



BT's response to Ofcom's consultation document

"Future of interconnection and call termination"

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1. Overview

- 1.1. Over the next few years the UK communications industry will need to migrate voice services from historical PSTN platforms using TDM technology to modern networks based on IP technology.
- 1.2. It is vital that CPs are encouraged to migrate their services to IP technology in a timely and efficient manner so that there is a smooth transition for end consumers.
- 1.3. To enable this, it is important that regulation of interconnection and call termination is both proportionate and effective. The migration to All-IP may provide an opportunity to reduce regulation particularly given that IP networks have been successfully interconnected with minimal regulatory intervention for many years. Care is needed to ensure that new regulation does not disturb existing commercial relationships or have unintended consequences for markets that are currently working well.

Where regulated prices for calls between networks apply

- 1.4. We agree with Ofcom that the regulated price should continue to be available at the point where the number range is deemed to reside, either at the DLE or IP POI (Point of Interconnect).
- 1.5. It is important that CPs should plan for the migration of their networks, and those of others, to IP. To do so it is important that the migration of number blocks to IP should be predictable. We consider Ofcom concerns can be best addressed through CPs being required to issue migration timetables and to give advance notice of when specific number blocks will migrate.

Technical standards

- 1.6. We consider there is a role for NICC in working with industry to agree the technical standards that should be used for IP network interconnection. Ofcom could then help support this by requiring that operators adopt these standards when making FTR available.
- 1.7. We propose terminating CPs should normally be able to rely on such technical standards used for traffic delivered to their networks and that the originating operators should be responsible for any interworking needed between their network and the terminating operator.
- 1.8. In the event that an operator chooses a technical standard that falls outside those approved for use by NICC, the responsibility for interworking should lie with that operator. In this way the incentives are in place for a convergence of standards and any cost of interworking with other technical standards are borne by the non-conformant operator and not imposed on the rest of the industry.

Regulation of interconnect circuits

- 1.9. Operators have a wide choice of how to interconnect with BT's IP network and require only a handful of interconnect points to obtain FTR prices. This is in stark contrast with the TDM network. We therefore agree with Ofcom that regulation of IP interconnect is not needed beyond that set out in the General Conditions, although we expect CPs will establish sufficient connectivity to offer a resilient service and ensure that network loading can be balanced.
- 1.10. As we move to IP networks we suggest it is proportionate for Ofcom to align the regulation of BT's TDM interconnect circuits with that imposed on KCOM. Ofcom could replace the charge control on DLE Interconnect with safeguard caps as a way of reducing the cost of regulation and the work required to set prices for these services.

Ensuring all calls are connected

- 1.11. We agree with Ofcom that BT's end to end connectivity obligation is no longer justified. Since BT's end-to-end connectivity obligation was imposed the transit markets have become fully competitive with BT no longer having SMP in any of these markets. This means CPs no longer need to rely on BT to discharge their obligations under GC A1.

Call termination charges

- 1.12. Termination rates have declined sharply in recent years and now make up a small proportion of the cost of voice services. This means any changes are unlikely to impact significantly consumer prices or benefit them. We therefore suggest Ofcom is pragmatic in how termination rates are set and that there are merits from holding termination rates at their current prices. It would be a poor use of scarce regulatory resource to undertake a resource intensive modelling exercise to reset termination rates.
- 1.13. If Ofcom were to adopt the EU European termination rate and this leads to a substantial cut to mobile termination rates, Ofcom should consider implementing this through the operation of a glide path rather than a one-off price cut to reduce any disruption to the market.

2. Response to specific consultation questions

Question 4.1: Do you agree that if BT's migration to an IP network is unpredictable, it could result in increased charges for providers routing calls to its network? Are there any other issues that might arise as a result of its migration?

