given that consumers have not identified the risks of network failure as a barrier to porting.</p> <p>Consumers may face lower costs associated with reduced transit charges compared with OR if the donor network is bypassed.</p> <p>A simplified portability process may make porting more attractive to consumers. Again this could lead to type 1-3 benefits identified by NERA. However the impact of this is expected to be negligible given that</p>	<p>Consumers may face lower costs associated with reduced transit charges compared with OR if the donor network is bypassed.</p> <p>A simplified portability process may make porting more attractive to consumers. Again this could lead to type 1-3 benefits identified by NERA. However the impact of this is expected to be negligible given that few consumers have identified the system as a barrier to porting.</p>	<p>System addresses the problems associated with network failure. Benefits here are similar to those identified for the ACQ option. Again the impact of these benefits is expected to be negligible.</p> <p>Consumers may face lower costs associated with reduced transit charges compared with OR if the donor network is bypassed.</p> <p>A simplified portability process may make porting more attractive to consumers. Again this could lead to type 1-3 benefits identified by NERA. However the impact of this is expected to be negligible given that few consumers have identified the system as a barrier to porting.</p>

	few consumers have identified the system as a barrier to porting.		
Operators	<p>The result of the CDB query would be that calls would be routed optimally through the network and directly to the recipient network. As a result there may be efficiency gains in the routing of calls to ported numbers.</p> <p>Minimises problems of congestion on donor networks with limited capacity, although this benefit is expected to be minimal.</p> <p>Additional conveyance costs associated with routing calls to ported numbers through a donor network will reduce.</p> <p>Inter-operator porting arrangements may be established more quickly and easily, speeding up the general benefits of number portability (including the positive effects on competition).</p>	<p>Optimal routing of calls to non-ported numbers. Once the CDB query has taken place, calls to ported numbers will be routed optimally but only after they have been returned to the originating operator by donor operators.</p> <p>Additional conveyance costs associated with routing calls to ported numbers through a donor network will reduce.</p> <p>Inter-operator porting arrangements may be established more quickly and easily, speeding up the general benefits of number portability (including the positive effects on competition).</p>	<p>Optimal routing of calls to non-ported numbers. Again once the CDB query has taken place, calls to ported numbers will be routed optimally but only after they have been returned to the originating operator by donor operators.</p> <p>Additional conveyance costs associated with routing calls to ported numbers through a donor network will reduce.</p> <p>Inter-operator porting arrangements may be established more quickly and easily, speeding up the general benefits of number portability (including the positive effects on competition).</p>
Costs:			
Consumers	As noted below consumers may face an increase in post dial delay for calls to non-ported numbers.	System does not address the problems associated with network failure since there is a reliance on the existence of the donor network. The cost associated with this is expected to be negligible given the low likelihood of failure of networks and the low volume of people it is likely to affect.	

<p>Operators</p>	<p>Implementation cost to Industry in excess of £250m, with ongoing costs of some £9m per annum.</p> <p>Since all calls are routed through the CDB there are inefficiencies in the routing of calls to non-ported numbers. These calls are associated with a CDB query, which is unnecessary. The impact of this would be to delay call connections to non-ported number relative to OR.</p>	<p>Implementation cost to Industry in the region of £100m, with ongoing costs in the region of £10m per annum.</p> <p>Reliance on donor network means that there is a routing inefficiency associated with the initial routing of the call to a donor network. This will lead to a greater time delay in establishing a connection for calls to ported or out of service numbers (compared with ACQ).</p>	<p>Cost not clear, but likely to fall between the costs of QoR and ACQ since functionality of ACQ and QoR is required.</p>
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- 3.73 The changes to the current system may result in a number of benefits, including elimination of the consumer costs associated with number changes resulting from network failure. In addition the changes could lead to congestion reduction, elimination of additional conveyance costs and network efficiency improvements. However there are also likely to be significant set up costs.
- 3.74 As noted above, a conventional cost benefit analysis would compare the gain to consumers as a result of prices falling closer to cost with the costs of introducing a new policy. Although there may be some benefits of this type as a result of reducing the risks associated with network failure, they are difficult to quantify. However, using NERA’s model and assumptions, the potential size of these benefits has been estimated at annex 4. NERA estimated that as a result of introducing number portability, there would be Type 2 benefits amounting to some £1,280 million (in 1993 prices) for some 2.6 million consumers. Using this it is possible to calculate a benefit per ported customer (as a result of encouraging consumers who would not previously have switched to now switch following the introduction of an ACQ database).
- 3.75 Mason estimated the net cost of an ACQ database system at some £200 million over ten years. This means that some 300,000 additional ports (as a result of introducing the CDB) over ten years would be required to offset the total cost. It is likely that only a modest increase in annual porting is required to offset this cost, i.e. somewhere in the region of 0.1% of subscribers who do not currently switch would need to switch operator each year and port their number.
- 3.76 However it is not clear that even this relatively modest increase in porting would be achieved since there is no evidence that consumers are concerned about the risk of network failure, or indeed that they are even aware of this risk. As noted, there is expected to be a very small risk of network failure that leaves consumers stranded, since an established customer base is expected to be valued highly by potential investors. In addition there is no evidence from consumer surveys that people do not switch operator because of the risk of network failure. Where the question has been asked, consumers have not given this as a reason for not switching. Small proportions cite the unreliability of other networks, but this is likely to relate to service quality and reliability. In addition small numbers cite the hassle of switching/porting as a reason not to switch/port but this is not likely to be influenced by the introduction

