All-optical switching for video content creation and broadcast

White Paper

HUBER+SUHNER

Dynamic fiber layer management with all-optical switching in broadcast networks

Achieving speed and reliability

The global appetite for access to existing and new content is one of the biggest drivers for technical innovation in the market today. The worldwide availability of ultra-high speed and reliable connectivity to the internet combined with storage and retrieval systems has created a growing need for flexibility in the creation, editing, distribution and broadcasting of content. While traditional broadcast infrastructure was well suited for a limited and well-defined delivery system, today's users expect instant availability across any network type and terminating on a wide variety of platforms.

Meeting evolving standards

In addition to the volume of data, the industry has experienced a rapid evolution in new standards. In the past, broadcasters only needed to produce and deliver content via one network type and in one broadcast format (SD or Standard Definition). The advent of High Definition and Ultra High Definition broadcast standards has now created a need to provide three versions of the same content with varied formats. In a traditional scenario these three formats would require three disparate camera systems, transmission methods, and compression/decoder equipment. With high-speed internet and other traffic types also running within the same network, these disparate requirements have stretched the bandwidth of the current network to breaking point.

Evolution of video content creation and broadcasting

Purpose-built equipment for the broadcast industry capable of simultaneous production of multiple standards is well suited for today's environment, but it comes at a price.

Expensive resources have to be used continuously and efficiently in order to justify the cost. Finding a more unified approach to the equipment required to support these challenges has become a priority for broadcasters and content providers. From a content creation standpoint, the solution has been to ensure that the output of the cameras and the editing and transmission devices is in a standard telco-centric format. The emergence of IP and packet-based solutions has allowed this market segment to more closely align with flexible and ubiquitous telecom standards and away from niche, less flexible legacy products.

Most notably, the content delivery and broadcast market has moved in the direction of more standard optical circuit types, using commercial off-the-shelf fiber optic transceivers, transport equipment and other network components. What used to be several different data streams – video, audio, data – based on unique transport methods can now be treated in a uniform manner.
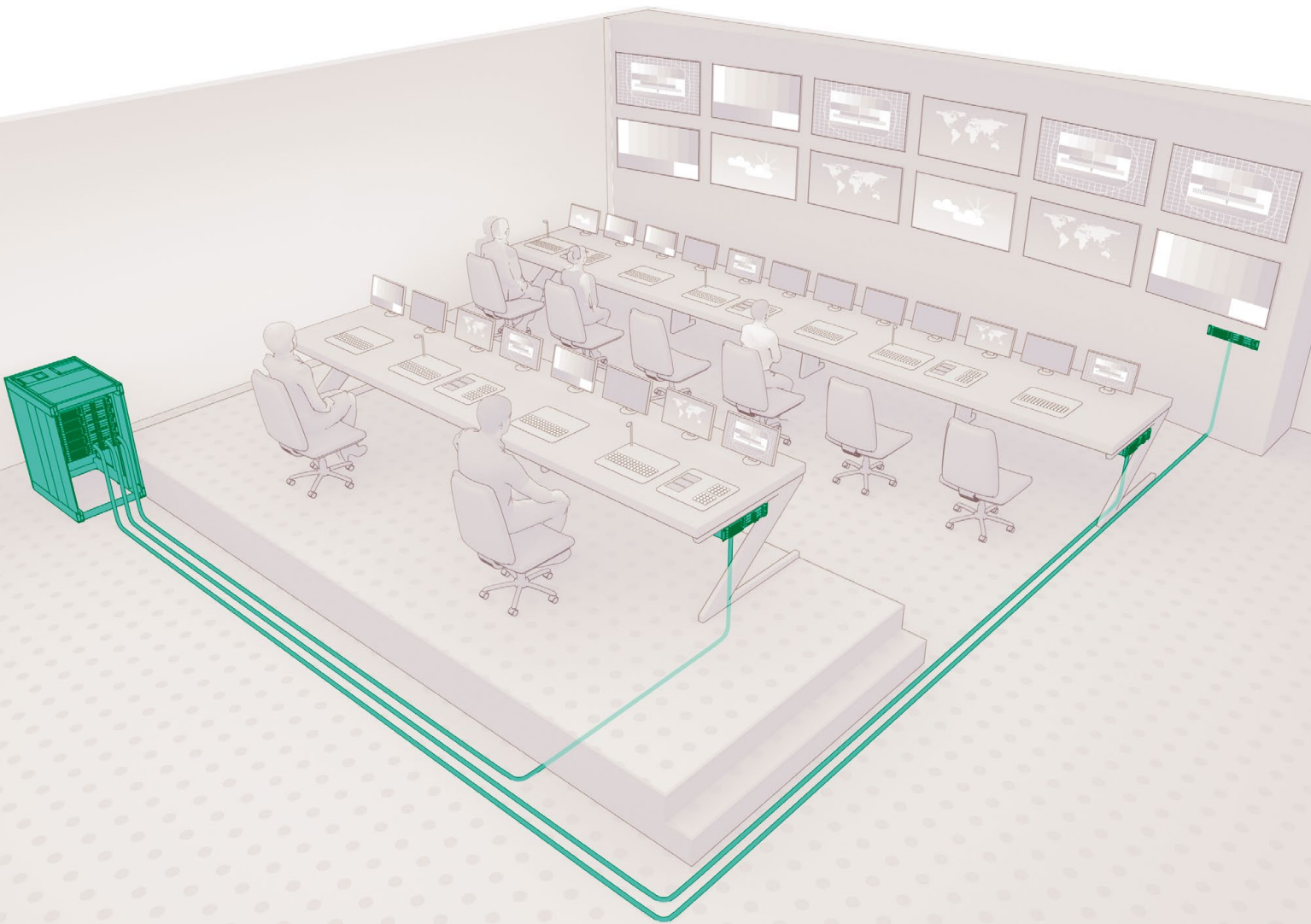
Emergence of fiber optic connectivity

