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# **Better Broadband Speeds Information: Voluntary Codes of Practice**

Statement

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## About this document

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Broadband is an essential service for people and businesses, who increasingly rely on the internet for a wide range of activities.

The speed at which a broadband connection downloads data is an important factor when customers buy a broadband service. Customers therefore need realistic information, both at the point of sale and in their contract, about the broadband speeds they can expect to experience.

Ofcom already has codes of practice on broadband speeds for residential and business customers, which require signatories to provide customers with estimates of the speeds they are likely to receive at the point of sale. In addition, they give customers the right to exit their contracts, without penalty, if their download speed falls below a minimum level.

This document sets out our decisions on the changes to the codes of practice to improve the information provided to customers and strengthen customers' rights to exit.

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# 1. Summary

- 1.1 Broadband services are increasingly important to people and businesses, many of whom depend on the internet for day-to-day activities including communication, entertainment and trade.
- 1.2 Broadband speeds have a significant impact on the quality of service internet users receive and the range of activities they can carry out. Therefore, speed is often a key consideration when customers choose their broadband service and it is important that customers know what speed they are likely to receive. This will enable them to make a more informed decision about which service would suit them best.
- 1.3 The Residential and Business Voluntary Codes of Practice on Better Broadband Speeds Information (“the codes”) have two objectives. First, to ensure customers have clear information to help them compare broadband offers, in particular by understanding the speed they are likely to receive. Second, to ensure that customers have protection if the actual speed they receive is below a minimum guaranteed level.
- 1.4 All the UK’s largest providers have signed up to the existing codes,<sup>1</sup> which set out several commitments to help customers shop around with confidence. Under the current code, customers buying copper-based broadband are given an estimated speed range at the point of sale and will also be given a minimum speed in their contract. Consumers have the right to exit penalty-free if their speed regularly falls below the minimum level.
- 1.5 However, the existing codes have a number of limitations, including not applying equally to all technologies and not capturing the effect of peak time congestion on the speeds customers will experience.
- 1.6 We therefore consulted on proposed improvements to the codes in October 2017. We have considered the responses to our consultation and have decided on the improvements that we will implement.

## Improvements to the codes

- 1.7 Following our assessment of consultation responses, most of which supported the improvements proposed in our consultation document, we have decided to implement the following main changes:
  - **More realistic speed estimates at the point of sale.** Speed estimates provided to customers at point of sale should reflect the speeds that they are likely to experience at peak times. This speed will take account of the fall in speeds that occur during peak-time network congestion, and is more reflective of the speed a customer will receive at the point in the day that they are most likely to be using their broadband

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<sup>1</sup> The current signatories of the Residential code are BT, EE, KCOM, Sky, TalkTalk, Virgin Media, Vodafone and Zen. The current signatories of the Business code are BT, Daisy, KCOM, TalkTalk, Virgin Media, XLN and Zen.

service. Peak times will be measured as 8-10pm for residential services and 12-2pm for business services;

- **Always providing a minimum guaranteed speed and the right to exit connected to this speed at the point of sale.** This will ensure that customers are aware of their right to exit their contract if speeds fall below a minimum level;
- **Strengthening customers’ rights and extending the right to exit to bundled products.** The right to exit will now apply to bundled products, such as landline services on the same line, or pay-TV services purchased at the same time as the broadband service. A new 30-calendar day limit will apply to the time providers have to improve speeds before they must offer the right to exit to customers, and providers will be required to make information about the right to exit in after-sale information more prominent and to link it more clearly to the minimum guaranteed speed so that customers understand what triggers this process.
- **Ensuring all customers benefit from the codes, regardless of their broadband technology.** The existing codes only apply in full to broadband services provided over certain networks such as copper and part-fibre. By moving to an approach that measures customer speeds at peak time, it is possible for the codes to apply in full to all access technologies. Under the new codes cable and fibre to the premise (FTTP) providers will also be required to provide detailed speed information to customers at the point of sale, including the normally available estimate and a minimum guaranteed download speed, which triggers the right to exit.

Figure 1: An illustration of the four key changes to the codes



- 1.8 We also consulted on the time period for implementation and concluded that 12 months would be a reasonable and proportionate timeframe. This balances the need for consumers to see swift improvements, with the time required for providers to make system and process changes, and help ensure that all major providers will be ready to implement the new codes at the same time.

### **Next steps**

- 1.9 The new codes will come into force on 1 March 2019, which provides an implementation period of 12 months. The existing codes will continue in force until that date, at which point they will cease to apply to any provider.
- 1.10 After implementation, we will closely monitor signatories' compliance with the codes and intend to publish an assessment of compliance in 2020: the year following implementation.

### **Expected signatories**

- 1.11 The following existing signatories have provided us with an in-principle intention to become signatories to the new codes at the time they come into force:
- Virgin Media
  - BT
  - Sky
  - EE
  - TalkTalk
  - KCOM (Hull Area)
  - XLN
  - Plusnet
  - Daisy

## 2. Introduction and background

### Background

- 2.1 Ofcom wants to ensure that customers are empowered to obtain the best communications deals available to meet their needs. We therefore consider it important that customers understand the broadband speed they are likely to receive from a particular service and provider, so that they can make informed purchasing decisions.
- 2.2 Specifically, our fixed broadband speed policy objectives are to ensure that customers:
- a) have clear information to help them compare broadband offers, including by understanding the speed they are likely to get; and
  - b) have protection if the actual speed they receive is significantly below a minimum guaranteed level.
- 2.3 Ofcom has introduced two key measures to help meet these objectives: Residential and Business Voluntary Codes of Practice on Better Broadband Speeds Information. All the UK's largest providers have signed up to these codes, which set out a number of commitments to help customers shop around with confidence. In particular, the codes specify the speed estimates that should be given to customers both at the point of sale and in post-sale information for standard copper-based broadband services.
- 2.4 In addition to introducing the codes, we have contributed to the work of the Advertising Standards Authority (ASA) and the Committees of Advertising Practice (CAP), who are responsible for the advertising guidelines for broadband speeds.
- 2.5 Advertised broadband speeds reflect the service a provider can offer, measured on a national basis. However, the speeds that each customer will experience will depend on the service available to their premise and is specific to the individual location. Therefore, each customer cannot rely on advertised speeds as being a reliable indication of the service they will personally receive. Our codes help to solve this problem by requiring providers to give customers as accurate information as possible on the service they will receive in their premise at the point of signing up for a new broadband service. Paragraphs 2.15 to 2.19 outline the recent changes implemented by the CAP to ensure advertised headline speeds provide a better indication of the speeds consumers are likely to experience.

