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**CURRENT MARKET AND TECHNOLOGY TRENDS IN THE BROADCASTING
SECTOR**

prepared by IHS Technology



Current Market and Technology Trends in the Broadcasting Sector

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Introduction

Like so many facets of the modern world, television has been transformed by the application of digital technologies and the parallel and related development of the fast evolving Internet. While some broadcasters – especially those in developing economies - still utilise traditional analogue transmission techniques, most have transitioned to more efficient and powerful digital means of sending their programming to viewers. Use of digital technologies has enabled explosive growth in the number of channels and choices of programmes offered. It has also ceded more control to the viewer, allowing on-demand access to programming – not only from broadcasters and pay TV service providers, but also increasingly from online video services delivered over the open Internet. Indeed, as this report outlines, the definitional boundaries between broadcasting and other forms of digital video delivery are increasingly blurred.

The viewer is undoubtedly a winner as a result of these developments as we move ever closer to the ultimate provision of ubiquitous choice, convenience and control. And broadcasters are usually winners too as evidenced by the impressive global TV market growth described in this report. Inevitably, that growth and technological development is not evenly distributed geographically, and we outline some of the key regional trends in the pages that follow, as well as some more focused snapshots of the market evolution within selected countries.

However, this report also highlights a paradox at the heart of this technological revolution; namely, that the ceding of ever more control to the viewer also inevitably means an increasing risk that broadcasters lose control of their programming. It becomes harder and harder to prevent unauthorised access to the copyrighted content that traverses the globe at lightning speeds as digital 'bits'. This poses an ever greater threat to the economics of intellectual property that sustain the broadcast and related industries

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Executive Summary

Television has been transformed by the emergence of digital technologies and the internet. However, while the online TV sector has been growing since 2009, traditional pay TV still accounts for the majority of TV revenues. Television has remained similarly resilient in the advertising market, where it maintains the highest share of advertising revenue across all media. Online video is currently growing complementarily to TV advertising, but some cannibalization is starting to be observed in the European Nordic region.

Television and video delivery platforms are becoming increasingly complex as viewing preferences move towards a world in which content is available on-demand and in a device agnostic manner. The move to digital from analogue delivery methods has been a key trend among traditional television platforms, since digitisation offers less constraint on the number of channels available to viewers. The development of the internet has also seen the growth of online video platforms, which has given rise to changing behaviours of viewers around the world, as well as new competitors to traditional TV players. This report offers an overview of the advantages and disadvantages of the various TV and video platforms currently available.

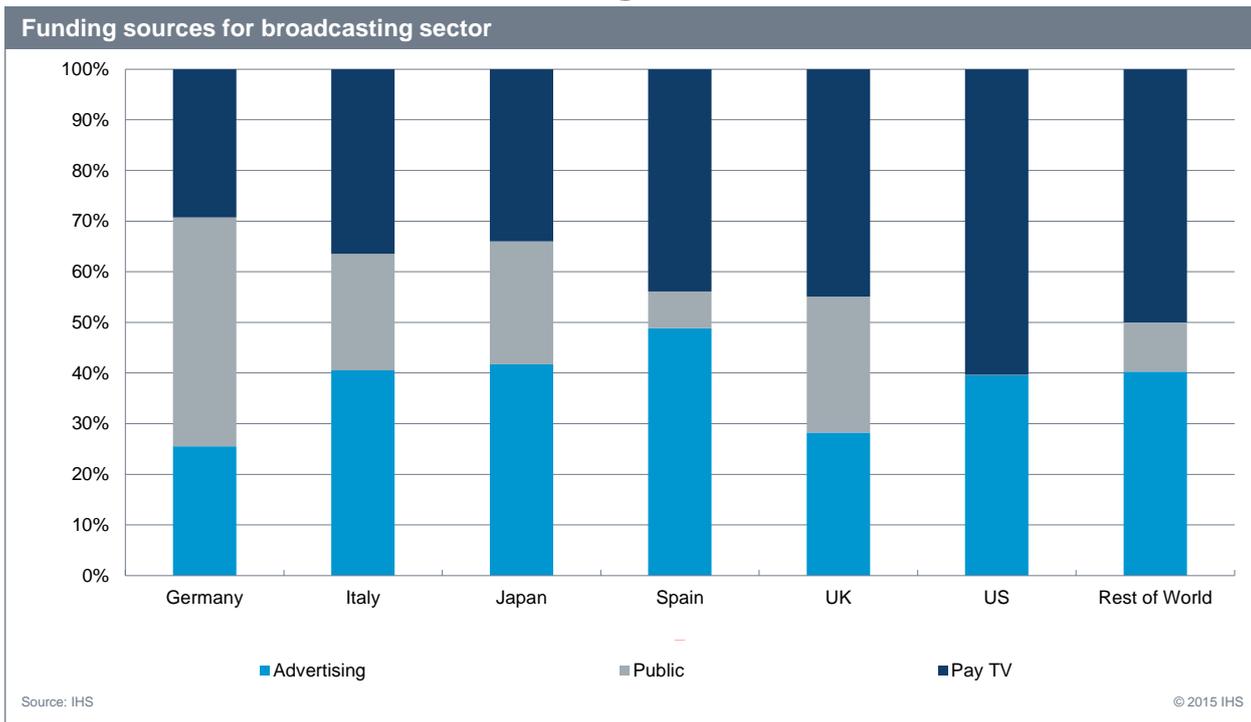
Mobile video consumption is growing rapidly, driven by the growth in smartphone adoption and advanced 4G mobile data networks. However, direct monetisation of mobile video is challenging, with users opting for free services or video delivered as part of a wider premium pay TV or online video subscription, for which there is no additional fee for mobile access.

The digitisation of all content has unified delivery platforms, meaning that future technologies a more fluent interchange between different platforms. For example, a satellite TV image can interface with internet content delivered over mobile. This places pressure on video distribution to move towards higher quality video. The cost of this has two aspects: the availability of a network or spectrum to deliver, and the technologies needed to improve the efficiency of delivery over a given network.

For broadcasters, a drawback of the increasing prevalence of digital technologies and changing viewing behaviour is that the ease of obtaining unauthorised access to copyrighted content has increased. As a result of this, various types of piracy have arisen, which bring with them the risk of broadcasters losing control of their programming, as well as threatening the economics of intellectual property.

The impact of shifting audiences on global TV and advertising revenues will largely depend on the legacy structures of each country's TV and wider media ecosystems. In order to illustrate the different characteristics of global markets, the final section of this report offers a closer look at the TV market in key territories worldwide.

The economics of the broadcasting sector



The worldwide broadcasting sector has developed into a mixed economy in which companies generate revenues from three major sources: advertising, subscription fees and public revenues.

Broadcasters funded by advertising and public revenues are typically free-to-air, aiming to transmit to the widest possible audience in their markets. The main vocation of advertising-funded or commercial broadcasters is to reach mass audiences or those of the most interest to advertisers (typically the most economically active). Publicly-funded broadcasters (variously funded by licence fees levied on households, government grants or other forms of direct taxation) place more of an emphasis on fulfilling public service goals of delivering information, education and entertainment to their national populations.

The longest established free-to-air broadcasters are mainly funded by advertising and are distributed via terrestrial networks. On the US model – one followed in other countries like Japan and Australia – broadcasters are essentially local operations serving a local metropolitan area. These broadcasters receive their evening or primetime programming from a centralised provider or network. Another model – followed in most European markets – is where broadcasters serve a national market, though still with some scope for providing some programming, like news, locally.

The last few decades have witnessed the consolidation of local stations in the US into groups and an increased in the proportion of stations that are owned and operated by major broadcast groups ABC, CBS, NBC and Fox. While publicly funded television exists in the US in the form of the PBS network, it is a much more marginal presence in the broadcasting market than is the case in Europe, where many public broadcasters have retained their status as market leaders (at least in the free-to-air market) since their early days as monopolies.

The advent of digital terrestrial transmission has greatly increased the number of TV channels available in the average home from four or five to 30 or more channels. However, this increase in the free to air offer has also fragmented TV viewing and these effects – combined with the worldwide economic recession of 2008/2009 – have posed a serious challenge to broadcasters. Some European countries are only starting to emerge from the downturn more than five years later.

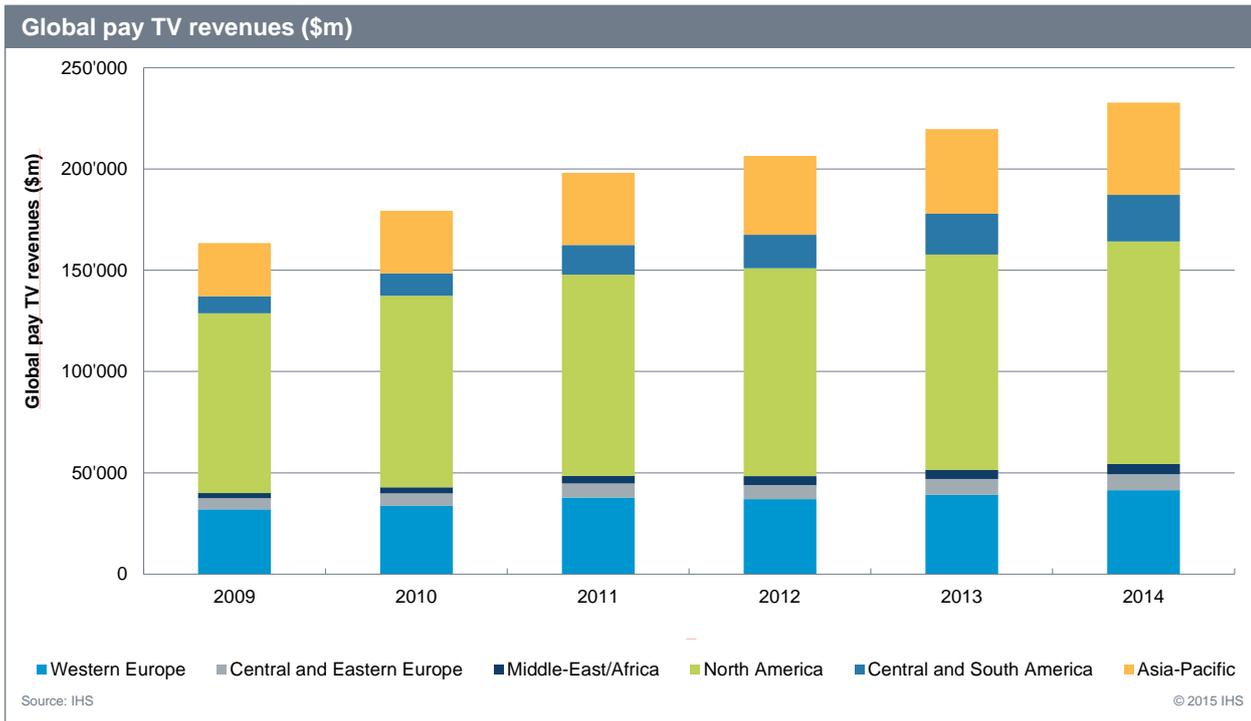
Pay TV, in contrast, has continued to grow and flourish - although the pricing of pay TV services and their penetration in the market - varies considerably. In countries with high cable penetration, like Germany, the Benelux and the Nordics, packages of channels are available at low or minimal cost, but in markets where pay TV launched when the offer of channels was more sparse – like France, the UK and Italy – pay TV is a more expensive product offering exclusive content like

first-run movies and exclusive sports. Broadcasts are encrypted and primarily funded by subscription fees either paid direct to the operator by subscribers (usually via satellite or IPTV) or via third parties (the usual model for cable TV). While some pay TV outlets (like HBO) are advertising-free, others are also partly funded by advertising. Canal Plus in France has always had an unencrypted evening window which included several commercial breaks.

Conversely, free-to-air broadcasters in the US have campaigned to receive a cut of subscription revenues from pay TV platforms. Carriage fees have become an important complementary source of income for the major US groups, although disputes over the level of carriage fees demanded by the broadcasters have resulted in frequent arguments between the two sides. European broadcasters in the Nordic region and Germany have successfully opened a similar revenue stream while ITV is lobbying to do so in the UK.

Free-to-air broadcasters are still major investors in programming in most markets, although the weight of their investment in sports means that pay TV operators have become the leading programmers in terms of in many countries: Sky TV in the UK and Canal Plus in France, for example. Even in the US, however, the broadcasters invest heavily in original programming, despite a dramatic rise in activity by basic and premium cable. In 2014/15, the five major US networks aired 85 original dramas and comedies, while cable aired 251 and SVoD players 19.

Overview of the pay TV sector



Whilst the broadcasting sector has seen the emergence of online video platforms in recent years, pay TV still accounts for the largest proportion of global TV revenue. Online revenues have indeed been growing since 2009, but currently IHS estimates around 5% of total global TV revenue (including public TV and broadcast advertising revenues) is attributable to online video.

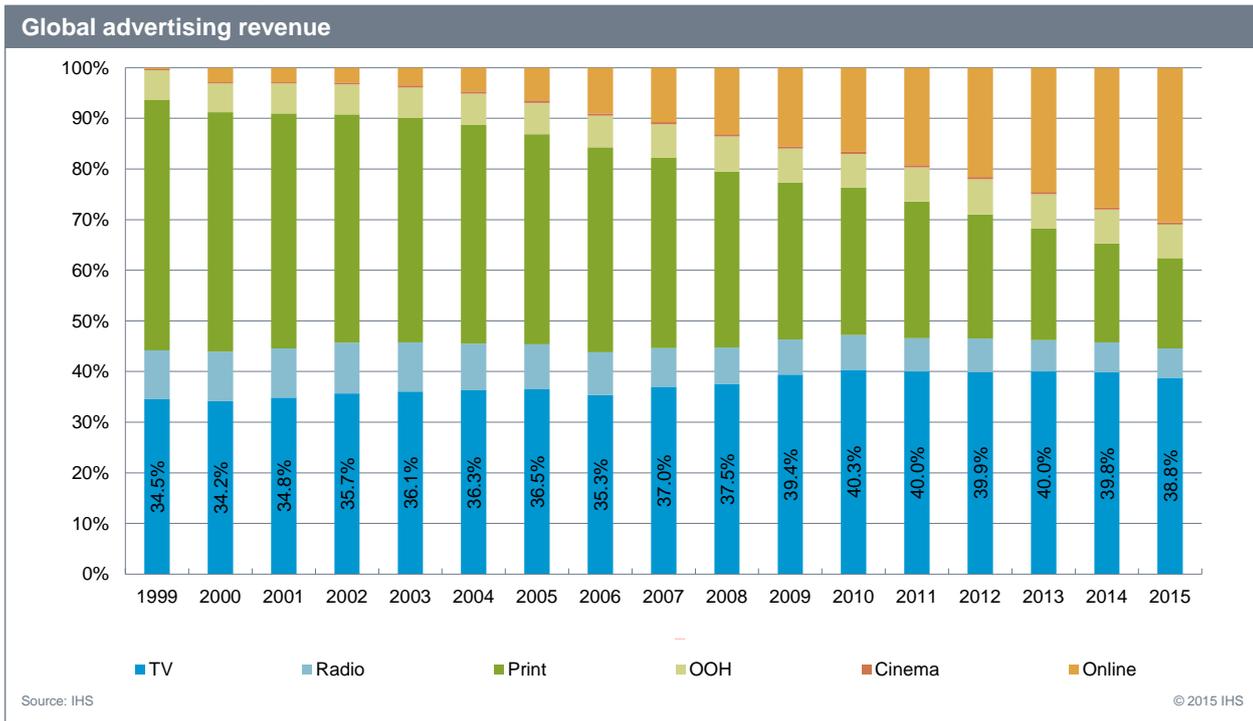
From 2009 to 2014 global pay TV revenues increased at a compound annual growth rate (CAGR) of 7.3%. This is despite the decline in pay TV penetration in some countries. IHS expects global pay TV subscription revenues to continue its positive growth trend over the next five years, however the rate of expansion is likely be slower in comparison to 2009 to 2014. Despite this, pay TV subscription revenues will continue to account for the largest proportion of total TV revenues.

Over the last five years, the fastest growing regions in pay TV revenue have been the Middle- East and Africa and Central and South America, which grew at a CAGR of 14% and 22% respectively from 2009 to 2014. In addition to this Asia Pacific continues to be a

contributing factor towards global pay TV revenue growth, owing to expansion in markets such as China and India. IHS expects Asia Pacific, Middle East and Africa, and Central and South America to be the main drivers of revenue growth as pay TV markets in these regions continue to develop.

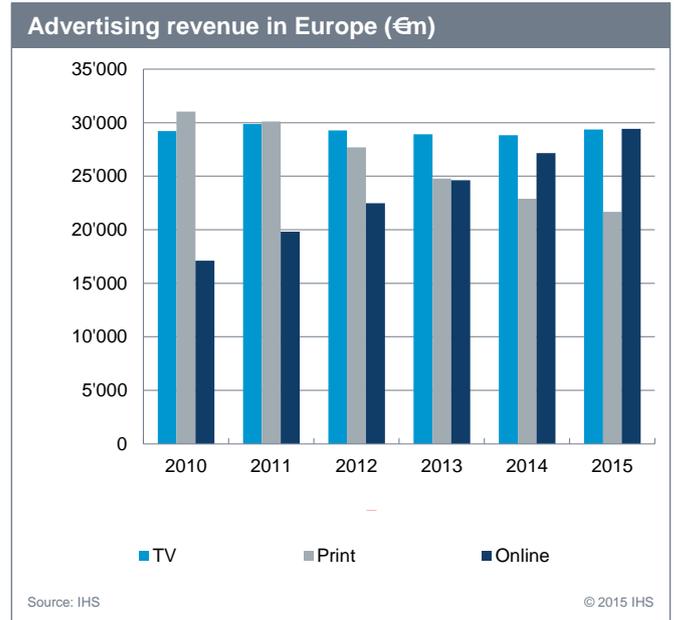
North America currently represents the largest portion of global pay TV revenues at 47%; however this is down from 54% in 2009. North American pay TV revenues have been increasing at 4% CAGR since 2009, yet this is the slowest rate globally. Western European revenues have been growing at a similarly steady rate since 2009, and currently account for 18% of the global total. Overall, IHS expects pay TV revenues in these more developed markets to continue slowing as pay TV become saturated. In mature markets such as the US for example, the increasing prevalence of newly-formed households not subscribing to any pay TV services (“cord-nevers”) are likely to have an impact on pay TV revenues, as providers such as Netflix challenge traditional pay TV packages.

TV Advertising



TV in the wider media advertising context

In the last five years, advertising markets have been characterized by the rise of online and mobile, deterioration of print and stability of TV. Between 2010-2015, newspapers and magazines have declined at a compound annual growth rate (an average decline per year) of -6.9% in Europe, -8.5% in the US, -4.3% in the APAC region and -5.8% globally. This is (in part) due to print budgets migrating online and has contributed to the strong growth in interactive advertising, which increased at a CAGR 2010-2015 of 17.4%, globally.



Throughout this time, TV advertising has remained stable, driven mainly by economic factors and quadrennial events (elections and sports competitions). Brand advertisers have remained loyal to the medium and perceive television as an effective tool in achieving their marketing goals.

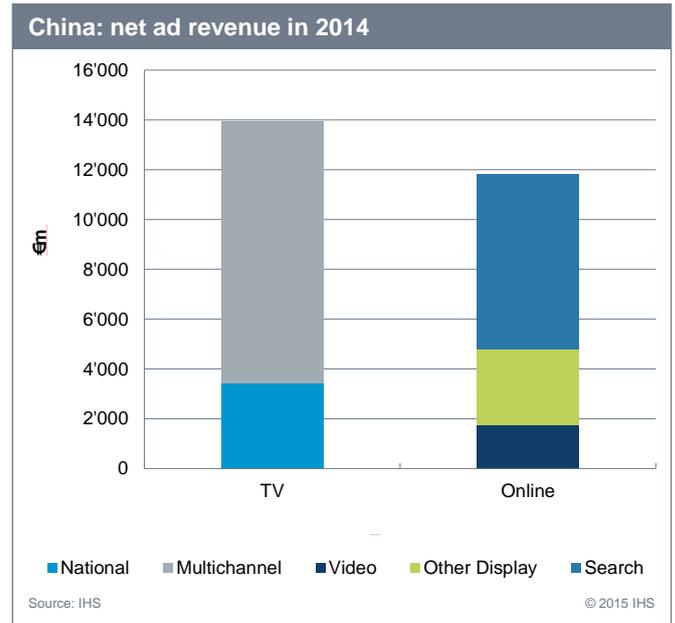
In 2014, TV advertising revenue amounted to €155.2 billion and accounted for 39.8% of the total advertising market, globally. It is the largest advertising medium, more than 10 percentage points ahead of online, the second largest.

Television has maintained its share of advertising revenue between 39.0% and 40.0% in the last five years and this is unlikely to change to in the mid to long-term. IHS forecasts a slight decline in its share in the next five years; however TV advertising will still account for 38.4% by 2019, only 1.5 percentage points lower than in 2014. This demonstrates the resilience of the medium and its entrenchment in the advertising ecosystem.

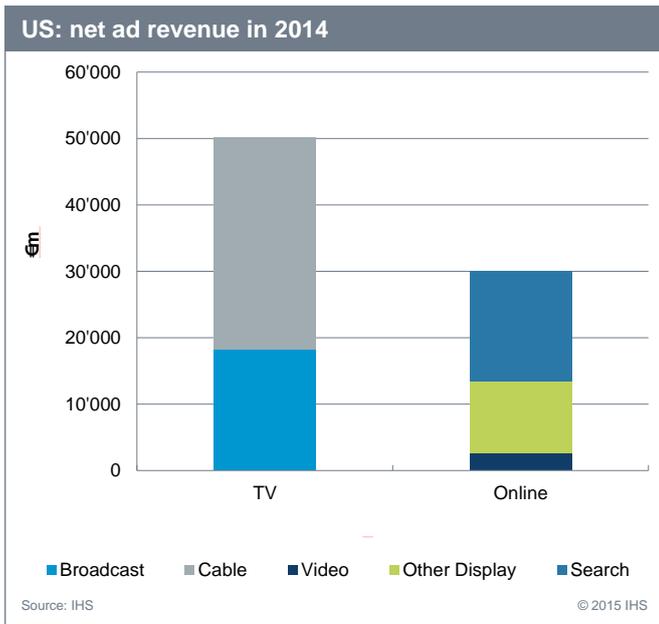
In 2010-2015, TV advertising markets were mostly immune to cannibalization from new, emerging advertising formats. Traditionally, online has mostly attracted performance-based advertising, leaving the TV brand budgets largely untouched. However with the rise of online video, services like Netflix are beginning to dent broadcaster audience shares in some markets and TV ad dollars are beginning to transfer online.

Structural factors in television determine potential of online advertising

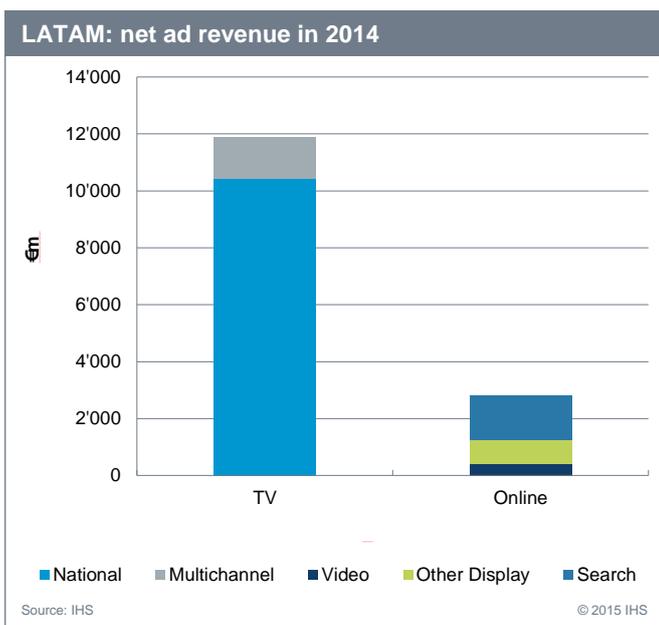
The magnitude of the impact of the rise of online video on TV advertising revenue will largely depend on the incumbent establishment of TV advertising structures. This varies by region. The opportunity for online advertising markets is proportionally larger in countries like China and the US, than in Latin American markets for example, and must be considered when analysing the impact of new advertising formats on traditional TV.



In China, there is stringent regulation on TV advertising covering both the length and content of the ads. Consequently many brands are already comfortable devoting a large share of their budgets to online advertising. As online video expands, the potential for cannibalization of TV ad budgets is hence higher as the transition from TV to online is not an unfamiliar one for advertisers.



In the US, the TV advertising market is different than in most Western markets as 63.4% of total TV advertising revenue is generated by multichannel rather than national TV channels. Pay TV provides a more niche context for advertisers allowing for better targeting of audiences than free-to-air TV and acts more competitively towards online advertising, a highly targeted medium. Consequently, online video advertising's share has remained quite small at 2.2% of total advertising revenue. However, the dependence of pay TV networks on niche audiences also means that they are much more flexible and willing to adapt to the shift of audiences online. IHS expects an increased innovation from US pay TV operators in the next two years, accelerating the shift of TV ad budgets to online video.

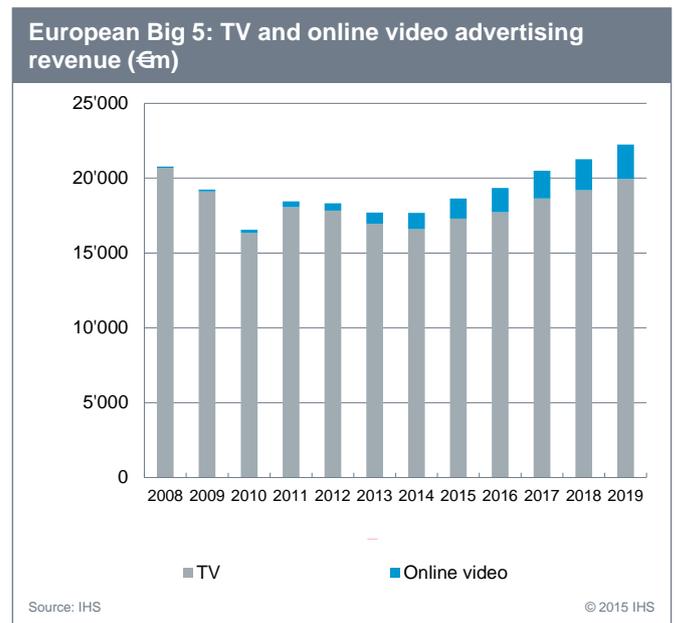


In Latin American markets, TV advertising is the dominant medium, with over 60.0% share of total © 2015 IHS

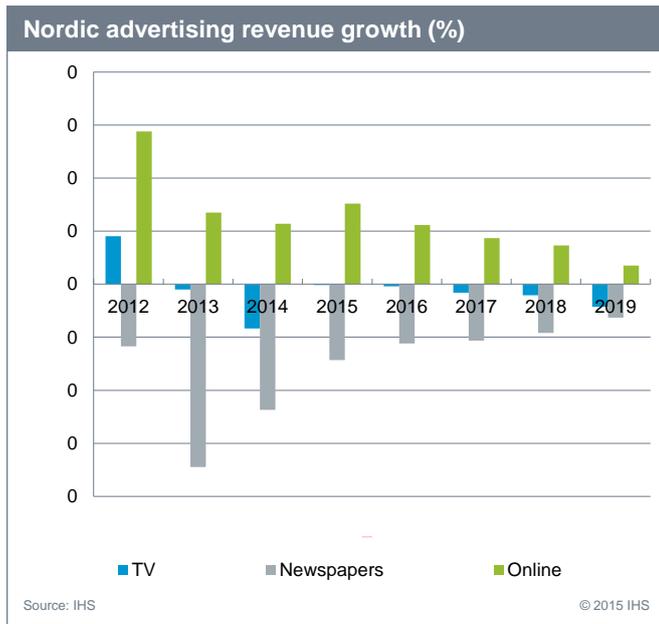
media spend. TV ad revenue is generated primarily by free-to-air broadcasters like Globo, Televisa and Grupo Clarín. Advertising budgets are planned around TV with other media acting as complements to TV campaigns. This will not change in the next five or ten years and places a ceiling on how much spend online can divert from other media, as the pot available is smaller to begin with in Latin America than Western Europe. With relatively small print markets to penetrate, the shift to digital will be limited and largely led by the terms set by the Latin American media conglomerates rather than the newcomers like Facebook and Google.

The rise of online video: complementary in the mid-term, a threat in the long term to TV advertising

Online video advertising has so far been complementary rather competitive to TV advertising globally. For example, in the European Big 5 despite the increase in multi-screen consumption it generates incremental revenue to traditional TV ad budgets and is still relatively small. In 2019, video will account for 11.0% of all TV and video advertising.



