SOLUTION DEEP-DIVE

Video-Over-IP is the Future-Proof Solution for the Modern OR



OR Integration

High-quality video with low latency plays a key role in successful surgical outcomes



When patients' lives are at stake, surgeons can't wait for images to buffer. In the surgical suite, the highest image quality and fastest data transmission help support best-in-class surgical performance. Hospitals need a reliable video solution that delivers uncompressed image transmission with ultra-low latency.

The use of digital imaging and video in surgical practice is just one component of the modern OR. This highly complex environment needs a user-friendly system to seamlessly integrate diverse technologies to minimize errors and enhance OR efficiency and ensure patient outcomes in the best possible way.

This paper will help you identify the important elements of a video system that offers the highest image quality and lowest latency and corresponding management resource.

Understanding methods of video signal transmission

There are many different ways to transmit video signals, but for the purpose of this paper we will focus on the transmission of video over an IP network. The important thing to know is that quality of the video can vary greatly depending on the technology used.

Video-over-IP is a technology used to transmit video signals between two or more locations over an IP network. In a video-over-IP system, standard video signals – such as digital visual interface (DVI), video graphics array (VGA), and serial digital interface (SDI) – are encoded into network internet protocol (IP) packages. These are then transmitted and decoded back to standard video signal for further processing, recording, and displaying.

Transmitting video over an IP network has many different facets. It is common to share content live or on demand by compressing data and sending it as a network stream.

Protocols such as SIP or H.323 are used when audio and video are transmitted (e. g. Skype). Streaming Full HD videos is broadly done in H.264 standard (e. g. Netflix or Amazon). A video stream typically starts after a short buffering phase, a pre-loading period that aims for stutter-free video instead of real-time transmission that may contain image jitters.

However, these methods involve compression, which reduces the video quality. While some compression technologies claim to be "visually lossless," they will never achieve pixel-perfect reconstruction of the raw signal.

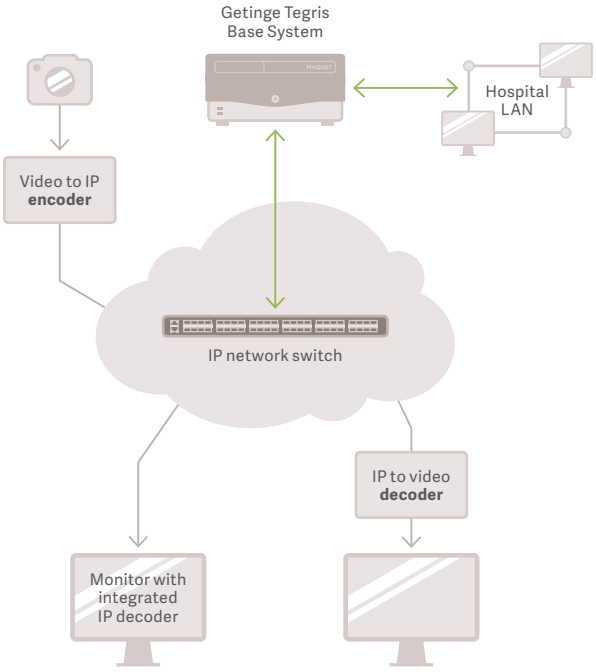
The importance of uncompressed signals

Medical professionals have different requirements than we see in the examples above. Delivering best-in-class performance in the OR requires the highest image quality and fastest transmission. This is why uncompressed video-over-IP is the appropriate real-time solution for the OR environment.

Video-over-IP offers end-to-end transmission of video signals with ultra-low latency – less than 5 milliseconds of delay. Transmission of native video resolutions up to 4K (4096 x 2160 at 60 Hz) sets the current standard. This gives surgeons accurate, real-time information to support the successful assessment and treatment of the patient's condition.

How video-over-IP systems work

There are four primary elements to a hospital-grade video-over-IP system: the central network, the IP encoder, and the IP decoder, the base system. Each plays a key role in the seamless transmission of video within the OR.