The fiber optic physical layer

In the area of the physical layer of the network, gone are the days of coax RF circuits. Today's content creation and delivery networks are all fiber optic, based on the speed and bandwidth requirements needed to keep pace with the consumer's appetite for new data. Fiber optic also enables transmission over a much greater distance than coax with much lower cross talk and signal distortion. With the transformation to deploying standard optical transmission equipment, the use of agnostic, physical layer all-optical switching allows the creation of an even more flexible and efficient architecture. Eliminating manual patching from the network saves manpower, time and money,

reduces the risk of human error and avoids impairment of the optical signal by repetitive connections.

Content creators can now share equipment such as multi-format cameras, compression equipment, en/decoders and access to transmission equipment as and when needed using optical switching. A provider no longer has to maintain a one-to-one ratio of equipment to a particular broadcast event or content creator. Instead these resources can be managed more efficiently resulting in faster content creation, at a lower cost and in various formats, available across any viewing platform.

Growing opportunity

It is important to note that while consumers' appetite for content continues to increase, the willingness for these same consumers to pay for the content has not gone up. In fact, with more digital generation and the ability to access content any place, any time, via numerous platforms – like streaming – the revenue per byte of content has gone down dramatically.

Providers need to be proactive and create a more efficient method to keep up with the habits of their consumers and the use of all-optical switching allows them to leverage and maximise the value of their production assets. That being said, the content creation and delivery market is a massive and growing industry with the potential for many emerging opportunities.

Global TV and radio broadcasting market

The global TV and radio broadcasting market is expected to grow from $347.81 billion in 2021 to reach $433.94 billion in 2025 at a CAGR of 6%.

(Source: Research and Markets:
«TV and Radio Broadcasting Global Market Report 2021:
COVID-19 Impact and Recovery to 2030». January 2021:
https://www.researchandmarkets.com/reports/5240292)

USD 347.81 billion   **USD 433.94 billion**

2021   **2025**
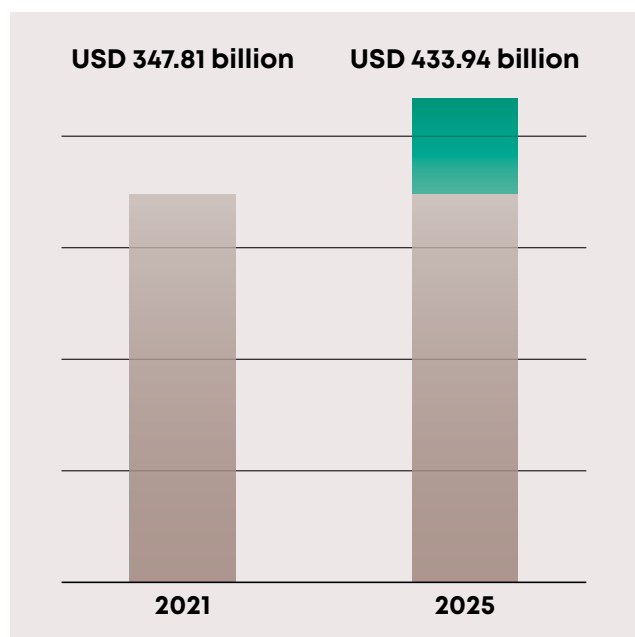
Market forecast to grow at CAGR of 6%

