Broadband volume and uses

Prepared for Openreach

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Summary

- There are a number of major trends in the adoption and usage of broadband lines over the period 2012-2020:
  - Broadband adoption is likely to continue to grow, with UK household penetration increasing from 76% to 88%, while the share of Openreach residential lines supporting telephony-only services will fall from 17% to 2%
  - The delivery of video over broadband lines is likely to continue to grow from 46 minutes per broadband household per day to 104 minutes driven by longer form viewing and connected viewing to the TV set
  - Smartphone adoption will continue to grow rapidly reaching 70m units from 38m, with similarly rapid take-up of tablets to reach 40m units from 11m. We see internet usage via connected mobile devices as largely additional to PC internet usage with a majority of it offloaded to home broadband via Wi-Fi, leading to overall internet usage per broadband household per day roughly doubling
  - While PC-based home broadband usage is likely to be flat to declining over the next few years, the growth in smartphone, tablet and TV use is likely to lead to significant overall growth in Openreach residential line usage, from 1.5 hours per day to over 3 hours, with 57% of this usage being very fault intolerant (i.e. video viewing)
- These trends are individually and collectively likely to put pressure on broadband infrastructure and hence reported fault rates, as:
  - Any increase in the adoption of broadband will make faults that affect broadband speeds apparent
  - The adoption of high speed broadband, where users pay extra for faster speeds, will make faults that affect broadband speeds more apparent (although the nature of the infrastructure used is different, which may also affect fault rates)
  - The increasing use of high bandwidth fault intolerant internet applications such as video will make both endemic and intermittent faults more likely to be reported
  - Any increase in overall broadband usage (among existing adopters) will make intermittent faults more likely to be reported

Introduction and project background

- Enders Analysis were approached by Openreach to provide forecasts of the adoption and usage of broadband lines in the UK, with a particular emphasis on developments and trends that may have an impact on the reported fault rate of the underlying copper access lines
- Forecasting the adoption within the broadband base of high speed broadband via FTTC and FTTP is specifically beyond the scope of this report, and we would note that this would influence reported fault rates, although there are both positive and negative factors. We have implicitly assumed that the adoption of high speed broadband is sufficient to support the growth in our usage forecasts, i.e. that congestion at the home hub is not a major factor limiting usage growth

- In this report we focus on key rising sources of pressure on broadband lines, and thus drivers of broadband fault rates, along with our forecasts out to 2020
  1. We first consider the overall volume of broadband lines in terms of residential broadband adoption and Openreach broadband lines used for broadband services
  2. We then look at trends in daily usage of broadband lines driven by :
     i. Connected TV viewing to TV sets and other screens
     ii. Take-up of multicast linear channels over IPTV
     iii. Growth in internet usage via mobile devices and the impact on overall internet usage
  3. Finally, we consider these factors in aggregate to assess the overall impact on residential lines looking at total daily minutes per Openreach household by usage and by fault tolerance

Key assumptions and sources

- Throughout this report, we have made two key assumptions regarding the nature of faults occurring on Openreach's copper lines:
  i. There exist faults which result in increased attenuation of a modulated digital signal, resulting in a reduced modem sync speed over the line, while not blocking the signal altogether, and allowing an analogue voice service to still function. An example might be physical wear on the line, or interference from a continuous power source
  ii. There exist faults that are intermittent in nature, and which either block a service completely or result in reduced modem sync speeds as in (i). These may be highly variable in their effect. An example might be interference from an intermittent electrical power source, or crosstalk between individual copper lines
- We view it as highly plausible that these types of faults exist, but we have no evidence of their frequency, and therefore cannot comment on the materiality of any of the impacts of the trends that we identify in this report

- We give in this report a number of forecasts around the adoption and usage of home broadband lines. These forecasts are sourced from a combination of:
  – Enders Analysis published forecasts
  – Enders Analysis in-house forecasts which are continuously maintained for research purposes
  – Adaptations and updates to the above forecasts performed for the purposes of this report

1. **Broadband adoption**
2. TV: Over-the-top and multicast
3. Smartphones and tablets
4. Overall line use

