# Measuring the experience consumers have when using broadband services

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# Agenda

- Ofcom's current broadband performance measurements

- The end-to-end chain of Internet content delivery

- Early results from a new approach
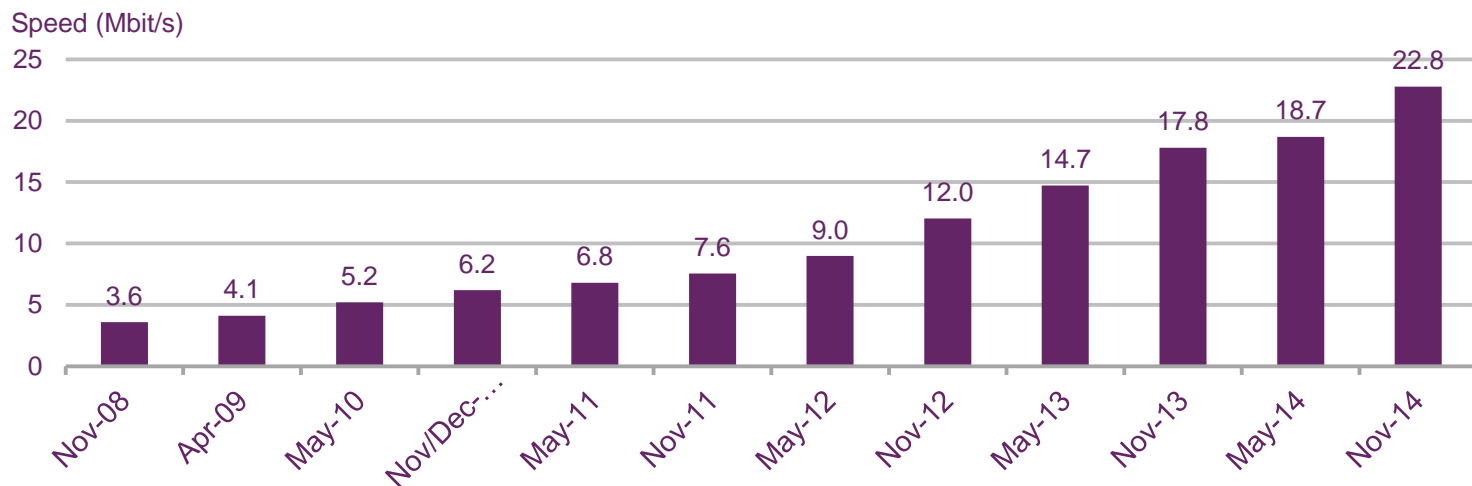
- Conclusions and next steps

# We have been measuring broadband speeds since 2008

- Under UK legislation Ofcom is required to find out about consumers' experience in their use of, and access to, electronic communications services

- We commission research in order to help us understand the performance of UK fixed-line residential broadband connections, including the average download speeds that they deliver

- Data is collected by research partner (SamKnows) from a volunteer panel of UK residential broadband users
  - Currently we have just under 2,000 users participating

- This approach uses dedicated hardware installed at the user's premises and is designed to accurately measure metrics that affect broadband performance
  - Panellists are selected to avoid bias
  - Measurements do not coincide with user's broadband use to avoid contention in the home

# Most recent results show average broadband speeds continue to rise in the UK

- Our focus on broadband speeds has contributed to continued investment by ISPs to improve the products and services on offer
  - Including the provision of superfast and ultrafast broadband
- While average speeds are increasing, there is a significant minority of consumers that remain on lower speed services

**Average actual broadband speeds: November 2008 to November 2014**

Speed (Mbit/s)

| Date | Speed |
|------|-------|
| Nov-08 | 3.6 |
| Apr-09 | 4.1 |
| May-10 | 5.2 |
| Nov/Dec-... | 6.2 |
| May-11 | 6.8 |
| Nov-11 | 7.6 |
| May-12 | 9.0 |
| Nov-12 | 12.0 |
| May-13 | 14.7 |
| Nov-13 | 17.8 |
| May-14 | 18.7 |
| Nov-14 | 22.8 |