However, there are other markets in Europe where cannibalization of TV ad budgets has already begun. In the European Nordics (Norway, Sweden, Denmark and Finland), from 2013 TV advertising revenue began to decline and it is forecast to continue falling through 2019. Although the cause for the drop cannot be isolated to one factor, Nordic TV broadcasters are increasingly citing the migration of audiences to online video platforms as a significant threat to their advertising revenues.

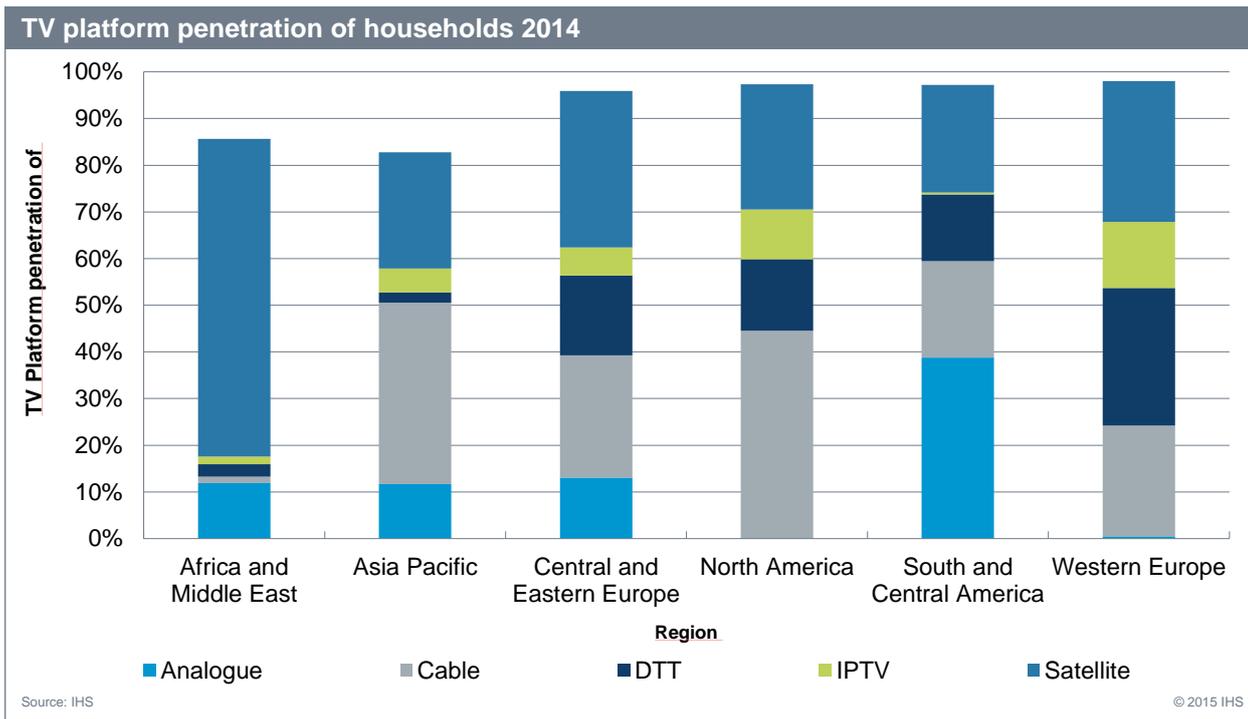


Online cannibalization of TV advertising revenue is still limited to few markets. However, it is important to note that global players (such as Google and Facebook and ad agencies such as WPP) are increasingly powerful players in advertising markets. These companies are creating new opportunities for advertisers and content producers to reach consumers and are increasingly targeting TV advertising revenue as their next source of growth. This will stimulate investment in online video content and increase innovation in advertising and technology among traditional TV broadcasters, who will fight to keep their audiences and hold on to their advertising clients.

Television and Video platforms

The distribution of television and video content is becoming increasingly complex as viewing preferences move towards a world in which content is available on demand and in a device agnostic manner. Traditional TV distribution platforms of terrestrial, satellite, and cable are moving towards complete digital broadcasting. There is a separate trend towards increasingly complex digital-only platforms.

Often, different methods of video distribution are referred to as linear and non-linear. In this report, “linear” content refers to content that is consumed at the time of broadcast, direct from the broadcast source. “Non-linear” content refers to material that is consumed on request, outside of the original broadcast period. References to non-linear content however exclude time-shifted content. “Time-shifted” is defined as content watched via a PVR (personal video recorder), or via an online or pay TV catch-up service within seven days of original broadcast.



Traditional Television Platforms

Terrestrial TV

Terrestrial TV services rely on a network of transmitter towers spaced around a given region. These broadcast the TV signal through either VHF (very high frequency) or UHF (ultra high frequency) transmission. Both VHF and UHF are portions of the electromagnetic spectrum typically reserved for short-range communication. Signals may propagate a little further than line of sight (particularly for VHF), but do not generally travel far enough to interfere with communications in distant areas, making them ideal for usage in TV and radio broadcasting. However, it can need more careful management around geographical borders where national broadcast may interfere with each other. Large geographical features, such as hills, mountains, or even large buildings can block terrestrial TV signals, meaning that a number of transmitter towers may be required to ensure that a given area has complete coverage.

UHF is increasingly preferred over VHF, as although the properties of UHF transmission mean that the tolerances in reception equipment must be tighter to enable clear reception, there are a greater range of suitable frequencies for transmitting TV. The range of usable frequencies has also effectively expanded as technology has improved and reception and broadcast equipment has become cheaper. In many markets, VHF TV transmission has been abandoned in favour of UHF. The UK dropped VHF terrestrial transmission in the 1980s.

The relatively short-range nature of terrestrial transmissions means that numerous transmitter sites are required. In a market such as the UK, this would be over 1,000 transmission towers to reach 99 per cent population coverage. In a market as large as China, in excess of 30,000 transmitter sites would be required for substantial population coverage using similar frequencies and technologies as North America and Europe.

Coverage may also vary at the channel level, depending on whether a channel belongs to a commercial or public service broadcaster. The public broadcaster channels are usually made available to the vast majority of a given country's population, at the 95 per cent plus level and often are mandated to do so by the nation's government. Commercial broadcasters, can pick and choose transmission locations, to maximise coverage for cost. Use of 100 transmitter sites might provide coverage of 80-90 per cent of the population for a country the size of France or the UK - sufficient for a leading commercial broadcaster, and at a fraction of the cost.

Digital terrestrial (DTT) services have replaced many of the older analogue terrestrial TV services in markets across the world, which reduces both wasted spectrum and transmission costs. Spectrum can be reallocated to revenue generating services such as mobile broadband. During the switchover from analogue terrestrial to digital, there is typically a lengthy dual illumination period, during which both analogue and digital signals are broadcast, providing the population with time to acquire necessary decoding equipment and switch their reception method.

There are a number of standards at use in the digital terrestrial world at present, including European standard DVB-T, Japanese standard ISDB-T, Chinese standard DTMB and North American standard ATSC. These standards have various different specifications for transmission mechanisms, but all aim to provide a template for multiplexing and improving the efficiency of frequency use. The European DVB-T standard is the most widely used worldwide, with deployments across Europe, Asia and South America. It has also been selected by African and Middle Eastern broadcasters. Different set-top box and transmission architectures are required for each different technology, meaning that, for instance DVB-T boxes are not compatible with ATSC transmission. Costs of reception equipment do vary as a result of the different scales of deployment. DVB-T boxes, for instance, are substantially cheaper than their ISDB-T counterparts.

In 2006 the International Telecommunications Union (ITU) put together a plan for the global migration from analogue to digital terrestrial television between 2015 and 2020.

The deadline for analogue switch-off in the Middle East, Africa and Europe is 2015. Most of this transition has already been completed in North America, most of Europe and some parts of Asia. The rest of the countries should complete this migration between 2015 and 2020.

Digitisation of the terrestrial platform has several benefits:

- Digitisation allows for increased spectrum efficiency which in turn allows for more channels to be broadcast
- Digitisation also allows for regulatory and government bodies to reclaim spectrum and repurpose it. Mobile's appetite for spectrum has seen it become a beneficiary of this redistribution.

Following the 2015 switchover, there is a risk of signal interference between countries that have switched to digital broadcasting and countries which have not.

Cable TV

Cable TV services were essentially the first non-terrestrial TV transmission mechanism. While relying on much the same methods of transmission as terrestrial TV services, using frequencies in the UHF range, the signal is instead propagated along a copper or fibre cable. Cable TV services were first used to provide TV signals to communities cut off from a terrestrial TV transmitter due to geographical features blocking the signal. A single large antenna would be used to receive the signal from a point which was within transmission range, and the households in the TV dark area connected via physical cable. For the early cable services, as the signal was essentially identical to that broadcast over the airwaves, no specialised equipment beyond a standard television set was required by the consumer to receive and watch TV distributed via this mechanism.

The fact that cabling shields the TV signal from interference from external signals, and also prevents the transmission being carried from leaking and affecting terrestrial communication, led to cable TV becoming more than a simple retransmission mechanism. Spectrum reserved for other uses in the terrestrial domain could be re-used via cable, allowing multiple additional TV channels and radio stations to be carried. The larger number of channels available made cable TV ideal for use in broadcasting pay TV, where users would pay extra, to receive more channels.

Cable services have evolved since their first inception, moving to digital encoding of their signals, accompanied by roll-out of two-way data services. Two-way data systems, at their base level, allow broadband Internet and telephony to be delivered via cable, but are also critical for enabling new generation interactive TV services. In order for interactive services to work, there must be a one-to-one connection between the consumer's set-top box or TV and the upstream parts of the cable network. This means that a consumer's remote control button-press can be conveyed up the network and enable a specific piece of content to be delivered to that one consumer. In a one-to-many system, such as terrestrial broadcast, the TV provider has little to no directional ability, meaning it cannot easily send specific pieces of content to any single end customer. Increasingly operators with no two way data systems, such as DTH or DTT operators are using transmission over the open internet (OTT) to satisfy consumer desires.

The disadvantages of cable largely stem from the fact that households must be physically connected to the network in order to receive the signal. Cabling large numbers of households is extremely expensive and necessitates vast quantities of up-front capital expenditure. Costs of cabling on a per household basis vary depending on population density and

geographical or planning issues, but a typical cost in developed markets such as the US or Western Europe would be €500-€1,000 per home connected or greater, and in the region of €200 for developing markets, such as China.

Furthermore, the economics of cabling low-density areas is such that in the majority of cases, a return on investment is unlikely, making cable TV only systems viable only for more heavily populated townships and cities.

Satellite TV

TV was first broadcast via satellite in the 1960s, however it was not until the 1980s and 1990s that the platform really began to take off as a means for domestic television reception.

Satellite TV services transmit signals largely in the C-band or Ku-band frequencies of the electromagnetic spectrum. These fall outside the VHF and UHF areas of spectrum used for terrestrial television and radio distribution, being at higher frequency. Such frequencies are typically ineffective for TV transmission from terrestrial transmitter masts or towers, as the signals are prone to interference from geographical features and buildings, causing them to attenuate rapidly. Delivering the signal in the frequency ranges using satellites, however, means that there will typically be no such obstacles in the way of reception, permitting C-band and Ku-band frequencies to be an effective method of signal dissemination.

Despite the lack of physical obstacles, however, the ~42,000km distance of the satellite from the Earth means that the signal is normally relatively weak by the time it reaches the point of reception and reception necessitates specialised equipment – namely a parabolic satellite dish, which collects the signal and reflects it onto a central reception antenna. The process amplifies the signal and eliminates noise or interference. Unlike cable and terrestrial TV, analogue and digital satellite broadcasts always require a specialised satellite set-top box to decode the signal. This is largely due to the fact that analogue satellite broadcasts are encoded at different frequencies to broadcasts via terrestrial or cable TV.

The higher frequencies which satellite broadcasts rely on come with benefits over cable TV and terrestrial TV in terms of data transfer. Higher frequencies have correspondingly higher bitrates, and can encode more information, normally allowing satellite to carry more channels than equivalent cable or terrestrial TV services. Satellite services also have the added advantage of not requiring any network build-out, meaning that compared to cable TV or terrestrial TV services, start-up costs are lower, but equally importantly, an entire market or region can be covered, including both low and high population density locales, making satellite TV a more economical proposition in more sparsely populated areas.

The disadvantage of satellite TV services compared to those using physical cabling, such as cable TV or IPTV, is that there is no one-to-one connection. This means that it is very difficult to enable true interactive services via satellite TV. Any signal sent out will be picked up by all users of the satellite service. Increasingly therefore, satellite services have been turning to alternative connection methods for enabling interactive services. These normally take the form of a

secondary connection to the set-top box – usually in the form of a broadband connection. This allows the delivery of content on a one-to-one basis to users, as well as allowing them to communicate with the platform, enabling interactive services. The current issue with this approach is that the satellite provider typically relies on a) the user having a broadband connection and b) the broadband connection being of sufficient quality to allow relatively rapid content delivery. In this respect the ability of on demand services provided by satellite operators is synonymous to that of OTT providers.

IPTV

IPTV is a digital only platform. IPTV services work in a different way to those using radio frequency broadcasts; information is encapsulated within Internet Protocol, a communications standard used in computer network data delivery. This is then delivered via a broadband connection to the consumer premises. One of the key differences between IPTV and radio-frequency broadcast services is that a consumer receives a single channel at a time the data is usually transmitted using a standard compression method, such as MPEG-4. With IPTV, when the user switches channel, the signal is relayed up the network, the unwanted channel signal switched off and the desired channel then sent to the user. This essentially means that IPTV services are less constrained in the number of channels which they can offer compared to cable platforms, as the limiting factor, which is normally the bandwidth of the cable at the point of reception is no longer a major issue. IPTV services do suffer from other bandwidth related problems, however, covered below.

IPTV services should be considered distinct from online or web-TV services, herein referred to as over-the-top services (OTT), which are accessed via a PC or mobile device via the open Internet. IPTV services are delivered via a closed network, normally owned by the IPTV service operator, with the information conveyed inaccessible to those outside the network. This makes IPTV services analogous to digital cable TV operations. Only households connected up to the network can access the TV service. This is a contrast to online TV services, which are normally accessible through any internet-connected network. The advantage of the TV service only being available within a specific network is that the quality of the signal can be controlled, something not typically possible over third party infrastructure.

While in theory, IPTV services should suffer from the same issues as cable in terms of network deployment and the expense associated, the infrastructure required for delivering IPTV is often already in place, or in the process of being deployed anyway. In many cases, the largest IPTV providers are the incumbent telecoms companies, such as Singapore's SingTel, Hong Kong's PCCW, Germany's Deutsche Telekom, meaning that they will typically cover the entire country with their telephony and broadband network. While IPTV availability will normally be lower than this due to some consumer connections being of insufficient quality to carry a TV signal.

One of the main problems which IPTV services face is that the infrastructure which they are operating over is not designed to carry TV signals. Traditional copper telephone lines cannot accommodate a great deal of data, meaning that in older networks, the bandwidths at

the user end may limit what can be received. In general, standard ADSL lines are the minimum requirement for IPTV and will normally allow the delivery of a single standard definition TV channel if it is compressed using MPEG-4 to roughly 2Mbit/s.

The main advantage of IPTV over satellite and terrestrial in particular, is the two-way nature of the connection. As a consequence, all IPTV set-top boxes can communicate with the network. This makes the introduction of interactive functionality especially straightforward, with on-demand services available by default for most IPTV systems.

On-demand and online video platforms

On-demand Video

On-demand systems come in a variety of forms, with on-demand content available via mobile, computers and also via TV services. For pay TV platforms, there are several active forms of video-on-demand at present.

Near-VoD systems, or nVoD systems, are typically used by satellite operators, or cable providers which have yet to launch true VoD services. nVoD services rely on a single piece of content being broadcast on sequential channels with staggered start times. Customers can consequently begin watching the content at a time which suits them. nVoD is typically only appropriate for high value content, however, as it is bandwidth intensive and costly (for satellite operators) to run. Typically, therefore, content available on nVoD services is restricted to blockbuster movies, available on a PPV basis.

True VoD systems have replaced nVoD for many cable operators. True VoD (simply VoD hereafter) relies on servers being situated within a cable or IPTV network. When a customer to a VoD-enabled service wishes to access a content piece, the server streams the content directly to their decoder. Normally, VoD content can be rewound and fast-forwarded in the same way a DVD might be. VoD libraries typically complement a linear broadcast service, although historically, some providers have provided VoD as the sole means of accessing paid content, although this has rarely been a successful strategy.

Satellite providers, which typically lack the one-to-one connection normally needed for VoD have adopted a range of more sophisticated VoD-like technologies to attempt to keep up with cable and IPTV services. Push-VoD services use PVRs to store broadcast content and make it available in a VoD-like fashion, with instant access, rewind, pause and fast-forward. The downside with PVR-based services is that the numbers of videos available instantly will be substantially lower than those available on a VoD service, as capacity for storage is reduced.

With improved consumer broadband connections satellite operators have newer more sophisticated distribution methods using IP. Using hybrid STBs (DTH/IP) the operator can deliver content over the open internet (OTT) and deliver streamed content to the consumer. This allows a tVoD experience without having to invest in costly infrastructure roll outs that are associated with huge levels of capital investment. By delivering the content outside of the walled-garden of the pay TV ecosystem there is increased complexities in protecting the file from piracy although this is mitigated with the content still being tied to the STB.

With OTT distribution becoming increasingly important, although remaining niche in terms of total viewing time, the video-on-demand sector is moving away from relatively secure walled-garden of pay TV operators. The content is now being delivered via an open network where there are more possibilities for the video to be intercepted. Pay TV VoD is also often delivered via IP but for the likes of Comcast or BT this is done through the IPTV network and is not over the open internet. The rise of Netflix and other SVoD (subscription VoD) services have been the main drivers of OTT consumption over the last two years and have used Silverlight and HTML5 extensions to secure the premium content it delivers to consumers.

HbbTV

The HbbTV standard ultimately aims to enable consumers to enjoy a variety of entertainment services including video on demand (VoD), interactive advertising, personalisation, voting, games and social networking as well as programme-related services such as digital text and EPGs through a single access point. It also aims to avoid technology lock-in (where consumers are trapped within a small selection of devices as a consequence of limited cross-device content availability) and help to promote competition.

OTT & catch-up platforms: an overview of the major players

Netflix

Netflix launched its streaming service as a value-add to its core rent-by-mail business in 2007. The service was initially tied to both the physical rental business and to the PC in the United States. As the service was bundled there was initially no revenue being generated from online video. However, Netflix was moving ahead of the curve to transition consumers to online SVoD, a business model that is familiar to consumers through the pay TV industry.

Netflix actively managed the transition of consumers' consumption to online video away from more familiar forms of consumption. Netflix incrementally improved the streaming service both in terms of device availability and content. Initially this was through dedicated Netflix streaming boxes, Roku was spun out of Netflix as a Netflix streaming box, and then to games consoles. The consoles were initially dependent on a Netflix disc being inside the device before becoming an application within the consoles media toolbar.

In 2011 Netflix moved to separate the Watch Instantly, streaming service, from its physical disc subscription. Although initially this was met with resistance from its subscribers it did not have a long term detrimental effect on Netflix's total subscriber base. The company's managed transition of its customer base to digital consumption has helped it convert its US service to 85% of its total Q1 2015 domestic revenues. The company has though faced significant challenges in controlling its costs in the lower margin business of OTT SVoD. Netflix has in response launched its Netflix Open Connect proprietary CDN. This allows the company to store its content on its own servers within partner ISPs network.

As Netflix has moved away from its physical disc business it has faced new challenges in protecting the content it licenses from content providers. Although with physical discs consumers could attempt to copy the content to their computer the studios would put DRM onto the DVD to try and stop this. When Netflix entered the streaming market it not only had to deal secure its own streams but also stop out-of-market users viewing content.

With rights licensed on a territory by territory basis Canadian Netflix subscribers are not licensed to view content sold for the United States. This also means that if a US subscriber travels to the UK they can only consume the UK's Netflix catalogue and not the larger US catalogue. VPNing into different catalogues remains an issue for the company with Australia reported to have up to 200,000 users of the VPN technology.

BBC iPlayer

Launched on Christmas day 2007 the first version of the BBC iPlayer was distributed through a P2P network due to the bandwidth limitations that existed in the UK broadband market. As the iPlayer was updated it moved towards unicast distribution provided by CDN partners. The service developed away from a desktop client, which only allowed non-linear viewing, to a service that was based around variable bitrate streaming. The BBC must protect its content both when it streams the content but also when it is downloaded and consumed offline on the PC and mobile devices.

The BBC interpreted its public service mandate to bring the service to as many connected devices as possible. However, this led the service to have relatively high cost of development due to device fragmentation - with more than 300 different Android device versions being created. The BBC is perhaps unique in the number of devices it is available on and the number of versions that were in the market.

The iPlayer, however, remains a non-linear service. In March 2015 90% of video requests were consumed on an on-demand basis. However, radio consumption is mainly based around the linear schedule with 73% of consumption of the BBC radio stations being consumed as a simulcast. This is due to the peaks of radio iPlayer being the daytime whilst consumers are at their desk and cannot access a traditional radio.

The popularity of on demand consumption shows the importance of making content available from a legal source around the initial linear broadcast date. If this isn't the case then consumers will take to illegal approaches to consume this content, either in advance of broadcast or post broadcast. With a global market consumers are increasingly demanding popular international content to be made available as close to its original broadcast date as possible. The BBC took this approach with the first episode of the new series of Top Gear which was broadcast to a global audience simultaneously to avoid devaluing the show in international markets.

Amazon

Amazon currently offers video content in the United States, Germany, Austria, Japan and the UK with transactional movies and TV shows. In all five markets content is available to be rented (iVoD) or purchased (EST) and includes both TV and movie content. In both Europe and North America the e-retailer has uses its Amazon Prime subscription to bring TV and movie content to consumers. Prime subscribers have access to a selection of movies and TV shows at no additional cost. In Europe, due to legacy issues from the acquired Lovefilm business, subscribers can also subscribe direct to the video service. IHS believes that Amazon

has been largely successful in managing its Lovefilm customer base to the Prime subscription over the standalone proposition.

MLB.tv

The digital media arm of Major League Baseball (MLB) provides MLB.tv. MLB Advanced media (MLBAM) currently controls all digital propositions of MLB and also is a white label provider of online video platforms, with HBO Now one of its more notable customers.

MLB.tv offers out of market baseball games within a subscription that last for the length of the baseball season (March-October). The subscription also gives consumers access to the MLB At Bat app, one of the top-grossing apps on the app store, where they can get news, highlights and radio feeds for games. Combined together MLB At Bar and MLB.tv had a reported 3.5 million subscribers in 2014.

The MLB season has 2,430 games and MLB.tv streams all out of market games to its subscribers as well as offering DVR functionality, alternative commentaries and multi-game viewing to a global audience. MLBAM streams content to games consoles, smart TV platforms, DMAs (Apple TV, Roku, Chromecast etc.), and has a native Windows 8 app. With traditional broadcast rights worth more than \$1 billion a year the enforcement of blackouts on the service has ensured that traditional broadcast rights holders are not being undercut by the OTT delivery of games.

MLB.tv has been recognised as a leading technical platform for the provisions of high quality online sports video, winning an Emmy in 2014 for Technical Engineering. MLBAM has provided a high quality service that provides a huge amount of content that the fans could not get through a legal source via traditional broadcast methods. By embracing OTT delivery MLB has found accretive revenue to the league by being able to actively monetise every game rather than the limited number of games that were broadcast to fans in the past. In addition to incremental revenue it kept fans, in the most part, from needing to find illegal ways to consume these matches and thus avoided one potential driver of piracy.

Okko

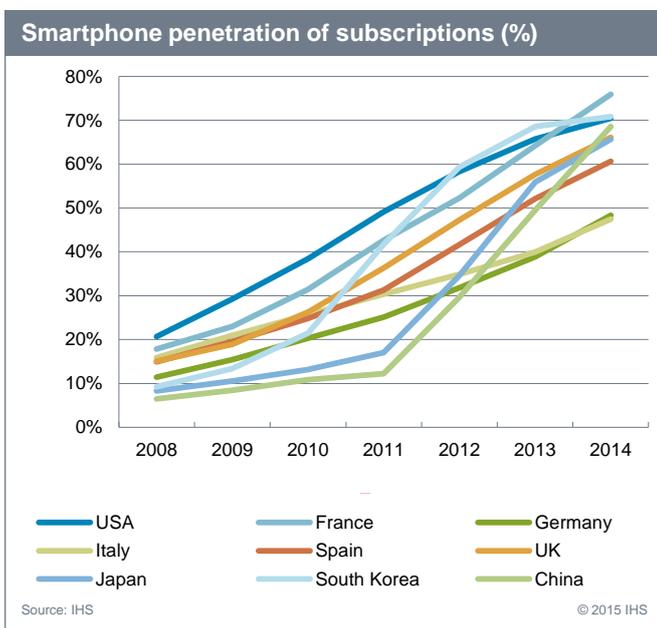
Okko is a Russian online video platform with two business models; transactional, and SVoD. The service is available on a variety of platforms but its main revenue stream is from Smart TV Transactional VoD, with more than 80% of consumption on Smart TVs. Okko launched in July 2011 and provides access to more than 5,500 movies in HD, ultra HD (4k) and 3D. It also offers access to TV channels through its Okko TV service.

Despite high level of piracy in the Russian market Okko has been relatively successful by focusing on the Smart TV platform which allows them to protect content better when compared to other platforms. This has helped Okko in negotiations with content providers (mainly local studios) to show content earlier or at the same time as theatrical cinema releases. These changes to the traditional windowing of content have helped avoid piracy by making desirable content available more conveniently to consumers.

Mobile television and video platforms

Mobile TV

Mobile TV and video content can be delivered through a variety of different technologies. The growth in smartphones and tablets, 3G and 4G networks, and content distribution through application stores has fuelled demand for mobile video access. Mobile operator Vodafone reported that 40% of its European data traffic was from video and audio services in the third quarter 2014, up from 35% in the same period in 2013. UK broadcaster, the BBC, saw 47% of its iPlayer requests come from mobile and tablet devices in 2014, up from 38% in 2013.



There are three main ways of delivering mobile TV and Video content:

- **Mobile Broadcast TV:** delivering one-to-many linear content using broadcast rather than cellular spectrum.
- **Mobile Unicast TV:** delivering one-to-one linear content over mobile (3G and 4G) data networks.
- **Mobile Video:** on demand and recorded video that can be accessed over mobile data networks, Wi-Fi, or side-loaded onto mobile devices.

Mobile Broadcast TV

Broadcast mobile TV offers a number of advantages over mobile unicast cellular delivered content. Using a broadcast signal rather than a cellular data network reduces the data load for the mobile operator and allows subscribers to access content without data charges or using data plans. But the challenges mobile broadcast TV faced have exceeded the benefits. These challenges include:

- **Limited handset support:** Mobile handsets had to be customised with additional antennae to support mobile broadcast television.
- **Additional infrastructure & spectrum requirements:** Mobile operators required additional broadcast (non-cellular) spectrum for their own mobile broadcast TV services.
- **Multiple standards & lack of global scale:** The variety of regional standards included: CMMB, ATSC M/H, MediaFLO, DVB-H, ISBD-T. The lack of a single standard limited device support and the ability to offer services at scale.
- **Monetisation:** There was limited interest in paying for premium services or an additional fee for already broadcast content.
- **Content rights:** Mobile operator run services need content rights or to work with premium content providers (e.g. sports channels).
- **Quality:** Most early mobile broadcast services suffered from poor picture quality. Often poorer than standard definitions (SD) and not capable of supporting high definition (HD), poor quality limited the user appeal of earlier mobile broadcast TV services

There was no global standard for mobile broadcast TV; instead regions adopted different broadcast technologies, which in turn required different mobile handset specifications which made mobile device makers less inclined to develop compatible handsets. This is also limited the addressable audience for each technology, making it harder to offer products at scale. Mobile devices required specific antenna support to receive the mobile broadcast television signal. Outside a few select markets, such as Japan and South Korea, there was very limited device support. The variety of standards includes:

- **ATSC M/H (Advanced Television Systems Committee – Mobile/Handheld):** The North American standard, still in limited operation by the Dyle TV consortium in the USA, ATSC M/H is an extension of the North American ATSC digital TV standard.