Central network

Video-over-IP systems require a central network – separate from the main hospital LAN – for high-bandwidth transmission of video and data.

A 10 GB switch is the core component of this network. Switches are available in different sizes with e.g. 10, 16, or 48 ports. Most hospitals are looking for more ports, which allow the technology to be shared among two or three ORs. All of this is highly dependent on the hospital setup and requirements.

IP encoder

Cameras, computers, and other video sources offer standardized video interfaces. These include video graphics array (VGA), serial digital interface (SDI), or digital visual interface (DVI). Each of these interfaces is based on copper wiring. IP encoders are used to convert video signals into IP packets, and feed the information to the IP network.

Encoders are available in single (1x Full HD), dual (2x Full HD) and quad (1x 4K) models.

IP decoder

IP Decoders are linked to the central network. They convert the received IP packets back to standard video signals, which are then displayed on a network-connected monitor. Decoders are available in dual (2x Full HD) and quad (1x 4K) models.

Some monitors are available with integrated IP Decoders. These monitors can streamline the planning, cabling, and implementation of the video-over-IP system.

The "base system"

What we call the base system here is the central device used to manage the network and the distribution of all routes between connected IP encoders and decoders or monitors. It is the central component for other integration functions such as recording, device control, and IT integration.

The number of inputs and outputs for video routing is only limited by the number of available ports on the network switch. To determine the size if this "base system", one must consider the expectation with regards to the following features: recording, streaming or UI camera live previews. For instance a setup with one channel recording, one software –based streaming and one camera live preview on the UI will require three inputs.

Important considerations when investing in a video-over-IP system

When hospitals are facing increasing cost pressures, every capital investment needs to be carefully measured against current needs and future growth. It is critical for hospitals to invest in a system that uses flexible, cutting-edge technology that will grow with the facility's needs.

The major benefits of an investment in the Getinge Tegris IP System include:

IP network

The video-over-IP system should be a separate secured and encrypted network, dedicated solely to video and data transmission in the OR. That system should be centrally managed for ease-of-use and flexible growth.

Video-over-IP systems benefit from IP network features that automatically detect connected devices. This is particularly beneficial with mobile devices, such as endoscopy trolleys, that are used among several ORs.

Latency

Transmission latency needs to be nearly zero. Undoubtedly the highest possible image quality and real-time availability are important to successful surgical outcomes.

Usability and connectivity

How does the system handle connectivity? Are different cable types and connectors accounted for? Ideally, your video system would have a single universal plug-and-play connector that works with any device.

Future-proof growth

Can your system evolve to accommodate growth? In recent years, video quality has been multiplied by a factor of four from Full HD resolution (2.1 megapixels) to 4K resolution. The addition of new, advanced devices and improved workflows should be handled effortlessly.

Cabling

Does the system use modern fiber-optic cabling, or traditional rate-limited copper wiring? Video-over-IP requires specific resources to deliver end-to-end uncompressed video transmission.

Copper wiring is rate-limited to 1 Gbps, with rate deterioration over long runs. Yet uncompressed video requires large amounts of bandwidth with approximately 3.7 Gbps.

Optical fibers can not only transmit more data, but they are able to run over greater lengths, and can comfortably accommodate the necessary capacity for uncompressed video. Additionally, they are resistant to electromagnetic interference present in hospital settings.

Technical details to dive deeper

Other important elements in your video-over-IP system

A variety of complementary technologies play a significant role in the successful implementation of your video-over-IP system.

Benefits of Fiber-optic cabling

As we've discussed, traditional cabling is copper-based, a legacy of the telecommunications systems of yester-year. Copper has limitations in both speed, distance, and resistance to electromagnetic influences. Uncompressed video signals require 3.7 Gbps bandwidth – beyond the capacity of the traditional copper cabling.

Fiber-optic cabling ensures fast transmission at high data rates across long distances. It is immune to electro-magnetic influences; optical isolation avoids any leakage curret between medical and non-medical device. As an added benefit, all connections are based on the same signal type and connection. This eliminates the days of unique cables, plugs, and sockets for each device in the surgical suite. Now hospitals can place IP sockets in convenient locations around the OR, allowing mobile equipment to be plugged in and automatically connected.



