MTM x Ofcom: Broadcast Distribution Costs

Final report

09 May 2024

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MTM forecast broadcaster distribution costs to 2040 to inform Ofcom on the commercial implications of IP delivery

Project scope

Ofcom are considering the Future of TV and, as part of this workstream, want to understand the evolution of the TV distribution landscape.

Ofcom has engaged MTM to:

- Identify the current TV distribution value chain
- Estimate current distribution costs for different types of broadcasters in the UK **[REDACTED due to commercial sensitivity]**
- Model a scenario-driven forecast of broadcasters' distribution costs up to 2040 **[REDACTED due to commercial sensitivity]**

MTM methodology

1. Create a comprehensive overview of the TV distribution value chain in the UK, identify commercial relationships and key players, estimate current broadcaster distribution costs.
2. Refine our current state analysis following interviews with broadcasters and technical distribution experts; define model scenarios.
3. Build distribution costs forecast model for each scenario and broadcaster.

Most broadcasters maintain a complex mix of proprietary and vendor-led solutions for content distribution

	Content production	2.1 Media management		2.2 Delivery and transmission		2.3 Reception and consumption
		Aggregation	Playout	Multiplexing	Distr. and Tx	
Capabilities	Content production	Media sourcing	DRM	MUX management	Towers / satellites	Personalisation (UI recomm, EPG); analytics
	Syndication	File transfer & contribution	Transcoding	Tx / Rx networks		UIs and end-user devices
	Ad sales	Access services	Metadata	Head-ends, APs	Fibre / Coax networks	Prominence
		Service scheduling	Content management	Origin servers	CDNs	IP service development
Participants	Production companies	PSBs				STB hardware
	Content creators	Pay TV providers			TV network operators	TV manufacturers
	UGC			Signal distributors	CDN operators	Non-TV manufacturers
		OTT providers			ISPs + MNOs	OEMs
		Tech vendors				
Commercial relationships		*Outsourcing arrangements to tech vendors.* *In-house systems and components with technical support from vendors.*		*Consolidation of broadcast and network infrastructure (PSB and Pay TV).* *Investment in CDN/ Partnerships (OTT providers).*		*EPG agreements.* *Ad-placement and branded content partnerships.*

Source: MTM analysis

IP service development costs and DTT costs have increased, but other unit prices have declined since 2014

Variable	High level description of changes since 2014
DTT MUX costs	▪ MUX operator contract costs are largely fixed in long term contracts, however there has been some cost increases since 2014 due to inflationary pressures ▪ Additional inflationary pressures in early 2023 are likely to increase MUX operating costs further in the near term
DTT channel pricing	▪ Demand for DTT channels from commercial broadcasters has fallen steadily since 2014
DSAT channel pricing	▪ Significant falls in demand for satellite capacity since 2014: for example, C4 has halved it satellite distribution expenditure since 2016 ▪ Demand for DSAT distribution (uplink and capacity) has fallen ~77% since 2014

Variable	High level description of changes since 2014
Media management	▪ Media management services are subject to long term fixed contracts ▪ We understand media management contract costs to have declined for most broadcasters since 2014: technology advancements are offset by more complex requirements
IP service development	▪ Investment in IP service development has increased significantly since 2014 (in some case by 3x or more)
CDN fees	▪ CDN (content delivery network) price per GB of data delivered has dropped since 2014 by ~90% for broadcasters delivering high volumes of content over IP ▪ A race to the bottom means CDNs are offering highly competitive data delivery rates in order to appeal to broadcasters

Conclusions

Individual broadcast channels have had distribution costs fall steadily, while costs for some channel groups and MUX operator costs have gone up

- Broadcasters channel portfolios are changing, and have increased in size: 38 DTT / 99 DSAT (BBC, ITV, C4 and UKTV) channels in 2014 vs. 44 DTT / 139 DSAT channels (BBC, ITV, C4 and UKTV) in 2022
- There has been a small reduction in transmission fees for DTT (Digital Terrestrial Television) on commercial multiplexes and Digital Satellite channels

We formed a base case forecast, and considered credible scenarios which may have a material impact on broadcasters' content distribution costs:

- We modelled a range of scenarios for costs for DTT, with future MUX contract negotiations a key unknown
- The change in broadcast channel line-ups are accompanied by increased total IP (Internet Protocol) delivery costs. This is despite lower unit costs for IP delivery and increased syndicated IP delivery
- Our base case assumes that the BBC will not renew its PSB3 MUX license in 2030. Other scenarios that were considered in addition to the base case included: significant reduction in DTT channel line up, especially post-MUX renewal in 2034, which may further accelerate adoption of IP within unconnected homes, along with scenarios in which transition to hybrid and OTT/IP video was slower than the base case
- Closed IP platforms (e.g. Virgin Media Stream, Sky Glass) may seek to monetise their UIs through delivery fees, wholesale charges, supply of ad inventory, etc.