Broadband adoption: impact on fault rates

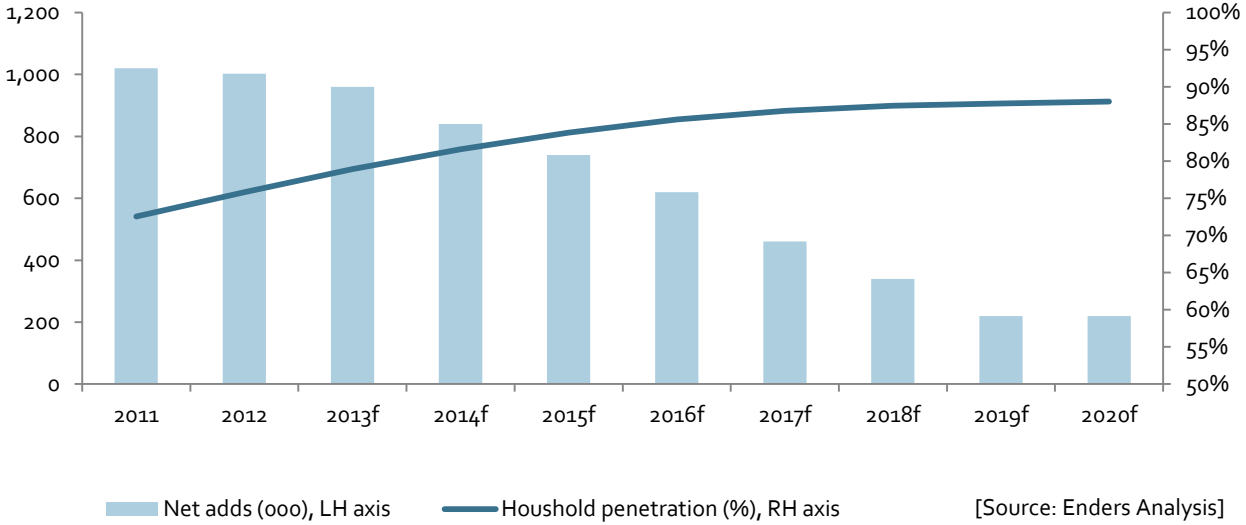
- The adoption of any type of broadband may increase the rate of line faults reported, as:
  - Any fault in the line which increases attenuation will be more obvious to an end user, as it will reduce a readily observable and measurable variable: broadband speed. While broadband speeds vary in any case due to distance from exchange, many subscribers receive an estimate of the expected speed beforehand, so may notice the speed reducing impact of a fault
  - The use of broadband significantly increases the amount of usage of the line, with even very short-lived breaks in service sometimes noticeable to the end user, increasing the likelihood of intermittent faults being reported

- In the rest of this section we give our forecasts for the adoption of broadband; in the following sections we look at the usage of broadband lines and consider the impact of the changing nature and volumes of usage

Broadband adoption forecast

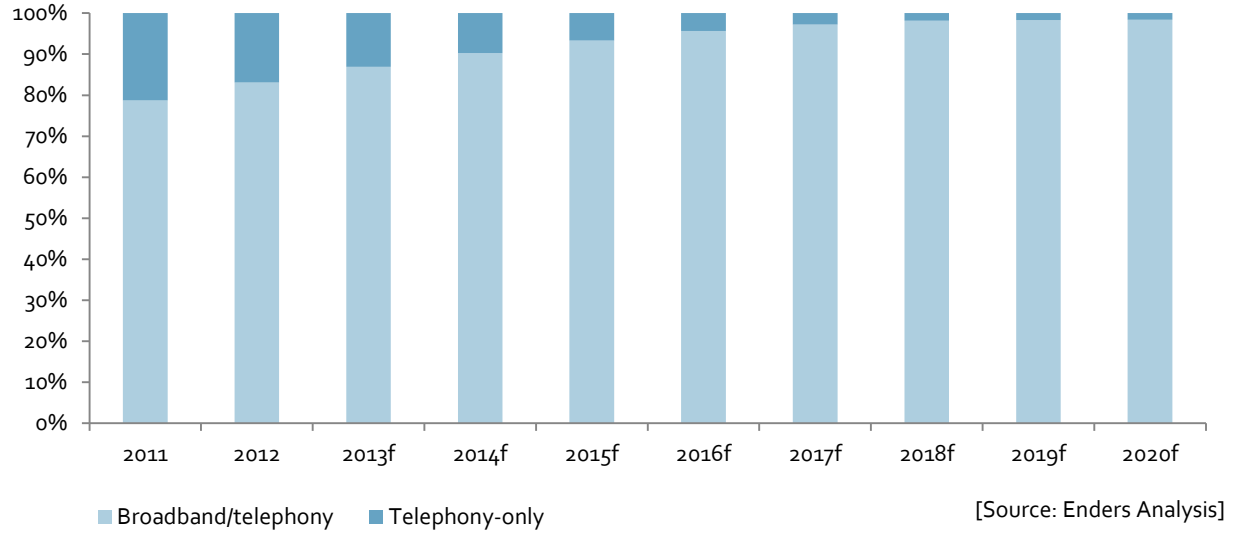
- We estimate that there were around 20m residential broadband lines in service at the end of 2012 (based on operator reporting), representing 76% of UK households
- Recent growth has still been strong despite penetration already being high, with 1m lines added in both 2011 and 2012
- We expect growth to moderate over the next few years as the market saturates, but with some residual growth driven by demographic drift and household growth
- The total number of residential lines (including telephony-only) has recently stabilised after some years of decline, as the requirement to have a line for broadband has resulted in re-connects for this purpose outweighing the impact of mobile substitution
- We expect the total number of lines to grow in line with household growth over the coming years, supported by broadband growth
- This results in a continued shift from a mix of telephony-only and broadband lines to a base dominated by broadband. We forecast that the proportion of telephony-only lines will fall from 17% in 2012 to 2% in 2020