- **CMMB (China Multimedia Broadcasting):** The Chinese mobile television product backed by China Mobile was announced in 2006. Services began to roll out in 2009, by 2011 the service covered 800m people and there were 35m compatible handsets in use. However the rise of smartphones means that device support is limited and alternative video services are prevalent.
- **ISDB-T (Integrated Services Digital Broadcasting – Terrestrial):** The 1seg variant of Japanese digital TV is still relatively popular compared with other markets. At the time of 1seg's launch, the Japanese handset market was dominated by local Japanese domestic manufacturers such as Sharp, Fujitsu, NEC and others which supported the 1seg standard. Japanese mobile operators' strong role in handset distribution also helped create widespread device support for mobile TV. This means mobile operators can still require support for mobile TV in the handsets they sell even from international OEMs such as Samsung. However, Apple is now the number one smartphone vendor in Japan and the iPhone does not support 1seg mobile broadcast.
- **DVB-H (Digital Video Broadcasting – Handheld):** The most widely deployed standard in Europe, DVB-H initially enjoyed strong backing from device makers, operators and the European Union in the mid-to-late 2000s, but its positive early momentum was short-lived. Formally adopted as a standard in 2004 and backed by the EU in 2008, by 2011 mobile DVB-H in Europe was in steep decline with most services closed or planned for closure. By 2013 DVB-H in Europe was largely finished.

DVB-H enjoyed later success in Africa with pay TV provider DStv launching services in 2010 via a dedicated mobile TV receiver (Drifta) and on supported handsets from Nokia and ZTE. The service launched in South Africa with a free tier provided by e.tv and subscription access from DStv. DVB-H services also launched in Nigeria in 2008. DStv continued to roll out its Drifta product across its footprint of African countries including launches in Kenya in 2011 Ghana and Uganda in 2013.

The Drifta mobile TV portable decoder receives a DVB-H signal which can be transferred to smartphones and tablets via Wi-Fi and USB. It is available to existing premium TV services who are not charged a premium for mobile access (beyond the cost for the device), a standalone mobile subscription is also available for a fee of ZAR 49 a month. In Africa, where 3G penetration and adoption of mobile data services is lower than in Western markets there is a greater opportunity for mobile broadcast technologies over unicast

services. Services launched by a pay TV operator – which already has premium TV subscribers – also hold an advantage as a pay TV company is already making money from its TV subscribers.

- **MediaFLO:** Developed by Qualcomm, MediaFLO powered premium mobile TV services in the US which launched in 2007. Limited device support and limited user appetite for premium mobile television services hindered MediaFLO. The service was shut down in 2011 after US operator AT&T acquired the service from Qualcomm for its spectrum holdings.
- **T-DMB (Terrestrial – Digital Multimedia Broadcasting):** The digital TV standard developed and mainly used in South Korea (with some international deployments), T-DMB has been widely used on mobile handsets in South Korea. Similar to Japan's 1seg, the Korean service benefited from the support of domestic handset manufacturers including LG and Samsung and strong mobile operator backing. More recent devices have shifted away from offering T-DMB via a built in antenna (though it is possible to use the headphones to receive a T-DMB signal). Mobile TV services remain popular in South Korea which has been the first to launch a commerce LTE Broadcast service (see below).

Encouraging users to pay for premium mobile TV content has been a challenge for most broadcast mobile TV services. More successful services often broadcast the existing free-to-air television and so there was no additional monetisation.

Early variants of mobile broadcast television required significant hardware support including the addition of an antenna on the mobile handset to enable it to receive the broadcast signal. The limited appeal for premium services, and the variety of different standards, meant that device makers – outside a few key markets – were reluctant to invest in customised hardware.

Mobile Unicast TV

Using the existing mobile data networks means that services would enjoy widespread device support without the need for customised hardware. Unicast services also meant operators did not have to invest in additional spectrum for broadcast content transmission. Unicast services do come at a higher cost to the operator as the data is delivered to each user individually rather broadcast to many. Mobile unicast services saw more widespread success than most of the mobile broadcast services discussed above. However these too faced the fundamental challenge of monetisation, with users proving increasingly unwilling to pay a premium for mobile access to content – beyond a few notable examples such as premium

sports content. The challenge of balancing data and content costs has been another issue for mobile unicast services with some operators alienating users by charging users a subscription fee for the content and also charging for the data used to access the content.

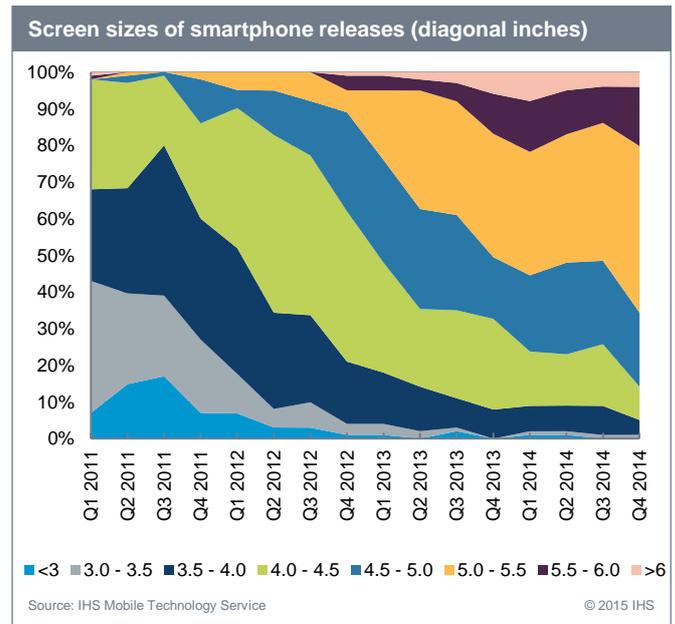
Mobile Video

The growth of smartphone penetration and content distribution via application stores has driven the appeal of cross platform mobile video services and therefore undermined the appeal of mobile only, particularly premium mobile, video services. Alongside unicast mobile television services, many mobile operators also developed on-demand offerings, but premium mobile only or mobile specific services were not able to compete with international OTT video players.

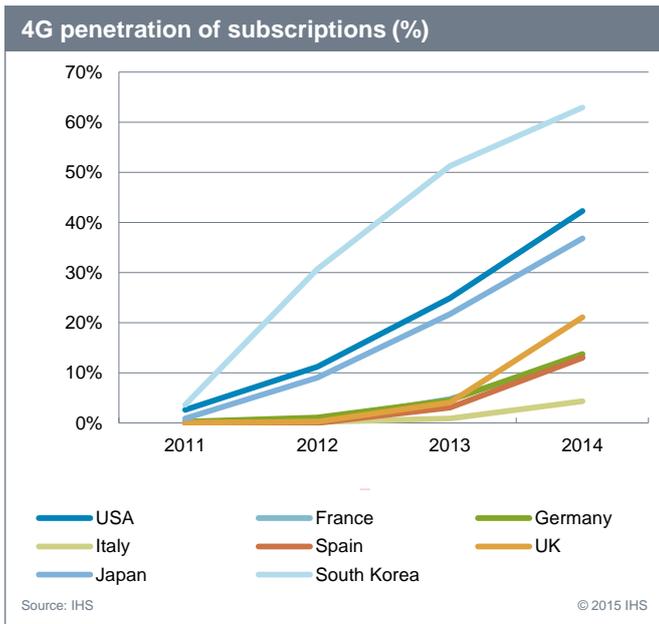
Direct revenues may be limited, but mobile video consumption is growing rapidly, mainly delivered over mobile or Wi-Fi networks via smartphone and tablet applications distributed through mobile app stores. The leading providers of mobile video apps include:

- Free advertising funded services such as YouTube or Dailymotion
- Free-to-air television providers that offer linear and catch-up content at no extra charge
- Pay TV companies that provide cross-device access as part of the standard content bundle for example Sky Go in Europe, and GO by OSN in the Middle East. OTT subscription video services that charge a single subscription fee regardless of platform or device e.g. Netflix, Amazon Prime Video, and Voyo.

The prevalence of the above models of mobile video distribution and monetisation makes it increasingly difficult to generate direct revenues from standalone or mobile specific TV and video services.



The evolution of mobile devices and networks has increased and addressed the demand for mobile video smartphones. Large screen smartphones provide a much better viewing experience the previous devices; more than 80% of smartphones released in Q4 2014 featured screens larger than 4.5 inches across. Screen quality is also improving with around 50% of Q4 2014 smartphones boasting high definition or better screens. The growth of 4G mobile which offers much faster data and lower latency data connections than 3G has also boosted mobile video consumption. By 2014 4G accounted for 42% of subscriptions in North America, 7% in APAC (and 36% in Japan, 62% in South Korea) and 3% in Africa and the Middle East.

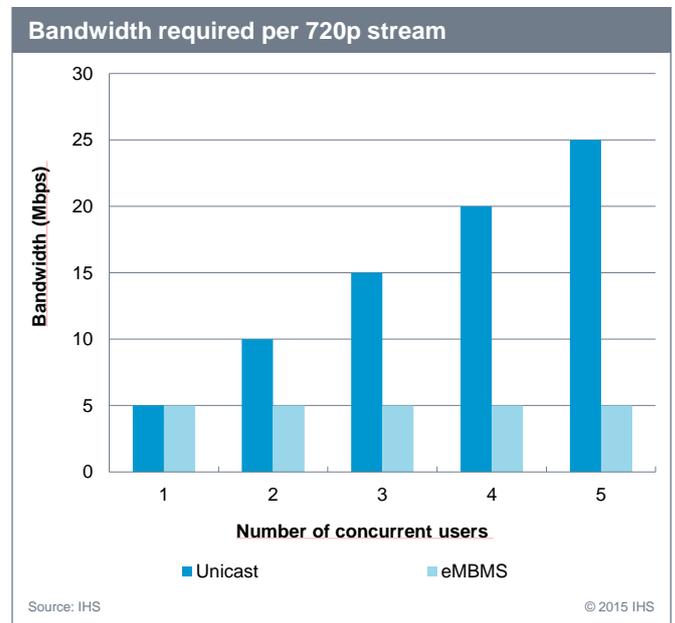


LTE Broadcast

LTE Broadcast, also known as multicast or eMBMS (evolved Multimedia Broadcast Multicast Service), is a technology that allows the simultaneous downlink of an identical data packet to multiple devices at consistent speeds. Unlike many older mobile broadcast technologies it is a part of the 4G LTE standard, included in release 9 of 3GPP, which should boost its likelihood to succeed in the market because of wider industry support.

Its key differentiator from traditional 4G LTE mobile data downlink, or unicast, which is used on mobile networks today, is that it is not affected by the number of users connected. Traditional mobile networks require greater capacity in order to handle increasing number of users accessing the same video stream or data download, whereas LTE Broadcast utilises its dedicated spectrum to deliver the same information to multiple users without an additional burden to the network.

Operators are able to trade-off how much capacity is used by LTE Broadcast, and how much of a mobile network's capacity is available for regular LTE services, in order to support higher quality video delivery or more simultaneous video streams. Typically, LTE Broadcast will deliver between three and five linear TV streams each with 720p HD video quality.



LTE Broadcast requires relatively little infrastructure compared to an LTE network deployment. The additional infrastructure required to enable LTE Broadcast is a software upgrade. This makes a network upgrade orders of magnitude cheaper than deploying a new mobile broadcast network, on new frequencies, and hence relatively fast.

The trend towards technology neutral spectrum licences in Europe should make deploying LTE Broadcast straightforward. For countries where the telecommunications regulator is separate entity from the TV regulator, the licensing process will likely be more unclear.

LTE Broadcast Benefits		
	Previous mobile broadcast TV	LTE Broadcast
Limited handset support	Devices required additional antennae.	Relies on Qualcomm chipset and OEM support.
Need for extra infrastructure/spectrum	Mobile operators required additional spectrum.	LTE Broadcast allows dynamic switching.
Lack of global scale	Regional standards included: CMMB, ATSC M/H, MediaFLO, DVB-H, IDSB-T.	Works across LTE standards.
Monetisation	Lack of interest in premium services.	Limited market for standalone premium mobile video.
Content rights	Limits on mobile rights.	Operators need content partners.
Picture quality	Worse than SD.	Full HD.

Source: IHS

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Consumer viewing habits

Viewing time

Cross-platform viewing times provide an insight into the changing behaviours of viewers around the world. IHS tracks the total viewing of France, Spain, Germany, Italy, the United Kingdom and the United States. By combining viewing time data from linear television, PVR (personal video recorder) time-shifting, pay TV video-on-demand services and over-the-top (OTT) content IHS is able to provide a holistic view of how video consumption habits are changing in response to the emergence of new media in these key markets.

In 2014 television content, linear and time-shifted viewing equated to 96% of all video consumption in IHS' six sample markets, with a combined viewing time per person per country of 1,574 minutes of video per person consumed each day through the TV. Despite a decline in linear TV consumption, it remains prominent in each of the monitored markets, equating to an average of 88% of total viewing time and reaching as high as 94% of viewing in some markets.

PVR viewing is the most popular non-linear method of viewing TV content, representing more than 50% of all non-linear consumption in 2014. Although in 2014 time-shifting slipped 1.6% in terms of overall viewing time it remained at an average of 6% of the total. Unlike linear which remained consistent across the markets, time-shifting levels varied due to differing levels of PVR and VoD availability. For example, in the United Kingdom where PVR systems are provided either as standard or at a nominal charge by all pay TV operators time-shifting makes up 17.1% of all video consumption. In Spain however, PVR penetration is comparatively low at just 14%, with PVR viewing making up just 3% of total viewing.

Weather conditions, economic shifts and popular sporting events all have an effect on viewing time. In 2014, for example, declines in UK linear viewing were partially offset by an increase during the 2014 football World Cup. In the US, linear viewing time is inflated by the Super Bowl. Across the six markets there is a general trend towards a reduction in linear viewing, however it is worth noting that these reductions are nominal, between 1% and 2% annually.

Move to on-demand

Pay TV VoD services offer a range of experiences depending on the availability of set-top box (STB) connectivity. Historically linear based pay-per-view

(PPV) and near video-on-demand (nVoD) solutions were employed by operators on receiver only STBs. With the rise of two-way networks and true VoD, operators have moved to enhance their offerings with internet connected STBs and a rise in IP-VoD (Internet Protocol video-on-demand) delivered over the open internet has been observed. Typically the number of views of on-demand content has increased in line with this transition as customers take advantage of the flexibility of true VoD content. In 2013 and 2014 pay TV VoD viewing grew 1% year-on-year. However, pay TV VoD only represents 13% of non-linear viewing and 1.7% of total viewing in 2014.

In 2014 OTT viewing time increased by 4.2% across the six markets with online short form content continuing to lead the field with a 2.6% share of total viewing time across the countries. Short form content grew on average by 1% in 2014 with the US and France leading with 6 and 7 minutes of total viewing time per person per day respectively. Extending beyond user-generated content (UGC), short form video is increasingly seen as the ideal format to reach the growing smartphone segment in both developing and developed markets. Major television networks such as the BBC are also exploring the possibilities of short form video, creating companion shows to drive engagement with its core shows' audience. Short form content is particularly popular with younger audiences, figures from YouTube's Multichannel Networks (MCN) indicating the most active demographic being aged 14-24 years old.

Online long form content viewing has accelerated in growth over the past 3 years. In the US, the success of subscription video-on-demand services such as Netflix has led to fears of a long term decline in traditional pay TV subscriptions, (known as 'cord-cutting'). In all the markets monitored, except Italy, there has been a decline in linear TV viewing, however this decline has been minimal. Qualitative consumer surveys and quantitative measures consistently produce varied results in regards to consumption of online long form video, which can largely be attributed to the passive nature of television consumption. Television audiences continue to follow established viewing patterns in regards to channels and programming in contrast to the more pro-active content discovery behaviour common in online platforms. Online long form content in 2014 on average constituted 2% of viewing time (or 13% of non-linear viewing) In the US, where this behaviour is at its peak, viewing share only reached 3% of average daily viewing.

TV Everywhere: a reaction to changing viewing habits

TV Everywhere (TVE) services are one approach that pay TV operators and network owners are exploring to combat a growing trend of cord-cutting. In particular, they are attempting to add new functionality and interactivity to the television viewing experience and allow consumers greater choice on how they consume their content. TVE has been developed as a collective strategy to enhance the traditional linear TV proposition by allowing viewing off the primary screen, onto second screens like tablets, smartphones and other devices. Pioneered by Epix, HBO, Time Warner, and Comcast, TVE services have taken on myriad forms, with each company adopting a slightly different strategy for success.

In spite of the differences in strategy, all TVE products have one thing in common; they allow current pay TV video subscribers to consume content on alternative devices to the pay TV STB either on a live or on demand basis.

All major pay TV operators have implemented some form of TV Everywhere service, although sometimes in very limited forms. Most operators provide web portals and/or apps for their customers to consume content away from the main TV screen. Despite mobile devices driving consumption of content within a TVE service, the majority of it happens on the customer's home Wi-Fi.

In many cases, the significant out-of-home TV Everywhere product is video-on-demand (VoD) with on demand content being more accessible than live. Operators will consolidate their licensed and original VoD content on web portals and apps. Even though the streaming of live channel feeds is largely relegated to the in-home space, NBC Universal, News Corp. and Disney have made several channels available for out-of-home streaming in the US, both on Wi-Fi and on cellular broadband.

VoD streaming

VoD streaming has been the most ubiquitous form of TVE, right from the very start in 2009 when Time Warner and Comcast first introduced the idea. However, the momentum appears to have shifted to streaming of live channels as pay TV operators bring full (or nearly full) line-ups to second screen devices. The long-term obstacles hindering the widespread rollout of live TV Everywhere content are licensing agreements. In the US Discovery Communications remains the lone major channel group hold-out not offering any TVE services on network sites or apps; VoD or Live Linear. The international business of discovery has made its content available to pay TV operators within their TVE service.

IHS believes that there will always be a place for live linear content because it offers customers the ability to consume content as it happens, which is extremely important for event driven programming. The availability of live linear streaming outside of the home is growing, but as yet, is still nascent when compared to traditional broadcast consumption.

Digitisation of content and piracy

As digital technologies and the internet continue to transform television, the ease of obtaining unauthorised access to copyrighted content increases. The following section of this report offers a closer look at how piracy has arisen and the different types that exist.

Main causes of piracy

The supply side of piracy falls into approximately two categories: persons or organisations aiming to profit, or groups believing that content should be free. The demand side of piracy can be multi-faceted, consisting of groups either unwilling, or in some cases, unable to pay for content.

Access Fees

The cost of pay TV subscriptions and costs of hardware setup are some of the biggest barriers to accessing broadcast signals. Although access fees cannot be cited as the sole reason for unauthorised access to broadcast signals, markets where top level access fees (as a proportion of monthly, per capita GDP) are high, tend to witness higher levels of piracy. Countries with an highly unequal income distribution, which despite having proportionally lower top level access fees, also display a higher than average level of piracy. Healthy competition between providers, help to keep costs low and make content available at multiple price points also serves to reduce the propensity to pirate content.

Deliberate restriction

Often content is deliberately restricted from being shown in certain regions (geo-blocking), certain times (windowing), or certain platforms. The rationale behind content restriction is maximising revenues by selling or renting content multiple times and at multiple price points throughout its lifecycle. For example sports are often "blacked out" in regions where they're shown live to encourage fans to stadiums. Movies are released first at cinemas, then made available for rental and viewing on premium TV channels, followed by release on broadcast TV and SVoD services. This can be frustrating for consumers who are aware that content has been released, but is not available via the method they wish to consume it, or at a price point they are willing to pay.

Regulations

National regulations, such as those in France, can often serve to re-inforce the traditional windowing system. While aimed at encouraging the flow of content across media platforms, the restrictions can often encourage piracy of in-demand content.

Types of content piracy

Increases in broadband penetration and speeds have also come hand in hand with making the transfer of content by illegal means easier and more convenient. The International Federation of the Phonographic Industry (IFPI) estimate that that 20 per cent of all internet users regularly access unlicensed services on desktop devices alone.

Methods of piracy can consist of either file sharing where entire files are transferred to the user's device, or streaming; where a video or audio feed is streamed in real time to the user. In both cases the data can be transferred as a single stream of data from host to client, or can be transferred in a peer-to-peer (P2P) network, where all devices that are downloading or have downloaded content, also transfer data to the other devices in the network.

Legislation to counter piracy has had a direct impact, as well as allowing for the 'management' of illegal activity. With many thousands of illegal streams being removed, ISPs blocking access to illegitimate content providing sites and also with legitimate websites becoming increasingly co-operative or prideful of protecting content IP there has been a sizeable success in the promotion of legitimate, monetized content. Although sites have been closed and even some major players in online piracy have been incarcerated, it still remains possible to bypass restrictions and currently is nearly impossible to stop someone who is committed from acquiring unlicensed content from doing so. This means that although many steps can be taken to minimise damage from piracy, strategies should be currently formulated to manage piracy, rather than to eradicate it. The following is an outline of the major methods that are used for pirating content and also include a number of techniques which allow restrictions put in place by ISPs and media players to be bypassed.

Torrenting

Torrenting, or BitTorrenting, is the term given to the use of a peer to peer network (P2P), to transfer data and content using the BitTorrent protocol. It is not to be confused with P2P streaming, as the end result is a duplicate copy of the desired file on the user's device, rather than a video stream that is not stored anywhere. The process required the user to first download a program or 'client' that will facilitate the transfer of data from the P2P network. There are a number of clients available, which range from small or 'lightweight' clients such as uTorrent which provide functionality for P2P transfer only, to larger clients such as Vuze, which also incorporate browser capabilities enabling users to discover content within the program itself. Both programs offer advertising funded versions, as well as a premium version, with the advertising removed. Although the majority of use for these clients is the transfer of content in breach of IP, they do not actually host either the content, or even the files (trackers) which allow users to start transferring content.

To initiate transfer a user must locate and download a small file called a tracker or tracker file. This small ~50kb file contains metadata on the file to be transferred which is then used in conjunction with a server (BitTorrent tracker) to keep track of where file parts are located and the availability of peer machines to transfer data. Trackers can be divided into two distinct groups; public trackers which can be accessed via the open internet and private trackers which require users to register before they can be used.

To locate these files, a number of websites have been set up to keep track of content by indexing files with metadata and supplying trackers or 'magnet links' which serve the same purpose. While the indexing sites do technically not host content, founders of sites such as ThePirateBay have been found guilty of copyright infringement and ISPs have been ordered to block the sites. Although the sites do also index some legitimate content, such as IP free video content, software, and game updates, the most popular usage is not for these legitimate purposes. It is important to note however, that P2P technology is not exclusively used for illicit file transfer and plays an important role in a wide range of businesses and programs including ranging from Skype, Word of Warcraft, Adobe's Flash player 10.1 and Spotify. Actively targeting and blocking the BitTorrent protocol from internet traffic, would therefore have a significant impact on legitimate business.

Blocking by ISPs

Increasingly, ISPs are blocking users from sites that are involved with breach of IP, with the main sites for a number of popular torrent sites blocked completely from access. IP owners are able to petition courts to review evidence surrounding a site, with the aim being to prove that the primary purpose of the site is to facilitate the illegal dissemination of content. The court order not only enables the 'takedown' of a website, but also crucially protects the ISP and interested parties from backlash from the website related to loss of earnings or net neutrality.

VPNs

There are two main methods to circumvent restrictions placed on websites by ISPs. Firstly, the targeted website can create a new domain which 'proxies' the original and allows the main site to be accessed via a different URL to the one which is blocked. Secondly, the user may make use of a VPN, or virtual private network, to hide their activity from an ISP, preventing the ISP from blocking access to a site. The widespread use of VPNs for this purpose is relatively new; previously VPNs have mainly been used by businesses and governments to transfer sensitive information and also by individuals from inside countries controlled by oppressive regimes. Many businesses will use a VPN to allow employees to securely access work files from a remote location. Attempting to disrupt the use of VPNs will have negative impact on a wide range of legitimate uses.

A secure VPN such as those used by businesses require the installation of a program which will encrypt data being transferred across the open internet and then decrypted at the other end by the target. More recently, very light VPNs have crept into existence, which may be as simple as a website accessible by a browser or an installed app which mask or funnel a user's traffic through itself, effectively hiding a user's activities. These can effectively circumvent an ISP blocking a domain, or even get round an internal networks list of blocked sites. Since they are based in either a browser or a mobile app, the light clients are inherently user friendly and can provide functionality with the click of a button. Examples include Hola VPN (which claims 44m global users) and Hotspotshield. VPNs such as these do not grant the user a good level of anonymity, and although bypass blocking and geolocation, it would be possible in many cases to match a user's IP address contacting the VPN host, with content being accessed.

VPNs can also be used in conjunction with streaming sites such as Netflix which are geo-locked, often in accordance with digital rights distribution deals. VPNs can mask a user's origin and make it appear that the user is in a different country. An example of this would be a Netflix UK user using the Hola VPN service to misinform Netflix servers that they are in the US, and

consequently accessing US content. Netflix has moved slowly to combat this kind of piracy which despite being in breach of EULAs, do still require a user to subscribe. HBO which has recently been very heavily affected by piracy, has taken a more aggressive approach and is actively finding VPN users of the HBO NOW service and sending them warning letters.

More developed VPN services are subscription based, and offer a more advanced functionality with greater protection for users. This means that not only can users bypass many restrictions, but can also be guaranteed a high degree of anonymity. A number of VPN providers log traffic, IP addresses or otherwise stamp user information in such a way as to allow the user of the VPN to be matched to activity, although the VPN still functions to 'tunnel' through to the desired site and prevent the ISP from blocking access. Therefore, user activity data does exist and depending on where the company hosting the VPN is located could be compelled by court order to release information indicating user activity. TorrentFreak.com carries out surveys of popular VPN sites and release information to users to inform decisions about which are the most private services.

Streaming

While P2P download piracy is a serious problem for episodic content, in the case of live event-driven content, the transfer of files after the event has finished is much less damaging. Sports content or popular reality shows suffer far more from the transmission of illegal streams, many of which can be found simultaneously with broadcast.

With the advent of formalised internet protocols, greater bandwidth availability and more widespread uptake of connected devices streaming of music and video has greatly expanded in use. According to Nielson; in 2013 there were 118.1 billion music streams, while video streaming currently represents around 30% of all internet traffic.

User generated streaming services are hugely popular with sites such as YouTube gaining problems with illicit content as they grow in popularity. Live streaming services allow the sharing of a user's uploaded video, as it is transmitted to the sharing site. Sites such as Twitch are increasingly popular among the gaming community, who consume live feeds from other gamers and gaming events. While YouTube and Facebook have met some success in tackling content in breach of copyright; the combatting of live streaming is technically more difficult and many legitimate live streaming sites are either not equipped to deal with this problem.

P2P Streaming

Not all streaming is transmitted from a single location via unicast. Some programs, such as Popcorn Time,

allow users to stream content P2P, rather than streaming content from a single server the files are shared throughout all users of the service. When a TV show or movie is selected for streaming, the program identifies users with the requested file segments and initiates the transfer of them, facilitating streaming. The use of P2P streaming is not a recent innovation with iPlayer using this technology up until 2008, until the BBC trust abandoned it in favour of more traditional means.

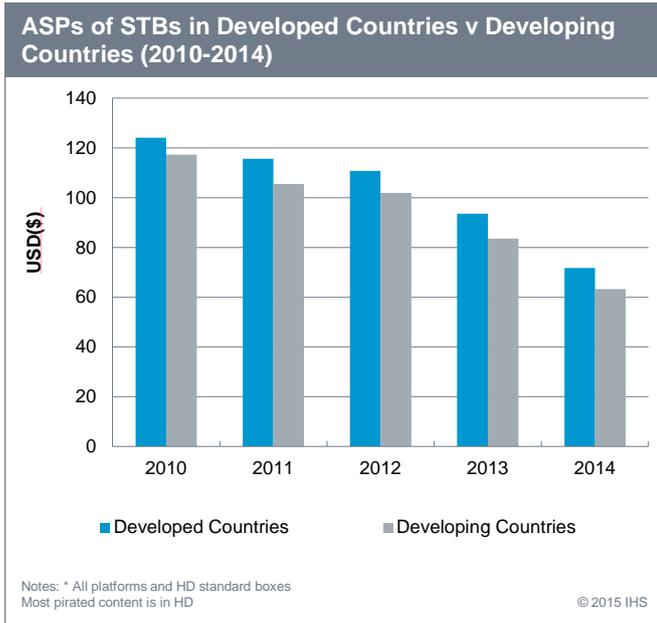
The advantages of P2P transfer are that loads on servers are extremely light, as no content data is actually transferred from website host to user. It also offers advantages around reliability as, although a tracking site is still needed, once a transfer is initiated, it will continue for some time even if the host site is no longer available.

Direct File Sharing

One of the more challenging methods to manage is the use of file sharing sites. File sharing or file storage sites allow users to store content online, either behind a password protected front end, such as Google Drive, or in a more open format where anyone with a link to the file can access it. Legitimate purposes can be storing documents photos or even music that a user wishes to make personal use of, using whatever device they may have to hand. Users can also store illegitimate content, as easily as they would on their own hard drives.