### The existing codes and their limitations

- 2.6 The broadband speed that an individual customer will receive depends on factors such as the length of the copper line connecting that address to the broadband network, and the level of congestion (i.e. how many customers are using the same part of the network simultaneously). In general, the provider does not know the exact speed that will be achievable to that customer at the point of signing up a new customer to a broadband service, but they can estimate the range of likely speeds.

- 2.7 The existing codes require signatories to provide speed estimates to customers at the point of sale for copper-based services. These estimates present the speeds available for ‘similar lines’<sup>2</sup> to that of the customer concerned, which means that they reflect the speed a customer is likely to receive on the basis of the characteristics of the line. However, as well as line characteristics, broadband speeds on any type of network may also fall below advertised speeds due to network congestion. Therefore, extending point of sale speed estimates to account for the effect of network congestion on broadband speeds will help to provide even more realistic information to customers.
- 2.8 Under the current codes, Internet Service Providers (ISPs) must provide a minimum guaranteed access line speed in after-sale information. However, at the point of sale, ISPs only need to provide this figure if a customer requests it, or questions what happens if they receive a lower speed than estimated. Strengthening the information provided to ensure the minimum guaranteed speed is always provided at the point of sale will help all customers to understand their rights.
- 2.9 The current codes also allow customers to exit their contract without penalty if their speed has fallen below the minimum guaranteed speed and the ISP cannot subsequently improve it. While this is an important safeguard for customers, the existing codes do not specify whether the right to exit applies to other services purchased at the same time as the broadband service or how long an ISP has to rectify a speed issue before offering the right to exit. More clarity is likely to help support customers’ awareness and empower them to exercise their rights. More robust monitoring of take-up will also help to incentivise compliance.
- 2.10 The key provisions of the current codes, including providing a minimum guaranteed speed and a range of speeds to customers at the point of sale, do not apply to cable and FTTP services. The nature of their networks means that speeds do not worsen with line length, so the access line speed should be similar to the advertised speed. As a result, cable and FTTP are not required to provide these estimates under the current codes. However, speed on all networks can degrade due to other factors (such as congestion at peak time) and so bringing these technologies into the codes will provide customers with more realistic speed information and help support consistency across providers.

## Summary of key consultation proposals

- 2.11 Following our review of the existing codes, we proposed several improvements that we consulted on in October 2017. The key proposals were:
- **Providing more realistic speed estimates at the point of sale.** We proposed that estimates should reflect the reduction in speeds that occurs during peak-time

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<sup>2</sup> On the DSL network similar lines are those that share the same degree of signal attenuation (the degree to which speed is degraded on the line – caused by line length, line quality/material, and surrounding environmental interference). For FTTC lines, Openreach provide access line estimates that already account for these factors. For cable and FTTP networks, where there is no line-specific signal attenuation, the new codes treat all lines on the network as ‘similar lines’, although if speeds vary by (e.g.) geography to a material degree, this would need to be factored in.



network congestion. This would give customers a better idea of the speed they will receive when they are most likely to use their broadband service.

- **Always providing a minimum guaranteed speed at the point of sale.** This proposal ensures that all customers are aware of their right to exit their contract if speeds fall below a minimum level;
- **Strengthening customers' rights and extending the right to exit to bundled products.** This proposal ensures the right to exit would apply to bundled products, such as landline or pay-TV services, which are purchased at the same time as the broadband service; and proposes that a new 30-calendar day limit will apply to the time providers have to improve speeds before they must offer the right to exit to customers; and
- **Ensuring all customers benefit from the codes, regardless of their broadband technology.** Currently, the codes only apply in full to broadband services provided over certain networks such as copper and part-fibre. This is because at present, speed estimates only need to reflect the reduction in speed caused by line length. We proposed that the revised codes should require speed estimates to also reflect peak-time congestion, which affects all networks. Therefore, for the first time, we would be ensuring that all signatories' customers benefit from the codes regardless of their broadband technology, including those on cable networks.

2.12 Section 3 of this document takes each of these areas in turn, setting out the consultation responses and our final decision.

## Ofcom's duties

2.13 The fixed broadband speed policy objectives set out above are consistent with Ofcom's duties under the Communications Act 2003. Ofcom's principal duty under section 3 of that Act is to further the interests of citizens in relation to communications matters and to further the interests of consumers in relevant markets, where appropriate by promoting competition. It must do so having regard, amongst other things, to the desirability of promoting effective forms of self-regulation, and to the interests of consumers in relation to choice, price, quality of service, and value for money.

2.14 Our decisions in relation to the codes set out in the next section of this Statement are also consistent with those duties. By ensuring more realistic speed estimates at point of sale, they improve consumers' ability to understand the service that they are buying and to exercise choice. Minimum guaranteed speeds and a right of exit again facilitate choice, and provide an incentive for providers to ensure a good quality of service. By ensuring all broadband technologies are covered, we are ensuring the benefits of the codes extend to more consumers.

## Changes in advertising rules

2.15 As well as addressing some of the limitations of the existing codes, the move towards using peak time speed estimates ensures greater consistency with speed claims used in advertising. The rules around broadband speed claims in advertising are dealt with by the

CAP and enforced by the ASA, and are therefore not in the scope of the codes. The codes are complementary to advertising regulation in that they deal with claims made to individuals about the particular service they will experience. However, we note that advertising is a critical part of the customer journey when purchasing a broadband package, and changes in the way that broadband speeds are advertised is therefore important context to the point of sale information provided by the codes.

- 2.16 Broadband providers can currently present speeds in advertising as “up to” a certain speed. This “up to” speed is currently defined as a speed that should be available to at least 10% of customers. Research carried out by the ASA in 2016 suggested that most customers believe they are likely to receive a speed at or close to the headline speed, but for up to 90% of customers<sup>3</sup> that may not be the case.<sup>4</sup>
- 2.17 Following a review, CAP announced new rules<sup>5</sup> for how broadband speed claims in advertising should be formulated and substantiated, with the aim of reflecting a larger proportion of customers’ experiences.
- 2.18 CAP announced on 23 November that numerical speed claims should be described as “average” in ads for residential broadband and should be based on a download speed available to at least 50% of customers at peak time. This guidance will take effect on 23 May 2018 after a six-month implementation period.
- 2.19 Ofcom welcomes the new guidance. Ofcom responded to CAP’s consultation in July 2017 supporting the use of an average measure of speed at peak time.<sup>6</sup>

## **EU Regulation**

- 2.20 As well as alterations to advertising rules, the legislative context surrounding broadband speeds has also undergone change. Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 laying down measures concerning open internet access (the Regulation), sometimes referred to as the Telecoms Single Market or Net Neutrality Regulation, came into force on 30 April 2016. This contains mandatory requirements for the provision of certain speed information in contracts, and applies to all ISPs. Article 4(d) of the Regulation specifies that contracts should include “a clear and comprehensible explanation of the minimum, normally available, maximum and advertised download and upload speed of the internet access services in the case of fixed networks”.
- 2.21 It is our view that the point of sale and after-sale speed information required under the revised codes is consistent with the information required in contracts under Article 4(d) of

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<sup>3</sup> Current CAP guidance requires the advertised speed of a package to be available to at least 10% of customers. As such, up to 90% of customers may not be achieving the advertised speed.