Overview

Applications

POLATIS® all-optical switches support a wide variety of applications in the broadcasting sector:

Central equipment room

- Management of cable head-end fiber trunks
- Line protection
- High density port switching via CWDM or DWDM

Broadcast studio

- Signal routing on multiple intra-facility tie lines
- Remote fiber switching

Control room

- Signal routing on inter-facility tie lines
- Sharing expensive post-processing equipment
- Remote fiber switching
- Secure networks for video communications
- High performance RF-over-Fiber applications

Outside broadcasting

- Mobile production vans
- Satellite uplink management

Examples


Live sports broadcasting

Broadcasting large-scale sports events such as motor racing and golf requires the installation of a redundant fiber backbone around the venue.

For motor racing it has to support complex live-timing obligations, on-board camera video, audio and data capture sites, and a myriad of specialist equipment dotted around the circuit. This backbone has several connection points or nodes located around each part of the circuit, which collect all the video, audio and timing data from that sector and send it in both directions around the circuit, back to the broadcast center in the paddock.

Using traditional outside broadcasting (OB) trucks with cameras spurred from them using dedicated point-to-point optical or copper cables is not practical.

Deploying all-optical switching enables multiple inputs that are not all required simultaneously, to be aggregated and selected for broadcast according to the production need.

All-optical switching, in addition to being protocol and data-rate agnostic, allows two diverse, protected fiber routes with automated provisioning for all of the critical systems, including Ethernet, RFoF, video and audio data – significantly reducing the complexity of managing this fiber infrastructure. The flexibility that all-optical switching affords the network and the consequent reduction in manpower needed to set it up means that the broadcaster can quickly redeploy the same resources at the next event, which may be only one week later, eliminating the need to have to two sets of equipment to keep up with the sport's schedule.
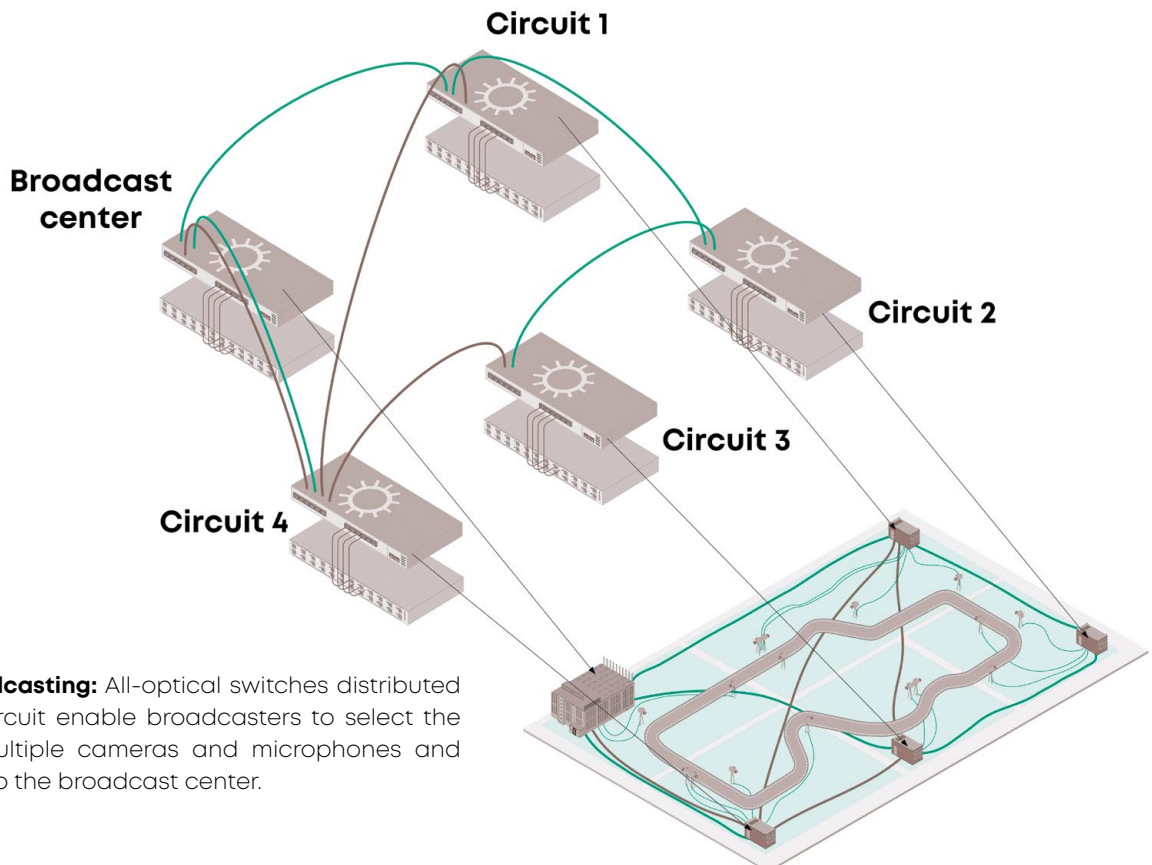
Outside broadcasting: All-optical switches distributed around the circuit enable broadcasters to select the input from multiple cameras and microphones and route it back to the broadcast center.