UK residential broadband net adds and household penetration forecast



[Source: Enders Analysis]

Openreach residential line mix forecast



[Source: Enders Analysis]

1. Broadband adoption
2. **TV: Over-the-top and multicast**
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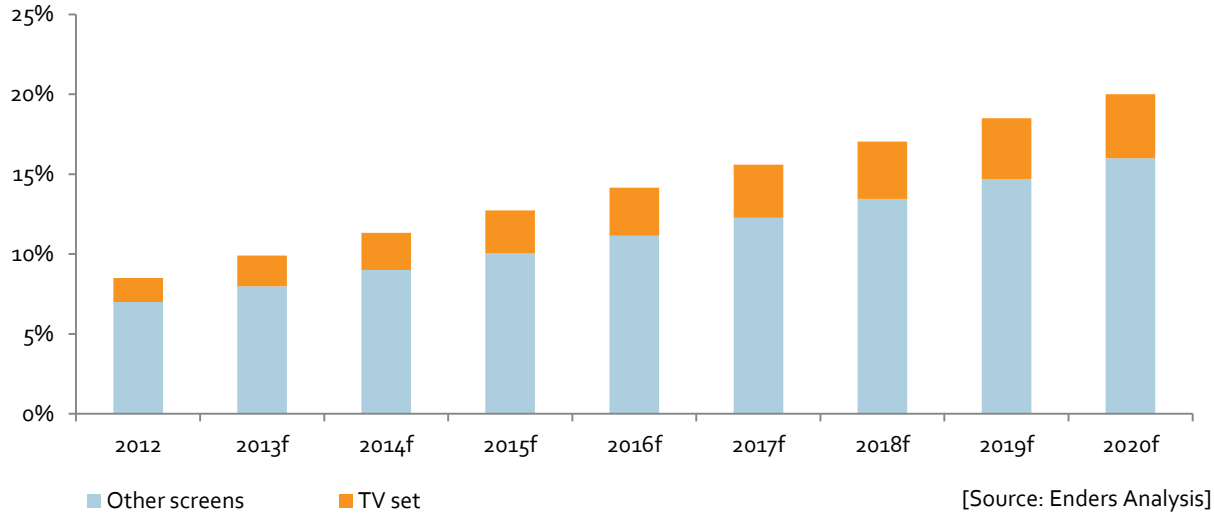
TV and video over broadband: impact on fault rates

- In this section we look at the impact of the growing use of broadband for viewing TV and video clips on a main TV set, PC or other device
- Video places particularly high demands on a broadband service, given the relatively high bandwidth being required on a continuous or near continuous basis. This can increase reported fault rates in two ways:
  - Video services typically have a minimum required bandwidth in order to function at all, or to deliver the optimum picture quality. Bandwidth requirements vary, with a rough guide below:
    - Video clips on a PC: 100-500kbps
    - TV shows/movies on a PC: 1Mbps
    - TV shows/movies on a TV set: 1-4Mbps
    - HD TV shows/movies on a TV set: 3-10Mbps
  - Note that with average ADSL speeds at around 6Mbps, a large number of ADSL end users would have their video quality degraded by a material reduction in speed
  - Video services also tend to be sensitive to any interruption in the bitstream, depending on the method of delivery:
    - Most over-the-top 'streaming' services actually use 'adaptive bit rate progressive download', which downloads the content in 2 second blocks requested every2 seconds, so any interruption of more than 2 seconds will definitely interrupt the viewing experience, and shorter interruptions may have some impact
    - Multicast services delivering linear TV over an IPTV platform do use genuine streaming technology, with a short buffer time – BT Vision for example has a 400ms buffer. These services typically have an on-demand backup source in the event of an interruption or error in the stream, but any interruption of more than 400ms would still interrupt the viewing experience