<sup>4</sup> ASA, 2016. Qualitative research for broadband speed <https://www.asa.org.uk/resource/qualitative-research-for-broadband-speed.html> accessed February 2018

<sup>5</sup> CAP, 2017. Major change to broadband speeds claims in ads <https://www.asa.org.uk/news/major-change-to-broadband-speed-claims-in-ads.html> accessed February 2018

<sup>6</sup> Ofcom, 2017. Speed claims in broadband advertising <https://www.asa.org.uk/resource/qualitative-research-for-broadband-speed.html> and [https://www.ofcom.org.uk/data/assets/pdf\\_file/0018/105435/annex-response-cap-consultation.pdf](https://www.ofcom.org.uk/data/assets/pdf_file/0018/105435/annex-response-cap-consultation.pdf) accessed July 2017

the Regulation. The revised codes also require that this information is incorporated into contracts in a manner intended to be consistent with the Article. By aligning the speed information required at point of sale and after-sale with the speed information required in contracts by the Regulation, this will help ensure customers are given consistent information at all stages of their contact with their provider, including when they contact them with any speed problems.

- 2.22 The codes are focused primarily on the needs of customers regarding broadband speeds rather than of providers regarding compliance. Ofcom will consider individual practices on their merits and any enforcement action in relation to the provisions of the Regulation in line with our enforcement guidelines.<sup>7</sup> ISPs are, as usual, encouraged to take their own legal advice on any additional or alternative steps to comply with relevant aspects of the Regulation.

## **Customer guide**

- 2.23 When the revised codes come into force on 1 March 2019, Ofcom will publish a customer guide to the new codes, which aims to inform customers of what they can expect from signatories and how they can make the most of their service.
- 2.24 The new codes require ISPs to provide the URL of our guide in their after-sale information. This will help to inform customers about what they can expect from signatories, as well as empowering them to use the right to exit process if they have concerns about their speeds.
- 2.25 Alongside this Statement we have published information to help customers to understand and exercise their existing rights under the current codes here:  
<https://www.ofcom.org.uk/phones-telecoms-and-internet/advice-for-consumers/advice/broadband-speeds-codes-practice>

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<sup>7</sup> Ofcom, 2017. Enforcement guidelines for regulatory investigations  
[https://www.ofcom.org.uk/data/assets/pdf\\_file/0015/102516/Enforcement-guidelines-for-regulatory-investigations.pdf](https://www.ofcom.org.uk/data/assets/pdf_file/0015/102516/Enforcement-guidelines-for-regulatory-investigations.pdf)  
accessed February 2018

## 3. Key proposals and consultation responses

- 3.1 This section sets out our provisional view from the consultation in relation to key proposals to strengthen the codes. We summarise stakeholders' responses and set out our view, following careful consideration of these responses. We then outline our decision in relation to each proposal.

### Providing more realistic speed estimates at the point of sale

#### Our proposal

- 3.2 In our consultation, we proposed that speed estimates at the point of sale should incorporate the effects of congestion at **peak time** (8-10pm for residential services, 12-2pm for business services).
- 3.3 By its very nature, peak time is when customers are most likely to use their service. Peak time estimates can therefore help customers compare services more accurately and choose a product that will meet their needs at the time they are most likely to use it, irrespective of the technology used.<sup>8</sup>
- 3.4 We proposed that ISPs test the speed of a national sample of their customers on each broadband package during peak time to produce a "normally available" speed estimate. This will need to be provided as a range at the point of sale, as under the current codes.
- 3.5 We proposed that the effects of peak time network congestion should also be reflected in the other speed estimates that ISPs need to provide, including the minimum guaranteed speed estimate, and the normally available upload speed estimate.
- 3.6 With numerical speed claims in broadband adverts now moving to a peak time measure from 23 May 2018, our proposal of requiring point of sale speeds estimates to also reflect peak time speeds will ensure consistency of information throughout the consumer journey.

#### Consultation responses and our assessment

- 3.7 The majority of respondents, including Which?, the Communications Consumer Panel (CCP), BT, Sky and TalkTalk, agreed that speed estimates at the point of sale should reflect peak time speeds.
- 3.8 BT Group commented that peak time speed was a key measure that affects the quality of the customer experience. Openreach commented that it was reasonable to adjust speed estimates to take into account peak time performance, and that it was particularly

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<sup>8</sup> Ofcom's UK Home Broadband Performance report shows that average broadband speeds decrease during peak times and that this degradation is more pronounced for some broadband packages than others. See Figure 9, Ofcom, 2017. UK Home Broadband Performance [https://www.ofcom.org.uk/data/assets/pdf\\_file/0015/100761/UK-home-broadband-performance,-November-2016-Technical-report.pdf](https://www.ofcom.org.uk/data/assets/pdf_file/0015/100761/UK-home-broadband-performance,-November-2016-Technical-report.pdf) accessed January 2017

important where different network architectures and technologies performed differently in peak periods.

- 3.9 Which? said that peak time speed was the most appropriate information to present to customers because this is the speed that they are most likely to experience. Which? also noted that consistency with CAP's guidance on advertised speeds would be helpful to customers. CCP were strongly supportive of the proposals to improve information and considered that reflecting the range of slower speeds that may be experienced at peak time was honest and realistic. A member of the public commented that basing estimates on peak time speeds would provide an incentive for providers to reduce network bottlenecks as far as possible.
- 3.10 Virgin Media disagreed with some aspects of the proposed approach; they suggested that a 24-hour average of actual speeds should be used, and queried the peak-time period used for business customers.

### **24-hour average speed estimates**

- 3.11 Virgin Media suggested that the normally available estimate should reflect a 24-hour average because customers use broadband services at all times of the day. Virgin Media referenced consumer research it had carried out, which it said indicated that customers found peak-time speeds unhelpful, and were interested in the speed they would receive over the whole day.
- 3.12 We do not agree that a 24-hour average speed estimate would better reflect the typical consumer broadband experience. A 24-hour average would combine speeds from peak and off-peak times; where congestion affects a network, off-peak speeds can be considerably higher than peak speeds (which also occur over a narrower timeframe). This could skew the average, meaning that an estimate based on a 24-hour average would be higher than the speeds customers could actually expect to receive at the time they are most likely to use the service (peak time), failing to give customers a realistic estimate.