- 2.1. We recognise that it is important that the migration of number blocks to IP networks should be reasonably predictable to support the efficient migration of services to IP. This applies equally to both BT and other operators' number ranges as they each migrate their TDM networks to all-IP.
- 2.2. An orderly and predictable migration will therefore enable all industry participants including BT and CPs to make efficient investment decisions, for example in interconnection circuits or interworking capability and to plan their own migration to IP.
- 2.3. We consider that BT does not have market power and so is unable to increase charges in the manner suggested by Ofcom.
- 2.4. We also note that charges might nevertheless need to increase due to rising unit costs, for example if the cost of media gateways are recovered over smaller volumes.
- 2.5. There are a number of other issues that need to be considered as part of the migration which include:

IP interworking

- 2.6. IP interworking is needed when the originator and terminator use different technical specifications for their IP networks (such as CODECs, packetisation time, DTMF format and signalling protocols.)
- 2.7. We consider that terminators should continue to specify the technical standard that the originator should present to them in order for the traffic to qualify for the FTR. If the originator uses a different technical specification for their network, then interworking will be required. The originator is usually responsible for the interworking and can choose to self-supply this or, alternatively, it can buy the interworking on commercial terms from either a transit operator or the terminator itself.
- 2.8. If the terminating operator decides to use a technical standard that falls outside those which are approved by the UK's standard setting body NICC the responsibility for the cost of the interworking should be reversed and rest with the terminating operator. This is because it is unreasonable to expect the industry to bear the cost of interworking with a non-approved standard. The incentive for convergence of standards is also supported if CPs using a standard outside these approved sets have to bear the costs of interworking.

Continued use of allocated number ranges

- 2.9. TDM networks route traffic based on allocated number ranges. We suggest that a more granular level is only adopted once migration to IP networks is complete. Otherwise additional and unpredictable costs would be imposed on TDM originators and may cause

unintended impacts on TDM networks. It is therefore important that the POIs at which FTR is available should be specified on the basis of allocated number ranges.

Bulk migration of imported numbers to IP needs adequate advance notice

- 2.10. Where imported numbers are being migrated to an IP network in bulk, it is likely that the donor will have to change the porting prefix used. It is important that all CPs have sufficient notice of the migration to ensure the existing porting process can manage the migration. We suggest that there should be a sufficient notice period to enable CPs to manage this process. This may need a separate consultation with the Industry through the OTA to reach agreement on this process.

Question 4.2: Please state which of these measures you consider would be appropriate for securing efficient migration and why?

- 2.11. Ofcom sets out three potential regulatory options for supporting efficient migration. BT considers that of the three options, only the requirement to set out a migration timetable is appropriate. As explained in our response to Question 4.1 above, BT considers any such requirement should apply to all CPs and not just BT. Our reasoning is set out in more detail below.

A requirement for BT to set out a migration timetable

- 2.12. BT agrees it is appropriate for CPs to set out a migration timetable and suggests that these should comprise two elements, first a broad plan which shows how many number blocks will migrate each year to enable CPs to determine the overall capacity needed to deliver traffic at IP. Second, the provision of at least several months' notice for when each specific number block is to migrate from TDM to IP. A combination of these two elements is sufficient to help establish conditions for efficient migration as this will enable CPs to plan effectively the migration of their interconnect estate.

Mandated pace of migration

- 2.13. We do not support this option.
- A mandated pace of migration can only result in efficient migration if the migration of number blocks can be forecast accurately. We consider it is not practicable to forecast with sufficient accuracy when number blocks should be migrated for this to support efficient migration. There are a number of reasons for this:
- Uncertainty over the pace at which consumers will take up IP voice service
 - The impact 5G mobile networks on the demand for fixed voice services
 - Uncertainty over the market shares of BT other CPs
 - The extent and pace of investment in fibre networks and how this will impact the market
 - The challenge of needing a granular forecast by exchange area and number block.

- 2.14. BT considers that provided adequate notice is provided to CPs of when a number block will migrate within the context of a migration timetable, sufficient certainty will be provided to CPs to enable them to plan their own migration. A mandated pace of migration is unlikely to provide net benefits and may lead to inefficient migration, not least due to the difficulty in forecasting accurately the pace of customer migration a number of years in advance.