Video-on-demand forecast

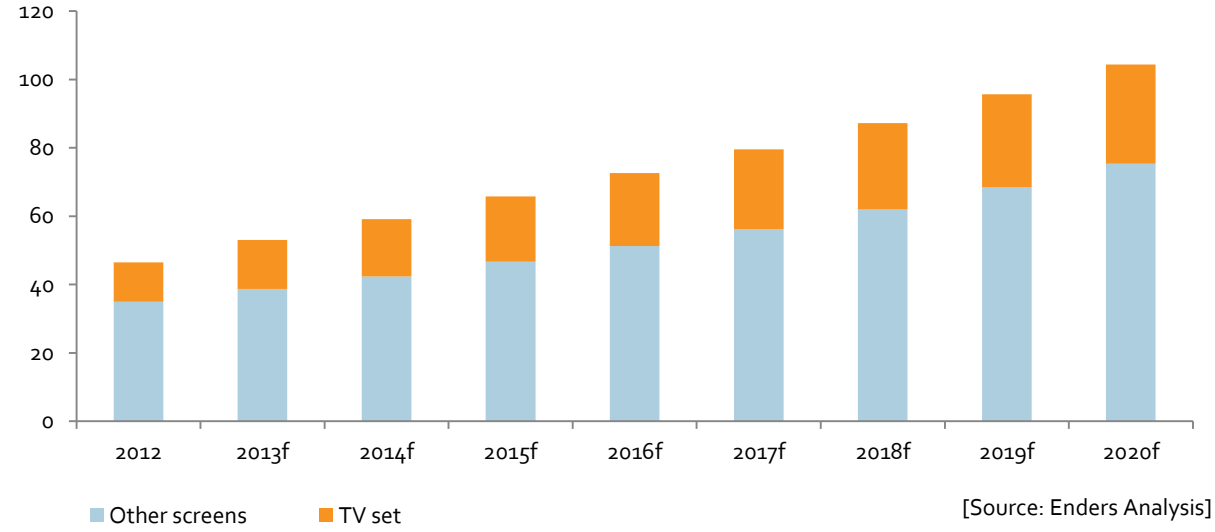
- We estimate that total video-on-demand is currently around 8.5% of UK video viewing, with most of this being short-form video delivered to PCs
- We anticipate this growing to 20% of total video viewing by 2020, with the strongest areas of growth being (i) longer form content, and (ii) viewing on the main TV set
- Note that the types of video that are growing strongly are the types with higher bandwidth requirements, and therefore will have the highest impact on fault reports
- Note also that our forecasts assume that a large proportion of non-linear viewing continues to be done via PVRs with local storage. Should TV platform operators move to networked PVRs which store content in the cloud (as all are considering), the amount of connected viewing would be considerably larger
- This translates into minutes of video watching per day per broadband line more than doubling from 46 in 2012 to 104 in 2020

Connected viewing % of total viewing



[Source: Enders Analysis]

Connected viewing minutes per broadband household per day

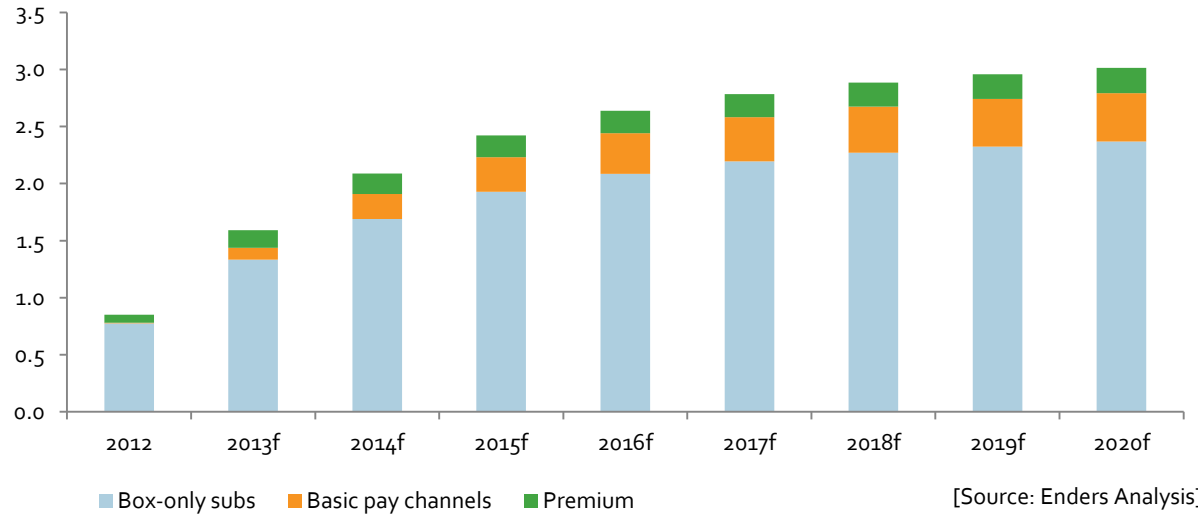


[Source: Enders Analysis]

