VIDEO

HYBRID DTH/DTT

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REACH TV HOMES ANYWHERE WITH COST EFFECTIVE, IMMEDIATE ACCESS

MANY VIDEO MARKETS ARE UNDERGOING A MIGRATION FROM ANALOGUE TO DIGITAL AND FROM STANDARD DEFINITION TO HIGH DEFINITION TV. AT THE SAME TIME, PROJECTS FOR ULTRA HD ARE BEGINNING TO EMERGE, A PROGRESSIVE EVOLUTION OF SIGNAL QUALITY THAT WILL BE AN IMPORTANT DRIVER OF GROWTH IN THE COMING YEARS.

Globally, Eutelsat has gained a leading position in digital migration, with over 10 years of pan-regional experience and more than 20 countries served, including France, Greece, Italy and Ireland in Europe, and in Africa, Algeria, Equatorial Guinea, Gabon, Kenya and Zimbabwe, among many others.

Satellite offers a clear advantage when it comes to delivering linear content. When compared to the coverage and capabilities of terrestrial networks, satellite provides cost-effective and immediate access to TV customers virtually anywhere, with consistent signal quality across the coverage, be it directly with Direct-to-Home (DTH) or indirectly by distributing content to other networks, including cable, Digital Terrestrial TV (DTT) and IPTV.

THE CHALLENGE IN ENSURING NATIONWIDE DTT

The main challenge in deploying nationwide DTT is to ensure the timely switch-over of networks to entire populations, to avoid creating a "Digital Divide". This is particularly the case when countries need to efficiently serve vast geographic regions with mountain ranges and wide-spread islands outside of DTT network footprints, or with interference issues on borderlines to neighbouring countries.

> **"exclusive use of terrestrial networks could permanently exclude a significant portion of consumers"**

Funding a nationwide DTT network is often underestimated and can delay the switch-over to DTT. As such, particularly in emerging markets, experience has shown that a hybrid approach, with satellite feeding DTT networks and at the same time complementing DTT white-spots via DTH, is the most cost and time efficient solution.

Most terrestrial operators deploy fibre networks or DTT towers based on the potential return on investment. Users in more rural or semi-rural areas generally go unserved. As a consequence the exclusive use of terrestrial networks could permanently exclude a significant portion of consumers, leaving them unable to access both linear and non-linear services in areas with no terrestrial coverage.

Picture resolution and screen quality are continually improving, requiring increasing bandwidth resources to provide audiences with the quality they expect. Broadcasters need to ensure sufficient spectrum is available for future HD or Ultra HD services. Terrestrial networks and especially DTT networks may face challenges in terms of future readiness due to a potential lack of spectrum.

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INSURING NATIONWIDE DTT

HOW CAN SATELLITE HELP?

Rather than investing in costly nationwide terrestrial infrastructure to extend networks to smaller population bases, many operators have realised that they can reach their last-mile objectives via satellite. No additional massive investment is required because the overall region – including rural areas, islands and borderline regions - is already fully covered by the footprint of the satellite. Homes throughout the satellite coverage can receive the DTT channels immediately, without needing to wait for new investment in the terrestrial infrastructure and its deployment across the territory.

France carried out its digital transition between 2005 and 2011 and is a good example. France started DTT roll-out in 2005, covering 35% of the population, with the aim of covering 100% in three years.