FTR at both DLE and an IP POI simultaneously

- 2.15. We do not support this option. A requirement for BT to offer FTR simultaneously at both the DLE and IP POI for a specified time weakens the financial incentive for timely migration and will make it harder to plan for an efficient migration. It would also require otherwise unnecessary and costly changes to billing and reconciliation systems. For these reasons BT considers this proposal is not appropriate.

Question 4.3: Would the regulation of charges for media conversion, switching and conveyance for calls routed via IP networks be an effective means of preventing excessive charges and promoting an efficient migration to IP?

- 2.16. BT considers this proposal is premature and unnecessary. Before introducing any new ex ante price regulation Ofcom needs to conduct an assessment of the relevant markets (including an assessment of whether BT has market power). It also needs to consider whether its existing powers are sufficient to address the perceived risk and whether the proposed intervention is proportionate.
- 2.17. There is already a market for calls delivered over IP which terminate on TDM (and vice versa) and CPs have a number of options available to them as set out in our response to question 4.8. As well as the established market in transit services, operators have the capability to self-provide. Any new regulation will be costly to implement and will disturb existing commercial arrangements that exist for traffic delivered via IP interconnect to TDM.
- 2.18. In paragraph 4.21 Ofcom suggests that costs for media conversion, switching and conveyance for calls routed to TDM via IP networks should reduce over time. There is no evidence for this. Economies of scale will be lost as volumes decline and existing platform costs are recovered over declining volumes. These charges will need to reflect underlying unit costs to ensure appropriate incentives are in place for efficient migration.

Question 4.4: Do you agree that it remains appropriate that telecoms providers maintain their discretion to designate a single POI at which the FTR will apply?

- 2.19. Yes, CPs should be required to designate the POI where the FTR is available for each number block they have been allocated. We expect CPs will need to establish sufficient connectivity to offer a resilient service and ensure that network loading can be balanced.
- 2.20. It is important Operators offer FTR to entire number blocks at their POI as operators using TDM networks must route traffic at a number block level and are therefore unable to split traffic across different POIs.
- 2.21. As explained in the answer to 4.1 above, BT considers that FTR should only be available if the originating operator uses the same CODEC(s), packetisation time(s), signalling protocol and DTMF format reasonably specified by the terminator.

Question 4.5: Do you agree with our assessment about how BT's market position in relation to interconnection might change during migration to IP?

- 2.22. We consider that during migration to IP the regulation of IP interconnection will continue to be unnecessary.
- 2.23. During migration to IP, transit operators act as a constraint on BT and continue to reduce the need for operators to connect to over 600 DLEs to achieve low call termination rates. The decline in the volume of number blocks that continue to be hosted on TDM as migration progresses acts to reduce the demand for traffic handed over or terminating at the DLE.
- 2.24. We consider it is unlikely BT will have SMP in WCO (Wholesale Call Origination) in the next review period. BT's SMP in WCO results from CPs who must buy WCO in order to enable their customers to make voice calls over their Wholesale Line Rental connections. There is a growing range of substitutes for fixed call origination. For example customers can originate voice calls over mobile networks or use voice services carried over their fixed broadband connections as an alternative to making a call from a fixed line. This in turn reduces the reliance on WLR as a service for enabling voice calls to be made. The increased use of social media and messaging platforms also change the ways customers communicate and further reduces the reliance on fixed voice calls. These factors dramatically change the dynamics of the call origination market making it less likely, when Ofcom next reviews this market, that BT will have SMP in WCO as migration to IP continues.

Question 4.6: Do you agree that there is unlikely to be a need to impose regulation on BT's interconnection circuits once migration to IP is complete?