Multicast forecast

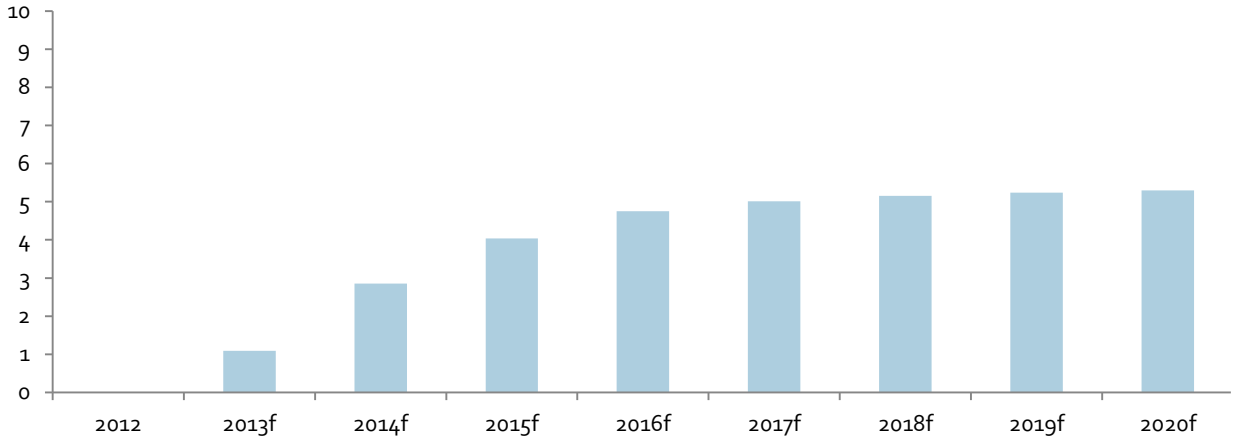
- Both BT Retail and TalkTalk Group offer TV platform services, where a PVR box, linear TV channels and on-demand services are bundled with a broadband subscription
- Both services rely primarily on Freeview for the delivery of mainstream channels, and only use multicast for extra basic pay and premium sports/movies options, which are available for an extra fee on top of the Freeview-based service
- Consequently the number of subscribers taking multicast channels is much lower than their total subscriber bases, and even for these subscribers the majority of their viewing will be over Freeview on DTT
- This leads to multicast having a relatively modest impact (compared to video-on-demand) over the forecast period; we forecast that it drives usage of just 5 extra minutes per DSL broadband line per day by 2020
- This does however assume that the above dynamics continue as they are; it is possible that extra channels will be bundled into the basic TV products, and/or channels migrate from the Freeview platform to paid-for platforms as IPTV services gain momentum

Pay-TV subscribers to TalkTalk and BT (m)



[Source: Enders Analysis]

Multicast viewing minutes per Openreach household per day



[Source: Enders Analysis]

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3. **Smartphones and tablets**
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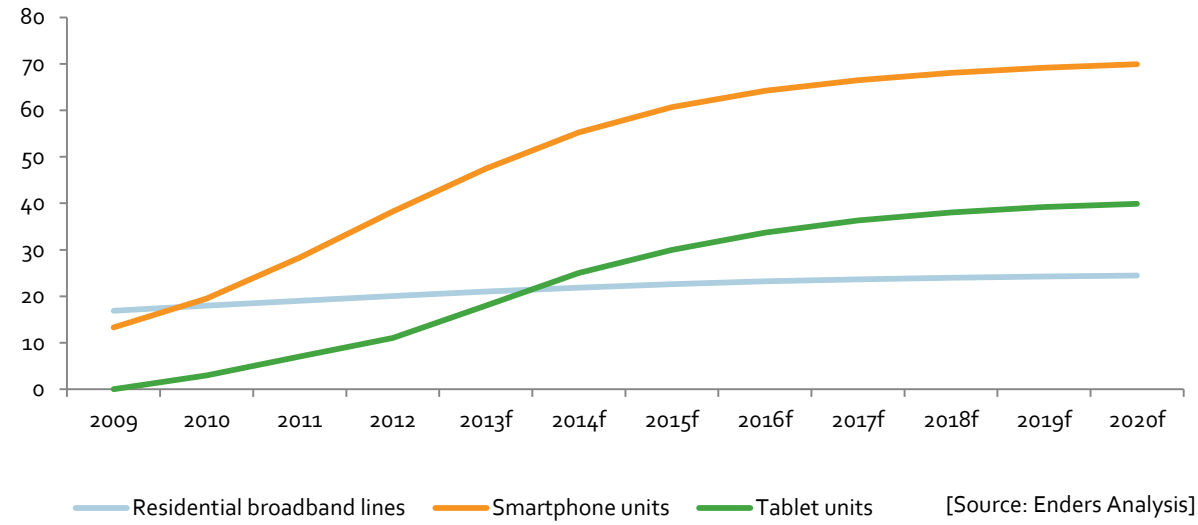
Smartphone and tablet adoption: impact on fault rates