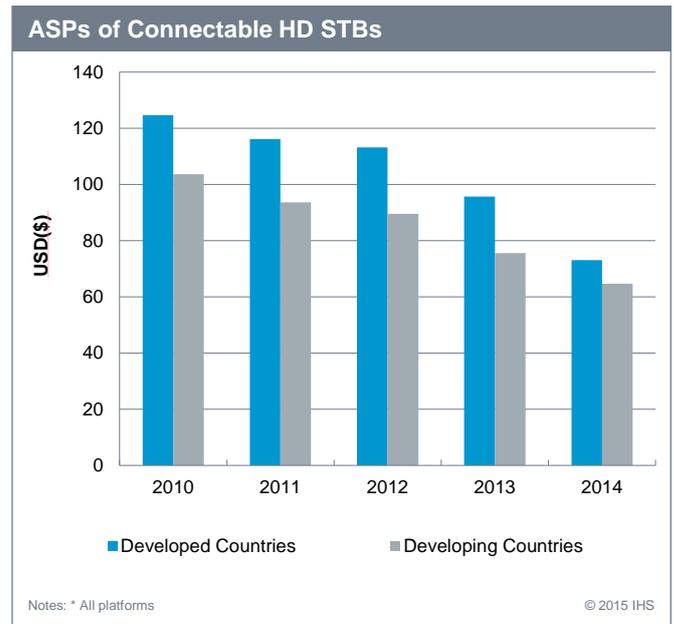
While Google will respond to copyright complaints by issuing warnings and terminating accounts, it can be difficult to detect illegitimate content, or even legitimate content, that if being shared in breach of usage rights. Dropbox has a novel solution in the form of hashing all content that is uploaded. This process involves running an algorithm on the raw data of any file that is uploaded and generating a hash string out of it. For example an MD5 checksum on a version of the WIPO logo would equal "F0DC08FE2D78890929E7E59B5902936B" for example. This hash would be the same wherever the image was used and would allow illegitimate use of such an image to be easily identified. Theoretically, by fingerprinting legitimate content in the same way, Dropbox can tell if content is copyright protected. Then if content sharing is also monitored, illegal sharing can be immediately terminated. However, if the file is modified in some way, encrypted or compressed then this method would leave copyrighted files undetected. In fact tools such as Boxcryptor exist, which allow users to easily manage the upload and download of encrypted files, while for ad-hoc files, users can apply something as simple as WinZip to foil detection.

Hardware enabled-piracy

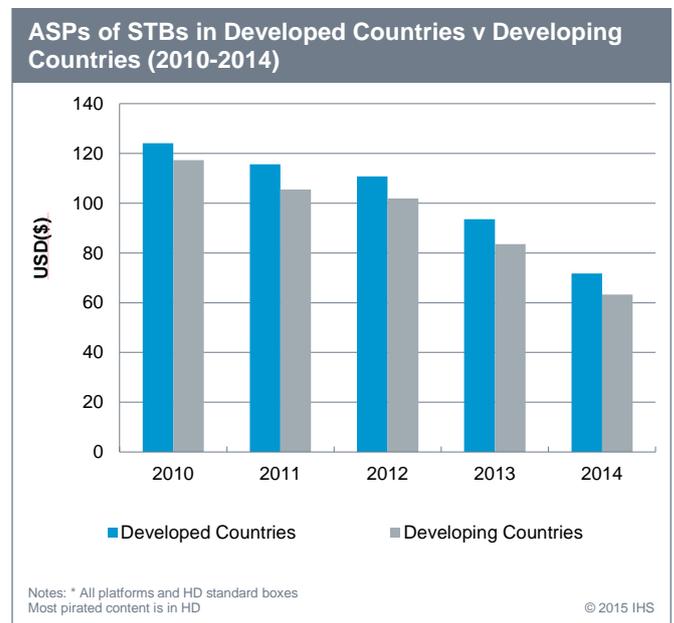


The decrease in the average price of set-top boxes across platforms over the years has been the result of price competition and saturation in the pay TV market. While, price erosion has undoubtedly meant pirates can procure an access point to pirating content at a lower price, it does not remain the sole factor contributing to piracy.

There is no definitive correlation between the rate of piracy based on the price of STBs in developed or developing countries, however, the STB market does have a large proportion of cheap STBs, made in developing markets such as China and India, where component and manufacturing costs are low. While these boxes were mainly used in developing markets, they are now also being sold across the globe in developed markets, a possible result of the increasing price of pay TV. These cheap boxes are sufficient enough in terms of hardware to be repurposed for pirating content by pirates. The majority of these STBs are built on open source standards to maximise device compatibility and because they are cheaper to implement than proprietary standards. This makes them not necessarily more vulnerable to hacking but the lack of control makes them more subject to manipulation when compared with expensive STBs and their sophisticated content security systems.



Most significantly is that some cheap boxes are now also connectable, in order to leverage the open-source standards and access to apps. Connectable boxes could be considered the more substantial factor on piracy, prices of connectable boxes in developing markets is considerably less compared to developed, and now 53% of STBs* shipped globally in 2014 are now connectable.



Satellite STBs have historically been cheaper compared to other platforms because of its transmission method. Although the low price of a satellite box can be an incentive for pirates, it is mostly the one way nature of satellite transmission, which has made it attractive to pirates. Unlike other platforms, satellite has no physical infrastructure to enter like cable or IPTV. The “break once run everything” scenario of satellite and the ability to access a wide

variety of premium content has resulted in satellite being more likely to be hacked.

Control Word Sharing

Control word sharing is a way of allowing multiple clients to access encrypted content with one set of decryption keys, also known as control words (CW). In a typical use case a legitimate receiver is equipped with software which allows it to share the control word over the internet to pirate set top boxes (STB), this allows them to access the content as if they had their own subscription. In addition, control word sharing also allows for the retransmission of content itself.

Part of the popularity of control word sharing is that the control word for DVB-based services is only 64-bits long and shared across all legitimate subscribers of a service. The short length of the key makes sharing this across public and private groups a trivial affair. STB manufacturers offering internet-connected STBs with software that manages the internet-delivered control words have boosted control word sharing. Control word sharing occurs in both commercial and non-commercial areas.

Control word sharing is largely a problem for satellite operators for a number of reasons. The large geographic reach of satellite transmissions makes signals available to people with no legal means of paying for decryption. Satellite broadcasts also contain large numbers of channels increasing the pay-off from decrypting the signals. The one-way nature of the transmission makes it difficult for broadcasters to monitor control word sharing.

Broadcasters can frustrate users of these systems by increasing the frequency of control word changes, up to every few seconds. The extra stress this places upon the control word sharing system can disrupt it causing frequent missed viewing periods.

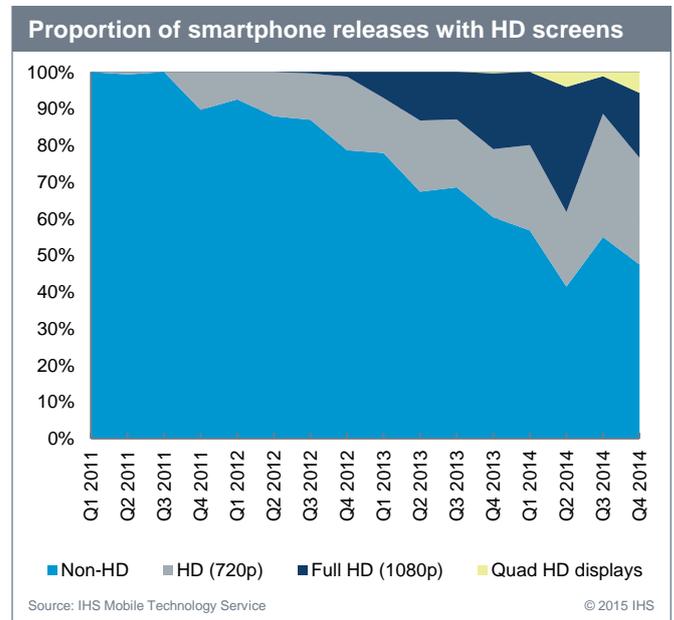
Smart Card cloning

Cloned smart cards are copies of a legitimate smart card, which are then distributed to enable users of the pirated smart card to gain unauthorized access to broadcast signals. Pirated smart cards contain all the encryption coding present on the original card, and makes the STB believe that it is reading a legitimate card.

Broadcasters operate a 4-5 year replacement cycle for smart cards used for conditional access, in part to limit the impact of cloned cards and the inherent shortage in permutations of encryption keys.

Mobile Video piracy

The growth in smartphone application stores can also enable access to new forms of content piracy. This is particularly the case on Android devices as unlike Apple’s more tightly controlled content and device ecosystem, Android is more open. Android device users can choose to download content from any source and so efforts to prevent content piracy are limited. Google and other application store owners can try to limit any illegitimate content from being distributed via their stores, but they still distribute mobile applications that provide tools such as torrents to download, stream, and view pirated video content. The advances in mobile technology in terms of network bandwidth, content distribution, and device size and quality are driving demand for video content and making access to pirated content easier.



Mobile devices and applications can also enable different forms for piracy including:

- **Screen recording and sharing:** Some smartphones from leading manufacturers provide built in screen recording functionality which can be

used to capture and then share copyrighted material.

- **Live broadcasting apps:** These include recently launched apps from Periscope and Meerkat as well as some built in live streaming apps which enable users to broadcast video content directly from their mobile devices over mobile and Wi-Fi networks. This could be used to stream copyrighted live broadcast content from other devices.

Limits on data plans and mobile network quality, however mean that most piracy is likely to take place on Wi-Fi rather than cellular networks. In this context, beyond using mobile apps as a way to access sites that provide pirated content, the nature of most mobile video piracy is similar to online video discussed above.

Physical Piracy

Physical piracy involves the unauthorised copying of physical media, usually for commercial reasons. The introduction of optical disks and the low prices for recordable media make the process cheap. Physical piracy is typically more prevalent now in markets where broadband infrastructure is less well developed.

Successful combating of piracy: case studies

As broadcasters have looked towards monetising their TV everywhere platforms they are placing greater emphasis on combating piracy. The largest satellite operators are enlisting the support of conditional access vendors to use automated anti-piracy solutions.

Large sporting events are magnets for pirate activity due to the high interest and that the broadcast rights are often sold to paid channels.

OSN – ICC Cricket World Cup

OSN, the largest pay TV provider in the Middle East and North Africa worked with Viaccess-Orca to prevent unauthorised streaming of the 2015 ICC Cricket World Cup. Viaccess-Orca activity monitored live video re-streaming, determining where piracy is taking place, the amount of piracy occurring, and who is watching the re-broadcasts. OSN was then able to send cease and desist orders to pirates, alongside deploying real-time technical measures to disrupt streaming. Additionally, Viaccess-Orca gathered evidence to present to law enforcement and government agencies. Viaccess-Orca estimated that throughout the tournament it eliminated 60% of the streaming link and interrupted the illegal viewing for 50% of the audience.

Irdeto – FIFA World Cup

The 2014 FIFA World Cup was subject to strong pirate activity. Irdeto disrupted 3,700 throughout the

tournament. European broadcasters were the main targets, accounting for 27% of streams it detected, followed by North American streams. Irdeto's work highlights the multi-national aspect of piracy: the most pirated match was the semi-final between Argentina and the Netherlands, but a North America channel was the most featured channel in the unauthorised streams.

Future of broadcasting technology

There are several technologies that may have a significant impact in the future capabilities of broadcast. As for every transmission system there is a balance between the amount of information being transmitted and the technology used do so efficiently.

Video distribution is under pressure – regardless of consumer demand and how that video is delivered – by the drive towards higher quality video. The technical notion of higher video quality is easy to qualify: higher resolution, more frames and better colours are the key variables. However, quantifying to what degree these technologies are appreciated and therefore demanded by the average consumer is harder. Many tests suggest that resolution increases beyond 4K will simply not have in-home applications, while frame rates and greater colour space and detail has more obvious benefits but doesn't have the track record when it comes to selling to consumers. High Dynamic Range (HDR) is the current industry focus – a colour based technology – along with 4K/UHD which is primarily a resolution increase in its initial rollout but is planned to include upgrades in frame rate and colour.

The other side of the equation is the cost of transmission. This has two variables: the availability of a network or spectrum to deliver, and technologies to improve the efficiency of delivery over a given network. Network or spectrum availability is not entirely a technology issue. The construction of new internet pipes, more transmitter towers, or the launch of new satellites is rooted in commercial decision making guided by regulation. Likewise any reallocation of limited public resources, such as spectrum (for terrestrial, mobile or satellite use) is primarily regulatory with strong commercial guidance.

Demand for information transmission has generally increased year on year, the available capacity for all major platforms, be it for the internet or for video delivery. The most consistent trends are towards the reallocation of spectrum previously used for broadcast TV in either terrestrial or satellite to uses in mobile data. Elsewhere the bulk of investment has come in mobile data infrastructure and internet connectivity, including public Wi-Fi.

While network infrastructure changes and evolves, technologies are also developed to more efficiently utilise those networks. The three key technology considerations are how traffic is structured; how the network transmits traffic; and how that traffic is compressed or encapsulated for delivery.

The efficient use of any network is initially based on whether the network structure is appropriate for its use. Networks can be used to transmit signals either in one direction to the receiver, or bi-directionally to enable information back into the network. Broadcast networks

are one direction only and this makes them very efficient delivering traffic to many people concurrently. A single signal can be sent out in a particular frequency, and all anyone has to do to receive it is tune into that frequency. This means a TV channel can be delivered to many millions of receivers by only being transmitted once, and therefore only taking up a small amount of available network and spectrum.

At the other end of the scale is a unicast network, typified by internet access. These are bi-directional networks where the user is able to make requests of the network, and the network then retrieves and delivers requested content to that user only. Unicast is a highly effective way to provision personalised and reactive services to a small number of concurrent users. The downside is that it is a very inefficient way to deliver the same content to many people in the same area at about the same time.

To provide a sense of scale, while around half of available internet traffic is used to stream video it only accounts for about 5% of viewing time. The extension to this is that current levels of video consumption cannot be distributed by the internet and won't be for several years. However, content that is not viewed by many people (much of what is available on YouTube or Netflix) is more efficiently served by just allocating the cost of distribution upon request. Content that has mass, concurrent or new concurrent audiences, such as live sports, news channels and core broadcast channels are viewed by so many people that they are more efficiently delivered as mass broadcast, which can be redelivered to other devices using in-home hard disk and Wi-Fi. A final key point is that there is technology for utilising internet networks for broadcast delivery called multicast IP. However, much like any network it requires new transmission infrastructure and fits in and around the wider, unicast internet infrastructure already in place.

Any structure of network then requires some means of transmitting content over it. Part of this decision is predetermined by the network type – satellite, fibre, copper wires and terrestrial spectrum all have particular mechanisms that allow for information to be delivered over the network type. On top of these are layers that describe the efficiencies of that distribution, often in terms of how many different signals – or sets of 1s and 0s – can be simultaneously sent and how to reconstruct at the other end. Semiconductor technology as well as more efficient delivery media (in particular light rather than electrons in the case of fibre) have enabled more information to move concurrently than previously. This has been driven primarily by digital technology, the means of sending data in discrete packets of 1s or 0s rather than along an analogue waveform. Digitisation requests technologies to ensure that each packet is properly represented – a 1 misrepresented as a 0 is very

different to an areas with a slightly off-shade of blue. In general though, digitisation of all content has unified the delivery platforms such that everything, from the internet to video, is essentially just data. Future technologies will see this technical unification married with a more fluent interchange between different platforms, such that a satellite TV image can easily interface with internet content delivered over mobile, for example.

In a longer view this will include switching transmission mechanisms from one delivery platform to another based on current need and how efficient the delivery is. This could include switching users from unicast to broadcast or multicast or from fibre to satellite without the viewer being aware, or embedding broadcast video into websites or web content into broadcast streams. This could result in advanced personalisation of content and advertising unifying the current silos of internet and TV.

The final technology to determine efficiency of delivery is compression and encapsulation. Compression most typically applies to video because raw, uncompressed video is so high-bandwidth. The live HD feed out of a sports stadium is transmitted at 300 Megabits per second (Mbps). This is the equivalent of 50 broadcast

channels, over 100x the fastest typical online video speed available for any duration of viewing, and there is no way to get that much information to a TV using an HDMI cable. Since video is so data intensive compared to other applications there have been ongoing global efforts to create video compression standards. These take a video and exclude the superfluous information in a systematic manner. The most well-known group of standards are MPEG-2, MPEG-4 (also known as AVC or h.264) and HEVC (h.265), but there are many more in existence. Regardless of network type, network structure or transmission mechanism, compression reduces amount of data, and therefore traffic, required for video delivery while attempting to retain quality.

Current compression mechanisms are able to compress that 300Mbps stream into around 10Mbps with limited reduction in visual quality. However, with more powerful computer processing on more consumer devices the opportunity to further improve upon compression is still available. Advanced computing happens to coincide with an important regulatory moment as many of the original digital video compression patents created for MPEG-2 in the 1990s are now expiring. Already new compression standards are being created taking advantage of this, meaning future video efficiency improvements are coming.

Delays in the Digital Transition in developing countries

The transition of terrestrial TV broadcasting from analogue to exclusively digital is a major technological feat. Furthermore, the transition can have a considerable impact on the cultural and political landscape of a country since digitization brings a multitude of free to air channels, allowing more access to content for consumers via the television medium as well as providing more opportunities for broadcasters to grow their offerings. Digital transition is a multidimensional task requiring decisions to be made on a great number of political, social, economic and technological issues.

The International Telecommunications Union (ITU) set a deadline for the implementation of analogue to digital switchover by its member-states of 17 June 2015. ITU stated that this transition period can be extended up five years only for the benefit of some developing countries. So far all developed countries (with the exception of Russia) have managed to shut off analogue terrestrial TV signals well before the deadline. The vast majority of developing countries, on the other hand, in Sub-Saharan Africa, Asia Pacific, South and Central America and the Middle East and North Africa are likely to miss the first deadline. Some of the reasons for the delay in implementing the switchover are discussed in the following paragraphs.

For broadcasters, network operators and consumer electronics manufacturers, addressing the requirements of digital transition is a costly enterprise. However, the viewer also bears a considerable part of the cost through the purchase of new equipment (a DTT set-top box, sometimes a new TV aerial) or through installation costs. The costs involved with digital transition are not insurmountable for a TV viewer living in a developed country, but they may constitute a significant portion of the disposable income of a family living in a developing country. For instance, the South African government has calculated that roughly 40% of the country's population cannot afford the purchase of a DTT set-top box.

Another factor impeding the fast roll-out of the switchover relates to labour resources. For instance, many Sub-Saharan African countries do not possess sufficient numbers of trained technical personnel like electronic engineers, DTT network technicians, or TV aerial installers needed to drive the DTT uptake. Some governments in developing countries lack the funds to

promote this, which in some cases has led to the outsourcing of DTT network roll-outs to foreign companies like the China-based StarTimes.

Implementing the switchover also requires the coordination of many parties, from government departments and regulatory agencies to broadcasters, network operators, consumer electronics manufacturers and even social institutions and charities. Developed countries had successfully managed this by creating specific purpose bodies, which allow for a smoother transition process, such as Digital UK in the United Kingdom. Most developing countries have not created similar bodies or organizations, which further slows the digital transition process.

Another delaying factor is the selection of a digital transmission broadcasting standard. Some developing countries were faced with a choice between the European (DVB-T) and the Japanese (ISDB-T) standards, especially taking into account the offers made by both parties. A prime example is South Africa, which initially favoured the adoption of the European DVB-T. However, in 2010 political favour turned to the Japanese standard; before the country decided adopt the newest European standard (DVB-T2) in 2011, after a cabinet re-shuffle and the removal of the former Minister of Communications.

Low TV household penetration of a terrestrial platform can also lead to a delay in digitisation. For example, in the Middle East and North Africa more than 90% of the TV households rely on the satellite platform, while in Asia-Pacific the primary penetration of cable and satellite TV is four to five times that of terrestrial. As a consequence, governments in these regions consider digital transition as a less urgent priority since a small minority of TV households will be affected. In addition, if a neighbouring country delays digital transition, a government's incentive to shut off analogue terrestrial TV may decrease, due to the reduced risk of interference between analogue transmissions of one country and digital transmissions of a neighbouring country. This has occurred in Sub-Saharan Africa, for instance.

In many developing countries broadcasters do not have the financial resources to support the switch to digital, and are placing pressure on governments to

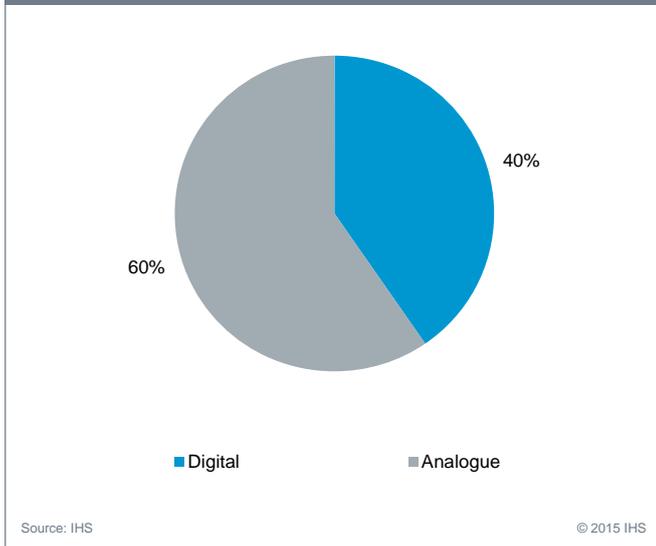
delay the whole process. Governments however may seek to promote domestic production of DTT TV equipment via blocking imported receivers, raising import duty taxes or requiring domestic-only production of equipment. This policy results in further delays to the switchover process if the local manufacturing industry does not have the necessary resources to start producing the equipment.

In the case studies that follow we will examine some of these issues in greater depth.

Market overviews and case studies

Sub-Saharan Africa

In Sub-Saharan Africa less than half of TV Homes have Digital TV



Sub-Saharan Africa is lagging behind other regions in the level of digitization of television distribution technologies. At the end of 2014 only 21m homes had a digital TV set, representing 40% of the total number TV Households in the region. Sub-Saharan Africa is the only region where the level of digitization of the television distribution technologies is below 50%.

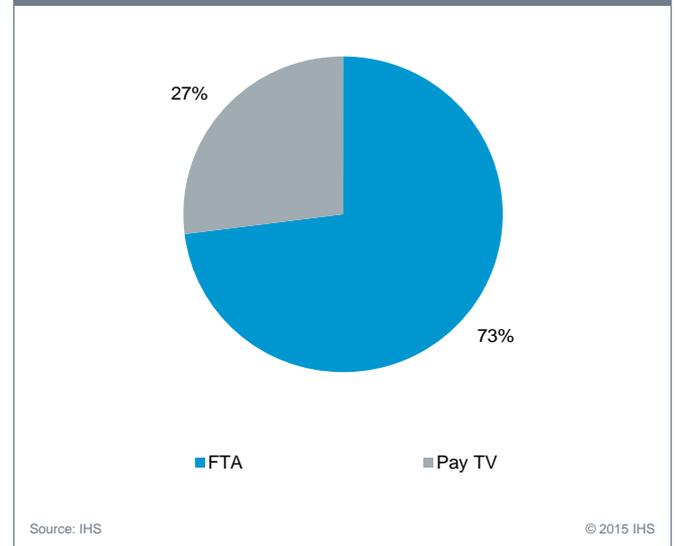
Sub-Saharan Africa is primarily covered by two TV platforms: satellite, both free and pay, alongside terrestrial. Cable TV and IPTV networks represent less than 1% of the total TV distribution market. The satellite platform has been digitized in the past ten years and is now 100% digital. Terrestrial TV is predominantly analogue: of the 34.5 million households relying primarily on terrestrial TV, only 10% have switched to digital terrestrial reception.

The transition from analogue to digital terrestrial TV (DTT) distribution is moving at a slow pace in the region. According to reports by ITU and pay TV operator Naspers, only 12 countries in Sub-Saharan Africa had launched DTT services by end 2014. Furthermore, only Rwanda and Mauritius have completed the transition to DTT, while Tanzania plans to switch off its analogue signal in June 2015. The vast majority of Sub-Saharan Africa countries will not meet the 17 June 2015 deadline for shutting off analogue terrestrial TV signal, set at the 2006 ITU Geneva Conference. We expect that the ITU will extend the deadline for switchover to 2020 for Sub-Saharan African countries.

The reasons why Digital Migration stalled in Sub-Saharan Africa are manifold: inadequate planning, indecision in selecting of the appropriate digital

broadcasting standards, lack of financial resources, and reluctance from consumers to commit to purchasing the necessary equipment, and disagreements between governments and broadcasters on how to fund the simulcasting period.

1 in 4 TV Homes subscribe to Pay TV in Sub-Saharan Africa



For many households in Sub-Saharan Africa a TV set is a luxury that they cannot afford, only 40% of households have a TV. According to UNESCO radio is the primary source for information and news. Another driver behind the low penetration of television is the lack of investment in rural TV coverage by governments. As a result Sub-Saharan African countries have the lowest number of TV sets per household.

Sub-Saharan Africa is predominantly a free-to-air (FTA) market. As of end-2014 only 27% of TV households subscribe to pay TV services. We attribute this to low household disposable income alongside the high level of unauthorized access to TV content. Satellite is the dominant pay TV platform in Sub-Saharan Africa with 11 million pay TV subscriptions in the region, accounting for around 78% of total pay TV subscriptions.

Pay DTT is growing fast in Sub-Saharan Africa. Pay DTT is cheaper than pay satellite TV, which is increasing the appeal of pay DTT to the growing middle classes. Two operators dominate the pay DTT market in Sub-Saharan Africa: Naspers and StarTimes. Both operators have agreements with African governments to act as sub-licensees for rolling-out DTT networks, but which also allows them to launch pay DTT services. This approach serves the interests of the governments in that they lack the financial resources to launch DTT networks themselves, and the operators through their pay TV platforms. The operators have substantially benefitted from this with StarTimes attracting 2.1 million subscribers by end-2014 and

while Naspers' GOtv service recorded 900,000 customers at the end of 2014.

Case Study – South Africa

South Africa Key facts – 2014

- **Population:** 50.8 million
- **Households:** 15.1 million
- **TV Households:** 12.0 million
- **Pay TV Penetration:** 47%
- **Broadband Penetration:** 23%
- **Mobile Penetration:** 137%
- **TV Ad Revenue:** €601 million

South Africa- platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	5,573	9
Satellite	5,581	849	100
Cable	0	0	0
IPTV	0	0	100
Total	5,581	6,422	58

Source: IHS

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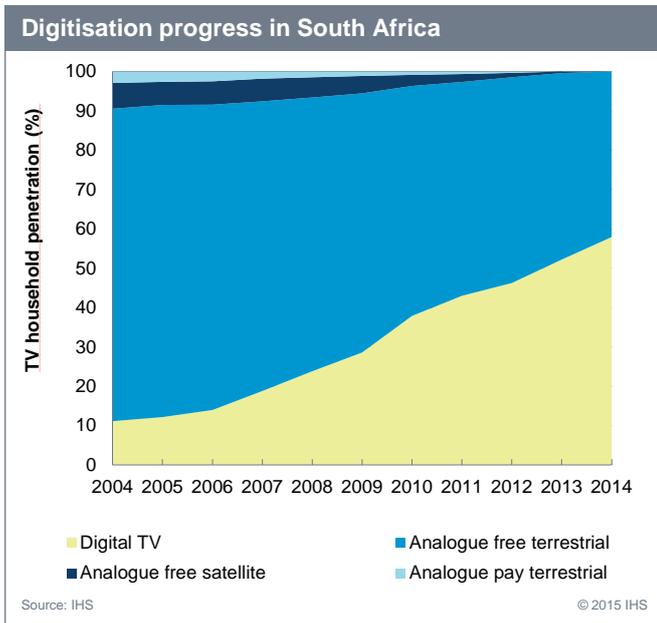
South Africa has the highest penetration of TV sets across Sub-Saharan Africa, at 79.5% at end-2014. South Africa has a high take up of pay TV services with 47% of TV households subscribing to a pay TV service. The only active platforms for TV distribution in South Africa are terrestrial and satellite. South Africa's terrestrial TV platform is predominantly analogue. State-owned Sentech has launched pilot DTT services, with a national launch planned for 2015. To support this Sentech has deployed its DTT network to 84.2% of the population.

The Digital Migration process has stalled in South Africa and it will miss the 17 June 2015 deadline for shutting off all analogue terrestrial broadcasting. The main reason behind the delay in implementing the digital switchover has been mismanagement by the government. Initially, the government was indecisive about which digital broadcasting standard to implement with successive Ministers of Communications split between supporting DVB-Tx and ISDB-T. Following the adoption of DVB-T2, the government deliberated over the issue of integrating an encryption module into the DTT set-top boxes. Additionally, the government had to withdraw its promise to subsidise the purchase of DTT set-top boxes for 5.5 million low-income households, due to lack of the funding. The Government has not

officially disclosed the final deadline for terrestrial switchover.