### **Defining business peak time**

- 3.13 Virgin Media's response questioned the basis for defining the peak time for business services as 12-2pm and argued that this was more likely to be due to employees making personal use of the internet during their lunch break, rather than actual business use.
- 3.14 The proposed peak time definition was based on network traffic information from signatories, which showed a modest peak between 12-2pm. Regardless of whether the peak is primarily due to lunchtime personal use or other factors, the effects of the peak on speed are felt by those making business use of networks at this time. We also consider that it is important to have a consistent approach between networks and between the Business and Residential codes (in that both refer to peak time albeit that definitions differ).

## Conclusions

- 3.15 Having taken into account all the stakeholder responses to our consultation, our judgement is that peak times speeds are the most realistic and consistent information to provide to customers at the point of sale. Peak times will be measured as 8-10pm for residential services and 12-2pm for business services.

## Providing a minimum guaranteed speed at the point of sale

### Our proposal

- 3.16 We proposed in our consultation that the minimum guaranteed download speed should always be given at the point of sale, as well as being included in after-sale information. Providers would also need to make it clear at the point of sale that this is the speed below which customers can exit the contract without penalty.
- 3.17 Including this measure at the point of sale will further help to manage customer expectations about the potential performance of their line and underline that it is possible that it may be slower than the 'normally available' estimate. It will help customers to understand the minimum they should expect from their service and enable them to compare providers estimated minimum speeds when shopping around,<sup>9</sup> as well as drawing attention to the right to exit triggered by this speed.

### Consultation responses and our assessment

- 3.18 The majority of respondents, particularly members of the public, said that the minimum guaranteed download speed should always be provided at the point of sale.
- 3.19 CCP said that this requirement was a way of giving consumers equal access to the information that providers held, which empowered them to make an informed decision about the services they chose. One member of the public said they felt this was a key issue, and another said that they had previously found their minimum guaranteed speed difficult to access, thus pointing to the benefits of providing this at the point of sale.
- 3.20 BT Group and another organisation commented with concerns about the amount of information provided to customers at point of sale. BT commented that information about the right to exit would be too much for customers to take in over the phone, and that this should therefore only be provided when specifically requested. The other organisation was concerned that providing a normally available speed estimate range would constitute a lot of information, and suggested only providing the minimum guaranteed speed.
- 3.21 We recognise the risk that providing customers with overly detailed information at point of sale may cause confusion and adds to the amount of information provided to customers on a sales call. However, it is also important that customers are provided with sufficient

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<sup>9</sup> The ASA research linked above has shown that some consumers, particularly those who are less technically knowledgeable, may find it valuable to be able to compare minimum speeds.

information to make an appropriate choice on the right service for them, and enough information to understand their rights around exiting a contract. Although we acknowledge the concerns raised about the amount of information provided in the sales process, we consider that providing the customer with the minimum guaranteed download speed and the right to exit connected to that speed to be important information for a customer to receive at the point of sale.

## Conclusions

3.22 Having taken into account all the stakeholder responses to our consultation, our judgement is that providers will need to provide the minimum guaranteed speed and the right exit connected to this speed at the point of sale. Our view is that this approach balances the customers need for simple understandable information, with the need for providing sufficient information to make an informed choice, and the need to understand their rights to exit the contract if speeds fall below a minimum level.

## Strengthening customers' rights and extending the right to exit to bundled products

### Our proposal

3.23 The right to exit in the current codes applies to broadband, but not to other services that are brought in a bundle at the same time as the broadband service. The existing right to exit also allows customers to leave their contracts immediately and without penalty if their access line speed falls below the minimum guaranteed access line speed provided at the point of sale, provided that the speed cannot be improved. However, there is no time limit on making improvements to speed before the right to exit must be offered to the customer.

3.24 Our consultation proposed that the existing right to exit should be retained and strengthened in the new codes by:

- Extending the right to exit to bundled products. We specify that the right to exit for residential customers should be offered for phone services provided over the same line as the broadband service, as well as pay-TV services purchased at the same time as the broadband service. We did not propose to extend the right to exit to mobile services;
- Including a new limit of 30 calendar days for ISPs to diagnose and fix the speed problem before they must offer the right to exit to customers; and
- Requiring information about the right to exit in after-sale information to be more prominent and to link it more clearly to the minimum guaranteed speed so that customers understand what triggers this process.

3.25 In addition, to monitor the take-up of the right to exit more effectively, we proposed requirements for ISPs to collect data and report to us about how often speed problems are

reported, and how often the right to exit is offered and taken up. This will form part of our compliance monitoring work.

## Consultation responses and our assessment

- 3.26 All the members of the public who responded, as well as Which? and CCP, supported the proposal to extend the right to exit to phone and/or pay-TV services purchased at the same time as the broadband service. ISPs, including Gigaclear, Sky, and BT, also supported this proposal. BT noted that it should be up to customers to decide whether to exit these bundled products.
- 3.27 The majority of respondents, including members of the public, agreed that there should be a time limit for providers to fix a speed problem before offering the right to exit. Some respondents varied on the length of time at which that limit should be set, and some respondents raised exceptional circumstances that may not fit within the proposed time limit.
- 3.28 Sky's response agreed that Ofcom was right to ensure that providers address speed issues promptly, and supported the proposal for the right to exit to be offered no later than 30 days after the initial fault report from the customer to the provider. Many respondents agreed that 30 days was sufficient for an ISP to fix a problem while being a reasonable amount of time for customers to wait. Some members of the public commented that a much shorter time limit should be applied ranging from 3 days to 14.
- 3.29 Some providers, including the trade body ISPA, were concerned that 30 days was insufficient for providers (particularly resellers) to solve problems and suggested a limit of 60 days. Virgin's response also proposed 60 days as a more appropriate limit, suggesting that 30 calendar days would in practice be difficult to meet.
- 3.30 We acknowledge that resolving a speed problem within 30 days in some circumstances may be difficult, particularly if exceptional circumstances are experienced, such as a customer not being available for an engineer's visit within the time frame.
- 3.31 Having considered the responses provided, our view is that a 30-day period strikes a balance between ensuring that providers respond promptly to customer concerns about speed and allowing them the time to resolve any issues properly. We have included exemptions for exceptional circumstances, including where customers delay the resolution (such as postponing an appointment), to ensure that the time limit is suitably flexible, but only where there are genuine reasons to allow longer.

## Conclusions

- 3.32 Having taken into account all the stakeholder responses to our consultation, our judgement is that the right to exit will be extended to phone services provided over the same line as the broadband service, as well as pay-TV services purchased at the same time as the broadband service; and the right to exit process will include a 30-calendar day time limit. We believe this will provide valuable additional certainty and robustness for customers in a manner that is manageable for signatories.