Virtual extension of production studios

Many production facilities need to expand their capacity in order to meet growing customer demand for content. Unfortunately, a lot of these existing production studios are located in expensive cities such as New York, London and Tokyo where adding more space for expansion is cost prohibitive. Expanding the production facility using a satellite studio, connected to the center with tie lines, in a less expensive area is a more financially viable option.

Since production studios use multiple protocol environments like video, audio, Ethernet, KVM (keyboards, video monitors, and mice), traditional IP-based transport will not support this.

All-optical switching is data-rate independent and protocol agnostic so it can easily support the various protocol requirements. By front-ending the main production and satellite studios with all-optical switches, operators can extend their production facilities at a lower cost. For the users, the satellite studios are just a virtual extension of the main studio.

One further added benefit of using all-optical switches is the option to protect the tie line to the main studio with automated fiber protection switching so valuable production time and resources are not wasted while repairing a fiber break between sites.
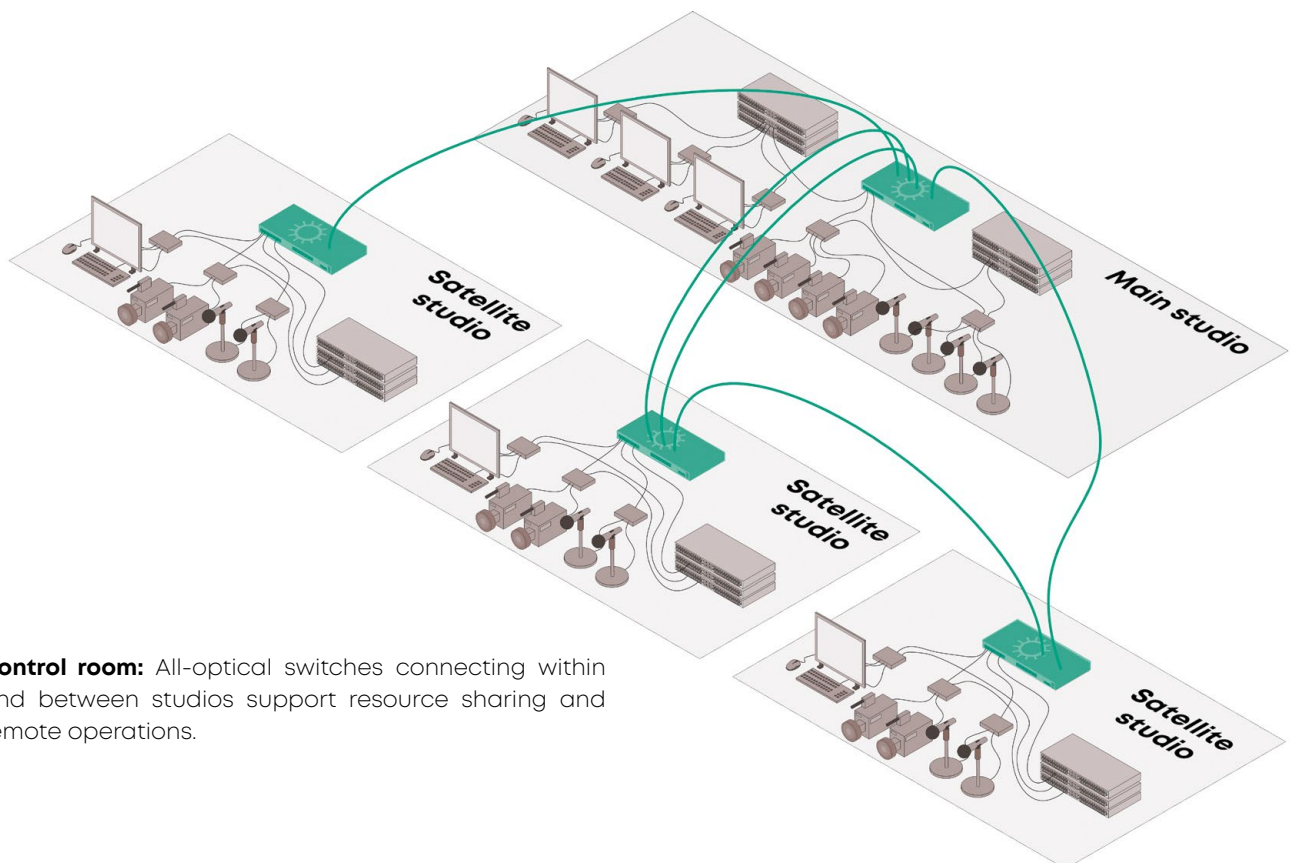
Control room: All-optical switches connecting within and between studios support resource sharing and remote operations.