Satellite is the only pay TV platform in South Africa. There are 5.6 million satellite TV subscribers in South Africa, with a further 800,000 households capable of receiving satellite TV broadcasts. There are two satellite operators active in South Africa, StarTimes and Naspers. Naspers through its DStv service dominates the market with 96% market share.

South Africa's media regulator, ICASA, granted provisional pay TV licences to five companies in April 2014. Of these, Siyaya TV has been granted a full licence to provide pay TV services over satellite.



Two broadcasters dominate the FTA television market: the public service broadcaster SABC and the commercial E.tv. SABC broadcasts three channels: SABC 1, SABC 2 and SABC 3. All are general entertainment channels broadcasting in English as well as in other official languages of the country (Afrikaans, Zulu, Xhosa, Sotho, Tswana). E.tv broadcasts two channels for free: the e.tv channel, which is a general entertainment channel and is frequently on the top of TV ratings in South Africa, and the all-news channel eNCA. E.tv has also created a number of thematic channels which are available only through the pay satellite platform.

Case Study – Nigeria

Nigeria Key facts – 2014

- **Population:** 178.5 million
- **Households:** 35.2 million
- **TV Households:** 15.9 million
- **Pay TV Penetration:** 23%
- **Broadband Penetration:** 0.1%
- **Mobile Penetration:** 78%
- **TV Ad Revenue:** €220 million

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	2,612	2,466	52
Satellite	960	9,858	100
Cable	0	0	0
IPTV	0	0	0
Total	3,572	12,324	85

Source: IHS © 2015 IHS

Nigeria is the most populous country in Sub-Saharan Africa and has the highest number of TV households. However, less than half of the nation's households are equipped with a TV set (around 45%) due to low average wages and relatively high cost. More than three out of four TV households in Nigeria, watch FTA TV while around 3.6 million subscribe to at least one pay TV service. Satellite is the main method used for receiving TV with 10.9 million households on both pay and free TV platforms, followed by terrestrial (analogue and digital) with 5.1 million

Digital television is still transitioning from analogue with half of the households having made the transition by 2014. Due to the lack of funds the Nigerian Government decided to "outsource" the roll-out of DTT networks. In 2010 the Public Service Broadcaster NTA formed a joint company with the Chinese pay TV operator StarTimes called NTA StarTimes. This offers a pay DTT service while rolling out the national DTT network to cover the 25 largest Nigerian cities. The shares in the company are split as follows: 70% StarTimes and 30% NTA. StarTimes is paying a fee to the Nigerian Regulator for every Nigerian city that the pay DTT service is expanding to. At the end of 2014 the Chinese company had over 2 million DTT

subscribers in Nigeria, making StarTimes the biggest pay TV operator in the country. The only other operator who offers a pay DTT service is Naspers, with its GOtv service. The analogue shut-off date has been postponed at least twice (from June 2012 to January 2015, then June 2015) and it is highly unlikely that Nigeria will have fully implemented the switchover by June 2015.

The satellite platform was fully digitized in the mid-2000s and is the main FTA platform in Nigeria attracting almost two thirds of the households pay TV services are also offered on satellite, attracting 960,000 subscribers at the end of 2014. The large bulk of satellite customers subscribe to the Naspers owned service DStv), followed by MyTV Africa and newcomer CONSAT, which launched in June 2014.

For free-to-air TV more than 70 commercial channels are broadcast, however the majority of them do not have national coverage. Advertising revenues are often inadequate to fund these channels and so some are funded by entrepreneurs, politicians, religious bodies or the armed forces. It is common for channels to have short lifespans.

The Nigerian Television Authority (NTA), formerly known as Nigerian Television, is the public service broadcaster of the country. It operates more than 31 TV stations across all the regions of Nigeria. The majority of its channels broadcast general entertainment content, while a few are thematic channels focusing on news and sports. The largest commercial FTA networks in Nigeria are Galaxy TV (the first broadcaster in the country), Africa Independent Television (AIT) and Silverbird. The commercial broadcasters' networks cover only some regions of Nigeria and not the whole country.

Case Study – Senegal

Senegal Key facts – 2014

- **Population:** 13.2 million
- **Households:** 1.7 million
- **TV Households:** 1.3 million
- **Pay TV Penetration:** 6%
- **Broadband Penetration:** 3%
- **Mobile Penetration:** 97%

Senegal - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	1,035	0
Satellite	63	52	0
Cable	0	0	0
IPTV	0	0	0
Total	63	1,087	0

Source: IHS

© 2015 IHS

The first FTA broadcaster in Senegal was the public service broadcaster, Radio Television Senegalaise (RTS). RTS operates two channels (RTS1 and RTS2) which are general entertainment channels and cover the whole country. Commercial broadcasters (such as 2Stv, SN2, WALF TV, TOUBA TV, SENTV) have been present in the country since 2001, when the government liberalized the regulatory environment. However, these TV services are available only in the capital Dakar and a few major cities.

61% of households in Senegal have a TV set, which is well above the average for Sub-Saharan Africa. The two major TV distribution platforms in the country are analogue terrestrial and digital satellite. Cable TV networks have been rolled-out in Dakar and a handful of other cities for redistributing satellite channels. There are no pay TV operators on the cable TV platform in Senegal. Instead there a number of small local cable providers. The cable service is regulated as a utility in Senegal. Around 10% of TV households used satellite. The satellite platform has been fully digitalized.

There are two pay satellite operators in the country: Excaf and Canal+ Horizons. Canal+ Horizons is a satellite service owned by Canal Plus Group which launched in Sub-Saharan Africa in 2001. The service offers premium content such as sports and African movies. However, it has suffered heavily from piracy

due to distribution of illegal decoders and cards by local dealers. Multiplatform operator, Excaf, offers the other satellite pay TV service. Excaf is trying to enlarge its customer base by focusing more on the provision of local content including movies, music, TV shows and the matches of the national football team of Senegal.

Senegal is in the early process of transitioning from analogue terrestrial to exclusively digital broadcasting. It is unlikely that the country will meet its June 2015 deadline. Senegal tried to follow the French system by assigning DTT licences to the content operators, rather than network operators. This system has led to delays as the country lacked the necessary financial resources to fund the roll-out of the DTT network. Furthermore, the Senegalese government had decided to subsidize 50% of the price of DTT set-top boxes, further complicating the funding issue.

In 2014 in an effort to speed up digitisation of the terrestrial platform the government outsourced the rolling-out of the DTT network to Excaf. The DTT platform in Senegal, according to the government plans, will comprise 4 multiplexes and will offer up to 60 channels, of which Excaf has the right to use 2 of the 4 multiplexes for launching pay services on the DTT platform.

Case Study – Kenya

Kenya Key facts – 2014

- **Population:** 45.0 million
- **Households:** 11.2 million
- **TV Households:** 3.5 million
- **Pay TV Penetration:** 16%
- **Broadband Penetration:** 1%
- **Mobile Penetration:** 69%
- **TV Ad Revenue:** €71 million

Kenya - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	275	2,725	34
Satellite	295	205	100
Cable	0	0	0
IPTV	0	0	0
Total	570	2,930	43

Source: IHS

© 2015 IHS

The FTA TV market in Kenya is dominated by the channels offered by the three largest media groups in the country: Standard Media Group, Royal Media Services and Nation Media Group. As well as owning newspapers and radio stations, Nation Media Group runs one TV channel, NTV. Standard Media Group offers a popular general entertainment channel, KTN, while Royal Media Services broadcasts another popular general entertainment channel, Citizen TV. The public service broadcaster of Kenya, Kenya Broadcasting Corporation (KBC) broadcasts two channels – the general entertainment channel KBC 1 and the culture-led Heritage TV. The KBC channels broadcast in English and Swahili while some of their programmes are also broadcasted in the other Kenyan local languages.

With more than 45 million people, Kenya had at the end of 2014 more than 11 million households but only one in three (32%) was equipped with at least one TV set. For many Kenyan homes, as indeed is the case for many homes in Sub-Saharan Africa, the possession of a TV set is a luxury.

As in the rest of Sub-Saharan Africa the majority of TV households in Kenya are still receiving analogue signals, mainly from the terrestrial platform. However,

in Kenya the digitization of television progressed with a slightly faster pace than in the rest of the continent. At the end of 2014, around 1.5 million homes or 43% of the total number of TV households in the country were receiving digital TV. It is marginally higher than the average for the whole of Sub-Saharan Africa which stood at 40% in 2014.

Kenya completed the digital transition in April 2015. . The first DTT signal was launched in the capital city, Nairobi, on 09 December 2009.. At the time of launch, the decision was taken to split the DTT network roll-out process. The government funded the Public Service Broadcaster, KBC, to roll-out a network and to carry its own channels (through its transmission technology offspring – Signet). However, the construction of the DTT network for commercial broadcasters was outsourced to a foreign company - the Chinese Pan Africa Networks Group (a sister company of pay TV operator StarTimes). As a method of compensation the Chinese network operator was licensed to launch a pay service in the DTT platform. At the end of 2014, the capital city of Nairobi shut off all analogue terrestrial signals.

Satellite is the second largest TV distribution platform in Kenya after terrestrial (analogue and digital). It is estimated that more than 500,000 TV households relied primarily on satellite for receiving their TV signal at the end of 2014. Satellite is offering FTA and pay content. At the end of 2014 there were three satellite pay TV operators in Kenya: DStv (owned by the South African Naspers Group), Zuku (owned by Wanachi Group – an East African Media & Telecoms business group) and StarSat (the satellite service of StarTimes launched in October 2014).

Asia Pacific

The Asia-Pacific (APAC) region is home to more than half (50.2%) of the world's TV households. The vast number of TV homes in China (430 million), India (169 million), Indonesia (64 million) and Japan (52 million) means developments within the APAC TV markets are likely to affect the global TV sector.

Cable, IPTV, satellite, and terrestrial technologies are all present in APAC, some of which are still in analogue form. The largest TV platform is cable. Over 360 million TV households (or 50.4% of TV homes in the region) by the end of 2014 rely on cable for their primary reception of a television signal. The digitization of cable TV has progressed while the rate of digitization has increased roughly one out of seven cable households is analogue. Governments in the region expect total digitization of the cable TV platform before end-2020

Japan has fully digitized its cable TV network while in China the digitization at the end of 2014 has reached 80% of cable TV homes. In India, the Ministry of Information and Broadcasting is implementing a four-phase strategic plan for the total digitization of the cable TV platform. In phase one, the digitization of the networks covering the four largest metropolitan areas of the country (Mumbai, Delhi, Kolkata and Chennai) was successfully completed by December 2013. In phase two, the digital conversion of the networks in 38 large urban areas was successfully completed by December 2014. After the first two phases, around 30% of cable TV homes had been converted to digital. Phases 3 and 4 will be complete by the end of 2016 according to the MIB plan. It will be a big challenge to meet this deadline as these phases comprise the conversion of smaller urban and rural networks across India.

Satellite is the primary method of reception for 224 million TV households. The platform is 100% digital. One-third of satellite TV homes (66 million) subscribe to a pay TV offer. More than 800 FTA channels are broadcast via satellite in China, while a similar number of FTA channels broadcast via satellite in India. A substantial challenge for the pay TV satellite operators will be to lure analogue cable subscribers to upgrade to their services. In more mature television markets pay satellite has benefited from the digitization of the terrestrial and cable platforms, we expect a similar trend in the APAC countries.

The terrestrial platform is the third largest in the APAC region. At the end of 2014, 85 million TV households relied exclusively on terrestrial reception. Three-quarters of these terrestrial households (63 million) still receive an analogue terrestrial TV signal, while the remaining 22 million are digital terrestrial television (DTT) households. The digitization of the terrestrial TV platform in the APAC region has progressed with an unequal rhythm across the region. Countries such as Japan, South Korea, Australia, New Zealand and

Taiwan have already completed the analogue to digital switchover, while the vast majority of other APAC countries are not expected to complete the switchover before 2020.

Japan planned to shut off all analogue terrestrial TV stations by July 2011 but the Fukushima earthquake resulted in an extension of the deadline up to March 2012 when the transition was successfully completed. Shortly after the earthquake,

Although the digitization of the terrestrial platform was a priority for Australia, Japan, New Zealand, South Korea and Taiwan, this has not been the case for other APAC countries including China, India and Indonesia. The Indian government's priority is to digitize the cable platform, leaving the terrestrial platform in analogue mode at least until the end-2018.

For many Asian governments, the most delicate issue in the implementation stage of the Digital Transition is finding the necessary financial resources for subsidizing the purchase of DTT receivers by the viewers. Some countries have chosen to offer support for low-income households in the form of subsidizing the purchase and installation of an antenna and DTT set-top box:

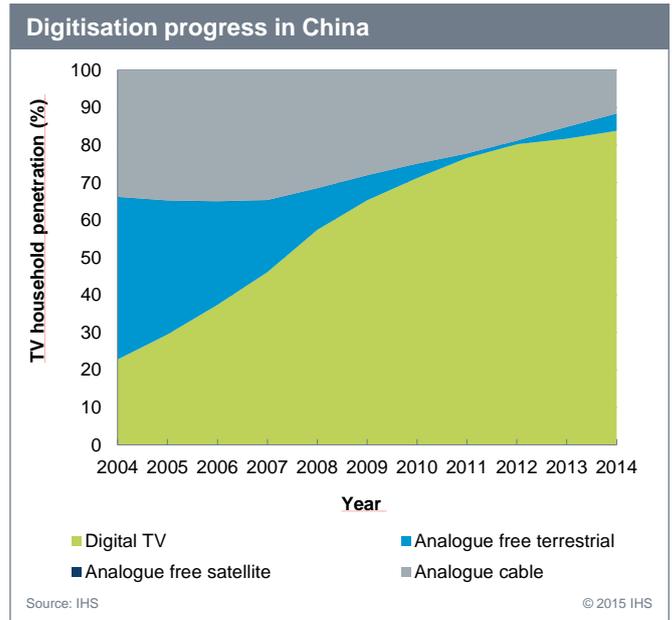
- **Malaysia** and **Vietnam** plan to subsidise DTT receivers to around 2 million low-income homes
- **Singapore** will support around 160,000 households.
- **Thailand** will issue coupons for the purchase of a DTT set-top box to each one of the country's 22 million households. Each coupon is worth \$22 and the total cost of the programme has been estimated to be around \$495 million. However, by the end of 2014 only 3 million coupons have been used.

IPTV is the fourth largest TV platform in APAC. At the end of 2014 around 48 million households were subscribing to an IPTV service. This figure represents 6.67% of total pay TV homes. Other APAC countries with IPTV networks are Taiwan, Singapore, Malaysia, India, Indonesia and Thailand. Part of the success of the IPTV platform in the region is due to the migration of analogue cable subscribers to IPTV.

Case Study – China

China Key facts – 2014

- **Population:** 1.37 billion
- **Households:** 483.0 million
- **TV Households:** 430 million
- **Pay TV Penetration:** 63%
- **Broadband Penetration:** 45%
- **Mobile Penetration:** 94%
- **TV Ad revenue:** €26.5 billion



	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	24,814	20
Satellite	0	136,500	100
Cable	234,000	0	79
IPTV	34,400	0	100
Total	268,400	161,314	84

Source: IHS © 2015 IHS

China accounts for one third of the world’s total TV households. Chinese viewers have access to a large number of TV stations; over 2,780 were in operation at the end of 2014.

From the early 1980s, the provision of television to every Chinese household became a priority for the government and, as a result of targeted funding by state bodies and banks the progress of the TV network roll-out was fast: by 1985 more than two-thirds of the population had access to TV. The 1990s saw the introduction of satellite and the first foray into pay TV.

Digitization of the TV distribution platforms has progressed substantially. Nearly 85% of the country’s TV households were receiving digital TV broadcasts by the end of 2014. This is largely due to the swift digitization of the cable TV platform as over 80% of cable TV households were digital at the end of 2014. The digitization of the terrestrial platform, the only other TV distribution platform apart from cable which is still broadcasting an analogue signal, is progressing with a slower pace. The current target for analogue switch-off in China is 2018.

The public service broadcaster of China, China Central Television (CCTV), has the largest number of FTA channels offered by a single operator in the country, at 23, of which some are broadcast in foreign languages (English, French, Spanish, Russian and Arabic). The flagship channel of CCTV, CCTV 1, is a general entertainment channel which is almost always at the top of TV ratings listing in the country. Other popular non CCTV-controlled channels in China are channels owned by provincial governments, such as Hunan TV, Jiangsu TV, Zhejiang TV, Beijing TV and Dragon TV (Shanghai).

Cable is the largest TV platform in China - cable households form around 54% of the total number of TV households. Cable TV in China is seen more as a utility rather than as a pay TV service. Each region and major city in China has cable TV provided by a single regional operator, meaning the market as a whole is largely fragmented. Cable networks in China are still largely one-way networks, which limits the growth of interactive and on-demand services that can be offered.

The digitization of cable infrastructure has been rapid, primarily because the government had adopted a “Cable First” strategy, which subsidized the purchase of cable set-top boxes to speed up the digitization process.

Satellite is the second largest TV platform in China. The entire platform is digital with 700 free to air channels. In 2006, the Chinese government founded the China Direct Broadcast Satellite Corporation (CDBST). The main goal of the state-owned satellite company was to create the first satellite operator in China which would plan and launch a number of direct broadcasting satellites for TV broadcasting in the country. The first of these satellites was Chinasat-9 which successfully launched in 2008. In 2014, CDBST

was managing a fleet of seven direct broadcasting satellites of which five are used for TV broadcasting.

Digital terrestrial is not yet fully developed in China. Because the government has prioritized the digitization of the cable platform only a handful of channels, all from the state broadcaster CCTV, are available in the analogue terrestrial platform in rural and remote areas of the country. China has been planning the digital transition since early 2000. It developed its own digital terrestrial broadcasting standard called DTMB in 2004, which became an official DTT standard in 2006. The second part of the digital transition plan saw CCTV embark on converting more than 18,000 transmitter sites (towers) from analogue to digital. By comparison, 1,154 transmitter sites were converted to DTT in the UK. The DTT network is unable to cover 100% of the Chinese population, which has forced the government to devise a plan where around 10% of the population will be served by a satellite service in a similar way to FreeSat in the UK or Tivusat in Italy. China plans to switch off analogue terrestrial broadcasting in 2018.

China's first IPTV services were launched in the country's major cities during the fourth quarter of 2006. Telecom operators offer IPTV as a bundled service which is a key reason as to why China boasts the world's largest IPTV subscriber base.

Case Study – India

India Key facts – 2014

- **Population:** 1.29 billion
- **Households:** 264.9 million
- **TV Households:** 168 million
- **Pay TV Penetration:** 80%
- **Broadband Penetration:** 7%
- **Mobile Penetration:** 74%
- **TV Ad Revenue:** €2.3 billion

India - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	30,458	0
Satellite	50,764	3,120	100
Cable	84,210	0	49
IPTV	203	0	100
Total	135,177	33,578	56

Source: IHS

© 2015 IHS

India has a multi-faceted FTA television market. While the public service broadcaster, Doordashan, offers over 21 channels (broadcasting in 11 different Indian languages) its popularity is confined to the rural and semi-rural areas of the country. The most popular FTA channels are those offered by the three largest Media Groups of India: STAR India (offering 48 channels in eight languages), Zee Entertainment Enterprises (offering 33 channels in eight languages) and Viacom18 Media Pvt Limited (offering 15 channels). The commercial channels primarily offer the three most popular content genres in India: fictional entertainment (mainly Indian and US TV series), Bollywood movies and reality shows.

Nearly 63% of homes in India had a TV set by the end of 2014. For many Indian families living in rural and even semi-rural areas the possession of a TV set is a luxury. Having said this, India is a television powerhouse exporting TV programming to neighbouring countries with large subcontinental diaspora.

The growth of TV accelerated in the 1990s with the deregulation of the broadcasting sector, allowing the launch of non-government controlled channels, and the steady roll-out of cable and satellite TV networks. Pay TV services were introduced around the same time and foreign broadcasters such as Rupert Murdoch’s STAR TV Network, MTV, and BBC gained a foothold in the vast market. More than 2,000 channels are now available in the Indian television market via cable and satellite platforms.

At the end of 2014, 56% of TV households received digital signals. Cable digitisation is scheduled for completion by the end of 2016. The terrestrial platform remains analogue and there is the risk that India might not be able to implement the switchover by the end of the decade. Although India has a high proportion of pay TV customers, many of these homes receive cable TV via illegal transmission. The satellite platform is beset with similar piracy problems, with around 15% of reported satellite subscribers receiving signals illegally.

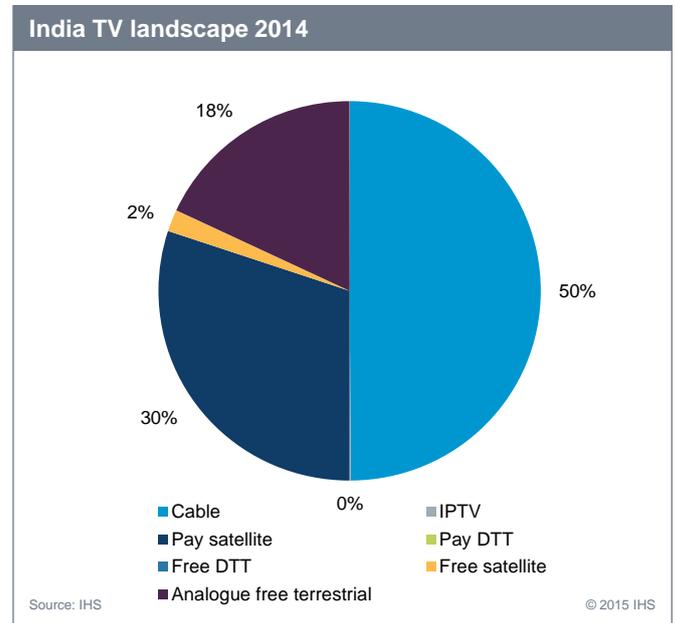
Cable is the largest TV platform in India, serving 50% of TV households in 2014. Digitization of cable infrastructure is a substantial undertaking due to the size and the complexity of the cable market in India. There are more than 60,000 local cable operators and 6,000 operators of multiple cable systems. The Indian government’s main aim in digitising cable is to increase tax revenues by gaining greater accuracy regarding the number of paying cable subscribers.

The government’s plan to digitize cable is split into four phases: Phase 1 focused on the four largest metropolitan areas of India: Mumbai, Delhi, Kolkata and Chennai. Phase 2 targeted cities with a population of greater than 1 million people. Phase 1 and 2 were successfully completed in December 2014. At the end of phase 2, around 30% of cable TV homes were converted to digital. Phases 3 and 4 target the rest of the country and are set for completion by the end of 2016. The largest cable TV operators in India at the end of 2014 were Hathway Datacom DEN Networks and SITI Cable Network

Satellite is the second largest platform in India, accounting for 32% of TV homes at the end of 2014. The satellite platform, which is entirely digital, was the first TV platform in India with foreign broadcasters and operators into the market. The largest satellite pay TV operators at end-2014 were: Dish TV, Tata Sky and Airtel Digital.

The terrestrial platform remains analogue. The prioritisation of cable digitization has delayed the conversion of analogue terrestrial to digital. Only 23 of

630 transmitters had been converted from analogue to digital by the end of 2014. The Indian government has committed to complete the switchover by the end of 2017. The sole broadcaster on the terrestrial platform is state-owned Doordarshan.



Case Study – Japan

Japan Key facts – 2014

- **Population:** 127.1 million
- **Households:** 52.7 million
- **TV Households:** 52.1 million
- **Pay TV Penetration:** 69%
- **Broadband Penetration:** 92%
- **Mobile Penetration:** 122%
- **TV Ad Revenue:** €10.6 billion

At the end of 2014, 26 million homes in Japan were primary cable households. Around 65% of cable TV households incur a small retransmission fee to receive FTA TV broadcasts via cable whilst the remaining 35% subscribe to a traditional pay TV service. Digitization of cable started in the mid-2000s, and 100% of cable subscribers converted to digital by the end of 2012. The largest cable TV network in the country, J:COM, is also the largest pay TV operator. At the end of 2014 J:COM served approximately 4 million customers. The second largest cable network, VIC TOKAI, reported around 400,000 subscribers.

At end-2014, the satellite platform is the second largest in the country with over 15 million households. Around 9 million satellite TV households only watch FTA channels with around 6 million households subscribing to a pay satellite operator's offer at the end of 2014. The largest pay satellite operator is Sky Perfect JSAT with 3.4 million subscribers followed by Wowow with 2.8 million.

The Japanese government planned to switch off its analogue terrestrial signal and move solely to its home-grown ISDB-T standard in July 2011. This was extended to March 2012 in regions most affected by the 2011 Fukushima earthquake. At end-2014, 6.6 million households were receiving DTT on their primary TV set. There is no paid DTT platform.

The largest IPTV operator is NTT Plala with 3 million subscribers at the end of 2014 followed by KDDI with 455,000 subscribers.

Japan - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	6,629	100
Satellite	5,981	9,473	100
Cable	26,323	0	100
IPTV	3,785	0	100
Total	36,089	16,102	100

Source: IHS

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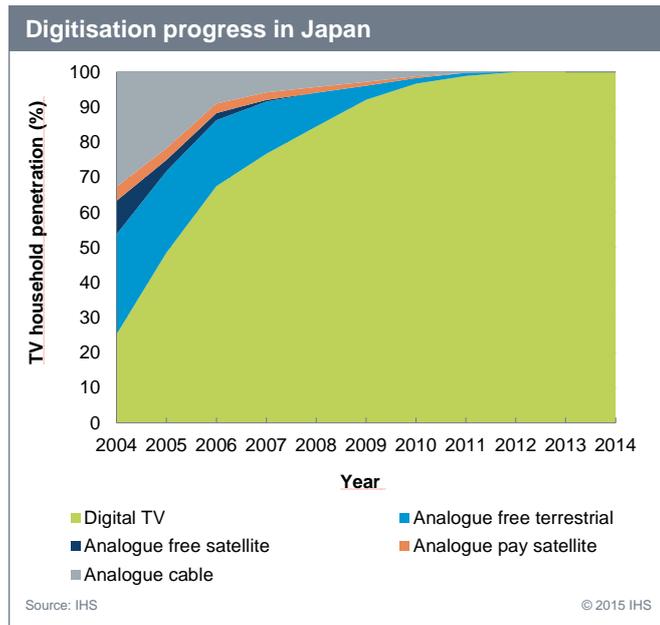
NHK is the public service broadcaster in Japan, broadcasting four channels (two on the terrestrial platform and two via satellite) for the Japanese viewers as well as an international TV service, NHK World. The four domestic NHK channels are three general entertainment channels (NHK General TV, NHK BS-1 & NHK BS-Premium) and one educational channel, NHK Educational TV. The largest commercial FTA TV operators in Japan are TV Asahi Corporation, Fuji Network System, Tokyo Broadcasting System Television, Nippon Television Network Corporation and TX Network. The most popular content genre in Japan is general entertainment.

The TV infrastructure in Japan is digital. The last platform to be converted from analogue to digital was cable in 2014. The satellite platform was converted in 2011 following pay DTH operator Wowow's conversion of its subscriber base in Q2 2011. . Around 69% of Japanese TV households subscribe to a pay TV service while around 16 million homes view FTA TV broadcasts.

Case Study – Australia

Australia Key facts – 2014

- **Population:** 23.7 million
- **Households:** 9.1 million
- **TV Households:** 9.1 million
- **Pay TV Penetration:** 32%
- **Broadband Penetration:** 75%
- **Mobile Penetration:** 131%
- **TV Ad Revenue:** €2.6 billion



Australia - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	6,096	100
Satellite	1,727	111	100
Cable	907	0	100
IPTV	222	0	100
Total	2,856	6,207	100

Source: IHS

© 2015 IHS

The Australian Broadcasting Corporation (ABC) is the country’s public service broadcaster offering five FTA channels (three general entertainment channels, one news channel and one children’s channel). The most popular FTA broadcasters are the commercial TV channels of Seven Network, Nine Network and Network Ten. Seven Network is the most popular channel in Australia receiving the highest ratings over the last three years. Nine Network is also popular among audiences primarily owing to rugby coverage. Finally, Network Ten is the third most popular FTA channel in Australia (ranking ahead of ABC) offering general entertainment content and current-affairs programming.