*UK fixed-line broadband performance, Ofcom, November 2014*

# We monitor broadband performance on an aggregated national basis

- We examine:
  - Upload speeds as well as download speeds
  - Differences between ADSL, VDSL and cable technologies
  - Variations in the performance of urban, suburban and rural regions (see figure below)
  - Time of day variations

**Average download speeds for fixed broadband connections in urban, suburban and rural areas: May 2011 to November 2014**
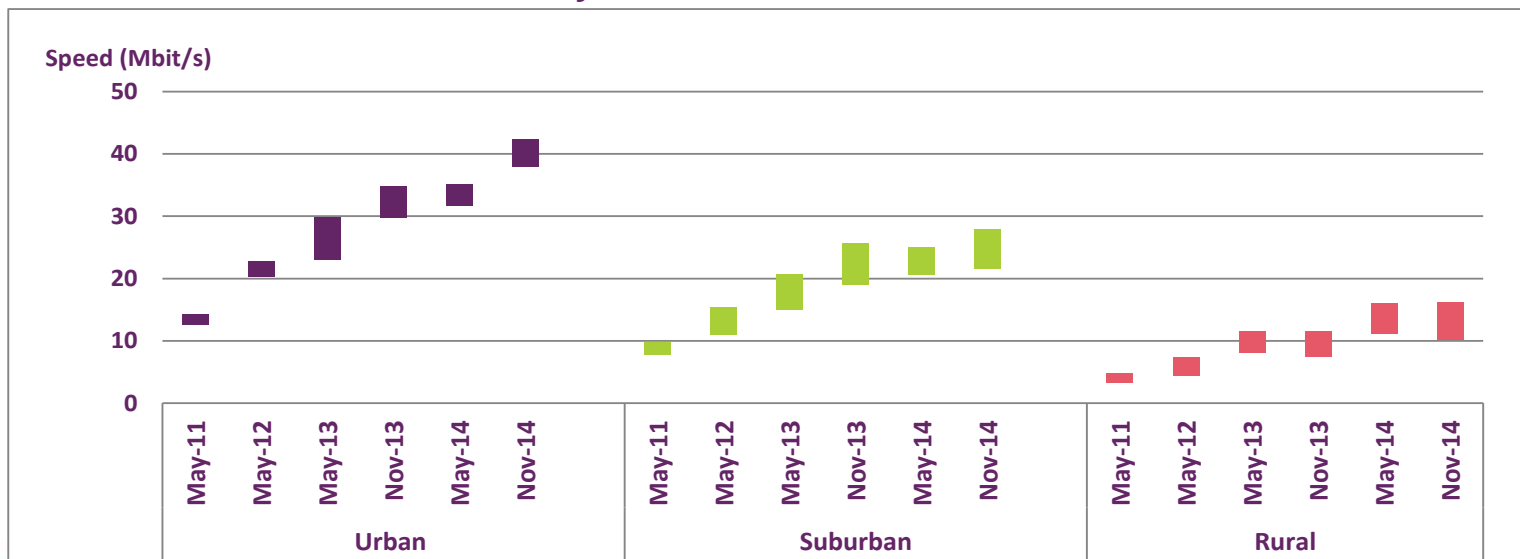
# We also compare how ISPs compare in a number of ways…

- For example, we examine:
  - Maximum, average and peak download speeds (see figure below)
    - For ADSL, FTTC and cable technologies
  - Variation in speeds during the day
  - Upload speeds
  - Disconnections