## A technology-neutral approach

### Our proposal

- 3.33 The current codes only fully apply to copper-based services, due to technical differences with other forms of broadband access technology, such as cable and FTTP. A cable broadband provider (Virgin Media) is a signatory to the current codes but with exemptions. Cable speeds do not degrade with distance, which means that every customer's potential access line speed is the same; because the current codes use access line speeds for estimates, this means that cable providers cannot give speed estimates that vary from the advertised speed and are therefore exempt from all aspects of the codes that require speed estimates, including the minimum speed and the right to exit.
- 3.34 By moving to an approach that measures customer speeds at peak time, these differences are overcome, and it is possible for the codes to apply fully to all access technologies. Importantly, this means that all providers can become code signatories and all customers can therefore benefit from the protections the codes provide.
- 3.35 However, the specific characteristics of each technology mean that the way in which the code requirements are implemented needs to be flexible. To ensure that the outcome of the codes is neutral with regard to the access technology, it is necessary to use different approaches to calculate estimates, whilst leading to similar customer outcomes in terms of protection and expectation.
- 3.36 We therefore proposed a different approach for calculating the minimum guaranteed speed for cable and FTTP services. For DSL services, the minimum guaranteed speed, as set out in the existing codes, is the 10<sup>th</sup> percentile<sup>10</sup> of the speed of similar lines to the customer's. For FTTP and cable, we proposed that the threshold should be at least 50% of the advertised speed<sup>11</sup> of the broadband package. This difference in approach compared to DSL networks reflects the fact that cable and FTTP networks can invest more easily to increase speeds and therefore improve the experience of all customers. We want to ensure that customers are protected where speeds fall significantly below expectations, while still encouraging ISPs to invest in their networks.
- 3.37 For DSL services, the normally available speed is taken from the access line speed of the 20<sup>th</sup> and 80<sup>th</sup> percentiles of similar lines to the customer's (see Figure 2), which is adjusted for the effects of peak-time congestion. For cable and FTTP technologies, we proposed that the 'normally available' range given to customers at the point of sale should be estimated in the following way. A sample of customers for each product is tested at peak time to determine their speed at the router (Consumer Premises Equipment/CPE). A prospective customer will be provided with their normally available speed range at the point of sale, which will be drawn directly from the 20<sup>th</sup> -80<sup>th</sup> percentiles of this sample group for the

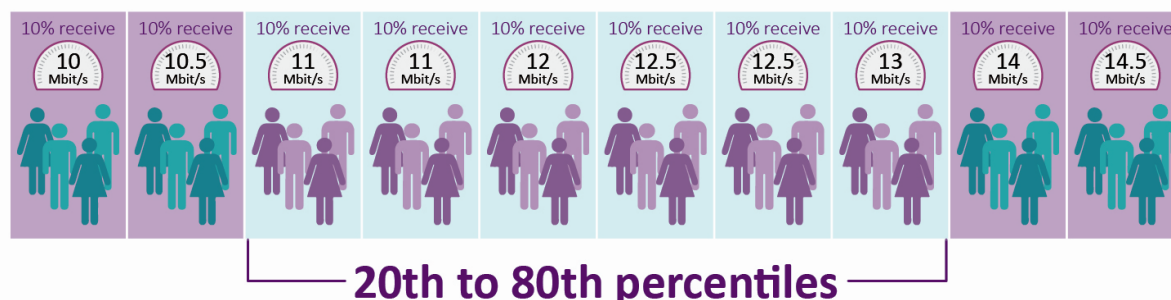
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<sup>10</sup> i.e. the speed of the bottom 10% of lines

<sup>11</sup> Advertised speeds will also be calculated on a different basis from 23 May 2018, following CAP's new guidance announced on 23 November 2017. CAP, 2017. Major change to broadband speed claims in ads <https://www.asa.org.uk/news/major-change-to-broadband-speed-claims-in-ads.html> accessed February 2018

relevant product at peak time. We have taken a national sample based approach because, unlike DSL services, the access line speeds of cable and FTTP networks do not vary with distance.

**Figure 2: An illustrated example of the 20<sup>th</sup> – 80<sup>th</sup> percentiles, giving the estimated speed range 11-13 Mbit/s**



## Consultation responses and our assessment

- 3.38 All respondents agreed that, in principle, the codes should cover all access technologies.
- 3.39 CCP welcomed the expansion of the codes to cover all networks and, therefore, all broadband customers. A member of the public commented that there should be no exemptions because it was important for customer choice and competition that all ISPs compete on a level playing field.
- 3.40 ISPA and Openreach welcomed the expansion of the codes to cover all technologies, but noted that flexibility of approach would be necessary to ensure that the requirements of the codes could be satisfied by non-DSL service providers and new technologies. Another organisation said that this would allow for easier comparison, meaning that customers could make better choices about the right products for them.
- 3.41 We agree with ISPA and Openreach that, in order for the outcome of the codes to be technology-neutral, the codes would need to be sufficiently flexible to account for the unique characteristics of each access line technology. To this end, the revised codes contain provisions for FTTP and cable services to test and calculate speed estimates in a different way to xDSL services, and can be expanded to cover providers of other technologies as they apply.

## Conclusions

- 3.42 Having taken into account all the stakeholder responses to our consultation, our judgement is that the proposed changes to extend the codes to cable and FTTP technologies achieve a consistent customer outcome across existing common technologies.
- 3.43 Through ongoing discussions with other providers, our approach will be extended to other access technologies used by any prospective signatory.

## 4. Implementing new codes

- 4.1 Following the publication of the new codes, prospective signatories will need time to change their systems and processes so that they can comply with the new requirements. These changes include setting up testing panels, creating new systems to collect data, and changing the way that their point-of-sale processes work. We requested comments on what period would be reasonable, in the light of the steps needed to comply.

### Consultation responses and our assessment

- 4.2 BT, Sky, TalkTalk, Daisy, Openreach, and one other organisation asked for a minimum of 12 months from publication of this statement for implementation of the new codes. Another organisation suggested that 120 days should be sufficient. Consumer groups including, CCP and Which? and a number of individual consumers asked for the codes to be implemented as soon as possible, to ensure that customers benefit from the changes swiftly.
- 4.3 Implementing the new codes will require Openreach-based ISPs such as BT, TalkTalk and Sky to implement systems changes to existing systems, train staff, and procure and carry out testing for congestion affects. Virgin Media and FTTP providers will need to develop new systems to provide this information at point of sale, as well as training staff and testing for congestion impacts to calculate more accurate customer speed estimates.
- 4.4 Some providers also pointed out that there are a number of changes to providers' systems required from other Ofcom initiatives such as automatic compensation, which need to be implemented over the same time period. TalkTalk noted that 12 months would be consistent with other regulatory changes imposed by Ofcom in the past that have required system and process changes.
- 4.5 For small ISPs procuring equipment and testing for the effects of congestion (which we require to be tested over a 3-month period) will be a significant additional cost and investment of management and other staff time. ISPA noted that requirements that are complicated or costly to implement risk pricing-out smaller providers. While the system changes and testing can be carried out concurrently, Daisy and Gigaclear explained that these were significant new burdens for ISPs, particularly smaller ISPs, and that it would need some time and money for implementation.
- 4.6 A number of respondents strongly presented their view that the new codes should go live with as many signatories as possible signing up at the implementation date to avoid any gaming of the rules by non-signatory ISPs who might exploit the fact that not signing up to the codes will mean that they can present higher broadband speeds, as they will not be taking account of congestion.
- 4.7 On 23 November 2017, CAP announced that from 23 May 2018 advertised broadband speeds should be the median peak time speed and presented as an 'average'.<sup>12</sup> Moving to

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<sup>12</sup> See footnote 11 for reference and link to the CAP's announcement.

the new codes promptly will ensure consistency of approach for information throughout the consumer journey from advertised speeds, to point of sale, to after sales and contract information, as key metrics will all be based on peak-time speed.