Any reduction in broadcast or media management commitments for broadcasters may be reinvested in IP services

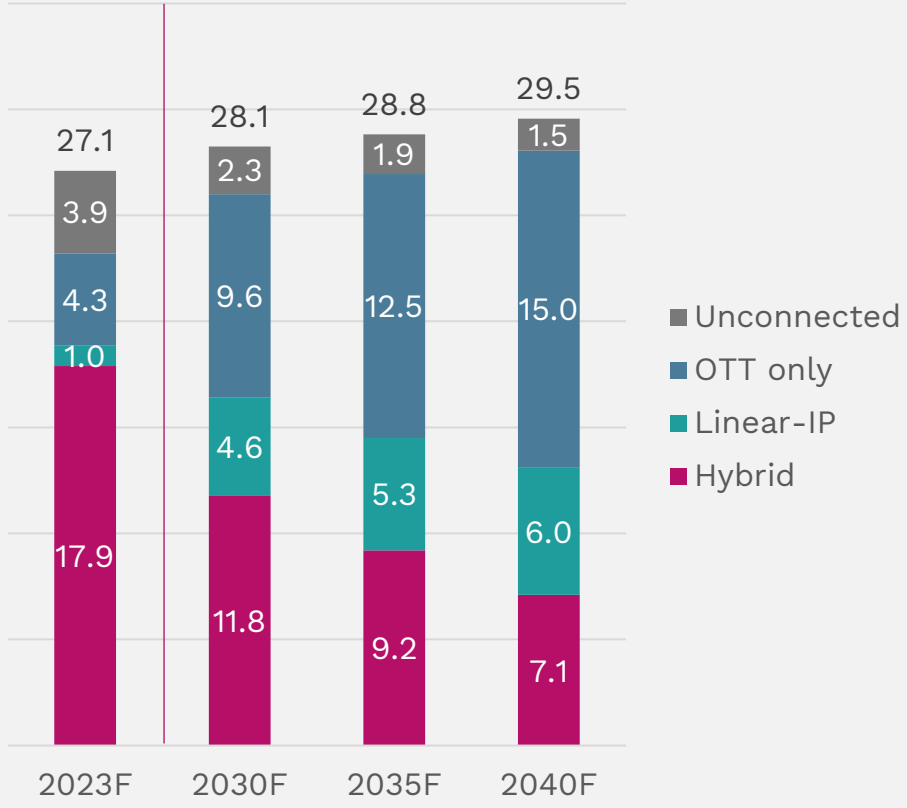
- The base case does not consider reinvestment into IP service propositions
- Given the discretionary nature of IP service development spend, it is reasonable to consider that cost savings could be reinvested in other areas of the distribution landscape (including in original content)

Our viewing forecast suggests SVOD, BVOD and live-IP viewing increase, and broadcast viewing declines significantly

- Total decrease in daily-minutes viewed per-person from 2023 to 2040:
  - SVOD (+46%); BVOD (+62%); total linear (-54%), with linear over IP increasing by 126%

We assume that ~95% of homes can receive and view video over the internet by 2040 (93% in 2035)

UK homes by primary TV UI type, millions



We identify four distinct types of TV user interfaces, the basic technologies through which audiences consume long-form TV, depending on the TV platform they use as their primary set, and its degree of IP connectivity:

- **Unconnected**: The TV set has no connection to IP-delivered video and relies entirely on linear broadcast delivery, mainly from DTT or Freesat
- **Hybrid connectivity**: TV set receives linear broadcast programming through a distribution mechanism like DTT or satellite, but is also connected to the internet and can receive VOD services and IP-delivered linear channels alongside.
- **Linear-IP**: TV set receives both linear and on-demand content through a pay-TV platform like Sky or Virgin, but over IP only (i.e. no broadcast component). These platforms have incentive to give prominence to linear channels because a key revenue stream is linear pay-TV packages, esp. sports
- **OTT only**: TV set has no broadcast delivery and relies entirely on IP, delivered through a patchwork of VOD and linear services. Includes IP-delivered platforms from a variety of tech & hardware players (Google, Roku, streaming devices like Fire & Apple TV, etc).