**Average download speeds for ADSL2+ packages: May 2011 to Nov 2014**
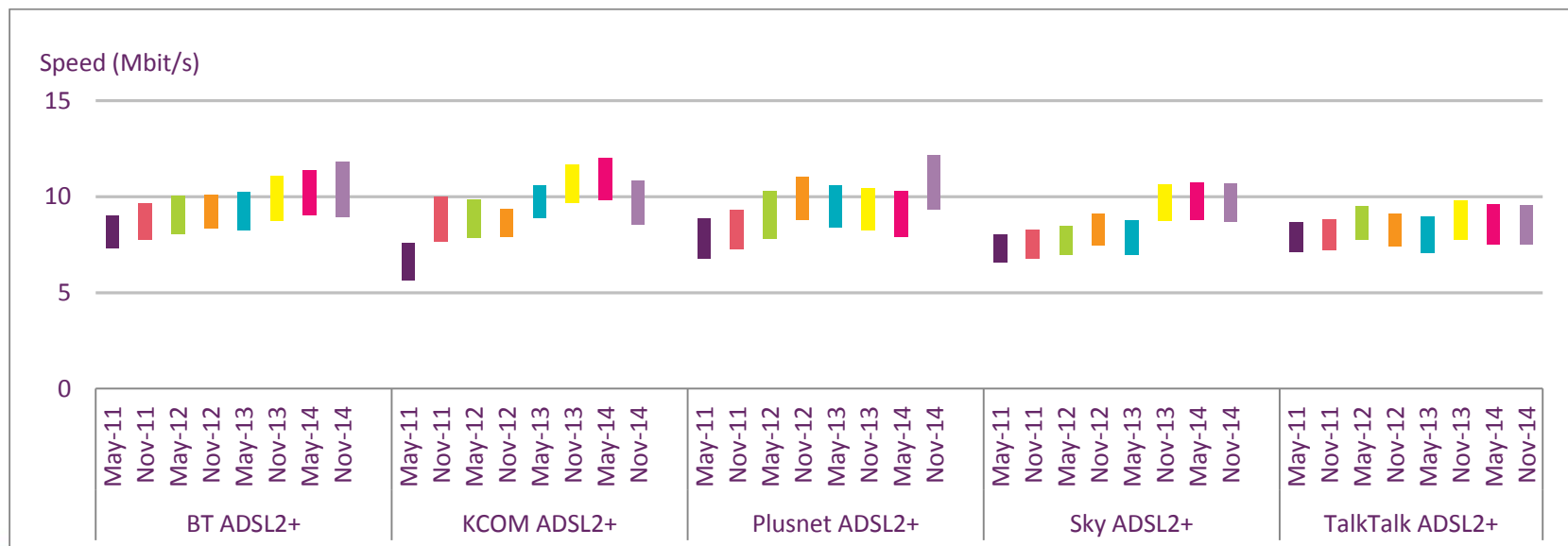
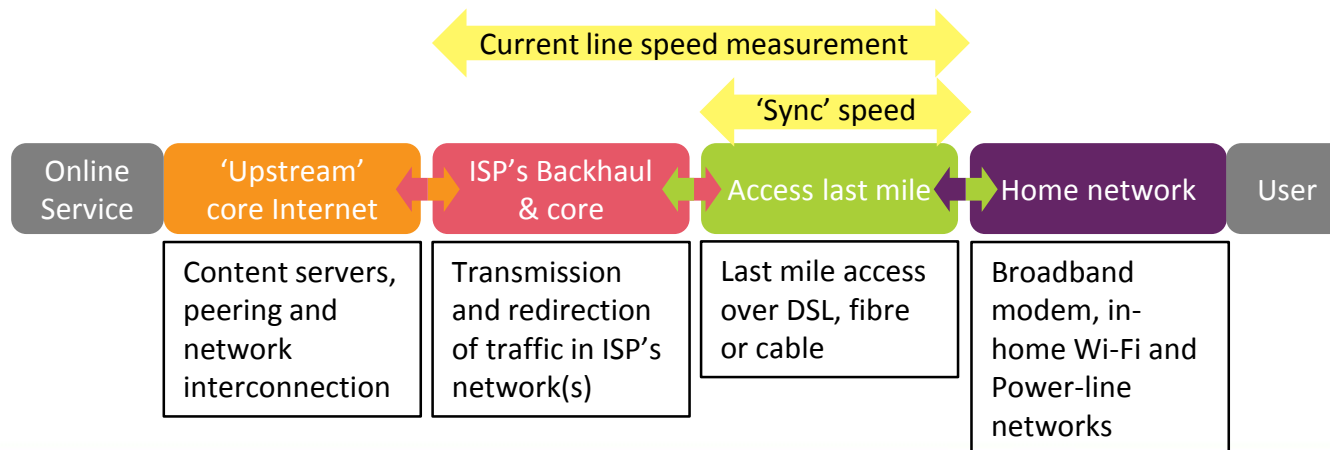# We measure a number of metrics other than speeds