of a CDB since the consumer experience of porting is not expected to change markedly.

- 3.77 It is worth noting that NERA estimated that the bulk of consumer benefits from introducing number portability resulted from the increased competition as a result of encouraging higher levels of number portability. The high value of Type 2 benefits drives the relatively modest increases in switching required to offset the costs of the CDB. However it is not clear that these benefits would be as high if NERA's modelling exercise were repeated today, i.e. whether increased porting would stimulate such a large reduction in prices given the increases in competition in the fixed market which have occurred since NERA's study. Arguably the potential benefits would be substantially less given the increase in competition over the last ten years and the introduction of other competition-stimulating initiatives. However it is also clear that there is potential for more competition so there are likely to be positive Type 2 benefits, although the modelling of these is beyond the scope of this consultation document.
- 3.78 Annex 4 also contains estimates the potential benefits to consumers who would switch operator (even in the absence of a CDB) but who face the costs of having to change their number (or call subscribers who have had to change their number) as a result of network failure.
- 3.79 A simple exercise has been undertaken to estimate the loss in consumer benefits that might arise as a result of a subscriber of a failed network having to change their number. The intention of this exercise is to estimate the Type 1 and Type 3 benefits which may arise from eliminating the problems associated with failing networks. The calculation gives a consumer benefit of enabling consumers to retain their number in the event of network failure of approximately £220 (in 1993 prices) per subscriber with a ported number. Note that this is an average figure, and Ofcom acknowledges that in the case of certain subscribers, particularly business subscribers, the value of being able to retain numbers in the event of network failure may be substantially higher than this.
- 3.80 If the Atlantic case is taken as a typical example of network failure (although as noted the event is not considered typical in that it is not expected to recur with any frequency) it is possible to estimate the loss in consumer benefits as a result of the network failure.
- 3.81 When Atlantic failed approximately 14,000 subscribers lost their service for about one month and had to change their telephone number as a result. Calculations suggest that some £2.5 million - £3.0 million of consumer benefit was lost as a result of the failed network. This is negligible compared to the Type 2 potential benefits. For example in order to recoup the cost of introducing and running the ACQ system over ten years, some 60 - 70 similar network failure incidents would be required over a ten year period. Even a bigger operator, with some two million customers, would have to have almost a fifty percent chance of failing over a ten year period in order for the costs of an ACQ system to be outweighed by the expected benefits (that is, on an "expected value" basis). Since such a significant failure has never occurred (and arguably will not given the attractiveness of such a large subscriber base to new investors), even during the downturn facing the telecoms industry in recent years, it seems likely that the actual probability of failure will be substantially less than fifty percent.
- 3.82 Although subject to limitations, the available evidence is useful to gauge the likely scope of the benefits of a CDB in order to compare those benefits with the costs to

Industry of implementing a CDB. Hence although all the costs and benefits are not quantified, they do indicate that there are likely to be substantial up-front costs associated with the policy given the current level of take-up of number portability in the UK.

