The broadcast industry is evolving rapidly. Key service developments include the consumer adoption and consumption of high-quality TV, the evolution of video standards (migration to HD and emergence of 4K), and the adoption of managed IPTV and of TV services over the Internet or over-the-top (OTT) services, both linear and non-linear. These developments all have significant additional traffic requirements that could have serious implications for the satisfactory working of all types of fixed and mobile networks used to deliver them.

- Broadcast network operators need to review the broadcast and compression standards used in order to keep up with demand for higher-resolution video format. Hybrid (broadcast and IP) delivery models can be used to provide more immediate solutions.
- IP network operators need to put in place a range of technical solutions to help ease network pressures of both linear and on-demand content delivery.

**New TV formats will significantly increase the demand for capacity on broadcast networks**

Improvements in TV displays, including further migration to HD and the emergence of 4K (UHD), are driving increased capacity requirements for delivery networks. Compared with older formats, HD and 4K occupy significantly greater capacity on delivery networks, driven not only by the headline increase in pixel count, but also by the increased frame rate, dynamic range, colour gamut and audio quality that are included within the standards.

In the UK, OTT 4K services (such as those from Amazon and Netflix) are already available on IP networks. BT and Sky are likely to launch linear 4K services in 2016 or 2017, focusing on the improvements in frame rates for sports content. Virgin Media is likely to launch linear 4K services in 2018 or 2019, but it is unlikely that 4K will be launched on DTT before 2020. Two linear 4K channels are already available in Japan via satellite, and broadcaster NHK plans to launch 8K services – a more advanced UHD format at 7680×4320 pixels – before the 2020 Olympic Games. A 4K linear broadcast channel is available in South Korea over cable networks.¹

Improvements in video compression technology will go some way towards offsetting the uplift in bandwidth requirements caused by increasingly high-definition services. However, the amount of bandwidth required varies considerably – for example, sports content may require more bandwidth than dramas because post-production processing is typically more limited for sports content. Higher frame rates will also drive capacity requirements. Figure 1 shows the bandwidth requirement for different resolutions using MPEG-4 AVC and HEVC compression.

Broadcast content delivery: network operators must respond to increased capacity needs

The increasing availability and popularity of TV services delivered over IP networks is further driving capacity requirements. These services include operator-managed IPTV and OTT.

The long-term mix of linear and non-linear TV content consumption remains uncertain. As non-linear becomes more important, IP networks will carry an increasing proportion of TV content. However, it seems that linear will always be a part of TV content consumption, particularly for some user groups, so IP networks will need to cater for this demand too.

Traditional broadcast networks will be able to support the increase in capacity demand to different degrees. In the UK, the DTT platform is constrained – it has only 206Mbps of capacity today. More extensive broadcasting of HD channels will require migration of the DTT network to DVB-T2 and MPEG-4 compression, which presents significant equipment compatibility challenges. Satellite networks have the highest capacity of all of the traditional broadcast TV networks, with almost 3Gbps of capacity today. Fully commercial delivery of linear 4K content is feasible in 3–5 years without significant investment in infrastructure or set-top boxes (STBs). The cable network has almost 1Gbps of linear TV capacity today and will be able to support 4K linear programming when MPEG-2 transmission is switched off. Virgin Media is likely to need to subsidise at least some new STBs in order to achieve this. These metrics are UK-specific, but broadly reflect the broadcast capacity constraints worldwide.

IP networks were not designed for linear TV, but can support non-linear (including 4K), particularly when access networks have been upgraded (that is, to FTTC/FTTH or DOCSIS3.0). Looking ahead, IP operators will be able to design their networks to support linear TV and have a number of options to assist. The most important technology for this is multicast, which can ease congestion for linear content from the ISP’s core network to the FTTC cabinet, because only one stream is required per channel.

Figure 1: Bandwidth consumed by different pixel resolutions with MPEG-4 AVC and HEVC compression [Source: BBC iPlayer, Netflix, Ericsson, European Commission, Analysys Mason, 2014]
No single distribution platform or network technology can provide all of the desired qualities within a workable economic model

The ability to deliver large volumes of linear and on-demand content varies significantly by network. Traditional broadcasting networks can support high-quality, and in some cases high-capacity, linear TV services, but are unable to offer on-demand functionality. IP networks are ideally suited for on-demand content and are increasingly able to support linear content as well, but face challenges around quality and capacity (at least on ADSL connections).

Over a 5-year timeframe, hybrid models are likely to be the most economic means to meet the requirements for content consumption in the UK, including high-capacity linear and on-demand services. Operators will need to consider carefully how to manage and present these hybrid models to their customers, in order to ensure a seamless user experience at the most efficient delivery cost.

In the longer term, it is likely that IP networks will play an increasingly important role in linear TV distribution, as well as on-demand.3

Figure 2: Evolution of broadcast content delivery [Source: Analysys Mason, 2015]

Our full report on this subject, New service developments in the broadcast sector and their implications for network infrastructure, completed for Ofcom as an input to the Infrastructure Report 2014, is available here: http://stakeholders.ofcom.org.uk/binaries/research/infrastructure/2014/broadcast-dev.pdf.

Analysys Mason is closely monitoring developments in the broadcast industry. For more information about how we can help broadcasters and operators to understand and manage these developments, please contact ceri.tinine@analysysmason.com.

3 For more information, see Analysys Mason’s The emergence of the next TV distribution platform in Europe. Available at: www.analysysmason.com/About-Us/News/Newsletter/IPTV-platform-Europe-Oct2014.