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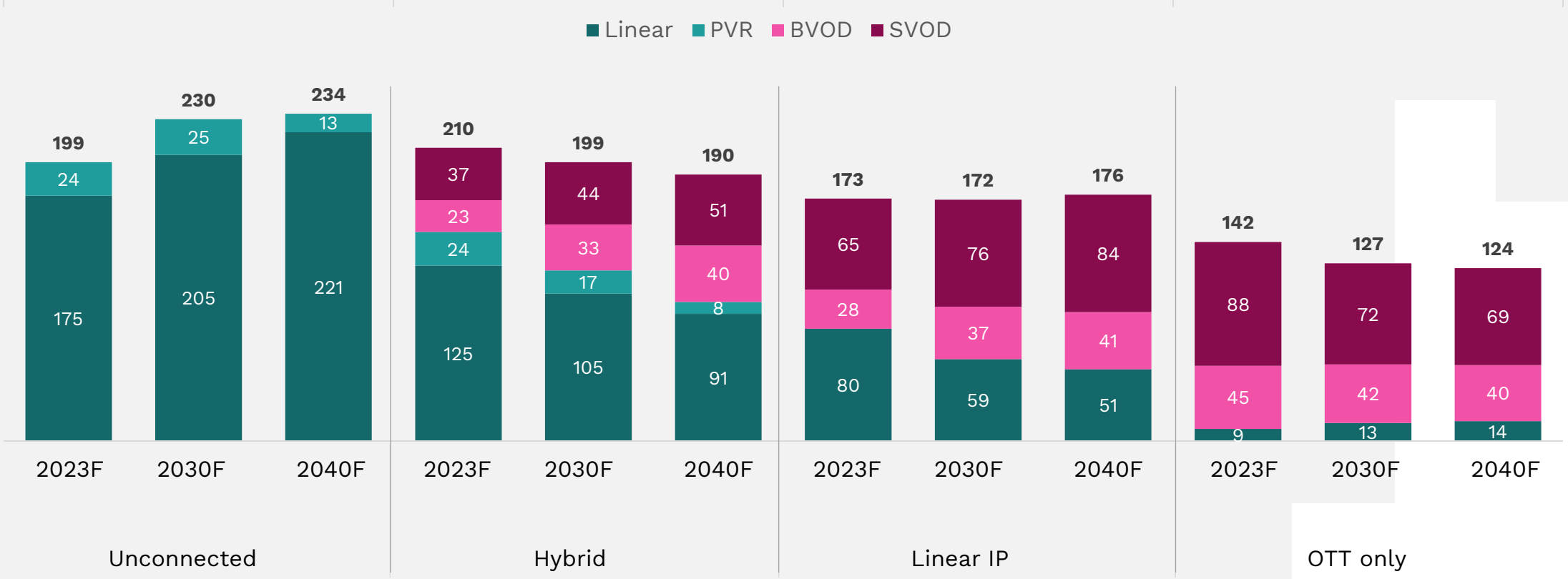
Source: 3 Reasons, MTM analysis

Each UI type has a viewing profile, based on historical viewing trends by age and content type

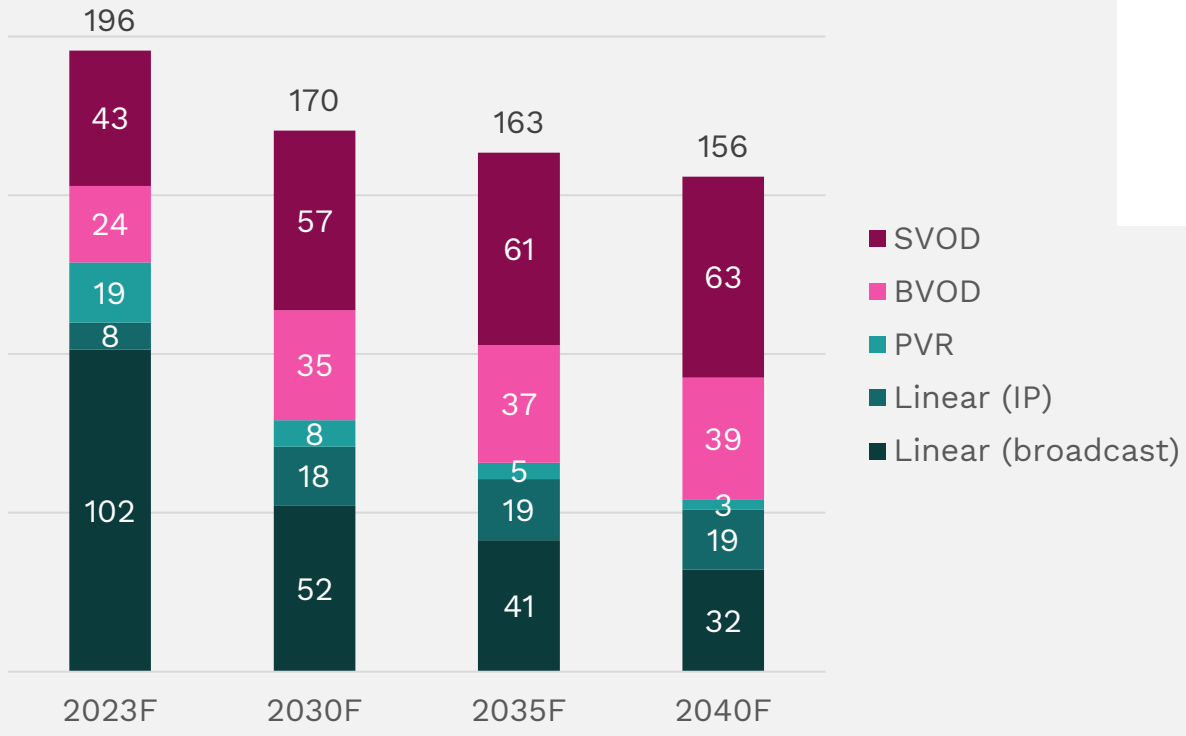
UI viewing profiles by content type – Daily individual minutes for different primary set HH category



Source: 3 Reasons, MTM analysis

Our TV-household and UI forecasts are combined to create a viewing projection that predicts 77% IP viewing by 2040

Viewing of content type, daily minutes per person



Analysis

- Combining our assumptions for UIs and viewing levels by UI predicts future viewing patterns:
  - Total viewing declines by 21% (196 minutes in 2023, 156 minutes in 2040)
  - Broadcast (i.e. video delivered by DTT or DSAT) as % total long form* decreases from 62% in 2023, to 23% in 2040, with an increasing % of linear viewing delivered over IP
  - We assume that total SVOD and BVOD continues to grow, driven by UI choices and increased adoption of online video devices and associated services