- 3.83 It is possible that these costs will be offset by benefits over a ten year period under certain fairly extreme assumptions. If very generous assumptions about porting levels and costs are used it is possible to achieve positive NPVs for both ACQ and QoR options. However this is not the case when Mason's core assumptions are used. In addition it is possible that fairly small increases in porting would be required for benefits to competition to offset the cost of an ACQ system (but not the QoR system), although there is no evidence that there would be any increases in switching as a result of reducing the risk of problems associated with network failures.
- 3.84 Moreover, Mason has stressed that there are likely to be additional costs under both options, which have not been factored into this analysis. These largely relate to operational costs. In addition, operators may face substantial costs associated with developing the solution, including those opportunity costs associated with diverting resources away from other projects. These have not been factored into the analysis. Operators also argue that there are further costs associated with QoR, which for some operators make it an unworkable solution. As a result, for both the AQR and QoR options, the actual costs are likely to be higher than proposed here.
- 3.85 The additional benefits of a CDB system are likely to be fairly small given the relatively small risk of network failure and the fairly small numbers of consumers likely to be affected. These are not likely to offset the estimated (and additional) costs outlined in the Mason report.
- 3.86 Consequently there does not appear to be a robust economic case for introducing a CDB.

Question 4: *Do you agree that the ten year life of investment Ofcom have used in this assessment of the costs and benefits of a CDB architecture are appropriate?*

Question 5: *Do you agree that there is not a robust economic case for investment in IN-based CDB over a ten year period? If you disagree, explain why?*

Question 6: *Do you agree with Ofcom's initial conclusion that it should not mandate the implementation of an IN-based CDB solution for UK number portability?*

Section 4

Short and longer-term issues

Short term

- 4.1 If, as set out in the previous section, requiring communications providers to implement an alternative solution for UK number portability is proved not to be cost justified, then the policy goal of protecting consumers of failed networks should be met by some other means.
- 4.2 In reviewing the June 2002 Consultation and subsequent December 2002 Statement, the remaining options in relation to the current implemented Onward Routing solution may be expressed as follows:
- Option A: Status quo
 - Option B: Implement solutions designed to manage a number change in the event of network failure
 - Option C: Block transfer in the event of network failure

Option A: Status quo

- 4.3 In this option, no change or enhancement is made to the current arrangements for number portability at all. Ofcom's own assessment of the market over the short to medium-term indicates that the risk of operational failure, particularly in terms of larger networks, is very small. As discussed below, migration to a direct routing number portability solution (which does not rely on the donor provider) may be precipitated by investment in Next Generation Networks (NGNs) during the next five to ten years. It might be argued that if, over this time frame, the likelihood of a similar business failure is remote, then the status quo may be maintained.
- 4.4 Ofcom does not consider that option A is viable since it fails to provide any measure of consumer protection whatsoever. As detailed in the previous section, there is no evidence to suggest that the failure of Atlantic has caused any consumer loss of confidence in number portability. However were a similar incident to arise (however remote a possibility that may be) it is not unreasonable to assume that the risk of loss of consumer confidence in portability will be higher particularly if such forced number changes are not offset by some contingency arrangement.

Option B: Implement solutions designed to manage a number change in the event of network failure

- 4.5 In response to the June 2002 Consultation, fixed communications providers recommended a possible arrangement whereby the number blocks of a failed provider might be transferred, perhaps temporarily, to a new provider(s) that might not supply physical lines connected to the numbers. Instead a range of network based services such as voice-mail, call forwarding and change number announcements might be provided to those customers who wanted to ensure that callers to their old numbers could continue to contact them whilst providing sufficient time to manage a change to a new number.

- 4.6 Like option A, this option offers no enhancement to the current Onward Routing number portability solution. Consumers would not be able to reconnect with an alternative provider and use their existing telephone number. However, this option could provide affected consumers with the means of reducing the costs associated with an unplanned number change.

Option C: Block transfer in the event of network failure

- 4.7 In the June 2002 Consultation:

- Oftel proposed that, in the absence of any voluntary transfer of number blocks, Oftel should intervene to require that, in the event of failure of a telecoms business, its number blocks can be transferred to another operator so as to ensure that calls to ported numbers continue to be supported. This should, with the minimum of disruption, enable customers of a failing operator to retain their numbers when switching to an alternative provider;
- Oftel asked whether the recipient of the transferred number blocks should be the operator with the most imported numbers from a block (after transfer of customers from the closing network); or whether transfer should be on some other basis;
- Oftel asked whether in the absence of any industry agreement, Oftel should determine the allocation of additional costs incurred by the operators involved in the transfer process. Oftel believed that such costs are unlikely to be large although this will be dependent upon the scale of transfer. Costs arise not so much from the transfer of the number blocks themselves as from the reconfiguration of the porting requirements; and
- Oftel proposed that industry develop streamlined processes and systems capable of rapid block transfer and porting reconfiguration to support the transfer of blocks. By 'block transfer and porting reconfiguration' Oftel meant the process of rearranging donor/recipient rerouting that occurs when the Onward Routing function is moved from the original block owner to another. Oftel assumed that the actual transfer of subscribers from one network to another would continue to use existing processes.