- 2.25. Yes. We agree that it is unlikely that regulation needs to be imposed on BT's interconnection circuits once migration to IP is complete.
- 2.26. When BT has completed its migration to IP, any remaining TDM interconnect circuits will no longer be required by CPs to give access to the FTR removing the justification for regulation of these circuits.
- 2.27. In an All-IP world CPs need far fewer points of interconnect with BT to access the FTR. Several options are available to CPs to connect with BT IP POIs. This can be via an Ethernet circuit supplied by BT (or via a third party operator) via peering over public internet or via a Telehouse and the availability of third party transit operators. This means there is no need to impose regulation on interconnection circuits to BT's IP network once migration to IP is complete

Question 4.7: Do you agree that we should continue to regulate BT's TDM interconnection circuits as the industry migrates from TDM to IP based networks?

- 2.28. BT considers that some regulation of TDM interconnection circuits at the DLE might be needed during migration to ensure CPs can access FTR at BT's TDM network but Ofcom should consider reducing the scope of current regulation applicable to BT's interconnect circuits as set out in Table 3.1 of the consultation.
- 2.29. One possibility for Ofcom to consider is matching the regulation on BT with that currently applicable to KCOM. Much of the current regulation on BT dates back many years and is no longer appropriate as we approach closure of the TDM network. One example that currently applies to both BT and KCOM is the requirement to provide new interconnection circuits (access on reasonable request). This could be reconsidered as it does not make sense to invest in new TDM interconnect circuits that will only be used for a limited period as we are looking to encourage CPs to migrate their services to IP.
- 2.30. We suggest the costs of imposing a charge control on a shrinking volume of DLE interconnect circuits is likely to be disproportionate to the benefits it might bring. An alternative approach Ofcom could consider is to introduce a safeguard cap, similar to the approach adopted with low bandwidth TISBO circuits in the Business Connectivity Market Review.
- 2.31. The requirement for accounting separation and cost accounting are no longer relevant given the small and declining volume of circuits, particularly if the suggestion for a safeguard cap is used in place of the charge control.

Question 4.8: Do you agree that it would not be necessary to impose regulation on interconnection circuits at BT's IP network during migration?

- 2.32. Yes, we agree that there is no need to impose regulation on interconnect circuits to BT's IP network during migration.
- 2.33. BT has offered a variety of interconnection options at IP for many years:
- Peering over public internet
 - Handover at neutral access points
 - Handover at specified BT buildings
- 2.34. These are set out in some detail within BT's IPX Technical Handbook. Across options 2 & 3, CPs can buy BT provided connectivity, provide their own infrastructure or buy connectivity from third parties. Around [8<] of BT's voice interconnect traffic is already carried over these IP access options, the rest handed over on TDM. This shows that regulation is not needed to enable CPs to interconnect with BT's IP network
- 2.35. The circuits used to interconnect CP networks with BT's IP network carry a full and rich blend of traffic, and not only voice traffic attracting FTR. Any regulation may impact on adjacent call conveyance markets (including transit and non-geographic traffic). Restricting connectivity to unidirectional geographic traffic attracting FTR would be very inefficient. Although segregation could in theory be achieved by deploying additional Session Border Controllers and ports at either end of a particular circuit, this introduces inefficiencies by reducing economies of scale and scope.

Question 5.1: Do you agree that BT's role is less central to the provision of end-to-end connectivity and that telecoms providers now have a choice of transit providers with whom they can interconnect?

- 2.36. Yes. We agree that BT's position in the provision of end-to-end connectivity has changed as the transit market has evolved.
- 2.37. In 2006 when the end-to-end connectivity obligation was introduced BT had a prominent position in the provision of transit services. In successive fixed narrowband market reviews Ofcom has progressively deregulated transit services, including inter-tandem conveyance, local-tandem conveyance and single tandem transit services following Ofcom's assessments that BT no longer has SMP in these markets .
- 2.38. Over this time BT's transit volumes have declined significantly as other large telecoms providers can either interconnect directly or use third party transit services. [8<] and this indicates that we no longer hold a prominent position in the transit markets.

- 2.39. As the transit markets have become more competitive and BT no longer has SMP in these markets we consider that BT's end-to-end connectivity obligation is no longer justified as CPs no longer need to rely on BT to discharge their obligations under GC A1.