Source: 3 Reasons, MTM analysis. Long form video for the purposes of this forecast is defined as professionally-produced video content on TV channels and streaming video services (excludes YouTube and social video on services like TikTok)

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Source: MTM analysis

Media management involves the organisation, preparation and administration of media content prior to its distribution

Media management is the process of organising media assets and creating broadcast feeds (playout). Key aspects include:

- **Aggregation**
  - Media sourcing
  - File transfer
  - Access servicing
  - Service scheduling
- **Playout**
  - Transcoding
  - Metadate layering
  - Content management

Overview: media management

Aggregation				Playout		
Media sourcing	File transfer	Access services	Service scheduling	Transcoding	Metadata	Content management
Media sourcing is the process of acquiring media content rights. It involves negotiating, obtaining and managing rights over time. Media sourcing can be carried out either in-house or outsourced to a media management company.	*File transfer refers to the process of moving digital media files in the production and post-production stages. File transfer and delivery from studios is built into the production budget and booked as required.*	*Technical and creative services that are used to make television programming accessible. This includes closed captioning, audio description, and sign language, etc. Access services are sometimes provided by the production house or broadcaster.*	*Service scheduling is the process of organising and scheduling tasks regarding the production, management and distribution of media content.*	*Converting digital-audio or video-data from one format to another so that multiple types of devices and networks are supported. This allows media to be streamed over IP networks, and to be played on different devices, such as tablets, smart TVs and smartphones.*	*Metadata management is the process of organising, storing and distributing metadata of digital media content. Metadata is data that describes the characteristics of media files such as the title, author and format. Metadata layering involves adding multiple layers of metadata.*	*Content management system allows broadcasters to store, organise and manage their content libraries. For online services like BBC iPlayer, CMS is important to ensure rights clearances, publication schedules and other associated functions are handled correctly.*

Source: MTM analysis

Broadcasters leverage cloud resources to manage complex delivery requirements

Cost drivers for Media management

Transcoded hours	Transcoding, or converting, media content from one format to another for video to play on a range of devices. Broadcasters can invest in their own infrastructure for transcoding (CAPEX) or rent/hire capabilities from vendors (OPEX).
TV content delivered (hours)	Additional channels – and hours of content delivered – affects OPEX via increased data storage requirements, variable labour costs, and media sourcing commitments. This relationship is not linear.
Content management system	Fixed cost depends on total size of content library and complexity of indexing and metadata schemas (simple, small, libraries are easier to manage and require less maintenance/updating than large complex libraries). Sophisticated CMS can automate manual tasks such as metadata creation and organisation.

Key trends

- **Technical improvements and efficiencies** (and increased use of AI) reduces the need for manual intervention – creates more streamlined workflows
- **Increasing demand for higher-quality production** (augmented reality, virtual reality, resolution) requires more storage space and put upwards pressure on costs
- **Migrating data to cloud storage** facilitates flexibility and scalability. It is also a more efficient solution as it removes on-prem storage requirements, however, it can be a more expensive solution despite reductions in unit costs
- **Heightened focus on content security measures** are driving up security-related costs as broadcasters invest in technologies such as encryption
- **Complex omnichannel delivery** means broadcasters must manage content across multiple formats and device types

Source: MTM analysis

Arqiva manages the UK DTT network – their services involves multiplexing, site management and ongoing maintenance

DTT MUX operators have contracts with Arqiva for DTT capacity and PSB MUXs are used for PSB channels. Broadcasters can secure capacity through negotiation with the MUX operators for COM4/5/6.

The MUX operators contracts with Arqiva for the provision of the DTT network expire around 2034; the potential terms upon which agreements are renewed have a significant impact on broadcasters' future distribution costs.

Our discussion with broadcasters have included scenarios in which the DTT network is switched off after 2034 if network renewal costs outweigh the potential upside for MUX operators.

Platform overview: DTT

Content providers secure DTT capacity if they are a MUX operator (BBC/ITV/C4) or through commercial negotiation with a MUX operator (COM4/5/6).

Multiplexing

Head-end MUX generation

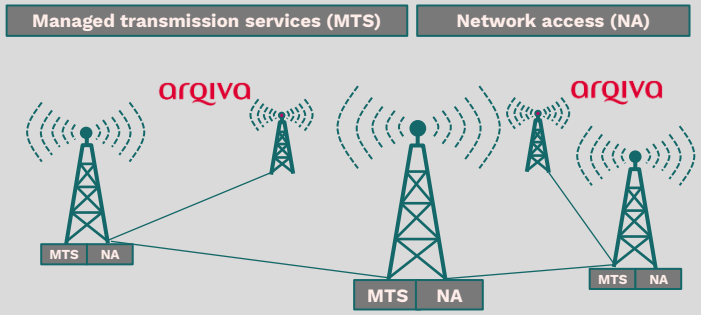
PSB1	BBC
PSB2	ITV 4
PSB3	BBC
COM4	ITV
COM5	arqiva
COM6	arqiva

There are 6 MUXs operated by BBC, ITV, C4 and Arqiva. PSB 1/2/3 have 98.5% household coverage and COM 4/5/6 have 95% coverage.