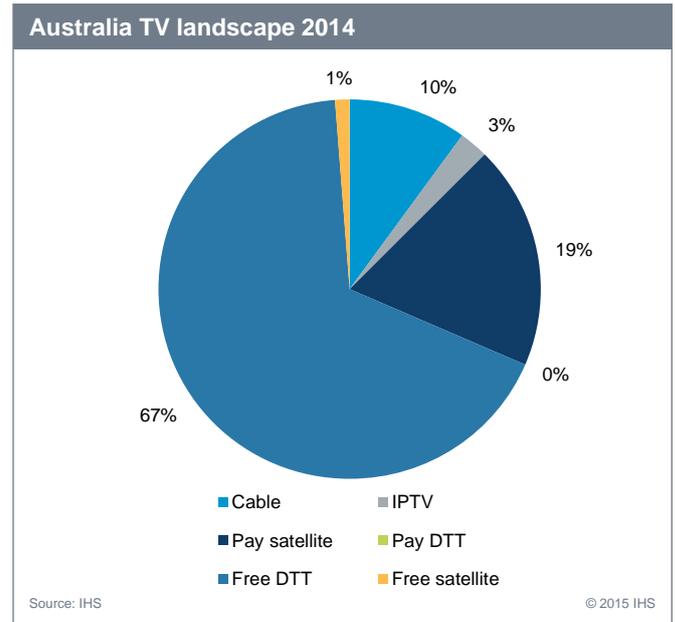
Australia has a high TV set penetration rate (99%) and has successfully converted its entire TV infrastructure to digital. Approximately 2.9 million homes pay for subscription TV. The major FTA broadcasters in the country are the public service providers, ABC and SBS, and the three major commercial free-to-air TV networks, Seven, Nine and Ten.

The terrestrial platform is the largest TV distribution platform in the country, with more than 6 million households exclusively watching terrestrial TV. Australia's digital transition plan closely followed the UK model, creating a body to act as a liaison between the government and the broadcasters in order to speed up the implementation of the digital switchover process. The first areas to shut off the analogue signal were regions in South Australia in 2010 while the final area to terminate analogue terrestrial broadcasting was Kalgoorlie, a remote town in Western Australia in December 2013.

Cable TV is primarily available in Australia's large metropolitan areas. Many of the early cable TV operators in Australia struggled financially due to the large infrastructure cost associated with laying cable over such a vast area to reach relatively few subscribers. With its combined cable and satellite subscriber base of around 2.5 million at 2014, Foxtel is Australia's largest pay TV provider.

Around 1.8 million homes connect to the satellite platform TV in Australia. The majority of satellite TV households (1.7 million) subscribe to pay TV, with a further 111,000 homes using free to air services.

IPTV connects around 220,000 homes and the largest operator is Malaysian-owned Fetch TV, which had around 77% of the IPTV platform by the end of 2014 .



Case Study – Vietnam

Vietnam Key facts – 2014

- **Population:** 90.6 million
- **Households:** 26.8 million
- **TV Households:** 23.0 million
- **Pay TV Penetration:** 29%
- **Broadband Penetration:** 29%
- **Mobile Penetration:** 150%
- **TV Ad Revenue:** €929 million

households in an attempt to speed up the transition to DTT. Analogue terrestrial is still the dominant platform in the country with almost 8.4 million connected homes at the end of 2014. Vietnam plans to shut off its analogue terrestrial networks in 2020.

Around 9 million homes were connected to cable in 2014. Cable infrastructure is largely analogue with only 10% of cable networks digitized. VTV operates the largest cable TV network in the country whilst the largest satellite operator in Vietnam is state-owned VTC which offers both FTA and pay TV services.

Vietnam - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	11,300	9
Satellite	2,260	448	100
Cable	4,420	4,580	28
IPTV	0	0	0
Total	6,680	16,328	0

Source: IHS

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The state broadcaster Vietnam Television (VTV) is the largest broadcaster in the country operating nine FTA channels. Of these channels six broadcast general entertainment content and three thematic (science & technology, sports, youth), while three general entertainment channels broadcast in HD. Additionally, there are three national channels operated by the Vietnam Multimedia Corporation (a company owned by the Ministry of Post and Telematics) and 63 regional TV stations.

Nearly 86% of homes in Vietnam own a TV set. Digital TV covers only five major cities and their surrounding areas, whilst three-quarters of the country still receive analogue TV signals. Just under 6.7 million TV homes subscribed to a pay TV service by the end of 2014.

Terrestrial is the primary platform used for TV viewing in Vietnam with 11.3 million households tuning in at the end of 2014. The switch to DVB-T is set to occur through four phases between 2015 and 2020. DTT is currently available to 2.9 million homes in five major cities but the government has committed to subsidizing the purchase of DTT receivers for 2 million low-income

Central & South America

51% of TV households receive digital TV in Central and South America (CSA). While the IPTV and Satellite platforms are digital the majority of terrestrial and cable households receive analogue signals. The total number 68% of primary terrestrial households in CSA receive an analogue signal.

56% of cable connections out of 36 million cable households were analogue at the end of 2014. Satellite is the third largest platform in the CSA region with 34 million households. Finally, IPTV is the smallest platform for TV distribution with only 1.5 million households.

The majority of TV viewers in the CSA region watch FTA TV, but pay TV is also enjoying healthy figures: 82.5 million households (or 55% of the total) watch FTA TV while 68.5 million households have chosen to subscribe to a pay TV service. Satellite and cable are the two largest pay TV platforms in the region, with each one controlling more than 30 million subscribers. Until the end of 2014 no Pay TV service is offered in the DTT platform, while the IPTV platform represents just 2% of the Pay TV market. Brazil had around 20 million pay TV households at the end of 2014, the largest in the CSA region. Mexico was second with 16.3 million and Argentina third with 9 million. Two thirds of the region's pay TV subscribers are coming from just these three countries.

The digitization of the terrestrial platform is progressing at a slow pace in the Central and South America. The majority of the countries will miss the 2015 deadline for digitization. Lack of financial resources delayed the switchover resulting in DTT adoption rates which are low. In many countries the only channels available on the DTT platform are those of the Public Service Broadcasters alongside a limited selection from commercial broadcasters.

The most attractive premium content in the region is broadcast exclusively on the pay platforms.

South America has largely adopted a Brazil-based variant of the Japanese DTT standard the ISDB-T. Mexico and along with other Central American and Caribbean countries have selected the standard ATSC. Colombia and Panama are the main outliers. Colombia uses the European standard DVB-T2. Panama has implemented the Brazilian variant of ISDB-T.

Puerto Rico is the only territory to have digitized its terrestrial broadcast. Mexico and Uruguay plan to finish their own analogue terrestrial TV broadcasting in December 2015.

Case Study – Brazil

Brazil Key facts – 2014

- **Population:** 201.7 million
- **Households:** 61.3 million
- **TV Households:** 60.0 million
- **Pay TV Penetration:** 34%
- **Broadband Penetration:** 35%
- **Mobile Penetration:** 140%
- **TV Ad Revenue:** €7.2 billion

Despite the restrictions in cable TV coverage nationwide all major metropolitan areas are covered by cable TV networks. At the end of 2014 around 7.5 million households used cable TV on their primary set. The cable infrastructure is largely digital with analogue networks in semi-urban areas. The largest cable TV operator in Brazil is Net Servicos, which holds around 89% of the cable market.

The terrestrial platform is used by more than 14 million homes as their primary means of TV reception. At the end of 2014 less than half of the terrestrial TV homes in Brazil converted to DTT: around 5.3 million. The digital switchover is set to be complete by 2018, having missed its original 2016 shutoff date.

The largest IPTV operator is Telefonica de Brasil with 95,000 customers.

Brazil - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	20,840	23
Satellite	12,371	19,000	100
Cable	7,545	0	97
IPTV	191	0	100
Total	20,107	39,840	73

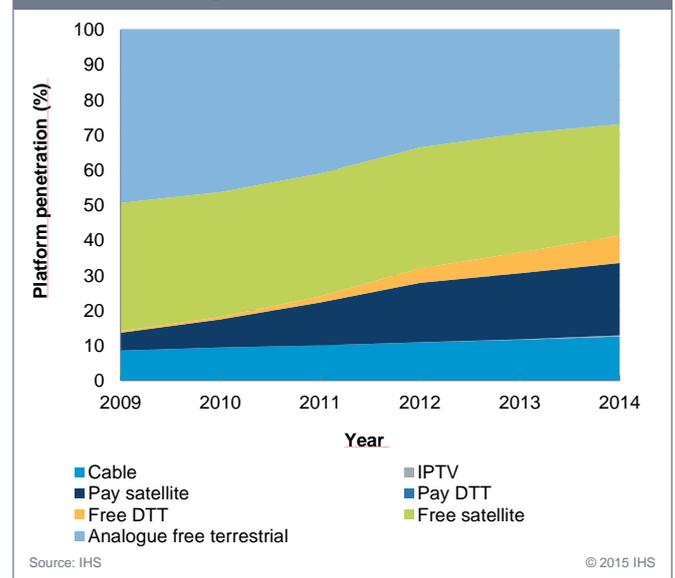
Source: IHS

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In Brazil state-owned TV stations have a very limited role in the FTA TV landscape of the country, covering just the sessions of the parliament, the senate and live broadcasts of judgements in the Supreme Federal Court and the Superior Court of Justice. From the 1970s, the FTA TV market has been dominated by the large commercial operators Rede Globo (the second-largest commercial TV network in annual revenues worldwide behind the US ABC Television Network), Rede Record, Sistema Brasileiro de Televisao (SBT), Rede Bandeirantes and Rede TV!.

The largest platform in Brazil is satellite. There is no terrestrial or cable TV coverage in large parts of the country, primarily because the costs of rolling-out the infrastructure are prohibitive. As a result satellite TV has flourished. Around 32 million households received satellite TV on their primary TV set in 2014 representing 53% of total TV households. The majority of satellite TV homes watch free TV while the largest satellite pay TV operators in Brazil are Sky Brazil with 5.6 million customers, Claro TV with 4 million and Oi TV with 1.2 million.

Evolution of TV platforms in Brazil



Case Study – Mexico

Mexico Key facts – 2014

- **Population:** 118.8 million
- **Households:** 29.2 million
- **TV Households:** 27.9 million
- **Pay TV Penetration:** 58%
- **Broadband Penetration:** 46%
- **Mobile Penetration:** 85%
- **TV Ad Revenue:** €2.6 billion

Mexico - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	11,599	54
Satellite	8,873	0	100
Cable	7,281	0	73
IPTV	163	0	100
Total	16,317	11,599	74

Source: IHS

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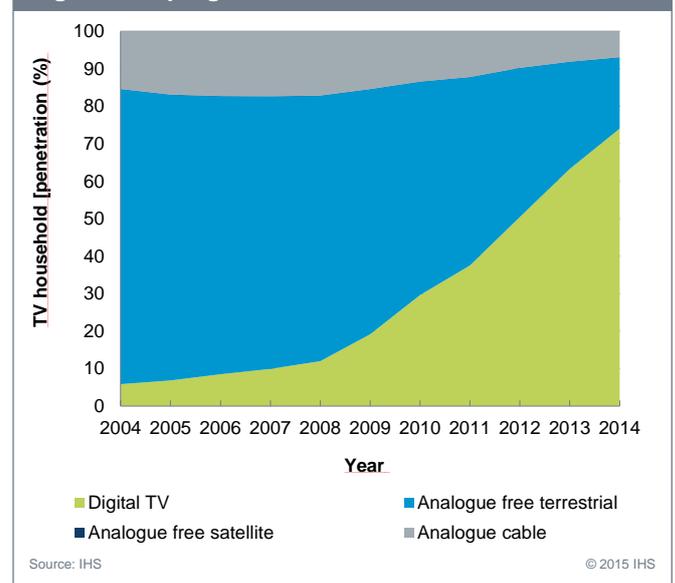
Mexico's state-owned television, the Mexican State Public Broadcasting System was created in 2010. It broadcasts three channels (transmitting in both analogue and digital), Canal Once, Canal 22 and the channel Una Voz con Todos (A Voice for All), offering mostly factual and educational content. Commercial FTA TV in Mexico is dominated by two large media conglomerates: Grupo Televisa and TV Azteca (or simply Azteca). Grupo Televisa operates two TV networks, Canal de las Estrellas and Canal 5, while TV Azteca operates another two TV networks, Azteca 7 and Azteca Trece. Another major commercial FTA broadcaster in Mexico is Multimédios Television.

11.6 million Mexican homes exclusively consume terrestrial TV. Mexico has started its DTT transmissions from the city of Tijuana, in the borders with the USA, in April 2013. Around 5.3 million TV households receive analogue terrestrial TV while around 6.3 million have converted to DTT. The Mexican government planned to shut off analogue broadcasts by end-2015, however this switchover is unlikely as a large portion of the populace cannot afford the purchase of a DTT receiver. In an effort to keep the process on track the Mexican

government plans to distribute 13.8 million digital TV sets before end-2015 to 44.3% of low-income families.

At the end of 2014, satellite had managed to attract 8.9 million connected homes while cable controlled 7.3 million TV households. The satellite platform in Mexico is digital, while 25% of cable customers receive an analogue service. The largest satellite pay TV operators are Sky Mexico which had 6.7 million subscribers and Dish Mexico with 2.6 million. The largest cable pay TV operators are Megacable with 2.4 million subscribers and Cablemas with 1.2 million.

Digitisation progress in Mexico



Source: IHS

© 2015 IHS

Case Study – Argentina

Argentina Key facts – 2014

- **Population:** 41.8 million
- **Households:** 12.2 million
- **TV Households:** 12.0 million
- **Pay TV Penetration:** 75%
- **Broadband Penetration:** 48%
- **Mobile Penetration:** 149%
- **TV Ad Revenue:** €1.7 billion

Argentina - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	350	2,983	90
Satellite	2,475	0	100
Cable	6,210	0	46
IPTV	0	0	100
Total	9,035	2,983	69

Source: IHS

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The public service broadcaster, Radio y Television Argentina Sociedad del' Estado, operates one TV network, TV Publica (formerly known as Canal 7), which has a nationwide reach via analogue (terrestrial and cable) and digital (terrestrial and satellite) transmissions. The FTA TV channels that attract the highest ratings are all commercial: Telefe (owned by a local subsidiary of Spanish telco Telefonica), El Trece (owned by the largest Media group in Argentina, Grupo Clarin), America 2 (owned by Multimédios America, another large media group in the country) and Canal 9 (owned by Prime Argentina S.A.).

The availability of free to air content in Argentina is extremely limited. Only one free channel is broadcast in 14 of Argentina's 23 provinces. As a result Argentina has a high rate of pay TV subscribers, with more than 75% of TV households subscribing to a paid service.

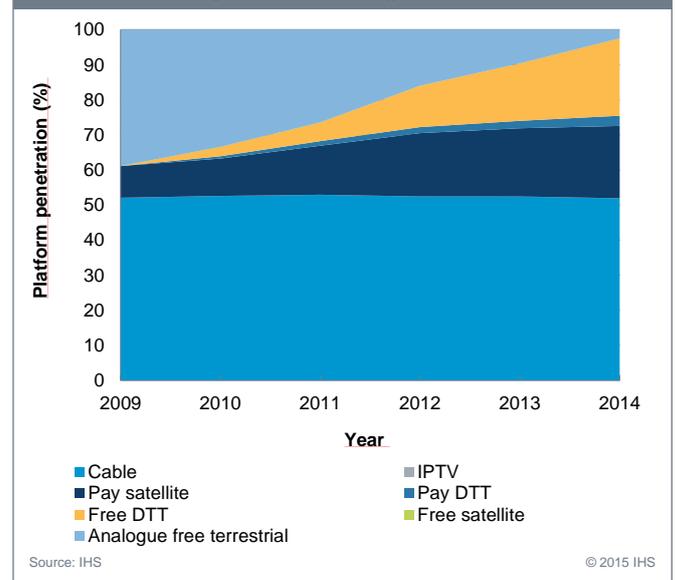
The absence of local broadcasters has greatly assisted the spread of cable TV alongside the inadequate terrestrial signal, with 6.2 million cable TV households. 60% of Argentina's cable network remains analogue, with full digitisation set to complete by 2020. The

largest cable operator in Argentina is Group Clarin, which holds approximately 55% of the cable market.

DirecTV Argentina is only provider of satellite TV services in Argentina, with 2.5 million pay TV customers.

In 2013 the government passed a law which mandated the inclusion of a DTT tuner to all TV sets and set-top boxes. This has boosted the uptake of DTT leaving Argentina likely to hit its 2019 target for switchover.

Evolution of TV platforms in Argentina



Case Study – Colombia

Colombia Key facts – 2014

- **Population:** 47.9 million
- **Households:** 15.2 million
- **TV Households:** 13.9 million
- **Pay TV Penetration:** 36%
- **Broadband Penetration:** 37%
- **Mobile Penetration:** 104%
- **TV Ad Revenue:** €1.3 billion

cable or satellite pay package), people living in rural areas in the northeast mountainous regions of the country can access only two FTA channels.

More than one out of three TV households in Colombia (36% in 2014) subscribes to a pay TV service. The majority of the cable TV networks are analogue, and digitization is unlikely to be complete before 2020. The largest cable pay TV operator is Telmex followed by the local telecoms operator UNE EPM Telecomunicaciones.

Free to air and paid for satellite services are available in Colombia. The largest pay satellite operator is DirecTV Colombia, a subsidiary of US-based DirecTV.

In contrast to its regional peers Colombia selected the DVB-T2 standard for its DTT platform, due to its cheaper set top boxes and less interference with mobile signals. Colombia aims to complete its switchover by end-2019.

Colombia - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	7,259	65
Satellite	1,420	1,580	100
Cable	3,631	0	47
IPTV	0	0	0
Total	5,051	8,839	0

Source: IHS

© 2015 IHS

In Colombia the public service broadcaster (Radio Television Nacional de Colombia or RTNC) operates three national channels: one general entertainment channel (Canal Uno), one educational channel (Señal Colombia) and one focusing on the activities of state institutions (Señal Institucional). Eight more state-funded regional channels operate in various regions of the country. Colombia also has two national commercial FTA broadcasters: Caracol TV (owned by Cadena Radial Colombiana) and RCN TV (owned by Radio Cadena Nacional). Finally, 42 local commercial broadcasters operate in Colombia, with each service focusing on one or two cities.

While more than 9 out of 10 households in Colombia possess a TV set there is a clear gap between Bogota and the major cities and the rural areas of the country. While around 96% of households in Bogota have a TV set, this percentage drops to an average of 74% in many rural regions. This dividing line is also extended to the amount and variety of TV content offered to viewers in urban and rural areas: while residents of Bogota and other major cities have access to around 10 FTA channels (plus the option to subscribe to a

Middle East and North Africa

The Middle East and North Africa region had around 54 million TV households at the end of 2014 as more than 96% of total households do possess at least one TV set.

95%TV households in MENA watch digital TV.

At the end of 2014, 89% of TV households primarily use satellite TV. Of the 48 million satellite households, 44.3 million watch FTA TV with 3.7 million pay TV subscribers. The free satellite platform was introduced to the TV viewers in the region in the early 1990s and has proven to be extremely resilient. High penetration of free satellite has also assisted the uptake of paid satellite.

Cable used to be widespread especially in the UAE and Qatar, but has transitioned to IPTV. Cable TV infrastructure is available in countries Lebanon, Egypt and Jordan. Most of the cable TV networks in these geographies are illegally re-broadcasting the TV programmes of the pay satellite operators.

The analogue to digital transition of terrestrial TV is experiencing a mixed fortune. In the UAE and Bahrain the digital switchover is advanced, some Emirates have already shut off analogue transmissions, Kuwait, Qatar, and Oman will also shut off analogue terrestrial TV at the end of 2015. In Algeria almost exclusively uses the VHF band for terrestrial broadcasting, where the deadline is June 2020.

The Algerian government is evaluating the possibility of advancing the switchover date to 2018 but no official date has been fixed. Similarly in Tunisia, where around 80% of the analogue terrestrial frequencies are in the VHF Band, an extension to 2018 is under discussion.

From the early 1990s the satellite TV households have started to expand in Middle East and North Africa and by 2014 the overall primary satellite penetration is 89%. The penetration in countries like the UAE, Qatar, Saudi Arabia and Morocco is much lower due to the existence of IPTV networks (in Morocco also the terrestrial platform has considerable strength). The strength of the satellite platform is further underlined by the plethora of channels that it carries, the vast majority of them FTA: At the end of 2014 more than 970 FTA channels are available across the region. The two largest pay TV operators in the region, Qatari-based beIN Sports Arabia and UAE-based OSN, are satellite operators. Satellite penetration has reached its peak in the region. In the UAE and Qatar, there are restrictions on the number of satellite dishes per building. Saudi Arabia is planning to introduce similar legislation.

Furthermore, the high level of investment in telecoms infrastructure is likely to lead to a migration to IPTV.

IPTV is offered in seven MENA countries while in only four of them (UAE, Qatar, Saudi Arabia, Morocco) IPTV subscribers exceed 3,000. UAE is the only country where two IPTV operators are active but they operate in different regions.

Pay TV penetration in the Gulf States is much higher than in the rest of the Arab States. The reasons justifying this trend are the numerous:

- Households in Gulf States have a high disposable income.
- Gulf States have invested heavily in telecoms infrastructure which facilitates the expansion of pay TV networks.
- In Gulf States such as Kuwait, the local population constitutes just a fragment of the total population of the country for whom pay TV is the best solution for foreign entertainment.

Case Study – Egypt

Egypt Key facts – 2014

- **Population:** 86.8 million
- **Households:** 20.2 million
- **TV Households:** 19.8 million
- **Pay TV Penetration:** 2.5%
- **Broadband Penetration:** 15%
- **Mobile Penetration:** 110%
- **TV Ad Revenue:** €122 million

Egypt - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	1,017	65
Satellite	497	18,288	100
Cable	0	0	0
IPTV	0	0	100
Total	497	19,305	3

Source: IHS

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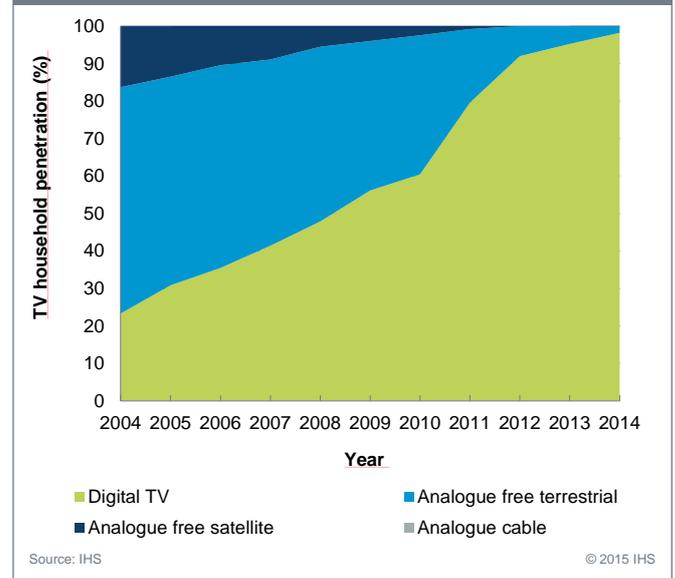
The public service broadcaster in Egypt, the Egyptian Radio & Television Union (ERTU), is the only broadcaster in the country licenced to broadcast on the terrestrial platform. ERTU operates 17 channels. Other broadcasters are only licensed to use the satellite and IPTV platforms. Four major commercial TV networks shape the FTA market: Al Nahar TV Network, Al Hayatt TV Network, CBC TV Network and Dream TV Network. Another significant FTA broadcaster in Egypt is the Saudi-based MBC Group with the channel MBC Masr (Egypt in Arabic).

Pay TV penetration is very low in Egypt at 2.5% of TV households, because of the strong FTA offer. This has ensured that the Egyptian TV landscape is dominated by free satellite, which has been entirely digital since the end of 2012. The two largest pay TV operators in the country are beIN Sports Arabia and OSN.

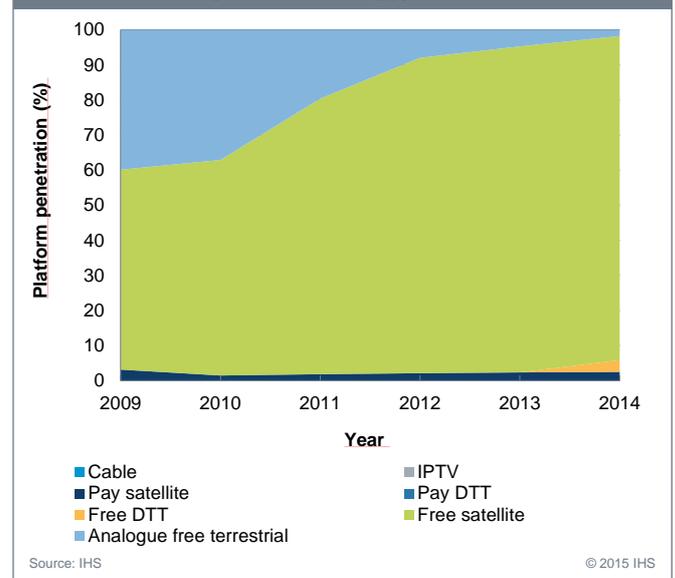
Digitisation of the terrestrial platform in Egypt has been delayed due to a lack of funding as well as governmental indecision over its transition strategy.

Analogue terrestrial currently accounts for just under 2% of TV households in Egypt.

Digitisation progress in Egypt



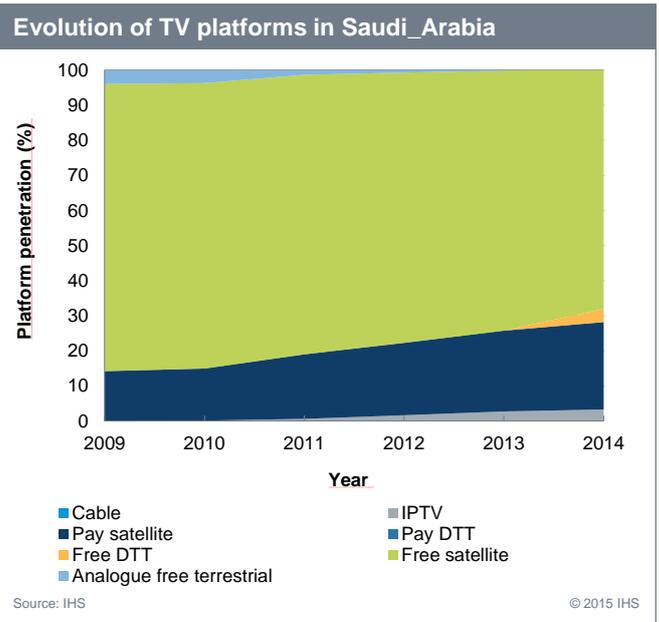
Evolution of TV platforms in Egypt



Case Study – Saudi Arabia

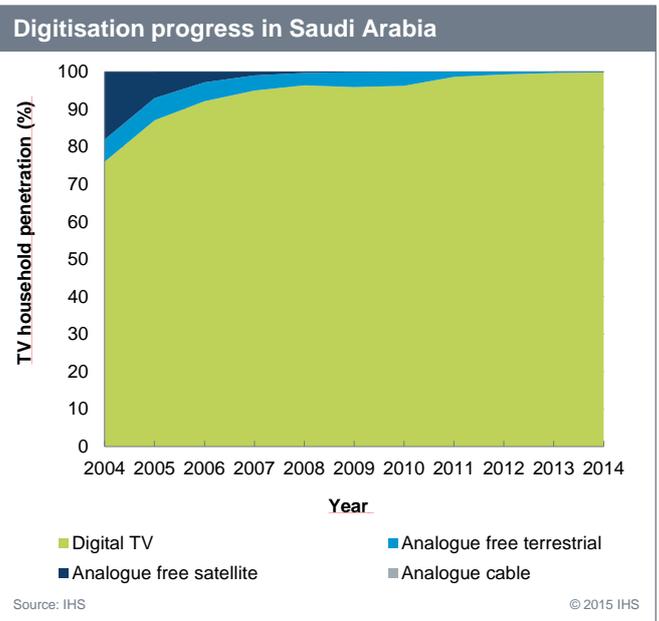
Saudi Arabia Key facts – 2014

- **Population:** 29.9 million
- **Households:** 5.4 million
- **TV Households:** 5.0 million
- **Pay TV Penetration:** 28%
- **Broadband Penetration:** 63%
- **Mobile Penetration:** 166%
- **TV Ad Revenue:** €766 million



	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	190	100
Satellite	1,219	3,429	98
Cable	0	0	0
IPTV	164	0	100
Total	1,383	3,619	4

Source: IHS © 2015 IHS



The Ministry of Culture and Information of Saudi Arabia operates the state-owned broadcasting services of the Kingdom of Saudi Arabia. More than 12 FTA channels are state-owned, including seven sports channels, one cultural channel, a channel covering religion and another one focusing on news and current affairs. The most popular FTA broadcaster in Saudi Arabia is MBC with its flagship general entertainment channel MBC1 and movie channel MBC2. Other popular channels are Rotana Cinema and the news channel Al Arabiya.