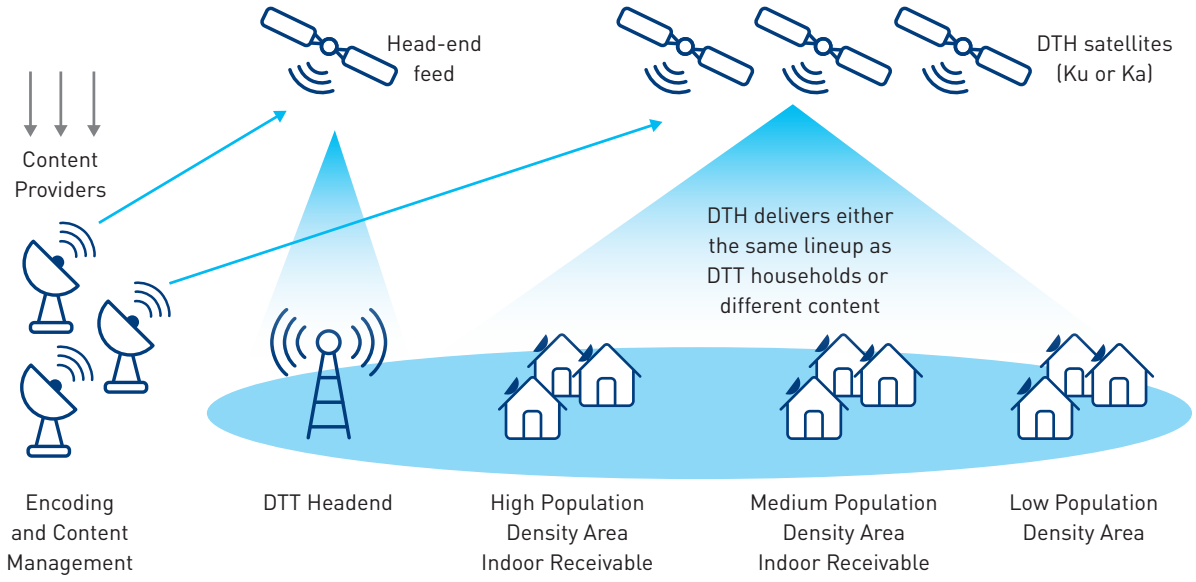
By mid-2008, the installation of new DTT transmission sites extended DTT coverage to 87% of the population, and 95% by end-2011. This left 1.5 million households outside the reach of DTT. Fransat, a satellite delivery service via Eutelsat which has broadcast since 2009, offers a DTH alternative enabling all the population to receive French DTT channels available on the network.

By covering 100% of the territory, the platform serves more than 2 million homes equipped for direct reception, efficiently meeting the needs of citizens situated beyond coverage of DTT, cable or ADSL.

Satellite feeds digital signals to many different platforms, whether DTH, terrestrial, cable, IPTV, web or mobile networks. It provides cost-effective distribution to a large nationwide coverage, independent of existing infrastructure and borders, enabling services to be delivered to the end-user irrespective of how challenging the landscape. It can reach an unlimited number of end-users with no additional costs, and handle all formats – digital, HDTV, UHD and IP – today and tomorrow.

By combining DTT and DTH distribution for digital migration, operators can offer a fast, cost-efficient, nationwide service that reaches everybody.

HYBRID SATELLITE AND TERRESTRIAL DISTRIBUTION



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HYBRID SOLUTIONS

THE BENEFIT OF POINT-TO-MULTI-POINT

Most governments that have decided on a DTT solution have found that as digital programming and picture quality expands - and the number of towers needed to serve their audience grows – satellite's point-to-multi-point advantages become obvious. Also, in some cases, the reliability of a terrestrial infrastructure is put into question due to environmental conditions on the ground, or the fact that fibre and other terrestrial infrastructure is vulnerable to theft or vandalism.

Kenya's recent experience is instructive. The company managing digital migration realised that the cost of bringing content from a central hub or from the broadcast studios to more than a dozen towers was actually less expensive via satellite than by fibre distribution. China's StarTimes uses Eutelsat satellite capacity in Africa to distribute content to terrestrial towers. In order to complete their coverage and reach homes not covered by DTT, they have widened their reach with a DTH offer. Conversely, Canal+ Overseas have complemented their DTH offer with a DTT package for French-speaking homes in Africa, using satellite to feed the towers and capture mass market audiences.

In Asia, the Philippines are a good reference case of how satellite infrastructure can offer clear value to a stand-alone terrestrial solution. The nation already has a thriving DTH market, and as it undergoes the process of analogue to digital migration, it is looking to strengthen its cable and DTT network. Here, a dedicated satellite spot beam would provide international programming to cable and IP distribution points and DTT towers, bringing new international content to the market and enabling broadcasters to provide audiences with more choice. Many other countries face similar challenges, and a combination of DTH and DTT can be the best solution.