Distribution

Signal distribution to TX sites is arranged by the MUX operator; main providers are BT and Arqiva.

Transmission



Managed transmission services (MTS) include design, build and operation of the network and multiplexing. Network access (NA) wholly controlled by Arqiva involves towers operation, maintenance and management of the transmitters. The MUX operators have long term contracts with Arqiva for MTS and NA. Regulated NA prices are subject to increases based on inflation.

Source: Arqiva, Broadcaster interviews, MTM analysis

MUX operators use DTT capacity for their own channels or lease to other broadcasters

Cost drivers for DTT

Number of commercial DTT channels

For most broadcasters, more DTT channels leads to additional channel fees, payable to the MUX operators (BBC, SDN, D3&4 and Arqiva). Channel fees are subject to commercial negotiation.

MUX operator obligations

BBC, ITV and C4 are MUX operators and have contractual obligations for network build and operation to Arqiva (c. £20m - £40m p.a.). MUX operators have control over the terms on which capacity is leased to channel providers: BBC uses all of PSB1 MUX (BBC A) for its own channels. SDN (a wholly owned ITV subsidiary) leases capacity to ITV and other broadcasters at commercial rates.

Key trends

- **Broadcasters have rolled out HD variants,** however, talk of an UHD channel launch on the DTT network is premature given multiplex bandwidth limitations
- **Channel timeshare stream sharing** is used to allow broadcasters to cut multiplex costs
- **Commercial MUX revenues have declined,** driven by instability in the UK TV ad market and fewer channel launches
- **Technological advances and more efficient use of spectrum** have caused a reduction in transmission costs
- **The introduction of 5G** presents a hypothetical alternative delivery mechanism. Trials are underway, and industry bodies such as 5G-MAG focus on its development

Source: MTM analysis

Broadcasters stream DSAT channels via leased transponder capacity, but uplink services are also an obligation

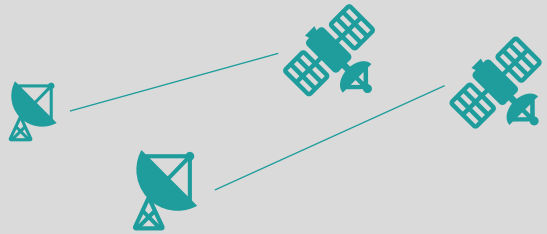
Broadcasters' satellite delivery is composed of two liabilities: transponder capacity on satellites, and the uplink components to communicate the video feed to the satellite.

Broadcasters' can secure entire transponders in bulk, and manage their own capacity (e.g. BBC/ITV) or negotiate with wholesale providers (e.g. Arqiva, BT) for capacity for individual channels.

Uplink facilities are either owned-and-operated or outsourced (major uplink providers include BT, Sky and Arqiva).

Platform overview: DSAT

	Multiplexing	Distribution	Transmission	
			Uplink	Transponder capacity
Content providers secure DSAT capacity either by buying an entire satellite transponder (bulk capacity), negotiating for single channels directly with satellite operators or buying capacity from a wholesaler (Sky, Arqiva, etc.)	*Satellite multiplexing occurs at the uplink site.*	*Signal distribution to uplink sites is arranged by the channel provider or the wholesale provider.*	*Satellite uplink communicates the channel signal with the appropriate satellites. Arqiva is a major provider of satellite uplink in the UK.*	*Channel providers can secure capacity by leasing transponders directly from the satellite providers, or via a wholesaler like Sky or Arqiva.*



Source: MTM analysis

Broadcasters are considering other delivery mechanisms, driving down transponder capacity costs

Cost drivers for DSAT

Total transponder capacity	Transponder leasing costs are variable on a per transponder basis, or (if secured via a wholesaler) on per Mbps basis. Long term leasing contracts may be signed (e.g. Sky and SES). Costs can vary, depending on the total capacity and the length of contract.
Total uplink capacity	Required uplink capacity varies with the number of TV channels transmitted. Choice of TV content standards (such as DVB-S2X) leads to efficiency savings, and reduced OPEX: i.e. more channels can be added to a transponder at the same cost.
SD to HD channel upgrades	Satellite transmission of HD and UHD channels is more expensive than SD. Additional bandwidth is required to transmit higher resolution video and audio. HD encoders / modulators and enhanced video compression is required.

Key trends

- **HD channel stream demand** – the BBC recently completed their regional satellite SD to HD upgrades for BBC One
- **Adoption of advanced technologies** such as High DVB-S2X improve video quality and bandwidth efficiency. Technological advances (e.g. more efficient digital signals) and increased competition drive down transponder capacity costs
- **Transponder capacity is likely to continue its gradual decline** in Europe. SES (operates Astra satellite fleet and used by Freesat / Sky) has seen its television revenue per channel decline ~6% Y-o-Y since 2015
- **Reduced dependency on satellite distribution** from major UK platforms in the UK, such as Freesat and Sky due to increased competition from OTT services and more cost-effective delivery methods (e.g. IP) that offer addressable advertising opportunities

Source: MTM analysis; SES annual reports.