28% of Saudi Arabian TV households subscribe to a pay TV service. The two largest pay TV operators in Saudi Arabia are two Pan-Arab operators beIN Sports and Arabia OSN. Pay TV services in Saudi Arabia are primarily available over satellite. Saudi Telecom resells the pay TV packages of beIN Sports Arabia and OSN on its IPTV platform.

Digitisation of the terrestrial platform is due to complete in 2015, with the vast bulk of analogue terrestrial homes already converted.

Case Study – Morocco

Morocco Key facts – 2014

- **Population:** 33.3 million
- **Households:** 6.7 million
- **TV Households:** 6.2 million
- **Pay TV Penetration:** 4%
- **Broadband Penetration:** 15%
- **Mobile Penetration:** 132%
- **TV Ad Revenue:** €32 million

Morocco - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	1,893	36
Satellite	198	4,094	100
Cable	0	0	0
IPTV	54	0	100
Total	251	5,987	11

Source: IHS

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The public service broadcaster in Morocco, Societe Nationale de Radio et Television (SNRT), operates six channels, available in both analogue and digital via terrestrial and satellite platforms, as well as via IPTV. SNRT offers national and local channels, as well as thematic channels (covering sports, religion, education and news). Morocco and Tunisia are currently the only two Arab countries which have licenced commercial channels to operate on the terrestrial platform. Medi 1 is the largest commercial terrestrial operator.

Morocco is largely a free to air TV market, with 4% pay TV penetration. Pay TV in Morocco is available over IPTV and satellite. The two largest pay TV operators in Morocco are satellite broadcasters beIN Sports Arabia and OSN.

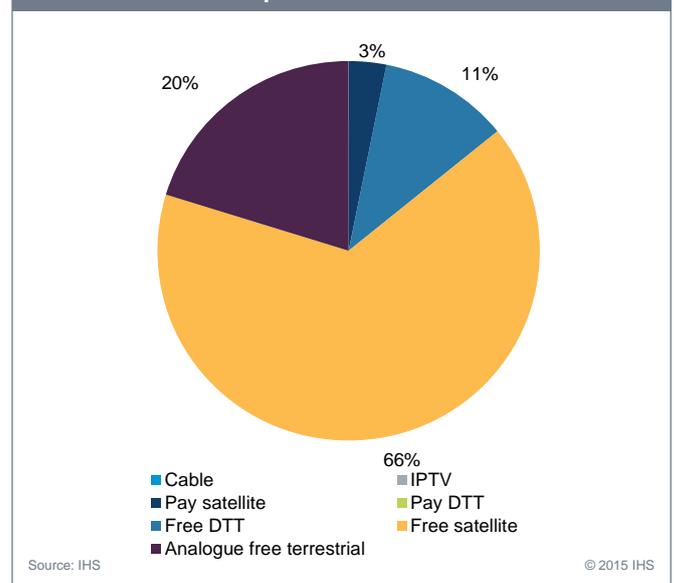
Morocco has a higher terrestrial TV usage rate than its regional peers, with 25% of Moroccan households using terrestrial as their primary TV source. In Morocco the government liberalized the licensing of terrestrial TV channels in 2002. The commercial channels that were launched by the mid-2000s have proven to be

popular, which has contributed to the popularity of the terrestrial platform.

The terrestrial platform remains largely analogue. The digital transition is being held back through lack of government funding. Morocco is unlikely to meet the June 2015 deadline for shutting off the analogue terrestrial signal.

The country's telecom operator, Maroc Telecom, offers an IPTV service which had managed to attract 54,000 subscribers in 2014.

Morocco TV landscape 2014



Case Study – Kuwait

Kuwait Key facts – 2014

- **Population:** 3.0 million
- **Households:** 0.4 million
- **TV Households:** 0.4 million
- **TV Penetration:** 99%
- **Pay TV Penetration:** 73%
- **Broadband Penetration:** 33%
- **Mobile Penetration:** 215%
- **TV Ad Revenue:** €333 million

Kuwait - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	16	84
Satellite	263	80	100
Cable	0	0	0
IPTV	0	0	100
Total	263	96	4

Source: IHS

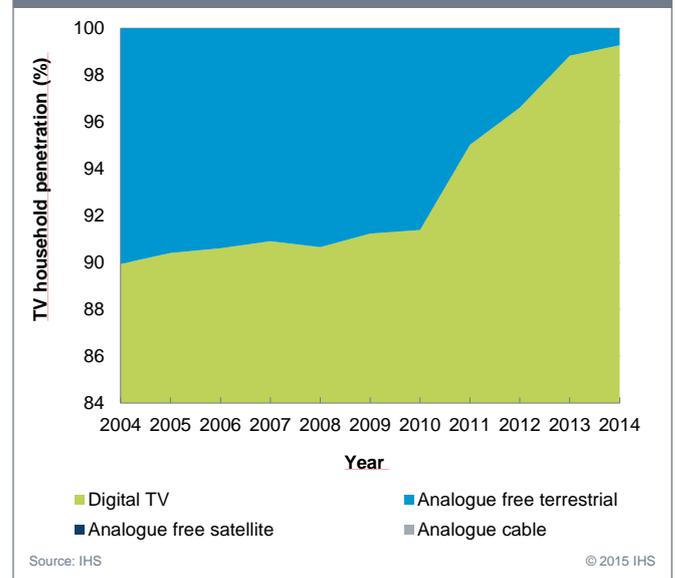
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The state broadcaster of Kuwait is Kuwait Television, which is funded and supervised by the Ministry of Information. Kuwait Television operates five channels, of which the flagship channel is general entertainment station KTV1. Three of Kuwait Television's channels are thematic (sports, religion and cultural) while KTV2, broadcasts general entertainment. The most popular broadcaster in Kuwait is MBC which broadcasts MBC1, MBC2 and MBC Action. Other popular broadcasters include Rotana and Arabic channels such as the Lebanese LBC International and the Egyptian Al Nahar.

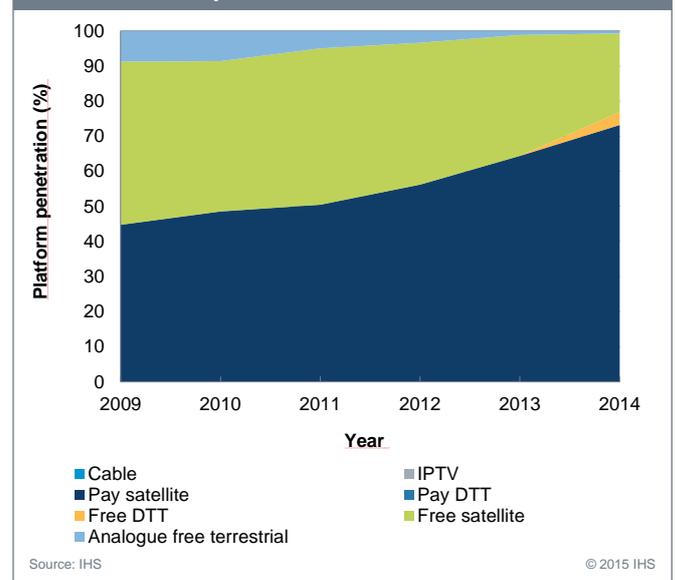
The television landscape of the country shares similar characteristics with that of the other Gulf States. Kuwait has a high penetration rate of TV sets, with 99% of households owning a TV. Kuwait is largely a pay TV market, with 73% of TV homes subscribing to a pay TV service. 96% of Kuwaiti households use either free or paid satellite as their primary means of TV consumption. OSN and beIN Sports Arabia are the two top pay TV operators in Kuwait, both of which provide

their services exclusively over satellite. The transition to DTT is due to be complete in the first half of 2015. There are no cable or IPTV networks in Kuwait.

Digitisation progress in Kuwait



Evolution of TV platforms in Kuwait



North America

Across North America there are 134 million TV households. 96% of TV households receive digital signals. The sole analogue platform in North America is cable. As both the USA and Canada have fully digitized their terrestrial platforms.

North America has a high rate of pay TV, with 84% of TV households in were subscribing to at least one pay TV service in 2014.

The largest TV distribution platform in North America is cable. at the end of 2014 there were 61 million TV households in the North American where the primary TV platform is cable. Around 6 million homes, were still receiving analogue TV signals at the end of 2014. Cable is also the largest pay TV platform in the region. USA has the majority of cable TV households with 54 million followed by Canada with 7 million. The largest cable pay TV operators in the region are: Comcast with around 22 million subscribers at the end of 2014 and Time Warner Cable with around 11 million subscribers during the same period. In Canada, the largest cable operator in 2014 is Rogers with 2 million subscribers.

At the end of 2014, 37 million households were primary relying on satellite for their TV signal reception. Satellite is primarily used for pay TV. At the end of 2014, the USA had 34 million satellite homes while Canada had 3 million. The largest satellite TV providers IN 2014 were the pay TV operators Direct TV (with 20 million subscribers) and Dish Networks (with 14 million subscribers). In Canada, the largest satellite operator in 2014 is Bell Satellite with 1.67 million subscribers.

Canada completed the switchover to digital terrestrial in July 2011. The switchover was relatively straightforward as the majority of TV households in North America do not use terrestrial television. In both countries DTT is a free platform.

IPTV is primarily offered as a bundled service.

Case Study – USA

USA Key facts – 2014

- **Population:** 319.9 million
- **Households:** 124.0 million
- **TV Households:** 120 million
- **Pay TV Penetration:** 97%
- **Broadband Penetration:** 77%
- **Mobile Penetration:** 114%
- **TV Ad Revenue:** €50.2 billion

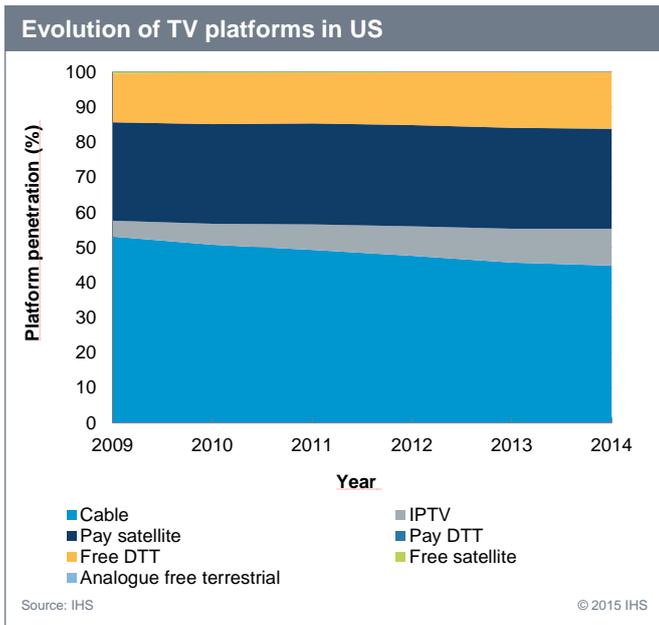
US - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	19,407	100
Satellite	34,330	100	100
Cable	54,041	0	91
IPTV	12,677	0	100
Total	101,048	19,507	96

Source: IHS

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The USA is the largest pay TV market with revenues topping \$86 billion in 2014.



FTA TV viewing in the US is dominated by the five major commercial networks, which together account for more than 90% of FTA TV viewing time of the average US household. PBS offers public service broadcasting. The five major commercial networks are: NBC, CBS, ABC, Fox Broadcasting Company and the CW Television Network.

All major US metropolitan areas are connected to a cable TV network. While the cable network in the US is extensive there is little overlap between operators, with service providers largely operating in non-competing areas. Cable has not yet fully digitized in the US, with 9% of cable customers having an analogue connection at the end of 2014.

Satellite is predominantly a pay TV service in the US with less than 1% of satellite homes consuming FTA satellite.

The US shut off its analogue terrestrial TV signals in June 2009. To ensure a swift switchover process the US government implemented a subsidy program. The NTIA issued two coupons worth \$40 for the purchase of DTT set-top boxes to each household.

Western Europe

There are 179 million TV households in Western Europe. Digitization of TV distribution platforms in Western Europe is almost complete in the region with the exception of cable. 9 out of 10 TV homes in Western Europe watch digital TV. In 2006 Western Europe started to plan and implement the analogue to digital transition of terrestrial TV broadcasting, setting benchmarks for other regions. The satellite TV platform Western Europe is digital. Cable is the only platform which is not digital yet, with 42% of cable homes in the region receiving analogue signals at end-2014.

Pay TV has a high penetration rate in Western Europe with 58% of households subscribing to a paid service.

Public Service Broadcasters like the BBC (UK), RAI (Italy), ARD (Germany) and France Television (France) took a leading role in launching new DTT channels in their respective countries and closing their analogue channels, encouraged by their governments. Governments in Western Europe were the drivers of the digitisation of the terrestrial platform, primarily because they wanted to auction the terrestrial frequencies in the UHF band. Greece was the last country to switch off its analogue terrestrial TV network in February 2015, following the rest of the region which had switched by end-2012.

Kingston Communications launched the first IPTV services in 1999 in the UK. IPTV is primarily offered as a bundled service by telecom operators. In 2014, IPTV services are offered in all Western European countries.

Case Study – Netherlands

Netherlands Key facts – 2014

- **Population:** 16.8 million
- **Households:** 7.5 million
- **TV Households:** 7.4 million
- **Pay TV Penetration:** 98.6%
- **Broadband Penetration:** 93%
- **Mobile Penetration:** 111%
- **TV Ad Revenue:** €966 million

Netherlands - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	441	54	100
Satellite	673	53	100
Cable	4,448	0	81
IPTV	1,755	0	100
Total	7,317	107	89

Source: IHS

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The public service broadcaster in the Netherlands, NPO, operates three national general entertainment FTA channels, eight thematic channels and one international channel, BVN, created in collaboration with the Belgian public service broadcaster VRT. Two companies dominate the commercial FTA TV market in the Netherlands: RTL Group, which operates five FTA channels and SBS Broadcasting Group which operates four FTA channels.

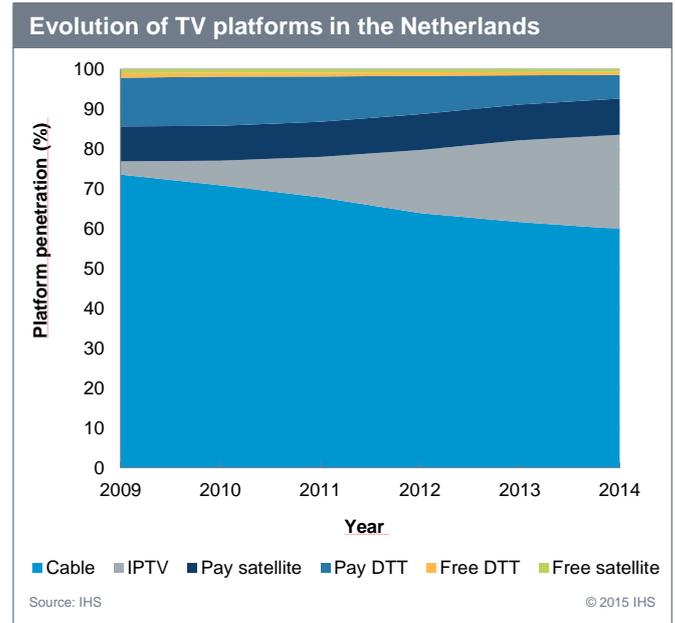
The Netherlands is the most heavily pay TV penetrated market in Western Europe, with 98.6% of TV households taking a pay TV service. The market has historically been pay TV heavy - penetration has remained above 90% since 1999 as a result of a mature cable platform. Furthermore, the Dutch free-to-air sector is small in the Netherlands as a result of the absence of an extensive free DTT offering. Whilst a public service DTT multiplex exists, the large bulk of terrestrial in the Netherlands is provided commercially by the incumbent Dutch telco KPN through its Digitenne service, which launched in 2003. This resulted in a further boost in pay TV penetration in the run-up to digital switchover in 2006, due to former analogue terrestrial households mostly switching to

low-end pay services. Luxembourg-based operator M7 Group's Canal Digitaal satellite operation also benefited from the switchover, resulting in a decline in cable's market share.

Post-switchover, cable's biggest challenger to its dominance has been KPN, which in addition to DTT operates an IPTV service that has emerged as a formidable competitor in the last five years, becoming the second largest platform in 2012. This has partly resulted from KPN upselling DTT services to IPTV.

Most recently further competition has arrived from over-the-top platforms, including Netflix, which launched in September 2013. This increasingly competitive situation has resulted in further consolidation in the cable sector from the combination of operators UPC and Ziggo in 2014 – the latter of which was the result of the merger of three cable operators back in 2006. Thus far, there has been no decision to require Ziggo to open up its networks for competition. However, KPN is required to grant third-party providers access to its networks for the next two years. Vodafone is one example of an operator that plans to make use of these networks to compete with KPN and Ziggo.

Despite its decline in market share, cable remains the dominant platform in the Netherlands. As with most cable-heavy markets, the conversion of analogue cable to digital cable is an ongoing process in the Netherlands. At the end of 2014, around 81% of cable users were using digital services.



Case Study – Finland

Finland Key facts – 2014

- **Population:** 5.4 million
- **Households:** 2.6 million
- **TV Households:** 2.4 million
- **Pay TV Penetration:** 83.1%
- **Broadband Penetration:** 74%
- **Mobile Penetration:** 182%
- **TV Ad Revenue:** €267 million

Finland - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	225	347	100
Satellite	63	48	100
Cable	1,481	0	100
IPTV	270	0	100
Total	2,039	395	100

Source: IHS

© 2015 IHS

The public service broadcaster in Finland, YLE, operates four national channels, including the most popular FTA TV channel in the country, YLE TV1. The second largest FTA broadcaster and the most popular commercial broadcaster is MTV3, owned by Swedish Media conglomerate the Bonnier Group. The second largest commercial TV station is Nelonen (owned by Sanoma Media) followed by Bonnier-owned station Sub.

In contrast to other Nordic countries which are beginning to see signs of decline in pay TV saturated markets, Finland is a market in which pay TV has been slower to grow. Pay TV is particularly seasonal in Finland which has impacted its growth. This is especially true for the pay DTT sector, which is often affected by short-term subscriptions taken out for sporting events or holiday homes. This said however, the last few years have seen pay TV increase in growth, led by fixed-network multichannel services.

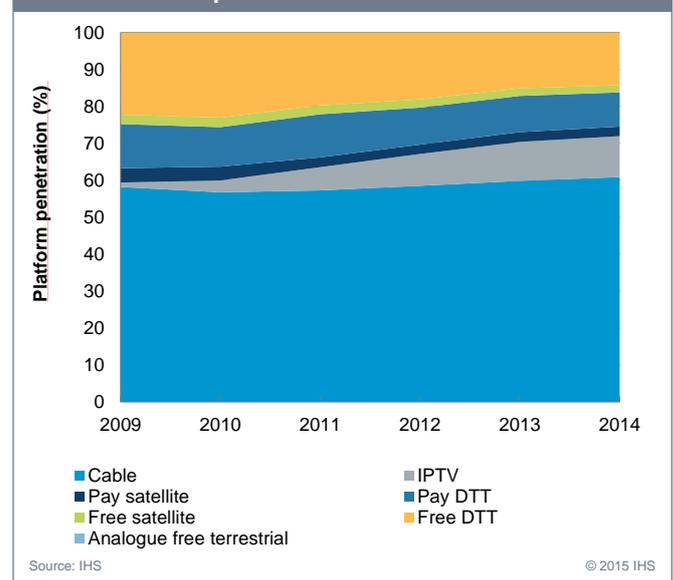
Where Finland is set apart in the Nordics is its full market digitization, following the switch-off of analogue terrestrial signals in 2007 and a move over to digital cable in 2008. The ambitious digital switchover process resulted in rapid growth in pay DTT as a platform, however did not have the same impact for cable. Whilst

cable as a platform is by no means in decline in Finland, its growth has been steady at best. IPTV has been the fastest growing pay TV platform in Finland over the last few years, but we also do not expect this to accelerate to a great degree in the forecast period. That said, the size of the FTA sector and the relatively slow pace of pay TV growth suggest there is still some room for expansion in Finland in the short term. In the longer term, the increasing prevalence of online services, which are already showing signs of influence on other Nordic markets, could dampen pay TV growth.

Structurally, both cable and DTT platforms Finland have moved towards a trend of consolidation in recent years, with the most recent example being cable operator DNA's purchase of pay-DTT service Plus TV in 2013. Together with its acquisition of cable operator Welho in 2010, this has made DNA the largest pay TV operator in Finland, with around 40% of the pay TV market in 2014.

Pan-Nordic DTH satellite operators Viasat and Canal Digital are present in Finland, however the market has always been the least significant for these operators. Satellite in Nordic markets has been in decline for some time, with Finland being no exception to this rule. This has resulted in Viasat and Canal Digital launching OTT TV services Viaplay and Canal Digital GO respectively, with Viasat particularly shifting its strategy to online offerings.

Evolution of TV platforms in Finland



Case Study – Austria

Austria Key facts – 2014

- **Population:** 8.6 million
- **Households:** 3.7 million
- **TV Households:** 3.6 million
- **Pay TV Penetration:** 47.2%
- **Broadband Penetration:** 67%
- **Mobile Penetration:** 145%
- **TV Ad Revenue:** €488 million

Austria - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	12	164	100
Satellite	101	1,805	100
Cable	1,270	0	56
IPTV	278	0	100
Total	1,661	1,968	85

Source: IHS

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The public service broadcaster in Austria, ORF, is the dominant FTA TV operator in the country. ORF offers one general entertainment channel and three thematic channels. It also operates an international channel in the German language, 3sat, which was created in collaboration with the German public service broadcasters ZDF and ARD and the Swiss public service broadcaster SF DRS. The first commercial TV station in Austria was ATV, owned by the German-based company Tele Munchen Gruppe, which was followed by a second commercial channel, ATV II. Puls 4, owned by the German Media conglomerate ProSiebenSat.1 Media AG, is another popular commercial channel in Austria.

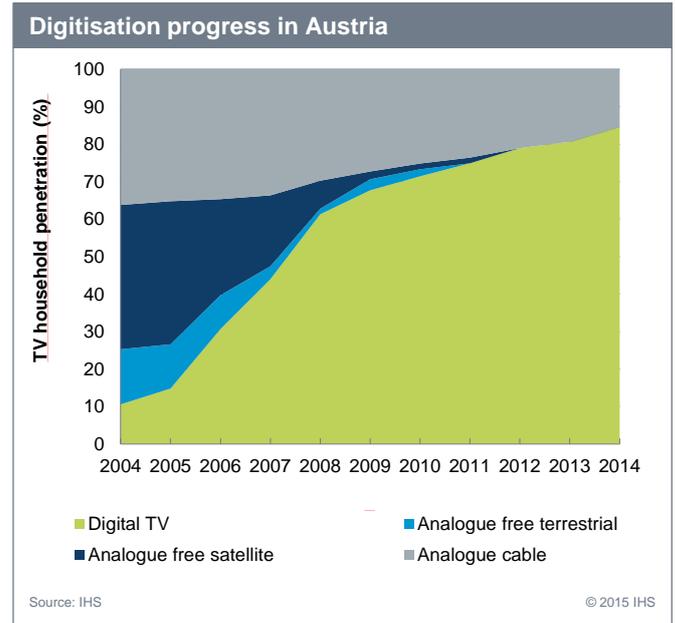
The Austrian market has parallels with the German market in that lower-end pay and free-to-air sectors still have a fair chunk of market share. Free satellite holds a good proportion due to the large amount of FTA channels available in Austria through Astra orbital slots coupled with the superior coverage satellite offers over fixed-network. Whilst the majority of the satellite channels are encrypted and require the purchase of a smartcard, we still define this as a free platform due to the absence of monthly payments. In 2014 digital free satellite increased further in Austria due to the movement of analogue cable subscribers to digital

satellite. This is a rare case in Western Europe and suggests Austrian consumers have a preference towards long term investments in equipment over monthly pay TV subscription fees.

Whilst Sky is present in Austria, IHS accounts for this arm of its business in Germany. We currently estimate its subscriber base exceeds 300,000 subscribers. Luxembourg-based M7 also operate a pay DTH service, however a large amount of this is German FTA channels repackaged in HD format.

Austria switched off analogue terrestrial signals in mid-2011 following a steady switchover process, whilst analogue satellite ceased in 2012. However, in another parallel with Germany the conversion from analogue cable to digital cable has been a slow process. At the end of 2014, 58% of total cable subscribers had switched to digital. In some cases analogue cable is perceived as free in Austria, particularly if it is bundled with household utilities. Austria's regulator RTR is currently working to promote awareness of digital cable, whilst the largest cable operator UPC offers unencrypted digital. Further digital advances are to take place in future with the full conversion of DVB-T terrestrial transmission to DVB-T2 set to commence in 2016, with an expected completion date of 2019. From 2013 DTT service SimpliTV has offered DVB-T2 on a pay basis, however this has shown no signs of growth so far.

IPTV is offered by incumbent telco Telekom's Austria A1 service, which has grown at a steady rate over the last few years. However, IHS does not expect this service to exceed 10% total market share.



Case Study – Italy

Italy Key facts – 2014

- **Population:** 61.2 million
- **Households:** 25.5 million
- **TV Households:** 25.3 million
- **Pay TV Penetration:** 30.2%
- **Broadband Penetration:** 55%
- **Mobile Penetration:** 141%
- **TV Ad Revenue:** €3.2 billion

Italy - platform overview 2014			
	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	2,805	15,639	100
Satellite	4,734	2,003	100
Cable	0	0	0
IPTV	81	0	100
Total	7,620	17,642	100

Source: IHS

© 2015 IHS

The Italian FTA TV market is dominated by public broadcaster RAI and commercial group Mediaset. RAI currently offers 13 channels (some of them thematic) while Mediaset provides 11 FTA channels, as well as a number of pay TV channels. Other major FTA commercial broadcasters in Italy are Discovery Italia (a branch of Discovery Networks Southern Europe) and Cairo Communications (which also owns the TV business of Telecom Italia).

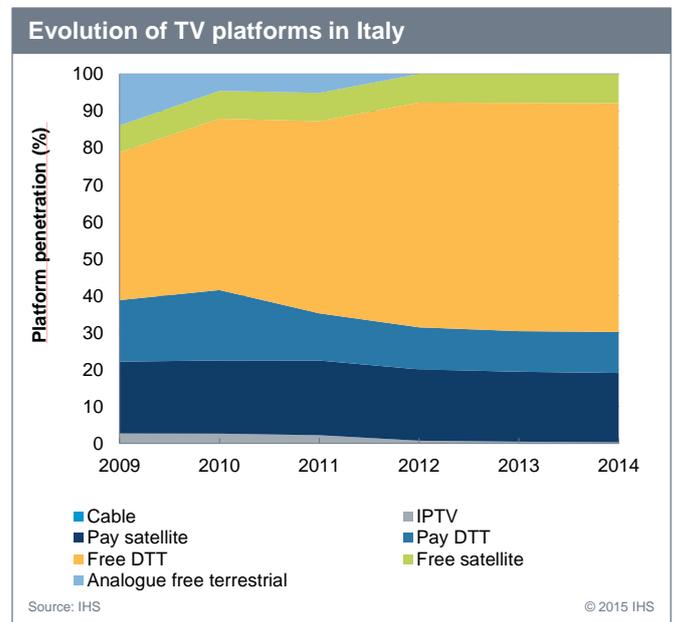
The Italian market is a challenging one for pay TV, owing largely to economic conditions which have stunted pay TV growth. To an extent pay TV is also affected by short-term subscriptions driven by football seasons. As a result, currently free TV outweighs pay TV in Italy. IHS does not expect this situation to change in the forecast period given the challenges pay TV continues to face.

In contrast to the similarly FTA driven markets in Germany and Austria, DTT is the main driver in Italy rather than satellite. Public service broadcaster RAI and Mediaset co-operate on the provision of FTA content, which offers an extensive portfolio of thematic channels, the range of which ensures its strong market situation. Italy completed its analogue switch-off in July 2012. Licences for three additional DTT multiplexes were put up for auction in February 2014, however

interest for this was limited, with only one multiplex taken by Italian media group Cairo Communications.

At present the Italian pay TV sector is an intensely competitive two horse race between satellite player Sky and pay DTT operator Mediaset Premium. There is no cable platform in Italy and IPTV's market share is negligible. This said, Telecom Italia announced a renewed interest in the IPTV sector in April 2015 via the launch of an IPTV service in partnership with Sky.

Of the two key players currently active, Sky has the greater scale and the biggest market share. However, Mediaset has continued to challenge its rival on content, particularly in relation to movies and sports rights, such as the Serie A football championship. With the current size of the FTA market in Italy at around 70%, both operators currently have a sizeable share of the market to target.