- Smartphones and tablets are likely to have two counteracting effects on the overall volume of broadband usage, and hence reported fault rates:
  - All smartphones and some tablets have a mobile internet connection in addition to a Wi-Fi connection; to the extent that their use for internet services *substitutes* for home PC-based internet use and to the extent that this usage is *over mobile networks*, they will have a dampening effect on overall broadband usage
  - On the other hand, much internet use on smartphones and tablets will be additional to home PC-based usage, and to the extent that this is carried over the home broadband connection via Wi-Fi, it will have an accelerating effect on overall broadband usage
- In this section we will quantify our estimates of these two effects in order to judge which will be dominant
- In terms of the nature of internet usage over smartphones and tablets versus that of PCs, the picture is also mixed:
  - Mobile web pages have historically been smaller than PC web pages, which reduces network demands, although mobile web pages are growing rapidly
  - User expectations are, however, higher, with pages expected to load faster due to the relatively smaller amount of detail delivered
  - Mobile devices often use Wi-Fi for 'heavy lifting' data activities, such as downloading apps and updating operating systems. While these are not very time sensitive, they do put extra demands on broadband lines when other activities may be concurrent, increasing bandwidth requirements
  - Mobile devices, and tablets in particular, are likely to increase demand for on-demand video services, often as a substitute for bedroom TVs (which have fallen in number following digital switchover)

Smartphone and tablet users and usage

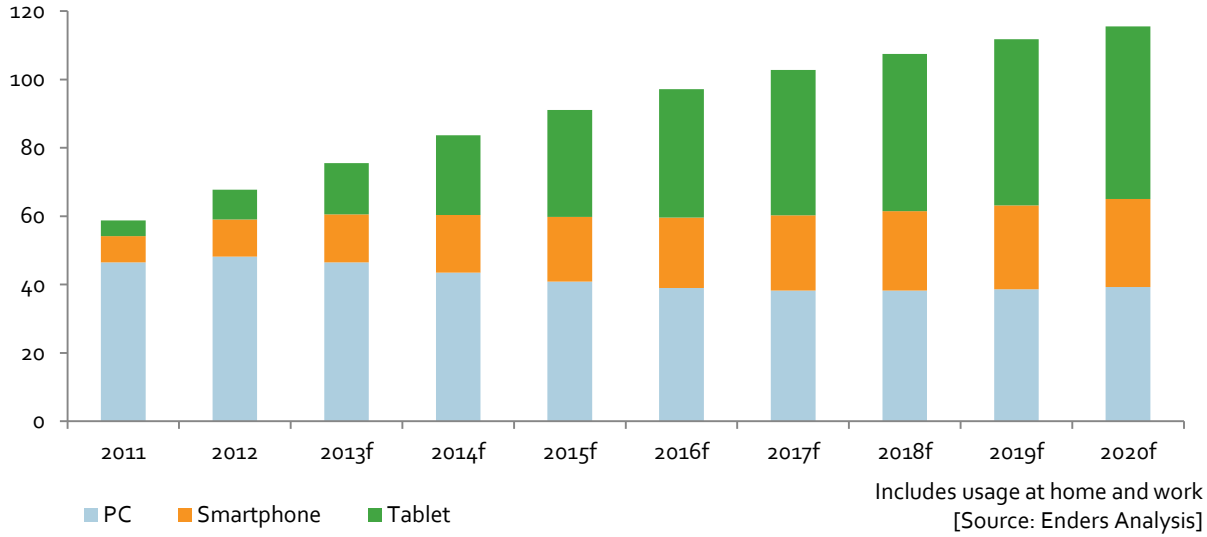
- Smartphones are already a mass market phenomenon, with over 60% of adults owning a smartphone at the end of 2012. We anticipate penetration continuing to increase as the entry level price falls into the prepay mainstream
- Tablets are a newer phenomenon in mass market terms, with the iPad only launched in 2010, but we believe that its usability advantages over the home PC are likely to lead to equally mass market adoption
- We believe that most smartphone usage is additional (as opposed to substitutional) to home PC usage, as it allows internet access on many occasions when a PC is not available, and many services depend on smartphones features (such as GPS, camera, accelerometer) that are not available on a PC
- Tablet usage is more mixed – although some is directly substitutional, the fast start-up time and ease of use is likely to drive significantly increased overall usage in our view
- As a result, we anticipate that PC usage hours will slightly decline over the next few years due to some limited substitution, but that overall internet usage will grow strongly

Mobile internet devices in use (m)



[Source: Enders Analysis]

Internet usage by device per PC internet user per day (min)