- 4.8 Most fixed providers set out, in their responses to the June 2002 Consultation, a range of commercial and technical hurdles to the transfer of number blocks from the failing provider to another provider, particularly (from a commercial perspective) where such a transfer is forced upon a communications provider(s) against their commercial judgement. The main technical problem, aside from interconnection issues, was in their view the transfer of 10k geographic number blocks between networks with different network coverage areas. This issue, whilst not insurmountable technically speaking, would seemingly present problems where there was a requirement to provide service to customers whose geographic location did not match the geographical area of an operator's network associated with a particular number range.

- 4.9 Fixed communications provider respondents to the June 2002 Consultation expressed no agreed position on how an operator or operators might best be chosen to take on the failed operator's blocks although most agreed that some form of distribution across relevant players would seem equitable.

- 4.10 Other proposals focused on the issues surrounding the transfer and re-hosting of blocks. Proposals included the separation of number ranges into smaller blocks for wider distribution amongst Industry, the mandatory escrow of essential data - particularly customer records - to a neutral third party to facilitate rapid re-hosting of numbers, and acceleration of BT data build in order to prioritise network changes

surrounding re-hosting in the event of network failure over other more routine data build requests (not considered to be unduly discriminatory, given the goal of minimising disruption to consumers).

Industry dialogue

- 4.11 Ofcom is in ongoing dialogue with Industry over its commitment to a rapid and positive response to any need to voluntarily undertake short-term counter-measures in response to any future network failure, particularly in light of the costs likely to be associated with alternative solutions.

Question 7: Do you agree that, if an IN-based CDB solution is not viable, Industry (landline providers) should implement option B or C (or a hybrid) as a contingency measure to address forced number changes arising from any future network failure?

Longer-term

Implications for mobile networks

- 4.12 Although Oftel's consideration of alternative number portability solutions was initiated largely in response to a public policy issue that arose in relation to the fixed market, the former regulatory body nevertheless recognised that mobile providers were likely to have an interest in terms of the existing solution for mobile portability and inter-working with fixed portability. Indeed Ofcom is aware that mobile providers are currently considering their positions with regard to alternative approaches to mobile number portability. Oftel therefore included a requirement to consider the implications for mobile networks when commissioning consultants to look at portability costs and implementation issues. The consultancy report suggests that the costs to mobile providers associated with the implementation of an IN-based solution to route calls based on information gained by querying a CDB are broadly equivalent to those identified by the fixed network operators.
- 4.13 In the case of mobile number portability, Ofcom believes there may be potential commercial incentives, particularly in terms of routing efficiencies and risks to recipient network proprietary services as porting volumes continue to increase¹⁵, to change to a direct routing solution which could be secured through Industry negotiation without regulatory intervention. If Industry negotiation were to lead to a collective desire to move to a direct routing solution for mobile portability, then we would be minded to expedite a review of the Functional Specification in order to identify regulatory barriers which might be removed to enable the voluntary migration to alternative, market driven, solutions for mobile portability.

Question 8: Do you agree that voluntary migration to a direct routing solution for mobile number portability is likely? If so, over what time period?

Next Generation Networks (NGNs)

- 4.14 The Mason Report highlights the migration of voice traffic away from current circuit-switched networks toward Internet Protocol (IP) networks over the next five to ten

¹⁵ On average around 90,000 mobile telephone numbers per month are currently ported between mobile providers. The volume of mobile telephone number exports has been increasing, on average, at 14% per quarter over the last year.

years. During this period it is probable that both technologies will co-exist and inter-work.