Most broadcasters use 3rd party CDNs to deliver content; some have invested in their own private CDN architecture

Broadcasters make choices about which devices and platforms they want to support. These decisions drive the complexity of their IP delivery pipeline: devices require file variants and platforms dictate specific metadata formats for content to appear properly in UIs.

Video content is delivered to end-user devices via CDNs or directly via peering relationships with ISPs (internet service provider). For some platforms, broadcasters deliver a master file and the platform is responsible for delivery (e.g. Sky via IP, VM).

Broadcasters have the option of investing in their own content caches to create a private CDN, however most have chosen public CDNs for their content delivery.

Platform overview: IP delivery

	Transcoding	Metadata	Content mgmt.	DRM	CDNs + peering
Content providers can use their own video apps for IP delivery or deliver their content to specific servers for syndicated via other apps or platforms.	*Converting video files into different formats for playback on different devices (e.g. HLS, MPEG-4, etc.).*	*Adding key information about the video content, including actors, descriptions and access services (subtitles).*	*Indexing and processing video files and associated data to make sure the right files are available (includes rights clearances).*	*Encrypting and other security protocols to prevent unauthorised access to content (e.g. for subscription services or to enforce geo-blocking).*	*Delivery video packages to end user devices, either via a network of caches or by connecting directly with an ISP to make content delivery cheaper and faster.*
	Broadcasters have the option of building their own IP media management solutions in house, using custom-built or off-the-shelf components; alternatively, third party vendors are available to outsource these aspects of delivery.			*Most broadcasters use DRM licenses from third party vendors due to the fragmented nature of device DRM requirements.*	*Most broadcasters use multiple commercial CDNs to deliver their video content; some broadcasters have invested in their own private CDNs or peering arrangements with ISPs.*

Source: MTM analysis

IP delivery costs are the product of total data delivered (via CDNs) and the variable cost per GB delivered

Cost drivers for IP delivery

# channels for IP linear distribution	Costs vary by number of channels delivered and the number of devices or platform formats that require support. Platforms such as Sky (Glass) / VM02 (Stream) don't currently charge carriage fees for syndicated delivery.
Total data delivered via commercial CDNs	CDN costs can be either a fixed fee deal that allows a certain amount of data to be delivered, or variable per GB. Key variables are total content streamed and the encoding rate (amount of data per second/minute watched).
CAPEX for owned-and-operated CDNs	BBC and Netflix, for example, have previously built and run their own CDNs. Fixed cost CAPEX obligations can include: hardware, network bandwidth costs, data centre costs (building / leasing); semi-variable costs include staffing.

Key trends

- **Increasing need for HD broadcast streaming**. As HD technology is more affordable, broadcasters are expected to delivery high quality streams without lag. Increased bitrates puts pressure on bandwidth requirements, but this is offset by continuous efficiency / technology improvements
- **Broadcasters are increasingly using multiple CDNs and load balancing,** to achieve better quality of service at a lower cost
- **Integration of OTT services into IPTV platforms provides viewers with a one-stop-shop for their content,** driving the trend towards IP-based delivery. Competition between broadcasters within the UI is fiercer as new players enter the market
- **Market fragmentation: more players in the IP space** as traditional barriers to entry are removed (such as competitive MUX capacity for DTT). Implications are pressure on traditional broadcasters to adapt, and traditional video distribution standards (such as DVB) are considered obsolete

Source: MTM analysis

Reception & consumption fees includes charges from end-user services and investment in (UIs) user interfaces

Reception and consumption includes devices and services used by end-users to receive and watch TV content, and associated services:

- Personalisation (UI recomm., EPG)
- Analytics
- UI and end-user devices
- Prominence
- IP service development

Reception and consumption fees may be charged by content distributors or aggregators for making content available to the end user. For example, Sky satellite contribution costs.

Overview: reception and consumption

Personalisation (UI recomm, EPG); Analytics	UIs and end-user devices	Prominence	IP service development
Personalisation: analytics engines that provide personalisation and recommendations for TV interfaces, e.g. "recommended shows", "top 10 in the UK". *Analytics: analysis of viewing and navigation behaviour used to inform business logic, including advertising, recommendations, product development and promotions.*	*UIs (User Interfaces) refer to the graphical interfaces or platforms through which end-users interact with media content, such as TV shows, movies, and other video content. These interfaces could be software applications or hardware devices, such as smart TVs, smartphones, tablets, game consoles, and set-top boxes.* *End-user devices, are the physical devices that end-users use to access media content, such as TVs, smartphones, and laptops.*	*PSB prominence in the UK refers to the legal obligation of certain television channels to provide a range of public service broadcasting content. This includes channels such as BBC One, BBC Two, ITV, Channel 4, and Channel 5. The prominence rule requires that these channels are given priority in the Electronic Programme Guide (EPG) and must be easy for viewers to find. The aim of PSB prominence is to ensure that viewers have easy access to a range of high-quality, informative, and educational programming.*	*IP service development costs are those incurred in developing the software-based systems which determine the functionality of IP programme delivery systems and make programmes accessible across different device types and operating systems. Examples are BBC iPlayer, ITVX investment.*

Source: MTM analysis

Cost drivers for reception and consumption are EPG fees, IP development investment, and platform contribution costs

Cost drivers for reception and consumption

IP development costs

Platform developments costs are CAPEX investment in software upgrades to the user interface / consumer facing platform. Additionally, OPEX includes custom components for individual platforms / devices and ongoing maintenance costs.