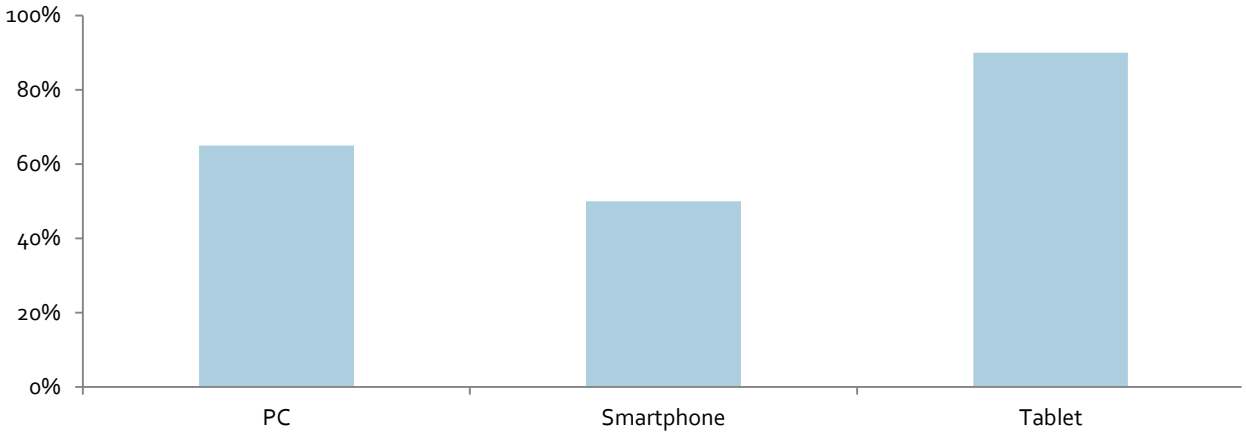
Includes usage at home and work
[Source: Enders Analysis]

Home broadband internet usage

- The majority of internet usage passes over home broadband connections:
  - Around 65% of PC-based internet usage is from home connections according to internet usage panels
  - Around 80% of smartphone data traffic passes through home broadband connections via Wi-Fi according to usage studies, but this is partly due to the data intensive 'heavy lifting' activities being done at home; we estimate the usage *time* proportion at 50%
  - The vast majority of tablet traffic is over Wi-Fi, with most tablets lacking a mobile connection at all

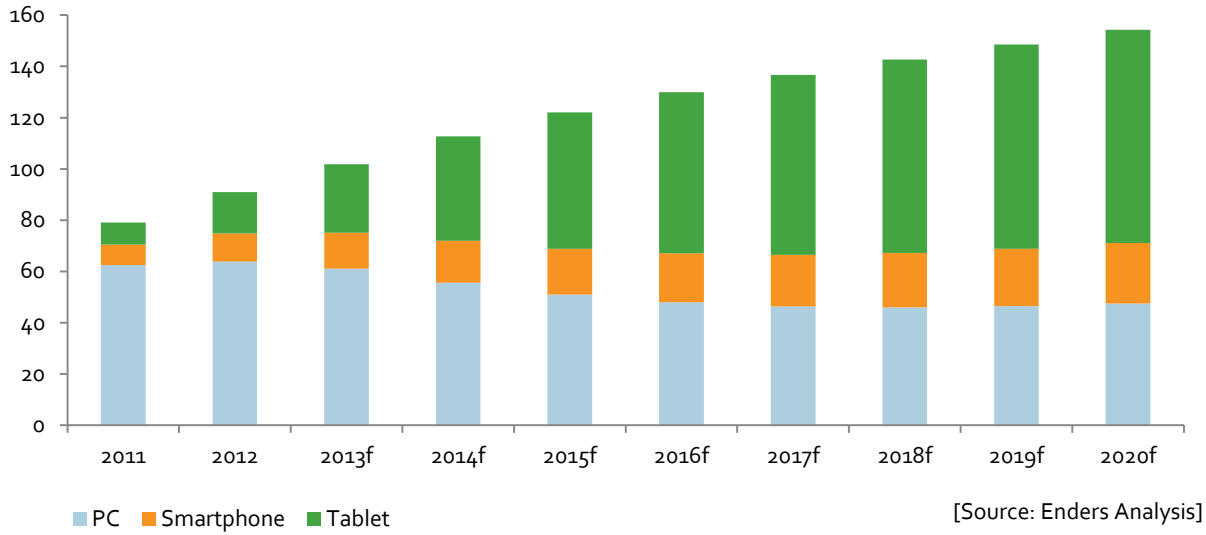
- These assumptions imply that usage per home broadband line will nearly double over the next few years, from 79 minutes per day in 2011 to 154 in 2020

Usage over home broadband (%)



[Source: Enders Analysis]

Usage per home broadband line per day (mins)



[Source: Enders Analysis]