The common specification for fiber-optic cabling is 50/125 µm (diameter), multi-mode (fiber type), 850 nm (wavelength), OM3 (quality class), LC (connector type), duplex (number of fibers)

IP assets: encoders, decoders, and monitors

Different types of encoders and decoders serve different signals and situations.

IP encoders

Encoders convert analog video signals into digital streams that are transmitted over your IP-based network. For best use of the technology's benefits, it is recommended to place the IP encoders close to the cameras and sources.

Single encoders

- Can encode a Full HD video signal and feed it into the network
- Require one free port on the central network switch

Dual encoders

- Can encode two independent Full HD video signals and feed them into the network
- Require one free port on the central network switch

Quad encoders

- Can encode a 4K-UHD video signal and feed it into the network
- Require two free ports on the central network switch

IP decoders

Decoders take the encoded data from the IP stream and convert them for display on a monitor.

Dual decoders

- Can decode two independent IP streams and output them as DVI video signals
- Require one free port on the central network switch

Quad decoders

- Can decode a 4K-UHD IP stream and output it as DisplayPort or Dual Link DVI video signal
- Require two free ports on the central network switch

IP monitors

Surgical monitors with integrated IP decoders are available in different sizes.

IP monitors

- Can decode a Full HD or 4K-UHD IP stream
- Require one (Full HD) or two (4K-UHD) free ports on the network switch

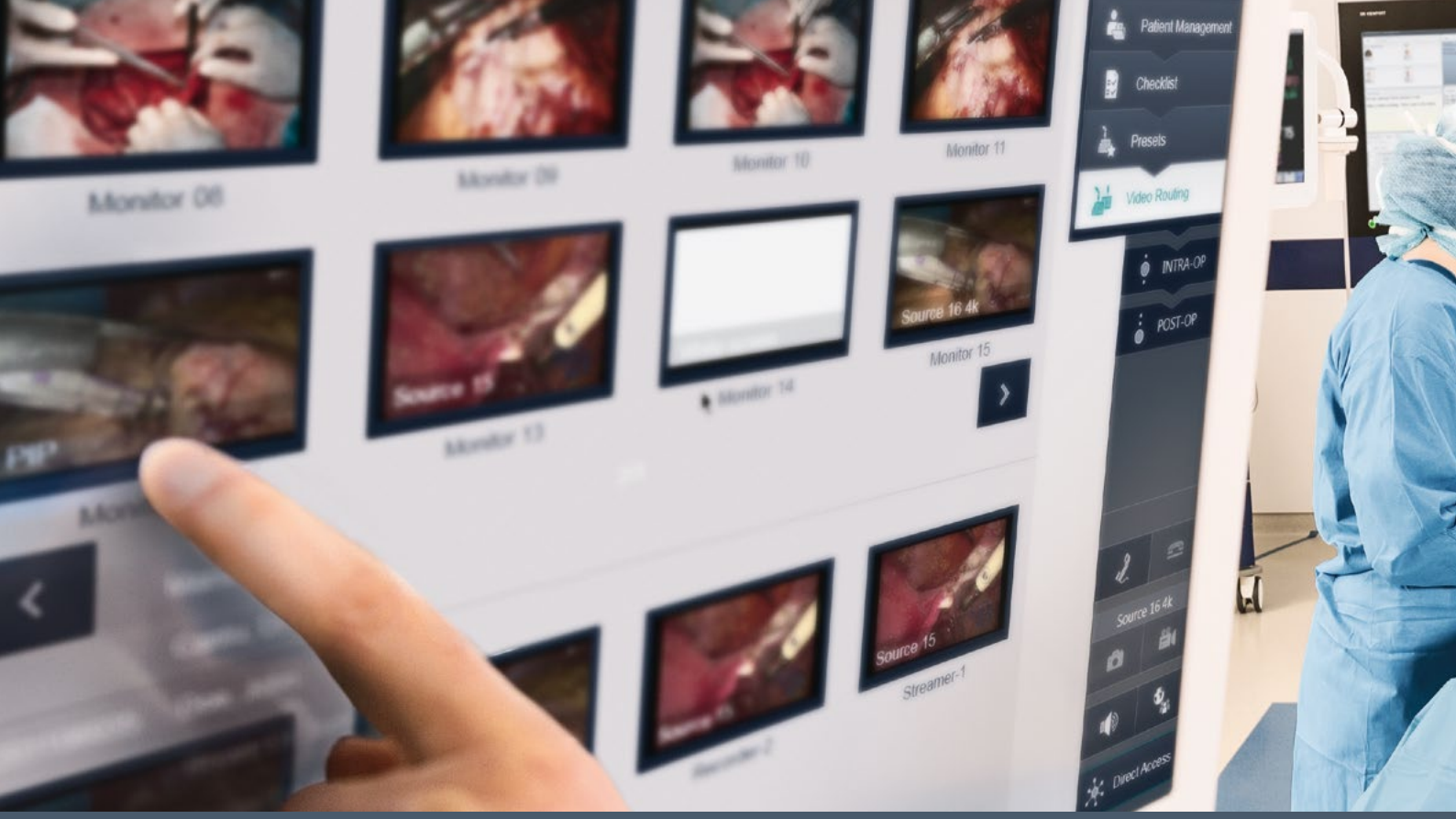
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IP network switch