Question 5.2: How might the transition to IP networks change the pattern of interconnection and how might this affect how E2E connectivity is achieved?

- 2.40. It will be considerably easier for operators to exchange traffic as the number of interconnect points needed to qualify for FTR rate will be much reduced.
- 2.41. In a TDM world CPs need to interconnect with BT at hundreds of DLEs in order to optimise their fixed call termination payments. This is achieved through their own network or through the purchase of transit services from third parties. Smaller CPs who lack the volume of traffic that make such a rich interconnect viable are disadvantaged.
- 2.42. In an All-IP world the economics of interconnection will be very different indeed.
- The concept of charging for each TDM switching stage and geographic distance at the heart of TDM interconnect charging will cease to be relevant and additional Conveyance (for both geographic and non-geographic traffic) may become a thing of the past. Only transit fees and, potentially, interworking charges are likely to remain in addition to the basic termination rates.
 - Multiple points of interconnect are only needed for resilience and the engineering requirement to avoid network hotspots, and not to access fixed termination rates.
 - The cost per minute of the associated interconnect circuit costs will be vastly reduced due to economies of scale as higher call volumes are carried over each circuit, and the lower relative costs of IP connectivity compared to SDH.
 - CPs have the opportunity to interconnect traffic without a physical interconnect; for example peering via public internet has been in wide use for many years.
 - The constraining factor on numbers of interconnect points will no longer be the cost of building or renting network assets to deliver physical interconnects but the administrative overheads in implementing and maintaining a further set of routing plans, price lists, contracts and billing relationships.
- 2.43. The commercial drivers for purchasing transit services from BT or another party will change over time from being predominantly driven by reducing call conveyance cost to reducing administrative cost. The prospect that some CPs are accessible by only one transit provider is likely to diminish rapidly .

Question 5.3: Do you agree that General Condition A1 is sufficient to ensure that telecoms providers can obtain interconnection and that additional access obligations may no longer be required to ensure end-to-end connectivity? If not, please explain why and what obligations you think are necessary.

- 2.44. Yes, we agree General Condition A1 is sufficient to ensure CPs can obtain interconnection and the additional end-to-end connectivity obligations on BT are no longer required as explained in our answer to question 5.1.

Question 6.1: Do you agree with our initial view that a lack of standardisation of IP interconnection may give rise to a risk of consumer harm?

- 2.45. We agree a lack of standardisation of IP interconnect could cause harm to customer service and network integrity if CPs do not put the appropriate checks and controls in place. BT considers further work needs to be undertaken by industry through NICC to improve interconnect standards and remove potential points of ambiguity as explained in our response to question 6.2 below.
- 2.46. BT employs a rigorous set of checks and controls including a stringent process of discovery and testing, as well as the implementation and testing of required mitigations as part of the interconnect on-boarding process. BT has developed a library of over [X] mitigation scripts and deploy many of these on a large number of our IP interconnects. This on-boarding process significantly reduces the risk to industry and ensures that the best possible service is implemented for our interconnect customers and therefore their end consumers. Without BT's approach the risk of failure would be very high, including poor call quality, breakdown in privacy controls and even the ability to route particular call types or calls to particular destinations.
- 2.47. After the on-boarding process has been completed failures are often encountered. For example where a CP makes a change in their network or transits new traffic without going through associated on-boarding. Inevitably one of the CPs has to take responsibility for resolving the issue, even in situations where the standards may be unambiguous.

Question 6.2: To what extent is there divergence among telecom providers in respect of the IP standards they are using? Do you consider a lack of standardisation of IP interconnection to be (or likely to be) an isolated issue or more widespread, which may require an industry-wide solution?