- 4.8 While we would encourage as many ISPs to sign up to the new codes from the implementation date, ISPs can become signatories after implementation. We encourage providers that are not in a position to sign up to the new codes at the implementation date to become signatories as soon as possible afterwards.
- 4.9 When assessing views on respondents, we considered the advantages of setting a shorter timescale for implementation. This could bring forward the time when the benefits set out in this document would be realised by customers. However, this needs to be balanced with the risks of implementing before systems are in place to make that implementation genuinely effective, the risks that providers may be discouraged from signing, and that some major providers may not be able to sign up to a relatively short timetable for implementation, which could run the risk of a confusing picture for consumers. We consider a 12-month implementation period allows sufficient time for effective implementation whilst ensuring benefits to customers are delivered consistently across major providers.

## **Conclusion**

- 4.10 Having taken into account all the stakeholder responses to our consultation, our judgement is that an implementation period for the new codes of 12 month balances the benefits and risks for consumers. Implementation should be completed by signatories and the new codes will take effect by 1 March 2019.

## 5. Monitoring and compliance

- 5.1 To ensure the effectiveness of the codes and the commitment of the signatories, Ofcom will monitor compliance with the requirements of the codes. The codes identify the data that ISPs must gather and supply to demonstrate their adherence to the requirements, and Ofcom may also request other reasonable information from signatories.
- 5.2 Where a signatory is considered to be non-compliant, Ofcom will attempt to reach a prompt resolution with the ISP. Continued or significant non-compliance may result in a signatory being expelled from the codes and a statement published to this effect.

### ISPs' responsibilities in relation to compliance

- 5.3 In signing up to the codes, ISPs agree to be bound by the spirit, as well as the letter, of the codes and to co-operate with compliance monitoring. As part of their obligations under the codes, signatories must therefore provide information requested by Ofcom for the purposes of such monitoring.

### Monitoring compliance with the codes

#### Testing

- 5.4 As part of the peak and quiet testing process, ISPs will need to report to us on their methodology and subsequent congestion calculations, when requested. We will review these to ensure they are using appropriate approaches for testing and application.
- 5.5 To check that the congestion figures are reasonable, we will sense check against our own data. Primarily, we will use our annual Connected Nations and UK Home Broadband Performance reports.
- 5.6 Where these checks provide cause for concern, we will review further with the ISP and ask for additional data. This will depend on the technology used and the capabilities of the ISP's network, but may include the estimated and actual line speeds for a set of customers. If there are any substantive concerns that cannot be resolved, the ISP may no longer be able to continue as a signatory to the codes.
- 5.7 Signatories will also be required to publish a high-level outline of their testing methodologies.

#### Point of sale information

- 5.8 To monitor the information given to customers at the point of sale, we will continue to monitor how and when signatories present this information to customers, including reviewing the information provided during website sales by continuing to carry out web audits, and carrying out mystery shopping as required.
- 5.9 As we do currently, we will review the results of this research with the signatories to ensure that they are clear on any areas for development and how they can address them.

The results may also indicate areas of the codes that may be improved upon by further review.

### **After-sale information**

- 5.10 To monitor the information provided in after-sales correspondence (such as welcome packs) we will request examples of this correspondence from ISPs to check that all information is included and presented correctly. Where we have concerns about the content, we will review with the ISP to bring the material into compliance with the codes.

### **Right to exit process**

- 5.11 The revised codes require ISPs to collect data on how often the right to exit is offered and taken up. We will request this data from ISPs to monitor customer take-up of this right and/or any alternative remedies offered. This data will help us to understand how often customers are reporting speed problems and what proportion are then eligible for the right to exit.

### **Reporting on compliance**

- 5.12 Ofcom will periodically report on compliance with the codes; this is likely to include mystery shopping results, commentary on testing methodologies and right to exit take-up, and assessments of web and after-sale audits.
- 5.13 We intend to report on compliance with the new codes for the first time in 2020.

### **Post implementation review**

- 5.14 BT have raised the issue of reviewing the operation of the codes once they have been in operation and their impact in practice can be assessed.
- 5.15 We intend to review and report on the impact of the codes within 2 years of its full implementation.

## A1. Other issues raised during consultation

- A1.1 This section sets out additional issues raised during the consultation that do not directly related to the key proposed changes.

### Other connection metrics

- A1.2 Andrews and Arnold and a member of the public commented that metrics other than speed, such as latency and jitter, were important factors affecting the quality of a customer's experience. They suggested that this information should form part of the point of sale requirements, as speed would not give a full picture of the service.
- A1.3 We acknowledge that factors other than speed affected the quality of a broadband service, particularly for uses such as voice over internet protocol (VoIP) and online gaming. However, we did not consider that, for the majority of customers, this level of detailed information would be helpful during the sales process, and there is a risk of customers being overwhelmed with information when comparing services. We also consider that, for most customers, speed is still the primary quality-related factor in their purchasing decision and particularly important in determining what they can expect to use their connection for. For the largest networks, data on these attributes is available at a network level in Ofcom's regular Home Broadband Performance reports.<sup>13</sup>

### Presenting narrow speed ranges as single point estimates

- A1.4 The existing and revised codes require the normally available estimate to be provided as a range in most cases, but allow it to be presented as a single figure if the size of the range is narrower than 2Mbit/s. Gigaclear stated that for ultrafast services this was a high degree of precision when compared to slower services and suggested that the threshold should allow better proportionality for such services.
- A1.5 We acknowledge that the range threshold could be too narrow to be meaningful for higher speed services and that a very narrow range for a high-speed service could imply a high degree of precision. We therefore agree that it would be reasonable for the threshold for presenting the estimate as a point to be different for services above 100Mbps.
- A1.6 To ensure that the threshold retains proportionality over a wide variety of speeds (from 100Mbit/s to over 1000Mbit/s) we have decided to use an approach that adjusted the proportion and size of the range more flexibly, depending on the speeds. For services with