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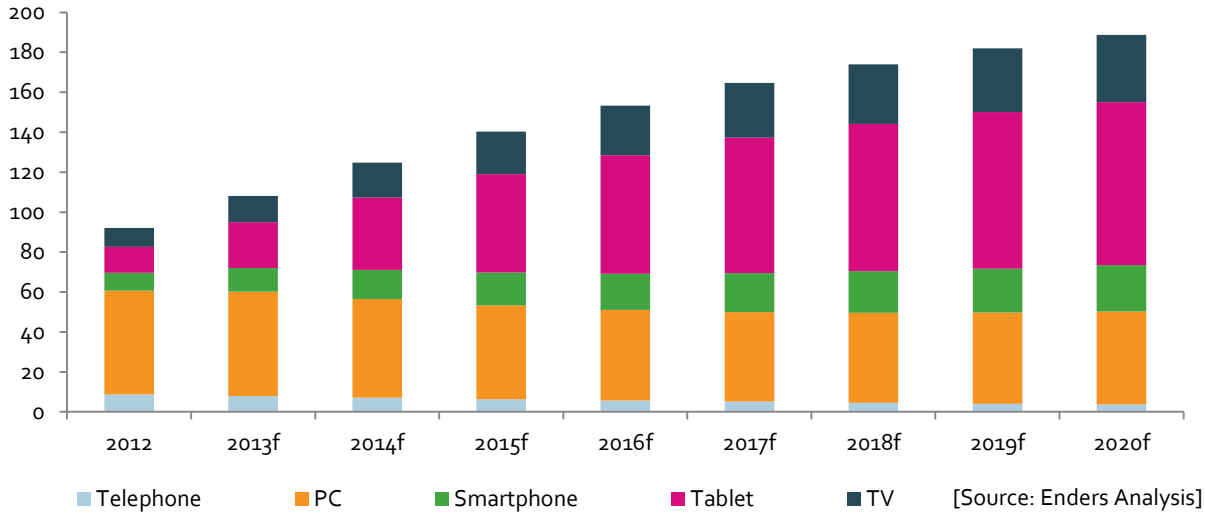
Overall line use summary

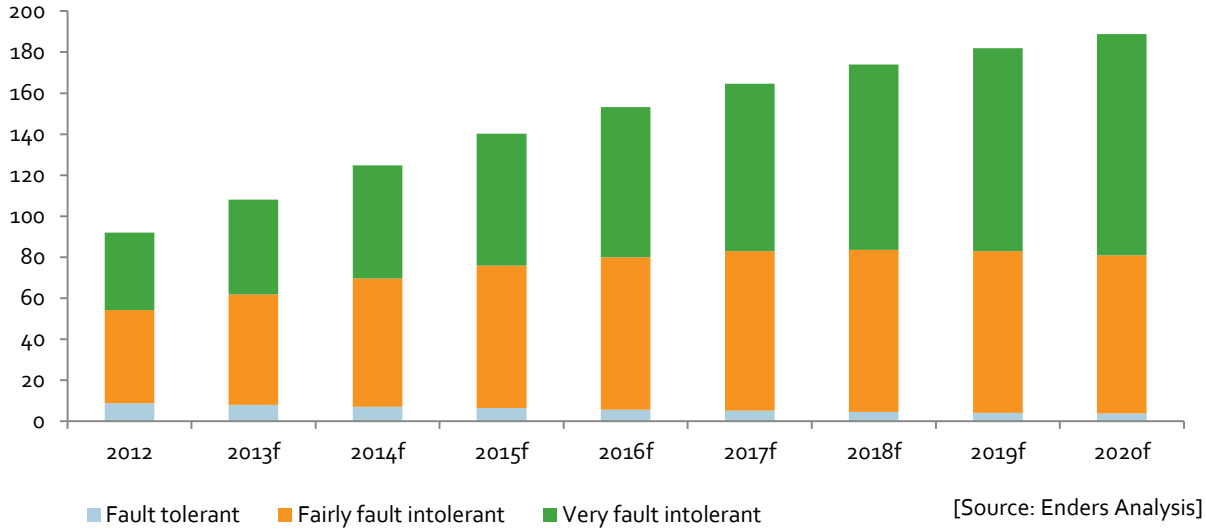
- Looking at the bigger picture, the UK local fixed telecoms infrastructure is continuing through a transition from being used predominantly for analogue voice calls to the predominant use being a rich array of data services
- We estimate that the overall minutes per line per day of active use will grow from 92 in 2012 to 189 in 2020
- Note that much of this usage will occur concurrently, and much will also occur concurrently with background data use such as operating system updates, app downloads and application polling, putting further pressure on line speeds
- Compounding this, several ISPs now actively market the 'totally unlimited' nature of their service, promising no traffic shaping, increasing the impact of non-time sensitive traffic on peak hour performance
- The nature of internet usage itself is also changing, with relatively fault intolerant applications such as video becoming more heavily used as broadband itself becomes more trusted
- As high speed broadband rolls out in the UK and elsewhere, further demanding applications may be developed to add to this trend

Use by device per Openreach household per day (min)



[Source: Enders Analysis]

Use by activity fault tolerance per Openreach household per day (min)



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