EPG fees

EPG fees may be charged by the provider of the EPG service. For instance, Sky charges an EPG fee per channel per annum in addition to its platform contribution costs.

Platform contribution costs

Sky platform contribution charges range widely from tens of thousands to millions per channel per annum. Additional conditional access charges are in place for premium channels. PSBs have commitments to other platforms, including Freeview/Freesat and YouView.

Key trends

- **Sky platform contribution costs and EPG charges trending downwards**. Broadcasters are opposed to Sky platform contribution costs as they argue that Sky gains value from streaming their channels
- **An evolving TV industry necessitates additional investment in IP services**. Competition is greater, and high-quality online platforms require investment
- **We understand that Sky / Virgin Media do not currently charge syndicated delivery fees** for IP streams. However, there is a possibility that Sky (Glass) / VM02 (Stream) may introduce this in future years. Specific terms, for now, would be highly speculative and subject to negotiation between Sky / VM02 and content providers

Source: MTM analysis, Sky Platform Charges rate card

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Viewing behaviour and technology developments means broadcasters need to review their distribution arrangements

Introduction – market context

VOD consumption is growing fast: VOD accounts for >30% of viewing in 2022, and will account for >50% of viewing before 2030. Younger audiences (16-34 year olds) in particular are ~30% more likely to watch VOD content and ~15% more likely to watch TV catch-up compared to older demographics.

Content is increasingly consumed over IP. >50% of live viewing will take place over IP by 2030, compared to under 25% today. DTT consumption is expected to fall at around 10-15% p.a., while satellite consumption is expected to fall even faster.

Overall spend on digital-first UK content has also grown in response to changing habits; UK digital commissioning spend grew nearly 200% between 2020-2021 according to PACT.

PSBs have embraced the increased demand for their streaming services: BBC iPlayer streams exceeded 6.6 billion in 2021/2022, a year-on-year increase of 8%. ITV Hub audiences and Channel 4 (All4) audiences grew by 22% and 21% respectively.

This has led to growing investments in IP delivery and operations: The BBC will spend £300 million on digital transformation plans focussed around iPlayer over the next 6 years. Between 2022-2023, ITV will spend ~£80million on non-content investments on ITVX alone. Channel 4 has rebranded All4 to be its master brand.

Non-PSBs have also seen increases in their delivery costs, again led by the growth in IP delivery demand. Various factors contribute to ongoing support of DTT and DSAT networks including as a means to meet PSB obligations for universality, and to support mass audience advertising models.

IP service development costs and DTT costs have increased, but other unit prices have declined since 2014

Variable	High level description of changes since 2014
DTT MUX costs	▪ MUX operator contract costs are largely fixed in long term contracts, however there has been some cost increases since 2014 due to inflationary pressures ▪ Additional inflationary pressures in early 2023 are likely to increase MUX operating costs further in the near term
DTT channel pricing	▪ Demand for DTT channels from commercial broadcasters has fallen steadily since 2014 ▪ Pricing for commercial DTT channels is ~28% lower than in 2014
DSAT channel pricing	▪ Significant falls in demand for satellite capacity since 2014: for example, C4 has halved it satellite distribution expenditure since 2016 ▪ Pricing for DSAT distribution (uplink and capacity) has fallen ~77% since 2014

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CDN fees	▪ CDN (content delivery network) price per GB of data delivered has dropped since 2014 by ~90% for broadcasters delivering high volumes of content over IP ▪ A race to the bottom means CDNs are offering highly competitive data delivery rates in order to appeal to broadcasters

Economies of scale opportunities are limited to DTT, DSAT and IP-delivery

Cost component	Economies of scale	Broadcaster cost savings
DTT	▪ Broadcasters (who don't operate a multiplex) must pay market rates when negotiating channel stream contracts. Operating a multiplex provides a cost effective means of delivery, as broadcasters can use multiplex bandwidth for their own channel streams ▪ This is subject to dependencies: wider channel stream demand, network access charge costs and multiplex contract size ultimately affect whether broadcasters operating multiplexes benefit from economies of scale	
DSAT	▪ During the contract negotiation process, broadcasters can negotiate fixed transponder capacity instead of a number of channel streams. Broadcasters benefit from higher purchasing power which helps reduce total contract prices ▪ For example, in 2022 Sky renewed their transponder capacity agreement with SES, providing them with transponder capacity instead of an agreed number of streams – this delivers flexibility in scaling up and down as required (i.e. add channel streams)	
IP	▪ Paying a variable unit rate per GB of data delivered is an expensive IP delivery solution. Broadcasters streaming high quantities data via IP instead agree a cheaper predetermined unit rate for a committed quantity of data delivered ▪ This brings additional scaling advantages – broadcasters can easily scale up for more popular shows at peak times (e.g. a one-off sports broadcast)	