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<sup>13</sup> Available here: <https://www.ofcom.org.uk/research-and-data/telecoms-research/broadband-research/uk-home-broadband-performance-2016>

headline speeds at or above 100Mbit/s, ISPs may present estimates as a point value if the size of the range is smaller than the cube root of the top of the range.<sup>14</sup>

## Guaranteed minimum upload speeds

- A1.7 An organisation commented that minimum upload speeds should also be guaranteed, and that this threshold should be included at the point of sale. They noted that upload speeds were becoming more important to customers due to the increase in social media, sharing, and cloud back-ups. They argued that upload speeds were not well understood by consumers and that including a minimum upload speed would help to educate and inform.
- A1.8 During the review process we considered whether the right to exit guarantee should apply to the minimum upload speed. We acknowledged that upload speeds were becoming more relevant for customers and therefore considered that having the minimum upload speed available on request at the point of sale was important for some customers. However, we did not consider that poor upload speeds were, in themselves, likely to affect most users' experiences to the degree that a general right to exit was warranted at this stage. However, this will be considered in future reviews of the codes.

## Consistency with EU Regulation

- A1.9 Andrews and Arnold raised concerns that the speeds estimates required by the codes, particularly the 'maximum' speed (defined by the codes as the 80<sup>th</sup> percentile of similar lines during quiet network conditions) were inconsistent with the requirements of the Regulation.
- A1.10 The Regulation requires ISPs to provide a "clear and comprehensible explanation of the minimum, normally available, maximum and advertised download and upload speed" (Article 4(1)(b)). The intention is to provide useful, clear information to customers. Further to this, BEREC Guidelines<sup>15</sup> state national regulatory authorities (including Ofcom) have flexibility to define 'maximum', 'minimum' and 'normally available' based on national circumstances, but that this should be clear and comprehensible, meaningful to end-users, comparable between providers and not liable to create an inaccurate perception of the service available.
- A1.11 In relation to 'maximum' speeds, the Guidelines say that the maximum is "the speed that an end-user could expect to receive at least some of the time". The intention, therefore is not to provide an outlier but something more normally achievable, in line with what they might reasonably expect if using their internet at the least busy part of the day. The 80<sup>th</sup>

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<sup>14</sup> For example, for the range 344-350Mbit/s, the size of the range is 6Mbit/s and the cube root of 350 is 7 - estimate may be given as point of 347Mbit/s (the midpoint).

For the range 112-120Mbit/s, the size of range is 8Mbit/s, but the cube of 120 is 4.9 - estimate must remain as a range.

<sup>15</sup> BEREC, 2016. BEREC Guidelines on the Implementation by National Regulators of the European Net Neutrality Rules [http://berec.europa.eu/eng/document\\_register/subject\\_matter/berec/download/0/6160-berec-guidelines-on-the-implementation-b\\_0.pdf](http://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/6160-berec-guidelines-on-the-implementation-b_0.pdf) accessed February 2018



percentile is, in our view, a fair way to quantify this and consistent with the Regulation and Guidelines.

- A1.12 The Guidelines state that the estimate of ‘minimum’ speed should be “the lowest speed that the ISP undertakes to deliver to the end-user”. The codes define the ‘minimum’ speed either as the 10<sup>th</sup> percentile of similar lines (for DSL technologies) or at least 50% of the headline speed (for those such as FTTP and cable). Because the right to exit is available below this point, the codes are again consistent with that interpretation.
- A1.13 The ‘normally available’ speed is defined in the Guidelines as “the speed that an end-user could expect to receive most of the time when accessing a service” with a component defining the specific period in which this speed should be achieved. Our view is that requiring an estimate based on the likely peak-time speeds of a line is consistent both with setting expectations of the service in general (i.e. ‘most of the time’), and the ability to set this across a specified time period.

### **Proportional billing**

- A1.14 The Communications Consumer Panel (CCP) and some individual consumer respondents suggested that the codes should require ISPs to charge customers different prices depending on the speeds they receive, rather than a price charged by the ISP, usually at a national level, for the broadband product being purchased. Under a proportional billing system, consumers with low speeds would pay less and consumer with fast speeds would pay more. Respondents described this as being particularly important for consumers with low speeds who do not have alternative broadband networks to move onto when exercising their right to exit.
- A1.15 In our judgement proportional billing where prices are charged to each consumer based on the speed they receive would significantly increase complexity for consumers, and reduce transparency. Consumers already have a number of different packages to choose from that provide different speeds at different price points. Consumers that experience lower speeds, for example on the Openreach network, are also often connected by a longer line than is the case of average. Therefore, the costs of serving and maintaining the connection to these properties may in practice be higher rather than lower, so proportional billing as it is proposed may not be representative of ISPs’ costs. Proportional billing would also affect all customers, whereas, in our judgement, our proposed approach in the new codes, which is more targeted for customers experiencing speeds below the minimum guaranteed download speed, is likely to be more appropriate and proportionate.

### **Discounts and compensation**

- A1.16 Some individual consumer respondents raised the issue of the codes requiring CPs to provide discounts or compensation to customers that receive speeds below the minimum guaranteed level.
- A1.17 We accept that a significant minority of broadband consumers do not have alternative networks to choose from and they will have limited options for resolving speed problems

through exercising their right to exit. In these circumstances, the new codes encourage ISPs to consider providing discounts or upgrades alongside the right to exit, particularly for those customers whose lower speeds are due to their line falling within the bottom 10th percentile of similar lines for copper-based technologies (xDSL technologies). We have therefore made a change to the codes to make this clear.

### **Definition of minimum guaranteed speed**

- A1.18 Some respondents, including Andrews and Arnold, Openreach, and a member of the public, were concerned that defining the minimum speed (to which the right to exit is attached) as the 10<sup>th</sup> percentile of similar xDSL lines could imply that such lines are faulty rather than just at the lower end of the statistical distribution.
- A1.19 This definition does not categorise the bottom 10% of lines as faulty. For some customers, a fault may put them below this speed threshold, but for others the normal performance of their line will naturally fall below this threshold and no improvements are possible. We consider this measure to be a reasonable minimum speed that will trigger the right to exit for consumers who are experiencing low speeds in comparison to their normally available estimate.

## A2. High-Level Testing Principles

- A2.1 To ensure that providers' speed estimates are as consistent and comparable as possible, the codes contain an annex detailing (at a high level) a number of principles for the speed testing that forms the basis of the new estimates. These principles set out the technical characteristics of the tests, explain how the results should be applied, and provide guidance on how many customers should be sampled.
- A2.2 The purpose of these test is, for DSL services, to determine the mean effect of congestion on each product at peak (and quiet) time, and, for cable and FTTP services, to provide peak and quiet speed profiles of customers to derive a range estimates.
- A2.3 There have been no substantive changes to the testing principles as a result of the consultation, but we have clarified two specific areas.