THE CHOICE OF BANDWIDTH

Once the logic of a satellite distribution network becomes apparent, the choice of bandwidth arises. Two solutions are possible:

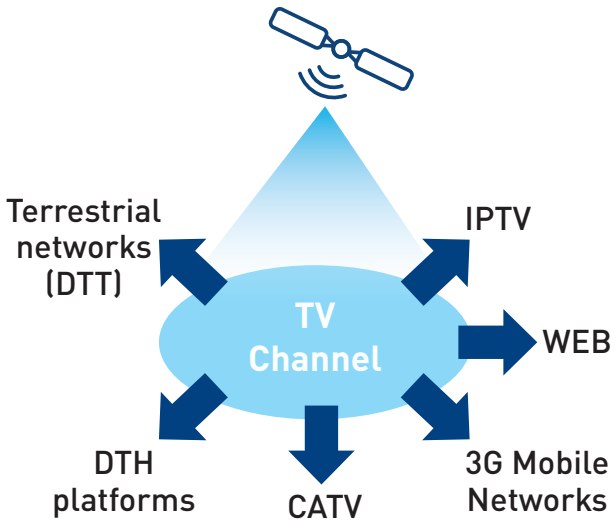
1. A hybrid solution combining C-band and Ku-band. C-band capacity is used for DTT tower feeding to populated areas, with a DTH complement in Ku-band enabling homes in rural areas to receive the same DTT channels.

2. A Ku-band solution, feeding DTT towers to reach populated areas, and also as a Ku-band DTH signal broadcasting the same channels to reach rural areas.

In some cases, countries have opted for a C-band solution to distribute programming direct to terrestrial towers, while using Ku-band for DTH broadcasting. Others such as Zimbabwe, which does not have significant rainfall, operate a total Ku-band solution using Ku-band satellite links to broadcast to terrestrial towers and to provide a comprehensive DTH offering.

C-band has been used in many cases owing to its resistance to rain fade. Depending on local weather, the choice of a C-band satellite might be preferable as it provides a robust transmission. However, Ku-band has historically been the preferred bandwidth for DTH, and it, too, has demonstrated the ability to provide operational service, even in rainy conditions.