- 2.48. BT has observed a significant variance across the industry in terms of adoption of NICC/industry standards which makes provision of interconnect products more complex. A significant number of our interconnect customers have some form of bespoke element to their interconnect implementation. As mentioned above, BT has built an extensive library of scripts we deploy in order to minimise the impacts of this diversity. These scripts are costly to develop and maintain, and create complexity in handling in-life repairs.
- 2.49. Often we see different interpretations of a standard which requires interworking to achieve interoperability. BT has the mechanism to cater for the variance in standard interpretations and non-standard deliveries but this takes time and is costly. BT considers that the originating CP should take the responsibility of and bear the cost of such investment. This is because the originating operator receives the retail revenue and so is well placed to decide whether to conform with industry standards directly or pay the terminating CP or a third party to deal with the issues on their behalf.

Question 6.3: What measures, if any, do you consider may be appropriate to address risks arising from a lack of standardisation of IP interconnection?

- 2.50. BT considers that a good basis already exists with the current NICC interconnect standards. The current interconnect standards in NICC would benefit from being reinforced through cross party CP collaboration to remove ambiguity and once this is done OFCOM should consider how to ensure compliance to these NICC standards.
- 2.51. Such a move by OFCOM should however not preclude mutually agreed variance from standards for individual CPs. We expect the industry and NICC will start to converge towards a single preferred set of variants for each of the fixed world and the mobile world which will reduce the costs for interworking within these variants. CPs that use a standard that outside these preferred sets should bear the costs of interworking as this approach provides the incentive for convergence of standards.

Question 6.4: Would it be useful to consider the case for intervention in relation to technical standards for interconnection ahead of our next market review?

- 2.52. BT considers that OFCOM should sponsor the creation of a new NICC Task Group Activity with a focus on the removal of ambiguity from current NICC interconnect standards. CPs should be encouraged to participate to ensure rapid progress, and to recognise the output of that activity as the starting point for evaluation of any subsequent disputes over IP interconnect connectivity standards.

Question 7.1: What are your views on the factors that we have highlighted as having a bearing on the setting of termination rates? What other developments should we consider?

Question 7.2: What are your views on the options we present for regulating the fixed and mobile call termination markets? Which appears to be the most appropriate regulatory option?

- 2.53. BT suggests Ofcom adopts a “light touch” when setting termination rates, as these make up a small proportion of the total industry revenues for voice calls and so any gains to consumers from revising termination rates are likely to be small. For this reason BT supports the retention of the current termination rates without going through a costly and time-consuming modelling exercise.
- 2.54. If Ofcom were nevertheless to decide to review termination rates, the administrative burden from reviewing rates could be minimised if Ofcom were to re-use the work currently underway by the European Commission to set an EU-wide “Eurorate” for the termination of voice calls. If these rates are significantly lower than Ofcom’s equivalent LRIC unit cost outputs for the period 2021-2026 we suggest Ofcom consider applying a glide path to those rates to ensure any price shocks to UK operators are mitigated.
- 2.55. We are concerned that any obligation to offer mandated reciprocity will have little benefit to end consumers given current levels of termination rates. It also adds complexity and may also have significant unintended consequences, particularly for ported traffic. This is because the UK currently has a regime whereby ported geographic calls are onward-routed. Mandated reciprocity opens up the possibility of arbitrage between fixed networks. The rate paid to the range holder may be different to the rate the range holder pays the recipient CP resulting in the arbitrage opportunity for ported traffic. This could then open up the possibility for artificial inflation of traffic and exploitation of this loophole by unscrupulous operators.
- 2.56. Mandated reciprocity also impacts on mobile number portability (MNP). The current MNP arrangements require indirect routing for ported calls and this makes the implementation of a bilateral reciprocity regime difficult. Onward routed ported mobile calls are priced as “donor pays all” so the recipient is unable to determine the rate to charge because this depends on the rate each originator has agreed with the range holder. Aside from the commercial sensitivity of such bespoke arrangements, the terminator does not know which operator originated the call and thus the termination rate collected by the donor.
- 2.57. Although we do not support mandated reciprocity for national calls we do continue to support a reciprocity regime for calls to and from non-EEA countries and to and from EEA countries in the event the UK leaves the EEA.