- Web browsing speed
  - The time taken to fetch the main HTML and assets (e.g. content files) from a webpage
- Latency
  - The time it takes a packet of data to travel to a third-party server and back
- Packet loss
  - The proportion of data packets that are lost in transmission over a connection
- DNS resolution/failure
  - The time taken for an ISP to translate website names into IP addresses
- Jitter
  - Measures the rate of change of latency

**Average (purple) and peak-time (green) latency for ADSL2+ ISP packages**

Milliseconds

| | BT ADSL2+ | KCOM ADSL2+ | Plusnet ADSL2+ | Sky ADSL2+ | TalkTalk ADSL2+ |
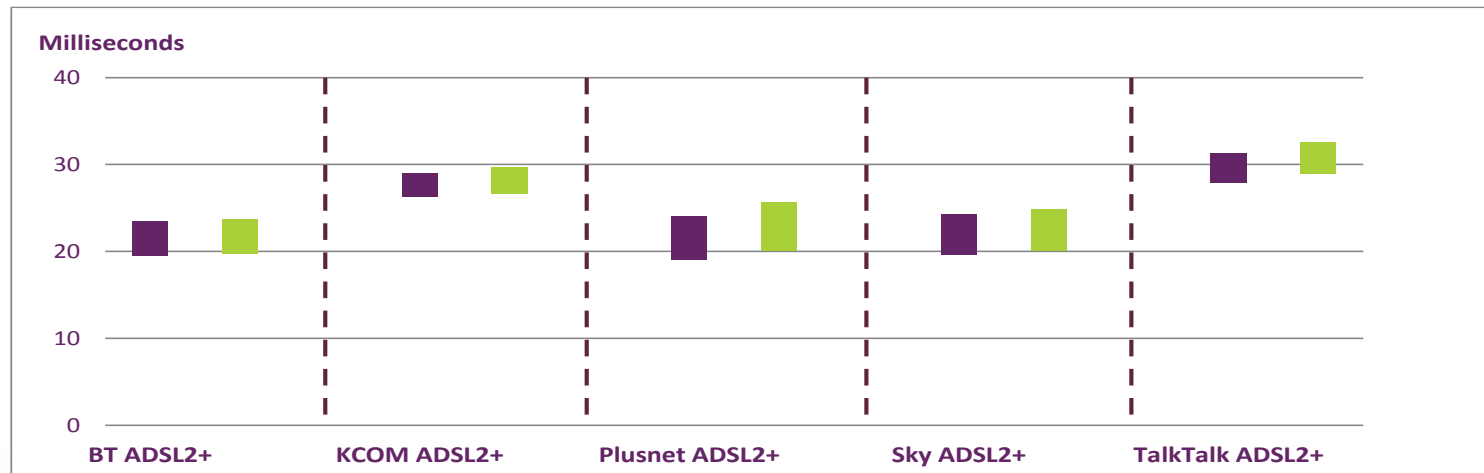
# A consumer's internet experience is affected by more than their access line speed

- All parts of the end-to-end chain of internet delivery can influence how the service or application will perform
    - And will depend on the tolerances of the application
    - As well as the expectations of the consumer

- As access speeds increase, these other parts may begin to more strongly influence the overall performance
    - For example, congested Wi-Fi in the home may affect the performance of services

Current line speed measurement

'Sync' speed

| Online Service | 'Upstream' core Internet | ISP's Backhaul & core | Access last mile | Home network | User |
|---|---|---|---|---|---|

| Content servers, peering and network interconnection | Transmission and redirection of traffic in ISP's network(s) | Last mile access over DSL, fibre or cable | Broadband modem, in-home Wi-Fi and Power-line networks |