Case Study – UK

UK Key facts – 2014

- **Population:** 63.9 million
- **Households:** 28.7 million
- **TV Households:** 28.4 million
- **Pay TV Penetration:** 56.5%
- **Broadband Penetration:** 84%
- **Mobile Penetration:** 131%
- **TV Ad Revenue:** €4.9 billion

IPTV has proved itself an aggressive competitor, with both BT and Talk Talk growing their subscriber bases via bundling predominantly FTA packages with multiplay offerings. BT has been particularly forthright in its challenge via heavy investment in sport, however Sky has retained key rights for Premier League football following a bidding war in February 2015 with BT and the BBC which exceeded £5bn in value. This indicates sport is a key driver of pay TV in the UK, and as a result we are not expecting significant movements within the sector.

Cable is the second largest pay TV platform in the UK, with customers currently served by Virgin Media, which was acquired by pan-regional US operator Liberty Global in 2013. The operator fully converted its analogue cable subscriber base to digital in November 2013. Whilst the platform has not experienced rapid growth of late, its customer base has been largely stable owing to its competitive internet and multiplay offerings.

The competitive landscape in the UK has been further shaken up by the increased popularity of online TV services such as Netflix and Amazon Prime. This has resulted in both Sky and Virgin launching services to compete effectively. Sky's approach has been to launch a standalone service NOW TV and a multiscreen service Sky Go for subscribers, which have so far shown signs of success for the operator. Virgin's strategy has been geared towards customer retention, with both the launch of the connected TiVo set-top box and a distribution deal with Netflix.

UK - platform overview 2014

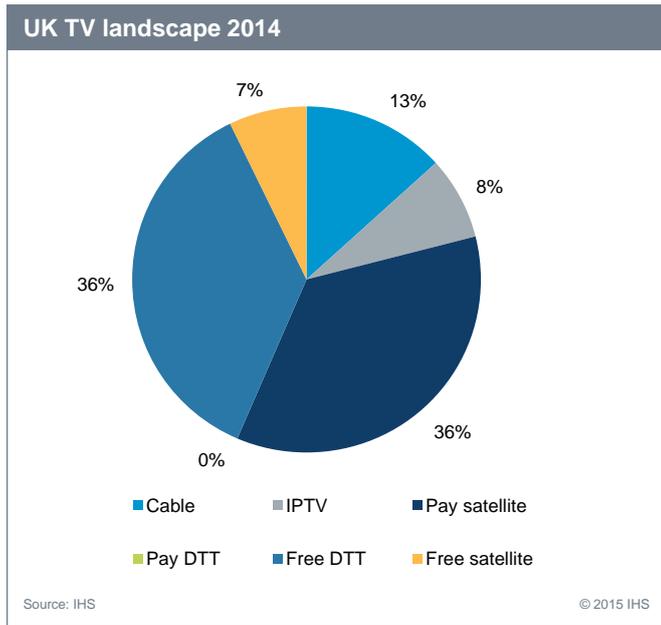
	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	10,303	100
Satellite	10,079	2,051	100
Cable	3,770	0	100
IPTV	2,190	0	100
Total	16,039	12,354	100

Source: IHS

© 2015 IHS

The UK has one of the richest and most diverse FTA TV markets in Europe. More than 55 channels (11 of them in HD) are offered for free via the digital terrestrial platform, Freeview. In addition, free satellite platform Freesat offers more than 200 channels. The public service broadcaster of the UK, the BBC, currently operates ten domestic channels plus a number of international TV channels, operated by BBC's wholly owned commercial subsidiary BBC Worldwide. ITV is the second largest FTA broadcaster of the country, operating five domestic FTA TV channels plus several channels available exclusively to pay TV platforms. The third largest FTA broadcaster in the UK is Channel 4, which offers six domestic channels (excluding time-shifted versions of its most popular channels). Channel 5 is the fourth largest FTA broadcaster in the UK offering one channel plus two time-shifted variations.

The pay TV market in the UK has historically been dominated by satellite operator Sky, owing largely to its exploitation of exclusive sports and movie rights. This is still the case – the operator held 62% of the pay TV sector in 2014. However, its dominance has not been without challengers.



Analogue switch-off occurred in the UK in October 2012. The FTA television segment in the UK continues to be strong, largely owing to the high number of channels offered by Freeview on free DTT and Freesat on DTH. Pay DTT however was a failure in the UK, with the services Top Up TV and OnDigital both closing having failed to amass significant customer bases.

Central and Eastern Europe

At the end of 2014 there were 143 million TV households in Central and Eastern Europe. 69% of TV homes in Central and Eastern Europe received digital TV. 42% of the terrestrial TV platform is still analogue, while two thirds (67%) of the cable TV networks need to be switched to digital.

56% of the TV households subscribe to a pay TV service. The major pay TV platforms in Central and Eastern Europe are cable and satellite, with small number of prominent IPTV operators.

Digitization of cable infrastructure in Central and Eastern Europe is occurring slowly. At end 2014 59.8% of cable homes were served by digital signals. IHS expects that the digitisation of cable in Central and Eastern Europe will not complete before 2020.

The transition from analogue to digital terrestrial television has started much later in Central and Eastern Europe in comparison with the Western part of the continent. The first DTT transmissions started in Lithuania, Estonia and Slovenia in 2006. Many non-EU countries are set to miss the 2015 deadline for digitizing their terrestrial TV platform.

The DTT platform in Central and Eastern Europe is predominantly a FTA service, as less than 1 million households had subscribed to a DTT pay service (the Baltic states of Estonia and Latvia had the majority of pay DTT subscribers).

Case Study – Russia

Russia Key facts – 2014

- **Population:** 139.2 million
- **Households:** 57.4 million
- **TV Households:** 54.6 million
- **Pay TV Penetration:** 66%
- **Broadband Penetration:** 48%
- **Mobile Penetration:** 167%
- **TV Ad Revenue:** €3.2 billion

Russia - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	0	13,048	68
Satellite	14,313	5,600	99
Cable	17,480	0	20
IPTV	4,187	0	100
Total	35,980	18,648	66

Source: IHS

© 2015 IHS

The public broadcaster in Russia is All-Russia State Television and Radio Broadcasting Company (VGTRK), transmitting three free-to-air channels that are available nationwide (Russia 1, Russia 2, Russia 24) and one pay TV channel (Russia K). VGTRK is owned by the federal government which also owns 75% of Channel One (Perviy Kanal) – the most-watched Russian channel. Channel One mainly broadcasts international series and some sports events. Gazprom Media operates two free-to-air channels (NTV and TNT) and a number of pay TV channels (including the NTV Plus channels).

Cable TV and IPTV platforms are prevalent in major cities while the satellite platform is used in the more remote parts of the vast territory of the Russian Federation. Also some DTH operators only operate in a certain region of the country. For example, Vostochny Express only operates in Siberia and the far east of the Russian Federation (using the Express AM5 satellite at orbital slot 140°E).

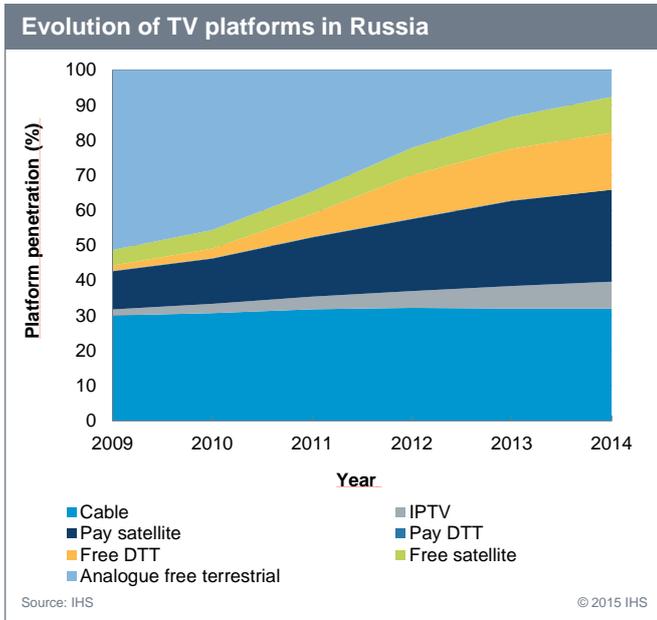
The main three free-to-air channels (First Channel, Rossiya and NTV) are state-owned and reach over 90% of the country's territory. These are very popular among the Russian viewers: over 70% of the

population routinely watches national television channels.

In December 2009 the Government set out a plan to complete the switchover of the analogue terrestrial signal to digital by 2018 following a missed 2015 deadline. At the end of 2014 there were 4.2 million households using only analogue free terrestrial TV, around 0.2 million analogue DTH users and 13.95 million analogue cable TV subscribers.

Currently the first terrestrial multiplex RTRS-1 is available to approximately about 85% of the population and RTRS-2 is available in 74 regions (to over 50% of the population). The Russian Television and Radio Broadcasting Network are also using the Express-AM33 satellite to transmit five national channels to the free-to-air DTH users in remote areas of the country unable to receive DTT.

At the end of 2014 the largest pay TV operators were satellite operator Tricolor, cable operator Rostelecom and multi-platform operator MTS.



Case Study – Poland

Poland Key facts – 2014

- **Population:** 38.2 million
- **Households:** 13.9 million
- **TV Households:** 13.4 million
- **Pay TV Penetration:** 83%
- **Broadband Penetration:** 59%
- **Mobile Penetration:** 145%
- **TV Ad Revenue:** €826 million

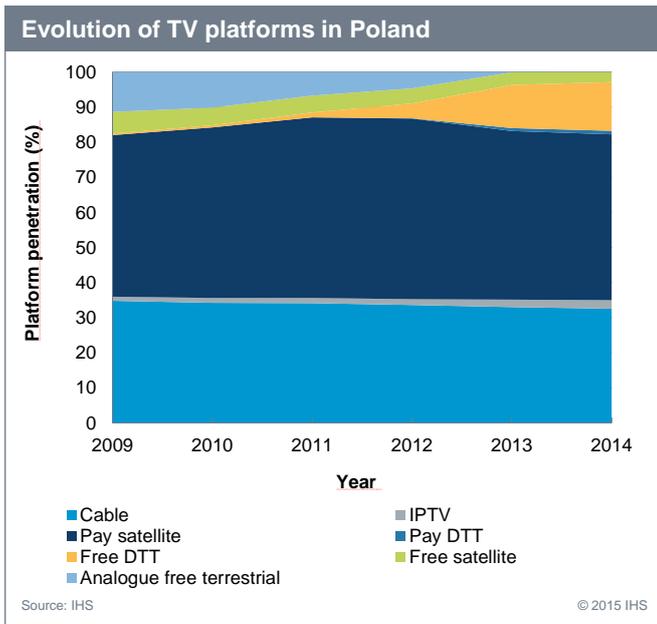
	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	135	1,858	100
Satellite	6,331	386	100
Cable	4,364	0	55
IPTV	326	0	100
Total	11,156	2,244	85

Source: IHS © 2015 IHS

Poland is one of the largest and most prosperous countries in the Central and Eastern Europe (CEE) region with an advanced pay TV industry and extensive fibre optic infrastructure.

The public broadcaster in Poland is Telewizja Polska (TVP). TVP offers seven free-to-air channels and two pay-TV channels (TVP Seriale and TVP Sport). TVP 1 is the most popular Polish channel which shows local series, documentaries and cooking shows as well as live sporting events. Polish media conglomerate ITI Group provides two free-to-air channels and a number of TVN pay TV channels. Commercial broadcaster Polsat Group operates two free-to-air channels, Polsat, one of the most popular Polish channels, and Polsat Sport News, alongside a number of pay TV channels.

Cable TV is prevalent in large cities. Overall however satellite TV is more popular in Poland, with satellite as a whole accounting for 50% of the TV market in comparison to cable's 33%.



Poland completed the analogue terrestrial signal switch-off in July 2013. The DTT offer in Poland is very strong: the three out of four multiplexes (free, available to 98.8% of population) contain 23 unique channels and the HD versions of the national broadcaster’s two main channels, TVP1 and TVP2. As a result of the strong offering, 1.86 million households have free DTT as the primary source of TV and 0.43 million have free digital DTH. No households receive analogue DTH signal.

Out of Poland’s 13.40 million TV households 11.2 million opted for pay TV over cable, DTT, IP or satellite. This is a result of Poland being one of the most economically developed countries in the region with high demand for premium content. The largest pay TV operators are UPC, Cyfrowy Polsat and nc+.

Case Study – Estonia

Estonia Key facts – 2014

- **Population:** 1.34 million
- **Households:** 0.6 million
- **TV Households:** 0.6 million
- **Pay TV Penetration:** 86%
- **Broadband Revenue:** 77%
- **Mobile Revenue:** 158%
- **TV Ad Revenue:** €26 million

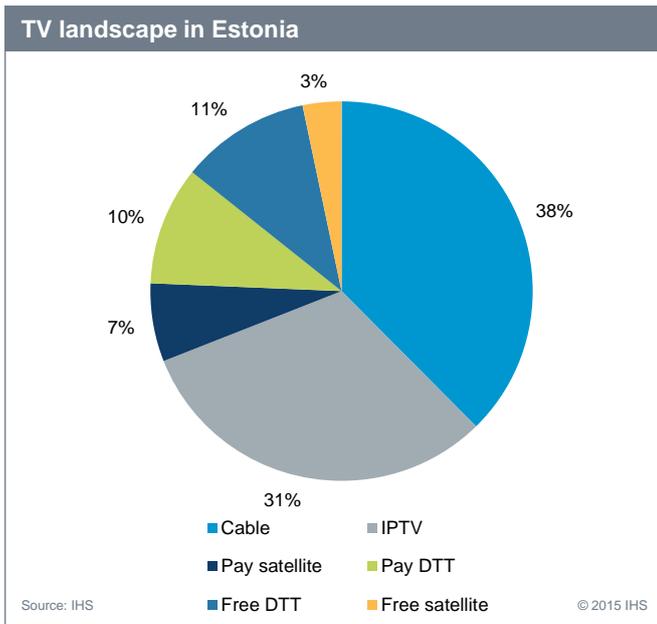
Estonia - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	56	61	100
Satellite	37	18	100
Cable	208	0	70
IPTV	174	0	100
Total	475	79	89

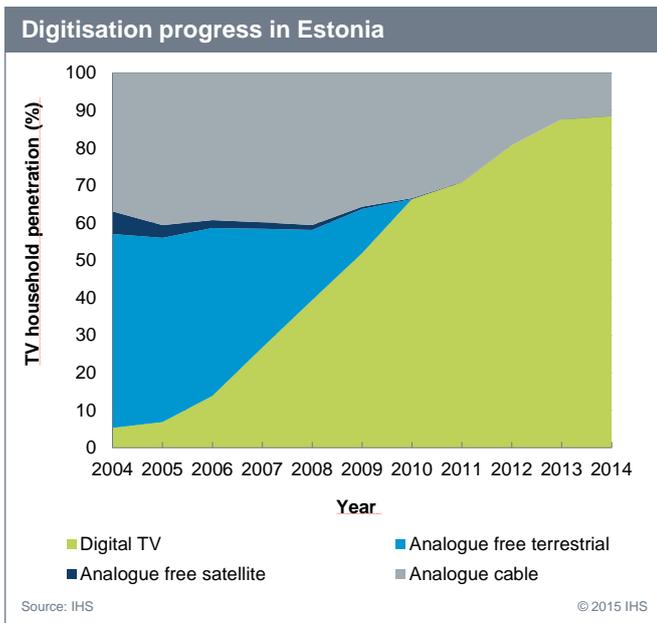
Source: IHS

© 2015 IHS

Eesti Television is the public broadcaster in Estonia, which offers two channels in Estonian—ETV and ETV 2—alongside a Russian language channel, ETV+. Eesti Television’s ETV is the second most popular channel in Estonia, showing series, documentaries and sporting events. The most popular channel however is private television station Kanal 2, which shows a large number of Estonian and international sitcoms. The Modern Times Group, a Swedish media conglomerate, has three FTA channels in Estonia: TV3, TV6 and TV8.



The analogue terrestrial signal switch-off took place in July 2010. There are four multiplexes in Estonia, two of which are free. The free-to-air sector in Estonia is currently decreasing however as pay TV continues to grow. This growth has been particularly led by IPTV, which at the end of 2014 accounted for 31% of TV households. At the end of 2014 the largest pay TV operators were IPTV operator Elion and satellite operator Starman. In general cable TV is prevalent in Estonia, particularly in the cities because of the existing infrastructure. IPTV is popular in parts of the country with high-speed internet connections.



Case Study – Croatia

Croatia Key facts – 2014

- **Population:** 4.4 million
- **Households:** 1.7 million
- **TV Households:** 1.65 million
- **Pay TV Penetration:** 43%
- **Broadband Penetration:** 57%
- **Mobile Penetration:** 113%
- **TV Ad Revenue:** €96 million

The analogue terrestrial signal switch-off took place in early 2011. DTT multiplex MUX-A reaches over 98.5% of the population and MUX-B is available to more than 95 % of the population. MUX-D reaches around 90% of the population of Croatia, and at least 70% of the population in each of the allotment regions. Close to 0.9 million households have free DTT as the primary source of TV and 39,300 have free digital DTH; no households receive analogue DTH signal.

There are 11 national and 21 regional TV channels available for free on the three DTT multiplexes including SPTV, a sports channel which shows a large variety of sports events including domestic league football and ATP/WTA tennis tournaments. The most popular channels in 2014 were publicly-owned channel, HRT1, and two commercial ones, Nova TV and RTL. This suggests that the wide availability of channels has driven the growth of the free DTT platform, which in 2014 was the largest TV platform in Croatia.

Croatia - platform overview 2014

	Pay subs ('000)	Free subs ('000)	Platform digitization (%)
Terrestrial	48	898	100
Satellite	111	39	100
Cable	154	0	69
IPTV	394	0	100
Total	707	938	97

Source: IHS

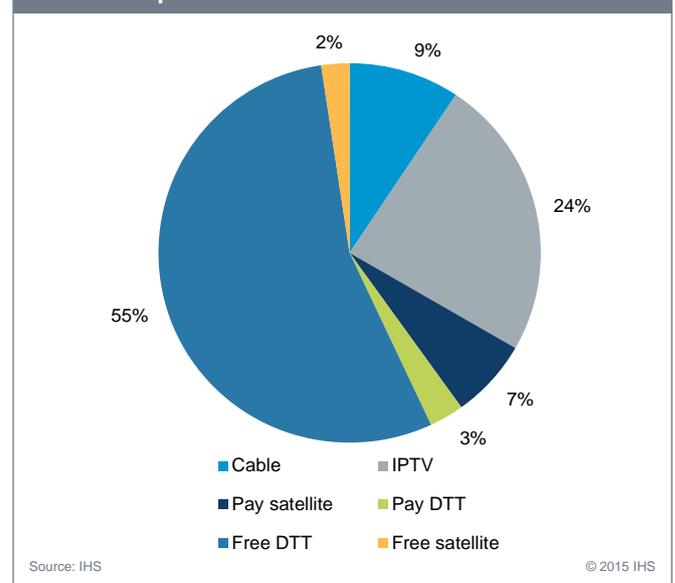
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Croatia's public broadcaster is Hrvatska Radiotelevizija (HRT) which offers four free-to-air channels in Croatian across the country: HRT 1, HRT 2, HRT 3 and HRT 4. HRT also provides an international channel which is aimed at the Croatians living abroad. Commercial broadcaster Central European Media Enterprises (CME) provides two free channels (Nova TV and Doma TV) and RTL Televizija, a commercial broadcaster owned by RTL Group, offers three channels (RTL, RTL 2 and RTL Kockica). Privately owned HOO TV broadcasts SPTV, a free-to-air sports channel.

Historically IPTV has been the most popular form of pay TV in Croatia because of the developed telecom infrastructure, and successful pricing and marketing strategies by IPTV operators.. Over half of Croatian pay TV subscribers use IPTV. At the end of 2014 the largest pay TV operators were IPTV operator T-Com Hrvatska and multi-platform operator Vipnet.

Cable TV is popular in urban areas whereas satellite TV is most common in rural areas. There are three DTH operators and all of them belong to foreign parent companies: Vipnet (owned by Telekom Austria), Total TV (owned by Kohlberg Kravis Roberts & Co. LP (KKR)) and Hrvatski Telekom (Deutsche Telekom).

TV landscape in Croatia



Methodology

Approach to data and market trends

IHS maintains a continuously updated database of technology and media market trends, television industry intelligence and historical and current analysis of technology and media developments collected using primary research methodology. We pride ourselves on ensuring that our analysts possess an in-depth understanding of the markets concerned and the players involved in these markets. As part of their day-to-day research methodology, IHS analysts regularly conduct interviews with market players and industry bodies, meaning that the majority of the information within this report is derived from direct contact with original sources.

IHS analysts benefit greatly, on acquiring technology and media market knowledge, by information and feedback obtained from a well-connected network of industry and market professionals and company executives. To complement the approach towards data and trend collection, specific interviews have been conducted, where appropriate, with market players, industry and trade bodies, consumer electronics manufacturers and regulatory authorities to gather and assess opinions on specific issues relating directly to concepts discussed within this report.

Unless otherwise stated, data and estimates in this report are derived from primary research conducted by IHS.

Countries included in figures and tables

Unless otherwise stated, data in the included figures and tables is from the following countries:

- **Western Europe:** Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, UK.
- **Central and Eastern Europe:** Armenia, Belarus, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Latvia, Lithuania, FYR of Macedonia, Moldova, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Turkey, Ukraine.
- **Middle- East and North Africa (MENA):** Algeria, Bahrain, Egypt, Jordan, Israel, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, UAE.
- **Sub-Saharan Africa:** Ghana, Ivory Coast, Kenya, Mozambique, Namibia, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Uganda, Zambia, Zimbabwe.
- **Asia and Pacific (APAC):** Australia, China, Hong Kong, India, Indonesia, Iran, Japan, Malaysia, New

Zealand, Pakistan, Philippines, South Korea, Singapore, Thailand, Vietnam.

- **North America:** Canada, USA,
- **Central and South America:** Argentina, Brazil, Chile, Colombia, Mexico, Peru, Venezuela.

Glossary

Control word: a decryption key

ARPU: ARPU is an acronym for Average Revenue per Unit and is equivalent to the average revenue generated by each subscriber in a given period (usually monthly or yearly).

Basic pay-television: the lowest level of service available for which the customer has to pay a monthly fee.

Broadband Internet: High-speed Internet generally taken to be Internet offered at speeds greater than 150Kbits/second. The term cable Internet also generally refers to broadband Internet offered over cable (as opposed to DSL or fibre)

Churn: Churn is an expression of the number of customers leaving a network (cancelling their subscription) in a given period calculated as a percentage of the average number of customers to that network during the period

Conditional Access Systems: Conditional access systems (CAS) are the encryption and control system used to protect delivered content from being decoded outside of the authorized network of STBs. It includes an encryption system at the transmission side and a companion decryption system in the STB, usually activated using a smart card.

Direct Download Links (DDL): downloading/streaming a file by means of a traditional client-server network (cf. peer-to-peer (P2P) network)

DSL: Stands for Digital Subscriber Line and refers to a set of technologies used for digital data transmission over a local telephony network. Several generations of technologies are in use at present, including the common (in order of data transfer speed) ADSL, ADSL2+ and VDSL.

File sharing: in the context of online piracy, file-sharing refers to the act of illegally distributing audio-visual content, computer software, video games, and other content. As a rule file-sharing is a non-commercial activity from a user perspective; however, there are commercial activities built around file-sharing (e.g. banner ads on torrent indexing sites). Internet file-sharing occurs on, but is not limited to peer-to-peer (P2P) networks.

Geo Blocking: the use of geo location software to prevent internet users from outside a particular region from accessing a website or its services. Each country in the world is assigned a set block of IP addresses, which forms the basis for geo blocking. Geo blocking is used by broadcasters to prevent users from outside their particular regions/country from accessing programming/content on their website due to limitations in their distribution agreement.

Grey Market: Grey market in this instance refers to broadcast content/pay TV signals that are accessed outside of the content provider's authorised distribution regions and which results in copyright infringement.

IPTV: Internet Protocol Television IPTV is the delivery over a broadband connection of television content using Internet Protocol within a 'walled garden' environment. IPTV has been widely used by telecoms operators to offer TV over their ADSL networks. IPTV can also be used by cable companies both within their own network infrastructure and as a means of expanding their service reach outside their areas of operation over unbundled third-party DSL networks.

Peer-to-peer (P2P): is a form of internet based network architecture wherein the participants/users are both consumers and suppliers, as opposed to a client-server based approach where the consumer only downloads material from the server/supplier. A P2P network relies on the increasing participating of users to increase the network throughput, and does not use centralized servers to store the material.

Penetration: Proportion of households (typically households owning TVs) with a particular service

Playback hardware: Refers to the equipment used to display/listen to material stored on recording media like optical disk, VHS etc. Common playback hardware are VCRs, DVD Players, Blu ray players etc.

Premium television: Single or packaged of high-value channels that contain premium content and command a high customer subscriber fee. Typically refers to recent movie or top-level mainstream sports content.

Progressive download: A system whereby content is transferred over an open or closed network and stored in memory. After a period of buffering, the content may be played out in real time or watched later depending on usage restrictions. At the completion of a progressive download a copy of the file is left on the device unless software intervenes to remove it. Many 'streaming' services in fact use progressive download

Set-top box: A cable set-top box is an analogue or digital receiver and decoder that converts the signal received to one suitable for a standard television set. The set-top also performs certain conditional access functions and may run the software that enables interactive television services. Set-top boxes are widely used in digital terrestrial, cable, satellite and IP television, but less widely used for analogue services.

Subscribers: A subscriber is an individual cable customer, the important distinction being that a subscriber is a single unique unit and thus differs from a subscription or RGU.

Smart Card: In the context of conditional access systems, smart cards, or integrated circuit cards (ICC) are plastic cards that contain embedded microprocessors, capable of storing conditional access

information on them, which are essential to decrypt and access the broadcast content sent to the set top box.

Streaming: A method of constantly delivering (usually audio visual) material over the internet. While traditionally streaming media involved a one to one connection between the user and the server, P2P streaming services are now available which use P2P technology to deliver media between many users while constantly accessing the content, unlike traditional P2P where individuals files can be accessed fully only after completing a download.

Leaching: In the context of online piracy, leeching websites are those sites that redirect users to third party streaming or DDL websites that offer (mostly illegally) copyrighted material. In many cases, leeching sites perform the role of an online content aggregator - categorising the copyrighted material available on these third party sites and offer multiple links to various sites for the same content.

User-Generated content (UGC): content uploaded by end-users. User-generated video is currently the most popular online video content (in terms of the number of streams). Sites like YouTube, DailyMotion, MetaCafe, myvideo.de specialize in hosting and delivering user-generated video.

Online Long form: Refers to any content viewed over the open internet which exceeds a predetermined duration. Typically 15 minutes is accepted as the minimum long form duration however this varies depending on the definitions of each data supplier.

Online Short form: Refers to any content viewed over the open internet which does not exceed predetermined duration. Typically 15 minutes is accepted as the maximum short form duration. Short form content includes User Generated Content.

VoD (Digital Rental): The practice of paying for a rental on an a la carte basis over the open internet and/or closed pay TV network (i.e. Pay TV on-demand and online rental combined)

Pay-TV On-Demand (Pay-TV-VoD): The practice of paying for a rental on an a la carte basis over a closed pay TV network. Formally speaking it applies to a temporary right of use that is purchased by a one off payment. It can be either movies or TV shows. For example, a movie rental through Foxtel's satellite TV platform.

Online Rental (Online VoD): The practice of paying for a rental on an a la carte basis over the open internet. Formally speaking it applies to a temporary right of use that is purchased by a one off payment. It can be either

movies or TV shows. For example, a movie rental through iTunes.

Electronic Sell-Through (EST): Refers to paid for transactional non-physical purchases for ownership of film entertainment content on both closed managed networks and the open internet. Excludes adult, event, free, sport and subscription content unless otherwise stated.

Online Subscription (Online sVoD): Refers to subscription video on demand (often referred to as 'streaming') over the open internet. These are temporary rights of use accessed with a recurring payment. For example, a subscription package through Quickflix.

Pay-TV Subscription Video on Demand (Pay-TV SVoD): Refers to subscription video on demand (often referred to as 'streaming') over a managed closed Network. These are temporary rights of use accessed with a recurring payment. Pay-TV SVoD must be independent of any channel packages.

Pay-TV On-Demand nVoD: Refers to the VoD system where the same content is broadcast over multiple channels with staggered viewing times. This technology is at its core linear broadcast

Pay-TV On-Demand Push-VoD: Push-VoD is technology whereby on demand content is broadcast in a scrambled format to the users set top box to be stored and viewed on request. This technology is popular with analogue satellite broadcasters who do not have the capacity for true VoD as it allows content to be shared over frequencies used by channels while they are off the air.

Live On-Demand Pay-Per-View: This technology uses live transmissions which are broadcast in a scrambled format to be decoded on request from the user.

Multichannel: small thematic channel, largely pay TV.

National channel: free to air channel