FEEDING DIGITAL SIGNALS TO DIFFERENT PLATFORMS



HYBRID SOLUTIONS

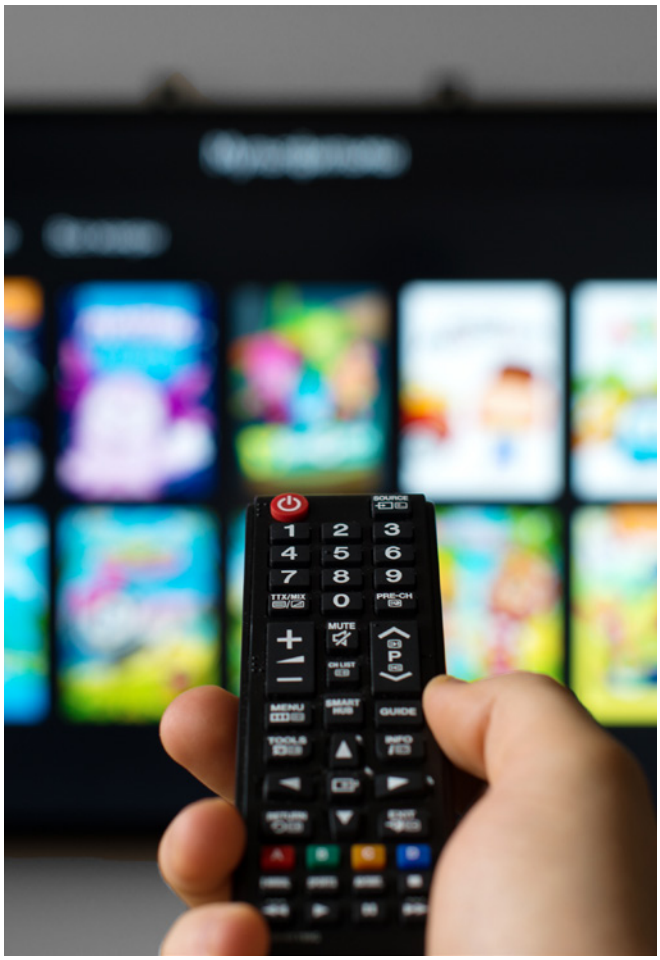
FREQUENCY MANAGEMENT

As terrestrial coverage is not as wide as satellite coverage, more than one terrestrial transmitter may be needed to cover a region. Network configuration must take the frequencies into account, either as a frequency independent Multiple Frequency Network (MFN), or frequency dependent Single Frequency Network (SFN), which reuses frequencies.

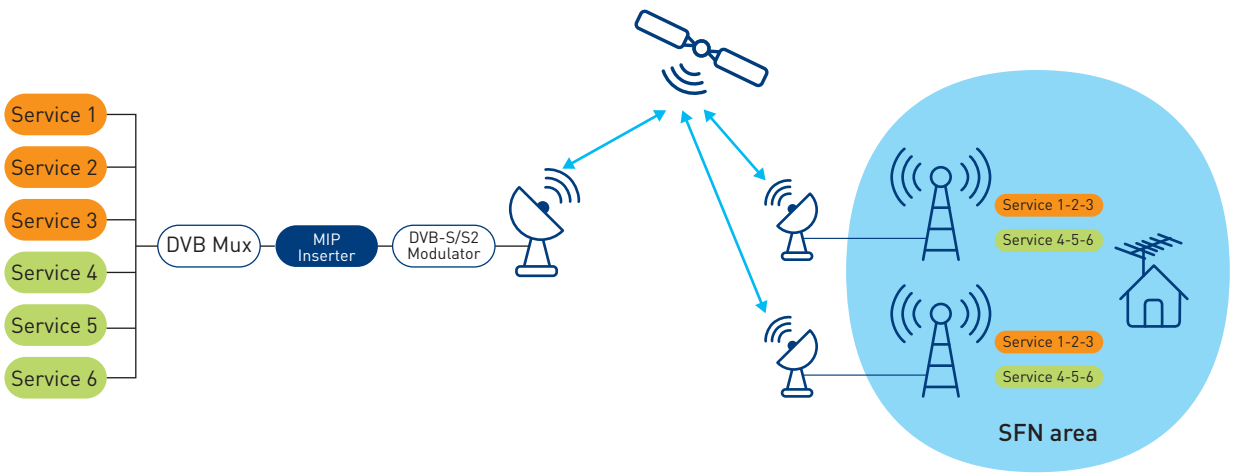
The MFN is a classic, simple distribution network, fully compatible with DTH distribution and the DVB-T terrestrial standard. High-power transmitters cover a wide area, with each transmitter using its own frequency to distribute a multiplex.

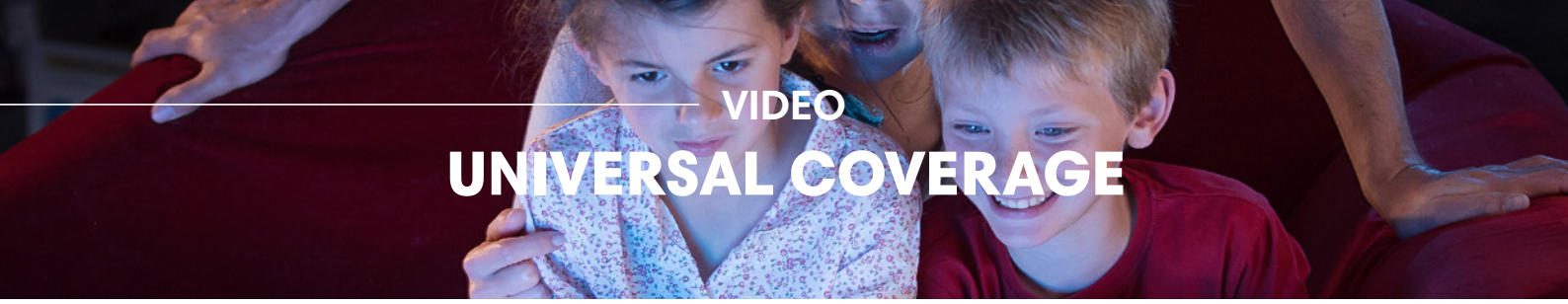
The SFN enables efficient use of broadcast frequencies, with the same frequency used over several areas. This means low-power transmitters can be used rather than the powerful transmitters used in MFN mode.