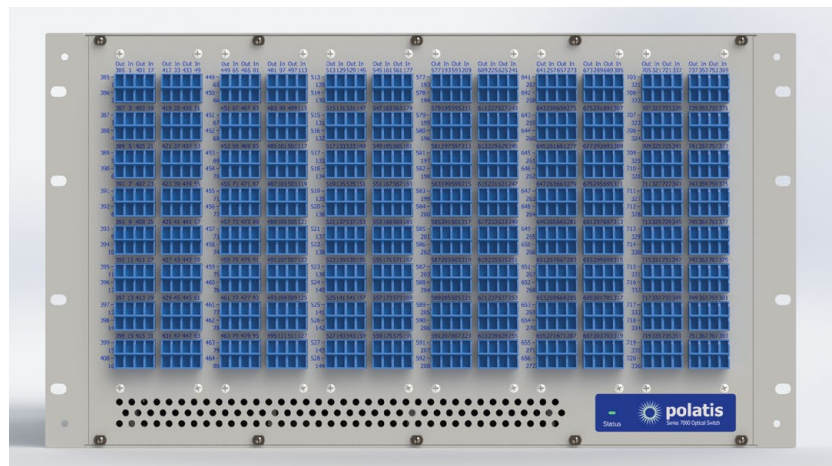
All-optical switching

Layer 1 all-optical switch

There are significant advantages to using POLATIS®
all-optical switching in the broadcast space:

- Protocol and data rate agnostic so future proofed against format changes
- Supports all video and audio formats: AES signals, SMPTE-276M, SMPTE-259M, 292M, ASI/DVB, NTSC, PAL, QAM
- Supports single, mixed and multiwavelength formats — TDM, CWDM and DWDM
- Ultra-low insertion loss and superior optical specifications
- Near-zero signal latency
- Dark fiber switching allows setting up and holding of switch paths in advance of the transmission of optical traffic
- Fully bi-directional optics

- Optional optical power meters offer real time signal monitoring to alert for degradation or loss of signal
- Optional variable optical attenuation allows the signal coming out of the switch to be attenuated so that the receive levels into the studio or receiving devices are the same, irrespective of the source
- Fully software-controlled - seamless interface with today's broadcast infrastructure
- Eco-friendly, low power consumption
- Available in symmetric N×N, asymmetric M×N and custom configurable port configurations
- Matrix sizes from 16×16 to 384×384 ports

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HUBER+SUHNER is certified according to ISO 9001, ISO 14001, OHSAS 18001, EN(AS) 9100, IATF 16949 and ISO/TS 22163 – IRIS.