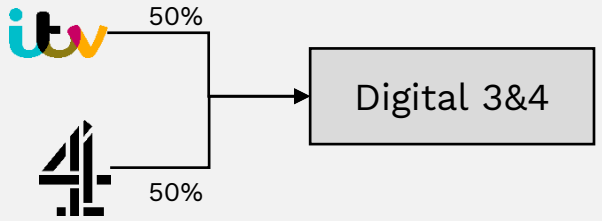
Key:  = low;  = medium;  = high

DTT costs are broadly fixed; but each cost component includes both variable and fixed components

Category	Media management	DTT	DSAT	IP-delivery	IP service development investment	Reception and consumption fees
Variable:	Total file variants and content library size drive costs. Digital rights management fees depends on IP viewing and # of viewer devices.	Leasing multiplex capacity from operators is possible, but the price is subject to supply / demand dynamics.	For some broadcasters, will vary based on number of channels (and by type), incl. regional variants and time-shift channels.	IP delivery costs are mostly variable and depend on the total quantity of data delivered.	N/A	Platform contribution costs and EPG charges depend on the number of channels / regional variants / time shift streams.
Fixed:	Costs are broadly fixed within contract terms.	Multiplex operating costs are subject to long-term contracts with Arqiva: these costs are broadly fixed, with some fluctuations based on inflation.	Satellite transponder capacity is secured with transponder suppliers (e.g. SES) via long-term contracts.	Broadcasters can agree fixed fee deals allowing them to deliver data via a CDN partner, provided it does not exceed an agreed threshold.	Broadly fixed and subject to broadcasters' IP strategy, although overall cost depends on service features and the types of devices supported.	Freeview and Freesat contributions via Everyone TV and DTV Services Ltd.

The DTT network shares costs between MUX operators via network access charges; ITV and C4 both contribute to D3&4

D3&4 commercial arrangement (DTT)



- ITV and Channel 4 are joint operators of the PSB2 multiplex via Digital 3&4
- Multiplex operator commitments include network access charges, and managed transmission services
- These costs are shared between ITV and Channel 4; each has annual commitments to D3&4

Freeview and Freesat

- The Freeview and Freesat platform is managed by Everyone TV
- Everyone TV receives contributions from their stakeholders which includes: the BBC, ITV, Channel 4 and Channel 5 (new as of 2021)

Network access charges (DTT)

Multiplex	Network access charge share per multiplex
PSB	23.5%
COM	9.80%

- Network access charges cover Arqiva's access to the transmission mast and site network, and antenna systems involved in providing DTT services
- These costs are shared between multiplex operators. Each multiplex operator pays a share of the total network access costs – if a multiplex is shut down, network access charges are shared between the remaining operators

Other shared costs

- Individual media management, DSAT and IP service development investment does not involve shared costs – any shared costs are likely be highly commercially sensitive and discreet in nature
- We don't anticipate broadcasters building a shared '*owned-and-operated*' CDN infrastructure: commercial dynamics within existing CDN arrangements would prevent a joint venture

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Glossary

Bitrate: The number of computer binary bits that are processed in a given time. Higher quality video streams typically require a higher bitrate.

BVOD and SVOD: Broadcaster Video on Demand (BVOD) refers to the streaming of video content of traditional television broadcasters through their online platforms (e.g. BBC iPlayer). Subscription Video on Demand (SVOD) refers to online streaming service (e.g. Netflix, Disney+) that provides users with access to video content for a subscription fee.

Carriage fee: Fees that pay-TV providers pay to TV network owners for carrying the network owners' TV channels on the pay-TV providers' platform.

CDN: Content Delivery Network is a distributed network of servers responsible for delivering web content.

Channel streams: Given bandwidth restrictions, timeshares are used to transmit multiple channels on the same channel 'stream'.

DRM: Digital Rights Management refers to the system used to control the access and use of digital content (by encryption) in order to protect copyright.

DVB: TV standards body; DVB-T and DVB T-2 are the adopted standards for the UK transmission network.

EPG fee: Electronic program guide fees payable by broadcasters.

Encoding: Process of compressing raw video and re-encoding into a different format.

Linear TV: Traditional method of TV broadcasting, where programs are scheduled and broadcasted at specific times and viewers watch the content in real-time.

Modulation: Transmitting video signal in the field of radio modulation and television technology to ensure more efficient transmission over long distances.

Mbps: Megabits per second.

MUX (multiplex): channels are grouped together and streamed via a multiplex to avoid spectrum overcrowding. **PSB MUX**: Public service broadcast multiplexes; there are three in the UK – PSB1/2/3. **COM MUX**: There are three in the UK – COM 4/5/6.

Platform contribution charge: a fee broadcasters must pay platform providers (e.g. Sky, Freeview, Freesat) for using their platform for stream channels. This can be paid on top of EPG charges.

Syndicated delivery: The delivery of TV channels where the host broadcaster is not responsible for the distribution.

Transcoding: Converting digital-audio or video-data from one format to another so that multiple types of devices and networks are supported.

Network access charges: the provision of access to the mast and site network installed by Arqiva for the purpose of providing transmission services for the DTT network.

Managed transmission services: a package of services including network design, procurement and installation of transmitters, networking monitoring and site maintenance.

WACC: weighed average cost of capital – financial metric used to calculate the cost a company must pay for its financing sources.

Thank you

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