- 4.15 Mason suggests that it is this change which currently explains the Industry resistance to investment to an IN-based solution for number portability. Having already invested in a functional solution for portability (the current Onward Routing approach) there is no Industry desire to engage in an extensive upgrade programme for legacy switching infrastructure.
- 4.16 However migration to NGNs might also precipitate the utilisation of a CDB for number portability. Two reasons are cited by Mason for this:
- The anticipated benefits of moving to NGNs are likely to promote a more receptive business response toward network capital investment.
 - The current Onward Routing system is thought unlikely to cope with an environment consisting of networks with different capabilities and, in any event, a CDB approach will become a necessity in an anticipated full IP environment.
- 4.17 Ofcom does not believe that operators are likely to invest in a CDB for number portability unless there is a clear business case for doing so, however receptive the capital markets become to network investment. It is difficult to base such a business case solely on the potential savings in conveyance costs when considering the conveyance costs associated with a Public Switched Telephone Network (PSTN) as much of this document explains. The move to IP-based NGNs can only increase this difficulty, since such technology is expected to result in a further decrease in conveyance costs. One interesting possibility is that a solution to the number portability problem may emerge as a side effect of a more general solution to the address resolution problems associated with NGNs. Major changes to existing network architectures will be required to support such concepts as mobility and personalisation, and it is reasonable to suppose that these might also result in an improved mechanism for implementing number portability. However, this is by no means certain, and Ofcom will be monitoring developments closely. If CDB type functionality does not emerge naturally from the current discussions of NGNs, Ofcom may still have a role to play in determining whether or not CDB type functionality should be delivered.

Question 9: *Do you consider that migration to NGNs will necessitate a change to the current Onward Routing solution for number portability? If yes, what changes and for what reasons? If no, why not?*

Question 10: *Do you consider that Ofcom may have a role to play in considering whether a CDB approach to number portability should form part of the development of NGNs?*

Question 11: *What changes (if any) do you think may be necessary to the current regulatory framework for number portability e.g. the Number Portability Functional Specification in response to migration to NGNs?*

ENUM

- 4.18 The Mason Report raises two issues concerning the relationship between number portability and ENUM (a standard to map E.164 telephone numbers onto Internet domain names).

- The UK ENUM Group (UKEG) recommendation that the ENUM registration make use of the number portability verification processes for numbers that are not currently contained in the DQ database (such as 08, 09, ex-directory and mobile numbers). Should any changes to current number portability processes arise (such as might be the case if the underlying solution were to change) then the impact on ENUM needs also to be taken into account.
- 'Operator' ENUM (which provides information to assist communications providers to handle calls) has been identified by some as a potential database for number portability.

Question 12: *What are your views on any 'operator' or 'infrastructure' ENUM facility being used as a future number portability database? What are the potential benefits and drawbacks of this?*

Section 5

Responding to this consultation

How to respond

- 5.1 Ofcom invites written views and comments on the issues raised in this document, to be made by **5pm on Thursday 4 November 2004**.
- 5.2 Ofcom strongly prefers to receive responses as e-mail attachments, in Microsoft Word format, as this helps us to process the responses quickly and efficiently. We would also be grateful if you could assist us by completing a response cover sheet (see Annex 2), among other things to indicate whether or not there are confidentiality issues. The cover sheet can be downloaded from the 'Consultations' section of our website.
- 5.3 Please can you send your response to warwick.izzard@ofcom.org.uk .
- 5.4 Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.

Warwick Izzard
Competition & Markets
4th Floor
Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA

Fax: 020 7783 4109

- 5.5 Note that we do not need a hard copy in addition to an electronic version. Also note that Ofcom will not routinely acknowledge receipt of responses.
- 5.6 It would be helpful if your response could include direct answers to the questions asked in this document, which are listed together at Annex 3. It would also help if you can explain why you hold your views, and how Ofcom's proposals would impact on you.

Further information

- 5.7 If you have any questions about the issues raised in this consultation, or need advice on the appropriate form of response, please contact Warwick Izzard on 020 7783 4127.

Confidentiality

- 5.8 Ofcom thinks it is important for everyone interested in an issue to see the views expressed by consultation respondents. We will therefore usually publish all responses on our website, www.ofcom.org.uk, ideally on receipt (when respondents confirm on their response cover sheet that this is acceptable).
- 5.9 All comments will be treated as non-confidential unless respondents specify that part or all of the response is confidential and should not be disclosed. Please place any

confidential parts of a response in a separate annex, so that non-confidential parts may be published along with the respondent's identity.

- 5.10 Ofcom reserves its power to disclose certain confidential information where this is necessary to fulfil its functions, although in practice it would do so only in limited circumstances.
- 5.11 Please also note that copyright and all other intellectual property in responses will be assumed to be assigned to Ofcom unless specifically retained.