### Sample sizes

- A2.4 Previously, the samples size guidance in the testing principles was primarily relevant to DSL testing. We have now updated the principles to more clearly cover cable and FTTP services.
- A2.5 The sample sizes outlined in the document are designed to ensure that the number of customers tested is appropriately large that the 20<sup>th</sup> and 80<sup>th</sup> percentiles drawn from it will be a relevant and broadly representative estimate.

### Server location

- A2.6 The testing principles require that speeds are testing between the customer premise equipment and edge of the ISP's network where it connects to the internet. BT commented that their on-network server would be able to satisfy this requirement, and Gigaclear commented that testing servers should be off-network.
- A2.7 The intention of this requirement is to ensure that the speed tests are (as far as possible) representative of a typical and reasonable customer connection, while being straightforward to understand and administer. We are concerned that on-net solutions would not satisfy this principle because they are not representative of traffic to a typical internet location.
- A2.8 Therefore, we have clarified the testing principles to state that the server used to test must be placed outside the ISP's network. In addition, test traffic should not be prioritised or routed in a way that would be unrepresentative of ordinary traffic.
- A2.9 For the avoidance of doubt, ISPs are required to procure their own server space for testing, although this may be shared with other signatories. As part of monitoring the effectiveness of the codes we will consider whether the option of a centrally-managed server would be necessary to ensure accessibility and/or consistency.

## A3. Further technology developments

### ‘Actual’ access line speed estimates for DSL

#### Background

- A3.1 Currently, premise level speed estimates at the point of sale for xDSL services are based on the access line speeds on lines that are characteristically similar to the enquiring customer’s. This model is used because data about each specific line is not available to ISPs.
- A3.2 As part of the code revisions, steps have been taken to make observed line speed data available for some individual lines or premises served by Openreach. This would mean that for some customers, their speed estimate could be much more targeted because it would be based on the observed access speed of their specific line, rather than estimated.
- A3.3 This line specific data is only available for the type of access technology currently in use on the line. For example, ADSL customers moving to another ADSL service, and FTTC customers moving to another FTTC service could benefit from this observed line specific speed information at point of sale. But those customers switching from ADSL to FTTC, for example, would continue to receive estimated line speed information.
- A3.4 Use of this data would be particularly helpful for customers whose lines are ‘outliers’ in comparison to characteristically similar lines, as it avoids the risk of significantly under- or over-promising.

#### Implementation

- A3.5 The provision of this data is underway, and we understand that it will be made available to ISPs later this year. Once available, ISPs will need to feed in data for ADSL services (which are not derived by Openreach) and adapt their systems to use the new data. The codes require ISPs to use this data once available, and we expect implementation in 2019.
- A3.6 The codes will be updated with an Annex detailing the way in which the data should be used to derive speed estimates to customers at the point of sale, which will be monitored and reviewed if necessary.

## A4. Glossary

- A4.1 **Access line speed or sync speed** – This refers to the speed of the data connection between the broadband modem and the local exchange or cable head end. This constitutes the maximum speed a customer will be able to experience on his/her individual line.
- A4.2 **Actual speed** – This is the actual speed that a customer experiences at a particular time when they are connected to the internet. This figure is often dependent on factors such as the ISP's network, its traffic shaping and management policy, the number of subscribers sharing the network and the number of people accessing a particular website at a particular time.
- A4.3 **ADSL** - Asymmetric digital subscriber line. A digital technology that allows the use of a standard telephone line to provide high speed data communications. Allows higher speeds in one direction (towards the customer) than the other.
- A4.4 **Advertised (or headline) speed** – The speed at which broadband services are typically marketed, currently often expressed as 'up to' xMbit/s (megabits per second). This speed will usually be calculated in a manner recommended by the Committees of Advertising Practice (CAP). From 23 May 2018, new CAP guidance will take effect; this recommends using a national peak-time median speed and referring to advertised speeds as an 'average'.
- A4.5 **Cable** – Sometimes referred to as Hybrid Fibre Coaxial (HFC) networks, cable networks combine optical fibre and coaxial cable (a cable made up of a conductor and a tubular insulating layer) to carry TV and broadband signals to end-users.
- A4.6 **Congestion (network congestion)** – A slowdown in performance caused when multiple users share the same bandwidth (the amount of data that can be transmitted in a fixed amount of time) within a network and the bandwidth available is less than the aggregate demand i.e., where there is higher demand for the service than it is able to provide, leading to less available bandwidth per user and, therefore, slower speeds. This is most commonly experienced during the evening peak time.
- A4.7 **Customer Premises Equipment (CPE)** – Also known as customer equipment or customer apparatus, usually a router or 'hub'. Equipment on customers' premises, which is not part of the public telecommunications network and which is directly or indirectly attached to it.
- A4.8 **DSL** – Digital subscriber line. A family of technologies generally referred to as DSL, or xDSL, capable of transforming ordinary phone lines (also known as 'twisted copper pairs') into highspeed digital lines, capable of supporting advanced services such as fast internet access and video on demand. ADSL, HDSL (high data rate digital subscriber line) and FTTC (very high data rate digital subscriber line) are all variants of xDSL).
- A4.9 **Download speed** – Also downlink or downstream speed. Rate of data transmission to a customer's connection from a network operator's access node, typically measured in Mbits/s.

- A4.10 **Fixed wireless access (FWA)** - An access service where the connection between the network and the equipment located at the customer premises is provided over the radio access medium
- A4.11 **FTTC (or Fibre to the Cabinet)** – An access network structure in which the optical fibre extends from the exchange to a street cabinet. The street cabinet is usually located only a few hundred metres from the subscriber’s premises. The remaining part of the access network from the cabinet to the customer is usually copper wire but could use another technology, such as wireless.
- A4.12 **FTTP (or Fibre to the Premises)** – An access network structure in which the optical fibre network runs from the local exchange to the customer’s house or business premises. The optical fibre may be point-to-point – there is one dedicated fibre connection for each home – or may use a shared infrastructure such as a GPON. Sometimes also referred to as Fibre to the home (FTTH), or full-fibre.
- A4.13 **Satellite** – Satellite broadband is a data service where satellites are used to provide the wireless data connectivity. A satellite dish at the customer’s premises connects to a geostationary satellite and transmits signals through the air.
- A4.14 **Upload speed** - Also uplink or upstream speed. Rate of data transmission from a customer’s connection to a network operator’s access node, typically measured in Megabits per second (Mbit/s).
- A4.15 **Wifi** – A short range wireless access technology that allows devices to connect to the internet. These technologies allow an over-the-air connection between a wireless client and a base station or between two wireless clients.