However, the main drawback with the SFN is that it is not possible to modify the DTT multiplex once it has been built, either by insertion of the Mega-frame Initialisation Packet (MIP) in the DVB-T network or by the T2-MI construction in the DVB-T2 network. The MIP identifies the start of a mega-frame, which contains the Transport-Stream-packets. In DVB-T, the MIP enables the synchronization of the streams at the DTT sites.



CONTRIBUTION TO TWO DTT SITES IN A SFN SCENARIO





UNIVERSAL COVERAGE

FEEDING THE NETWORKS

As the difference in bitrates can be quite significant between DTT distribution and DTH broadcast, a dedicated satellite transponder to feed the DTT transmitters with a single DTT multiplex is not efficient.

To optimise the use of the satellite capacity, one solution is to broadcast two DTT multiplexes into a satellite transponder.

To further improve the efficiency of the system, the DTT network and the DTH households can be fed at the same time.

However, a “classic” DTH distribution, which consists of multiplexing two DTT multiplexes cannot be used for DTT distribution as the DTT multiplexes cannot be multiplexed without breaking the SFN synchronization.

Also, with DVB-T2 modulation, a DTT contribution cannot be received in a DTH environment due to the T2-MI structure.

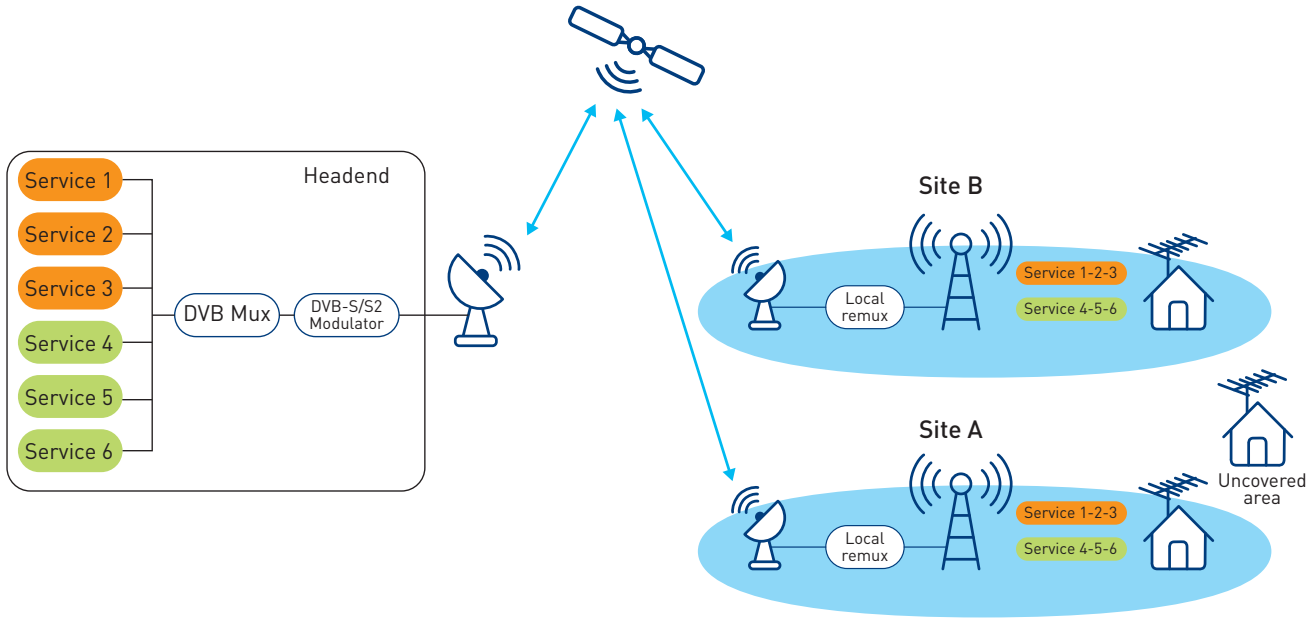
There are three solutions to feed a DTH and DTT network:

1. A DTT network in DVB-T Multiple Frequency Network (MFN) and a local remux at the DTT transmitter to recreate the DTH multiplex

2. Dual illumination with one DTH-compliant contribution and a second contribution for DTT networks

3. Deterministic Multiplexing to bridge the two networks, using a single transmission for the two contributions. Additional temporal information is inserted in the DTH satellite multiplex enabling the DTT multiplex to be rebuilt at the DTT transmitters. The synchronization is respected and is therefore compatible with SFN networks.

CONTIBUTION TO TWO DTT SITES IN A MFN SCENARIO



UNIVERSAL COVERAGE

DETERMINISTIC MULTIPLEXING

A DTH multiplex is created by multiplexing a number of services to fit into the satellite transponder, adding encryption if required and creating the appropriate PSI/SI. Before modulation, a dedicated PID containing an absolute time reference, as well as unreferenced PIDs for the DTT PSI/SI, are inserted into the MPEG-TS. This stream is DTH-compliant and can be received by set-top boxes and CE receivers for DTH purposes.

The DTT transmitters receive the stream, recreate the DTT multiplexes (PID and PSI/SI remapping) with the dedicated PID, and re-stamp the PCR (Program Clock Reference). The Transport Streams at the DTT transmitter output are rebuilt in the same way either in T2-MI format or in MPEG-TS format with MIP packet, guaranteeing the synchronization for SFN sites.

Deterministic multiplexing also enables national services to be replaced with regional or local ones. Regionalisation can also be done by Physical Layer Pipe (PLP) substitution, with national content isolated in a dedicated PLP and replaced with a PLP containing regional content.

There are several advantages to deterministic multiplexing:

- Networks are agnostic so compatible with DVB-S and DVB-S2 modulation
- DVB-T and DVB-T2 Networks can be fed, as can MFN and SFN networks
- DTH compliant
- Audio/video codec and format agnostic so compatible with MPEG2, MPEG4, SD, HD...
- CAS agnostic, the DTH feed can be scrambled and the stream descrambled at DTT sites

COMPLEMENTARY SOLUTIONS FOR UNIVERSAL COVERAGE

The bottom line is that a combined DTT/satellite solution is, in many cases, more cost-effective than standalone DTT, notably with governments that have enacted universal service commitments for telecommunications. What's true in Europe and the Americas is also true in Africa and Asia – nations that proclaim universal coverage as a policy goal cannot do it with terrestrial means alone.

> **“a combined DTT/satellite solution is often more cost-effective than standalone DTT”**

Once the problems of cost, reach and speed of deployment have been resolved, the remaining challenges for any country preparing for the digital transition are: managing the service, sourcing consumer hardware, distribution of set-top boxes, and sourcing content.

To find out more:
www.eutelsat.com/hybrid-dth-dtt

EUTELSAT, YOUR BROADCAST PARTNER

By sharing Eutelsat's longstanding technical and commercial experience from working with public and private broadcasters, as well as many regional governments around the world, Eutelsat can provide the most suitable satellite and best-in-class technical solution with the expertise to help drive the digitalisation process and contribute to the growth of a dynamic and durable broadcast sector.

Eutelsat is one of the world's leading and most experienced operators of communications satellites. Our extensive network of high-performance satellites, located between 133° West and 174° East, provides capacity to clients that include broadcasters and broadcasting associations, pay-TV operators, video, data and Internet service providers, enterprises and government agencies.

Eutelsat's satellites provide ubiquitous coverage of Europe, the Middle East, Africa, Asia-Pacific and the Americas, enabling video, data, broadband and government communications to be established irrespective of a user's location.

Headquartered in Paris, with offices and teleports around the globe, Eutelsat represents a workforce of 1,000 men and women from 46 countries who are experts in their fields and work with clients to deliver the highest quality of service.

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