Next steps

- 5.12 Following the end of the consultation period, Ofcom intends to publish a statement around February/March 2005.
- 5.13 Please note that you can register to get automatic notifications of when Ofcom documents are published, at http://www.ofcom.org.uk/static/subscribe/select_list.htm.

Ofcom's consultation processes

- 5.14 Ofcom is keen to make responding to consultations easy, and has published some consultation principles (see Annex 1) which it seeks to follow, including on the length of consultations.
- 5.15 If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at consult@ofcom.org.uk. We would particularly welcome thoughts on how Ofcom could more effectively seek the views of those groups or individuals, such as small businesses or particular types of residential consumers, whose views are less likely to be obtained in a formal consultation.
- 5.16 If you would like to discuss these issues, or Ofcom's consultation processes more generally, you can alternatively contact Philip Rutnam, Partner, Competition and Strategic Resources, who is Ofcom's consultation champion:

Philip Rutnam
Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA
Tel: 020 7981 3585
Fax: 020 7981 3333

E-mail: philip.rutnam@ofcom.org.uk

Annex 1

Ofcom's consultation principles

A1.1 Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A1.2 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

A1.3 We will be clear about who we are consulting, why, on what questions and for how long.

A1.4 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.

A1.5 We will normally allow ten weeks for responses to consultations on issues of general interest.

A1.6 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.

A1.7 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

A1.8 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 2

Consultation response cover sheet

- A2.1 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, without disclosing the specific information that you wish to remain confidential.
- A2.2 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.
- A2.3 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 complete their cover sheet in a way that allows Ofcom to publish their responses upon receipt, rather than waiting until the consultation period has ended.
- A2.4 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.
- A2.5 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, address, other 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: An assessment of alternative solutions for UK number portability

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	<input type="checkbox"/>	Name/contact details/job title	<input type="checkbox"/>
Whole response	<input type="checkbox"/>	Organisation	<input type="checkbox"/>
Part of the response	<input type="checkbox"/>	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 3

Consultation questions

Question 1: Do you agree that the three options Ofcom has chosen to consider represent the scope of technically viable IN-based CDB solutions?

Question 2: Do you agree that Ofcom has identified the relevant benefits of significance in the context of this RIA?

Question 3: Do you agree with Ofcom's assessment on the potential size of Type 2 benefits?

Question 4: Do you agree that the ten year life of investment Ofcom have used in this assessment of the costs and benefits of a CDB architecture are appropriate?

Question 5: Do you agree that there is not a robust economic case for investment in IN-based CDB over a ten year period? If you disagree, explain why?

Question 6: Do you agree with Ofcom's initial conclusion that it should not mandate the implementation of an IN-based CDB solution for UK number portability?

Question 7: Do you agree that, if an IN-based CDB solution is not viable, Industry (landline providers) should implement option B or C (or a hybrid) as a contingency measure to address forced number changes arising from any future network failure?

Question 8: Do you agree that voluntary migration to a direct routing solution for mobile number portability is likely? If so, over what time period?

Question 9: Do you consider that migration to NGNs will necessitate a change to the current Onward Routing solution for number portability? If yes, what changes and for what reasons? If no, why not?

Question 10: Do you consider that Ofcom has a role to play in considering whether a CDB approach to number portability should form part of the development of NGNs?

Question 11: What changes (if any) do you think may be necessary to the current regulatory framework for number portability e.g. the Number Portability Functional Specification in response to migration to NGNs?

Question 12: *What are your views on any 'operator' or 'infrastructure' ENUM facility being used as a future number portability database? What are the potential benefits and drawbacks of this?*

Annex 4

Estimating the likely benefits

- A4.1 There are likely to be two main groups of consumers who benefit from the introduction of a CDB. Firstly there are consumers who may have previously felt that it was too risky to switch and port their number due to the chance of network failure. This group may be encouraged to switch and port their number if the introduction of an ACQ database eliminates the risk that they would have to change their number should their new network fail. In addition the customers of failed networks who would have previously had to change their number benefit from being able to retain their number. People who wish to ring customers of failed networks on the original number also benefit following the introduction of an ACQ database.
- A4.2 The benefits accruing to these two groups of consumers are roughly estimated below assuming the introduction of an ACQ database. The same exercise has not been carried out for a QoR database since it is not clear that there would be any additional consumer benefits of this type since a QoR solution would not address the problems of Onward Routing when networks fail.

