



Matrix Switching vs. SDVoE: What Actually Matters for OR Video Routing in a Digital Operating Room

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If you're evaluating an OR integration system, you've probably heard two pitches already. One vendor says matrix switching is old technology and IP-based video (SDVoE, AVoIP, whatever they call it) is the modern choice for everything. Another says the opposite, that IP video is unproven in a clinical setting and matrix switching is the only safe option for surgical video routing.

Both are incomplete. These are two different technologies solving two different problems in an integrated operating room. The right choice depends on what you're routing and how far it has to travel, not on which one is newer.

This is written for the people who actually have to decide: biomedical engineers, surgeons, and procurement teams. No AV background assumed.

What a matrix switcher does

A matrix switcher is a box with sockets. Any input can be connected to any output, the way an old telephone exchange connected any caller to any line. When a laparoscopy camera's signal goes in, it comes out the other side unchanged. Nothing is compressed. Nothing is turned into data. Nothing is encoded and decoded.

This is simpler than it sounds. When an endoscope company builds a camera, it doesn't connect the camera to any computer or network equipment. The camera just sends a video signal down a cable, straight to a screen, the same idea as plugging a set-top box into a TV with an HDMI cable. A matrix switcher is a bigger version of the same thing: many cables coming in, any of them can be connected to any screen, but it's still a direct, unconverted signal the whole way through.

Because of this, latency is near zero. A fraction of a single frame. And the behaviour never changes, the switcher does the same thing today as it will in a year, because it isn't connected to the hospital's network at all.

The limitation: every camera and every screen needs its own cable run back to the switcher. More cabling, and the switcher itself gets bigger and costlier as you add more ports. This is the real reason AVoIP vendors point at matrix switching as "old." But then again, an AVoIP network also requires a cable run from every camera encoder and every screen decoder.

What SDVoE / AVoIP does

SDVoE takes the video signal, converts it into data, and sends it over Ethernet. At the other end, it's converted back into video. Done properly, this runs on a dedicated switch built only for AV, not the same network the hospital uses for computers and Wi-Fi.

Good SDVoE implementations get close to matrix-switcher latency, close enough that you won't notice a difference watching it. The real advantage is cabling and reach: instead of a dedicated cable per camera-to-screen pair, everything runs over standard network cabling, and adding another OR is closer to "add another network port" than "add another row to the switcher." This is what makes 4K medical imaging practical across a hybrid operating room in India, where signal has to travel between rooms, not just within one.

Here's the part worth being upfront about: a dedicated switch means building a second network purely for AV, alongside whatever network the hospital already runs. That's the right way to do it, the surgical feed never shares bandwidth with hospital IT traffic, so it can't slow down because of a software update or a busy Wi-Fi segment somewhere else in the building. But it's a real cost. Extra switches, extra cabling, extra setup that a matrix switcher simply doesn't need. If a vendor tells you AVoIP is automatically cheaper, ask whether their AV traffic runs on the hospital's existing network. That's cheaper, and it's also a risk, because your surgical video is then sharing infrastructure with everything else on that network.

Matrix switching vs SDVoE: the comparison

	Matrix Switcher (HDMI/SDI)	SDVoE / AVoIP
Latency	Near zero, always the same	Very low, but not zero
Signal path	Direct cable, uncompressed	Converted to data, sent over a dedicated AV switch
Reliability	Never affected by network issues	Also isolated from hospital IT, if on a dedicated switch, but that's a network you now have to maintain

	Matrix Switcher (HDMI/SDI)	SDVoE / AVoIP
Cabling	One cable per device, more of it	Standard network cabling, but on its own switch, not shared for free
Cost as you scale	Rises fast with port count in one room	Reaches across distance well, but the dedicated switch is a real added cost
Best distance	Short, inside one OR	Long, across a building, between ORs

Neither is the "better" technology in general. It's like asking whether a direct phone line or a private leased line is better, depends entirely on the distance and what you're using it for.

Where each one wins

Matrix switching wins inside an OR. The number of devices is fixed and known, a few cameras, the boom display, the anaesthesia monitor, maybe a recorder. The distance is short (typically under 20 metres). And the surgeon's live view should never depend on anything happening on a network. A direct cable removes that risk completely. This also covers endoscopy video integration, where the camera-to-display path has to be as direct as possible.

SDVoE wins when you need distance or scale in your OR integration system. Connecting several ORs to one control room, routing any OR to any other OR for live surgery streaming to a hospital's teaching hall, growing the system over time without re-cabling the building, this is exactly the problem it was built to solve, and it does it well.

Why "one is better than the other" is the wrong question

Any vendor telling you matrix switching is outdated is ignoring that most serious OR integration systems worldwide still use SDI/HDMI matrix switching for in-room routing, because nothing beats a direct cable for reliability when a surgeon is operating. Any vendor telling you AVoIP is unproven is ignoring that it's the practical answer the moment your OR video routing needs to cross real distance.

The better question to ask any OR integration system manufacturer in India is: how did you decide where to use which technology, and why? A vendor with a clear answer is worth listening to. A vendor pushing one technology everywhere, regardless of distance, is selling you their product line, not engineering your hospital's system.

The practical answer: match the technology to the distance

Matrix switching for in-room routing. SDVoE, on its own dedicated switch, for long-distance and multi-room connectivity. This isn't a compromise, it's using each technology where it's actually strong. And it's the more honest cost model too: you only take on the cost of a dedicated AV network where distance genuinely needs it, instead of paying for a matrix switcher's steep per-port cost across an entire building, or cutting corners by putting surgical video on the hospital's shared network to save money. This same logic applies whether PACS/HIS integration in the OT is part of the scope or not, and even where AI in the operating room is on the roadmap, the underlying video routing decision doesn't change.

Questions worth asking any operation theatre integration company in India

- For in-room routing, what's the actual latency, and how was it measured?

- If you're proposing AVoIP, does the video run on the hospital's existing IT network, or on a dedicated switch built for it? This is the single biggest factor in both cost and reliability.
- If it's a dedicated switch, is that cost shown clearly in the quote? How many encoders and decoders are shown in the quote?
- If you're proposing matrix switching across multiple ORs, what does the cabling and cost look like as more rooms get added?
- Why did you choose this technology for this part of the system, what's the engineering reason, not just what you sell?

A vendor who can answer these clearly, with different answers for different parts of the system, is building for your hospital's actual layout and clinical needs, not fitting your hospital into their one product.

Esbee Dynamed specialises in OR integration and connected surgical instrument tracking solutions. To learn how we can support your operating theatre, contact our team.

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