# Recently Ofcom has been looking at ways to measure internet quality of experience

- We have been conducting research into methodologies that can examine the various degradation effects that can occur in networks

- This approach is capable of:
  - evaluating the performance of the complete end-to-end connection chain between an online service provider and the consumer
  - identifying the parts of the chain that have the greatest effect on the consumer experience, for different types of online services

- It assesses how degradation could manifest itself in the performance of common internet services and applications, for example:
  - Video on Demand
  - Web browsing and social media
  - VoIP calls

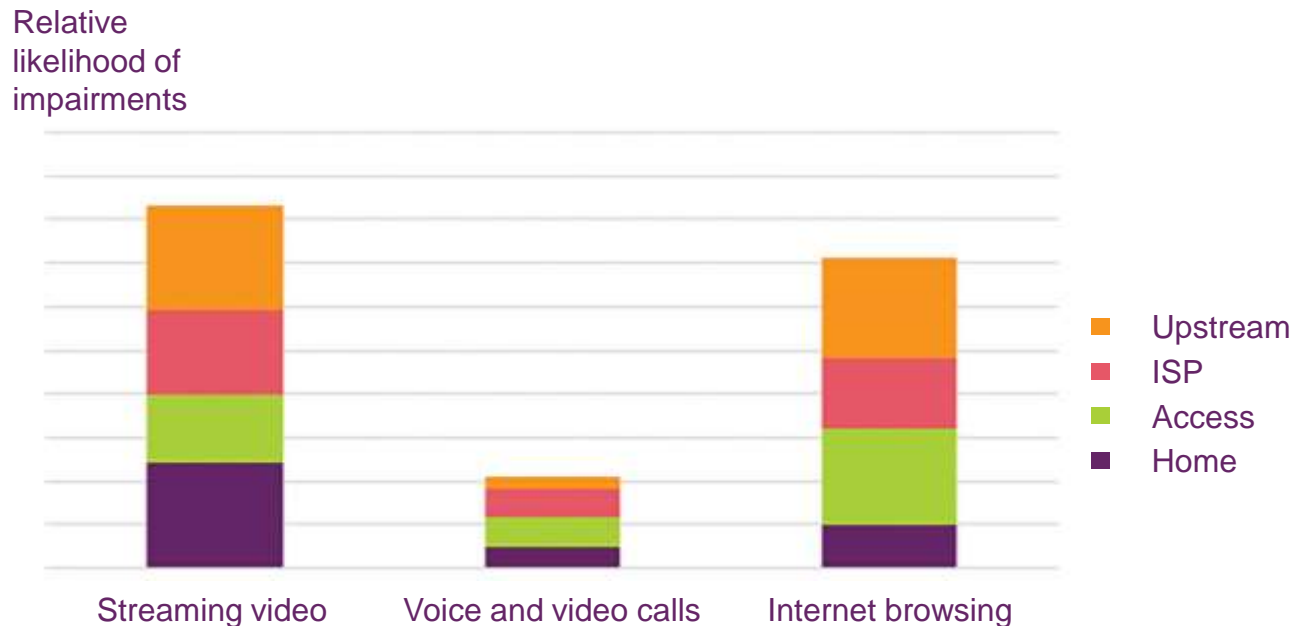- Our initial results were published in our Infrastructure Report 2014