Encouraging more switching

- A4.3 As noted in the body of this document, a CDB for number portability may be beneficial in that more consumers may switch and port their number because of the reduced risk of having to change their number should their new network fail. In the absence of a CDB which addresses these problems it is assumed that this group of consumers would not switch. In other words only NERA's Type 2 benefits from increased competition are achieved under this category because Type 1 and Type 3 benefits accrue to individuals who would have switched anyway but are now able to retain their number and those people who benefit from calling subscribers who switch but now retain their number.
- A4.4 The potential size of the Type 2 benefits can be estimated using NERA's model and assumptions.
- A4.5 NERA estimated that as a result of introducing number portability, there would be Type 2 benefits amounting to some £1,280 million (in 1993 prices) for some 2.6 million consumers who were expected to port their number over 10 years. This gives a rough guide to the Type 2 benefit per subscriber who ports as £490 in 1993 prices (or £650 in 2004 prices).
- A4.6 Mason estimated the net cost of an ACQ database system at some £200 million over ten years. This means that some 300,000 additional ports (as a result of introducing the CDB) over 10 years would be required to offset the total cost. It is likely that only a modest increase in annual porting is required to offset this cost, i.e. somewhere in the region of an additional 0.1% of subscribers who do not currently switch would need to switch operator each year and port their number.
- A4.7 This has been estimated using Ofcom's survey data and market information about switching behaviour and the number of exchange lines. Roughly 95% of residential and 90% of business consumers do not switch in any one year (estimated as a percentage of residential and business exchange lines). If an additional 0.1% of these subscribers did decide to switch and port their number each year as a result of

the introduction of a CDB, then over a ten year period over 300,000 additional ports would be made.

A4.8 This should be enough to offset the cost of a CDB.

A4.9 However it is not clear that even this relatively modest increase in porting would be achieved since there is no evidence that consumers do not port because they are concerned about the risk of network failure, or indeed that they are even aware of this risk. As noted in the main document there is expected to be a very small risk of network failure that leaves consumers stranded, since an established customer base is expected to be valued highly by potential investors. In addition there is no evidence from consumer surveys that people do not switch operator because of the risk of network failure. Where the question has been asked, consumers have not given this as a reason for not switching. Small proportions cite the unreliability of other networks, but this is likely to relate to service quality and reliability. In addition small numbers cite the hassle of switching/porting as a reason not to switch/port but this is not likely to be influenced by the introduction of a CDB since the consumer experience of porting is not expected to change markedly.

Benefits accruing to consumers

A4.10 Consumers who have switched but find themselves customers of failing networks would also benefit from an ACQ database, since they would not face the disruption to their service and the need to change their number as they would under the current system (NERA's Type 1 benefit). Moreover consumers who wish to contact these individuals now benefit from being able to use their original number, rather than having to find out their new number (NERA's Type 3 benefit). This benefit can be estimated by using NERA's assumptions about the size of Type 1 and Type 3 benefits and the volume of consumers they expected to benefit from number portability.

A4.11 NERA estimated that as a result of introducing number portability, there would be Type 1 and Type 3 benefits amounting to some £572 million (in 1993 prices) for some 2.6 million consumers who were expected to port their number over 10 years. This gives a rough value of £220 (in 1993 prices) benefit per subscriber who ports or some £290 in 2004 prices.

A4.12 If the Atlantic case is taken as a typical example of network failure (although as noted in the document the event is not considered typical in that it is not expected to recur with any frequency) it is possible to estimate the cost (or loss of consumer benefit) as a result of the network failure.

A4.13 When Atlantic failed approximately 14,000 subscribers lost their service for about one month and had to change their telephone number as a result. Had an ACQ database been operational these consumers may have still experienced a disruption to service but may have been able to retain their telephone number once their service was restored with another operator. The latest available data from Ofcom's residential research (February 2004) suggested that some 57% of residential consumers who switched their telephone supplier chose to port their number. The figure is higher for business consumers perhaps due to greater costs of changing their number. Assuming that some 75% of consumers who switch would port their number £3.0 million of consumer benefit was lost as a result of the failed network.

A4.14 In order to recoup the cost of introducing and running an ACQ database this means that some 70 network failures of a similar scale to that of Atlantic's failure would be

required over the ten year period. The benefits to consumers of being able to retain their numbers in the event of network failures are negligible compared to the potential Type 2 benefits which might result from introducing an ACQ database outlined above.