IP network switches are available in different sizes and with different capabilities (from 10 up to 48 ports), depending on the project scenario and requirements.

Every video-over-IP OR setup will need to be configured to run in a separate VLAN (virtual local area network). A VLAN separates physical networks into logical subnets and avoids any data exchange between different VLANs. An IP network switch can host several VLANs and so be shared among several ORs. This can help to reduce costs or save space in technical areas.

SFP+ modules are required to equip the ports of a switch. Any IP encoder and decoder connection requires an optical fiber SFP+ module per port. Each port can be flexibly used with either IP encoders or decoders.



Getinge Tegris OR integration management system

The solution for growth

Video-over-IP technology will play a growing role in the modern OR. Getinge has developed a future-proof platform for helping hospitals meet their evolving goals: the Getinge Tegris OR integration management system.



Video-over-IP is just one of the building blocks of the comprehensive Getinge Tegris system. Getinge Tegris acts as a central control for the OR. It perfectly integrates into your workflow, increasing the quality, safety, and efficiency of your OR procedures.

It unites user-friendly video routing, recording and transmission, data management combined with convenient device control in a single compact unit.



The value of Getinge Tegris OR integration to support video-over-IP

Video-over-IP support was first introduced with Tegris IP OR integration in 2014. Since then the technology, scope and advantages have continuously improved. Getinge Tegris IP is already positioned to support the growing market for video-over-IP.

Getinge Tegris places the entire OR at your fingertips. Video inputs can be recorded from range of sources and visuals can be displayed, saved, or streamed. It enables the seamless and simple integration of patient data from the HIS and PACS.

Surgical staff can also use Getinge Tegris to manage and adjust the settings of operating tables, surgical lightning, and other medical devices.

Getinge helps you plan for growth

Any OR Integration project requires detailed preparation and cooperation across multiple hospital departments. At Getinge, we involve all relevant parties from the start: surgeons, nurses, biomeds, and the IT department.

We provide project management and implementation support, guiding you through the process. Our specialists have detailed knowledge and best practice experience, and can support hospitals from planning through installation.

We also offer dedicated product training with either a sales or technical focus, meeting your facility's unique needs and concerns.

Learn more about Getinge video-over-IP solutions at **www.getinge.com/int/product-catalog/tegris**

GETINGE

Getinge is a global provider of innovative solutions for operating rooms, intensive care units, sterilization departments and for life science companies and institutions. Based on our firsthand experience and close partnerships with clinical experts, healthcare professionals and medtech specialists, we are improving the everyday life for people – today and tomorrow.

This document is intended to provide information to an international audience outside of the US.

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