# Performance is affected by the number of impairments that arise in the end-to-end chain

- And these impairments appear more likely for low bandwidth access connections



*Ofcom Infrastructure Report, December 2014*
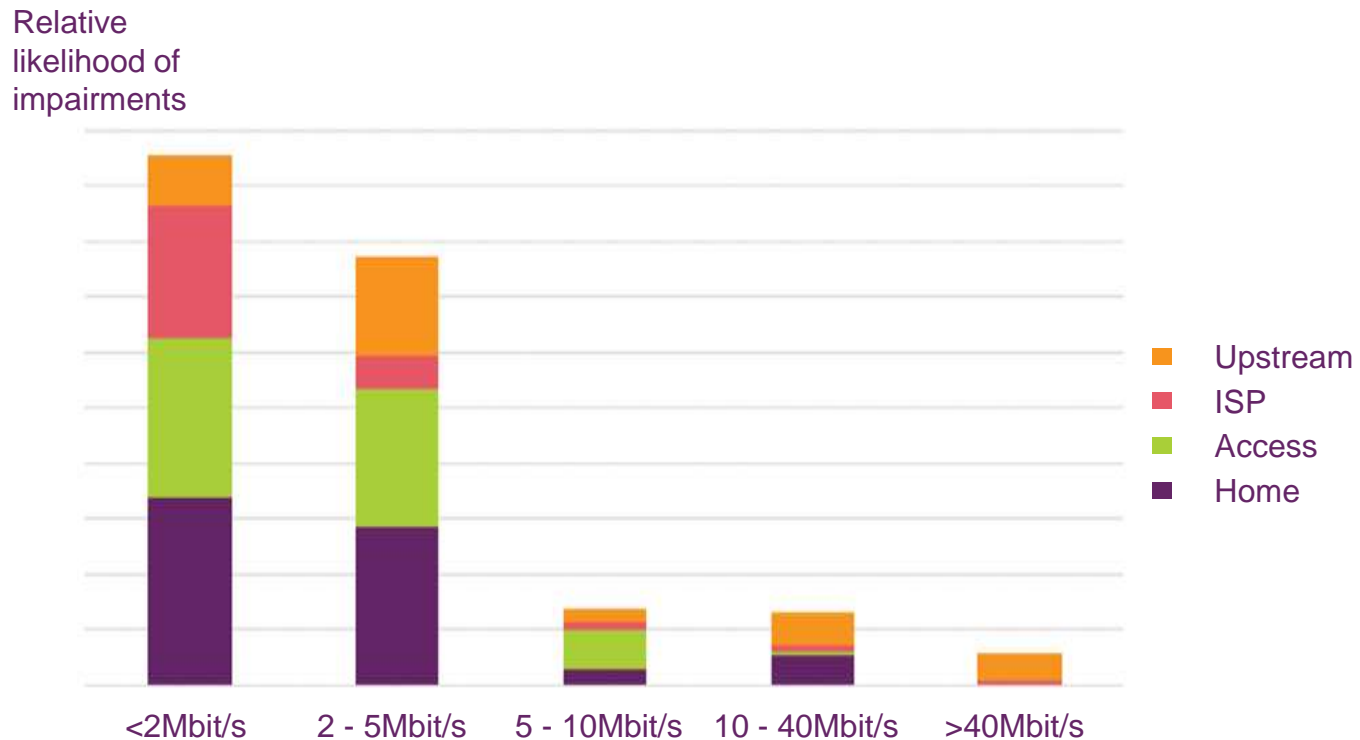
# Network congestion and degradation can affect different internet applications in different ways

- The new measurement approach was also used to investigate how different applications perform over the same broadband network

- Some internet services can be more sensitive than others to data transmission delays (latency) or data loss



Relative likelihood of impairments

Streaming video    Voice and video calls    Internet browsing

Upstream
ISP
Access
Home

# This approach has the potential to offer further insights into broadband services

- The results of this new measurement approach are indicative at this stage but illustrate its potential to provide useful input for consumers and ISPs, for example:

  - Consumers can access better information about the experience they are likely to have when accessing different online services

  - ISPs can gain better insight, helping them to identify how and where performance degradations are arising in the broadband delivery chain

# We plan to continue our research in this area

- We plan to carry out further research to develop our approach to evaluating the performance of the end-to-end broadband connection chain
  - And how new and existing broadband measurement techniques can be used to their greatest effect

- We will consider how information that they provide can be used effectively
  - How best to measure and articulate consumer experience
  - And to offer consumers useful and meaningful information about their broadband services

- We plan to publish further work in this area in this year's Infrastructure Report Update

**Thank you**