- A4.15 Even if we assume that a typical network failure affected an operator with some 2 million customers, such that some £430 million of consumer benefit was lost as a result of a network operator business failing, this would require a probability of almost 50% that an operator would go out of business over a ten year period on an expected value basis. Given that a failure affecting 2 million customers has never happened, despite the significant downturn facing the telecoms Industry in recent years, it seems likely that the actual probability of a network of this size failing is significantly less.
- A4.16 Consequently the potential Type 1 and Type 3 benefits as a result of introducing an ACQ system are likely to be significantly less than the cost of introducing the system.

Annex 5

Glossary

Average Porting Conveyance Costs (APCC): The transit costs incurred by the donor provider in conveying calls originating 'off-net' to a recipient provider. This process is essentially the same as a donor provider acting as a transit provider in the conveyance of a non-ported call.

Block transfer: The facility to transfer a block of telephone numbers from one provider to another.

Central Database (CDB): A database usually managed by a neutral third party and containing details of all ported numbers. Network providers download information from this database in order to route calls to the appropriate destination.

Communications provider: A person who provides an electronic communications network or provides an electronic communications service.

DTI: Department of Trade and Industry.

Donor provider: The communications provider whose subscriber number(s) are in the process of being, or have been passed or ported to a recipient provider.

E.164: An abbreviation of Recommendation E.164 entitled "The International Public Telecommunications Numbering Plan", published by the Telecommunications Standardisation Sector (ITU-T) of the International Telecommunications Union.

Functional specification: A document which specifies technical and other principles which are intended to enable the efficient implementation and utilisation of portability, published by Ofcom from time to time in accordance with section 60 of the Communications Act 2003.

High Level Service Description (HLSD): A description of number portability produced by the NICC.

Home Location Register (HLR): The main database of permanent subscriber information for a mobile network.

Intelligent network (IN): An Intelligent Network is a telecommunications network where some of the intelligence relating to routing and service provision is separated from the switches and centralised into a few service control points.

Mobile portability: Portability relating to telephone numbers allocated for use with mobile communications services.

Net Present Value (NPV): The current value of the future benefits of a project or investment net of the future costs, discounted at an appropriate rate.

Next Generation Networks (NGNs): NGN is a catch-all phrase for the infrastructure that will enable the advanced new services that are expected to be offered by mobile and fixed network operators in the future, while continuing to support all of today's existing services. The NGN concept is commonly referred to through various characteristics, such as:

- the use of packet-based transfer mechanisms,

- increasingly separated control functions for bearer resources, call/sessions and services/applications,
- decoupling of service provisioning from network access,
- support for a wide range of services and information flows (including real time/streaming/non-real time services, point-to-point, multipoint, broadcast and multicast voice, data, video and multi-media applications),
- seamless inter-working with legacy networks,
- support of generalized mobility, and
- provision of unfettered users access, via modern high speed access technologies, to competing service providers and/or services of their choice.

NICC: The Network Interoperability Consultative Committee. NICC is a UK telecommunications Industry committee which acts as an Industry consensus group in which specifications and technical issues associated with network competition can be discussed.

Number portability: A facility that enables subscribers, who so request, to keep their number independent of the organisation providing service.

Ofcom: The Office of Communications. The regulator for the communication industries, created by the Communications Act 2003.

Of tel: The Office of Telecommunications, whose functions transferred to Ofcom on 29 December 2003.

Onward Routing (OR): The system currently adopted for portability for geographic, non-geographic and mobile numbers, whereby calls to ported numbers continue indefinitely to be routed via the switches of the donor provider.

Portability: Any facility provided by a communications provider to another communications provider enabling any subscriber who requests number portability to continue to be provided with any publicly available telephone service by reference to the same telephone number irrespective of the identity of the person providing such a service.

Public Switched Telephone Network (PSTN): The collection of interconnected systems operated by the various telephone companies and administrations around the world. Also known as the Plain Old Telephone System (POTS). The PSTN started as human-operated analogue circuit switching systems, progressed through electromechanical switches. By now this has almost completely been made digital, except for the final connection to the subscriber.

Recipient provider: The communications provider to whom a subscriber number(s) are in the process of being, or have been passed or ported from a donor provider.

Subscriber: Any person who is party to a contract with the provider of publicly available telephone services for the supply of such services in the UK.

Tromboning: A loop in call routing through a transit or range holder network, occupying an ingress and egress circuit for the duration of the call.