Best Practices for Creating Complex Telemedicine Video Software Workflows

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About Frozen Mountain

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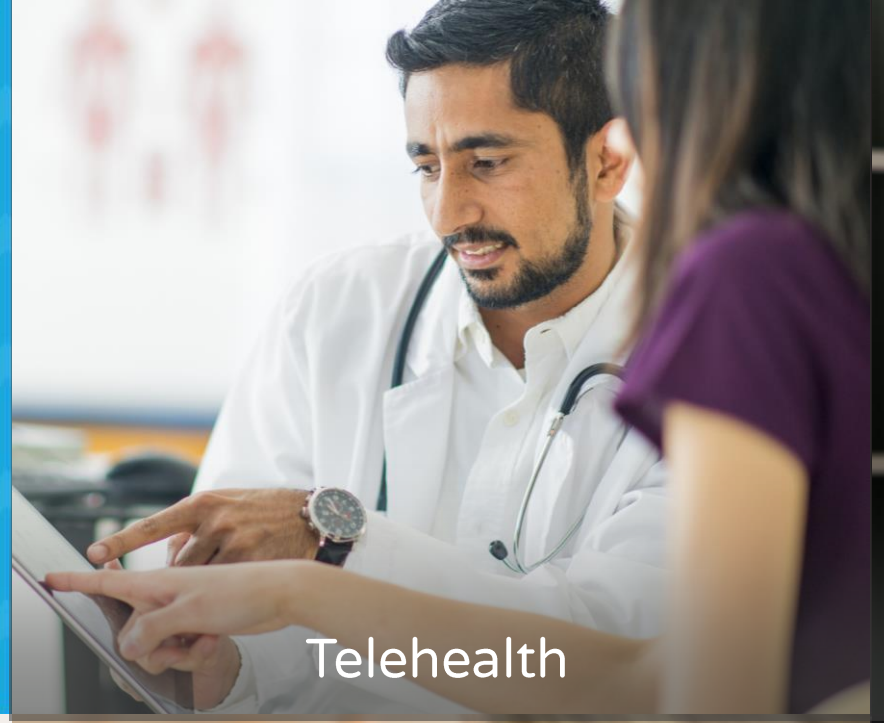
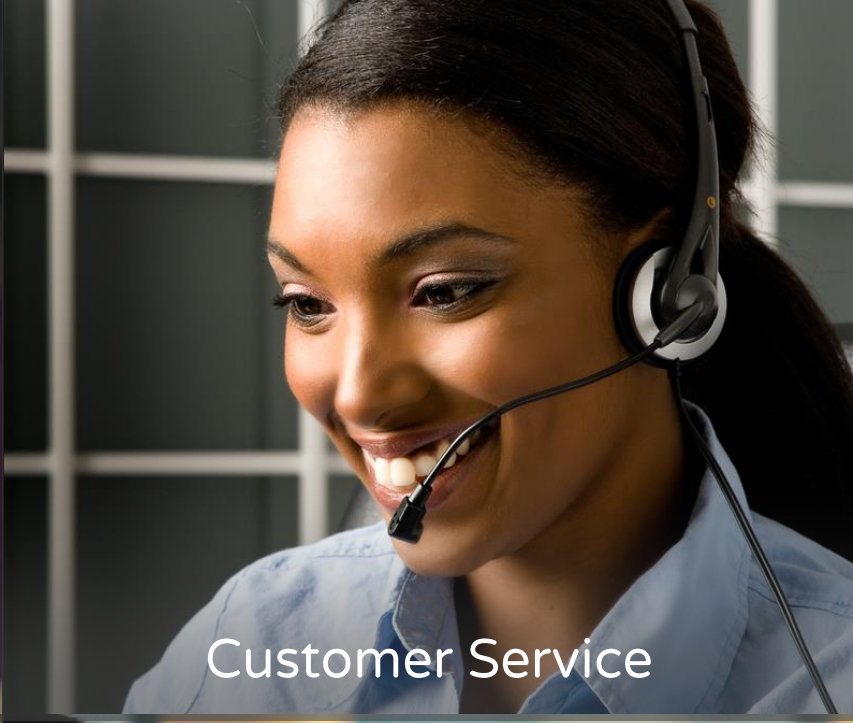
- Founded in 2008, celebrating 10 years of service
- Over 400 customers in 51 countries
- Extensive experience in Real-Time Communications software that enables developers to deliver customized solutions to complex telehealth workflows
- Experts in low-level audio/video capture, processing, transcoding, and transmission software

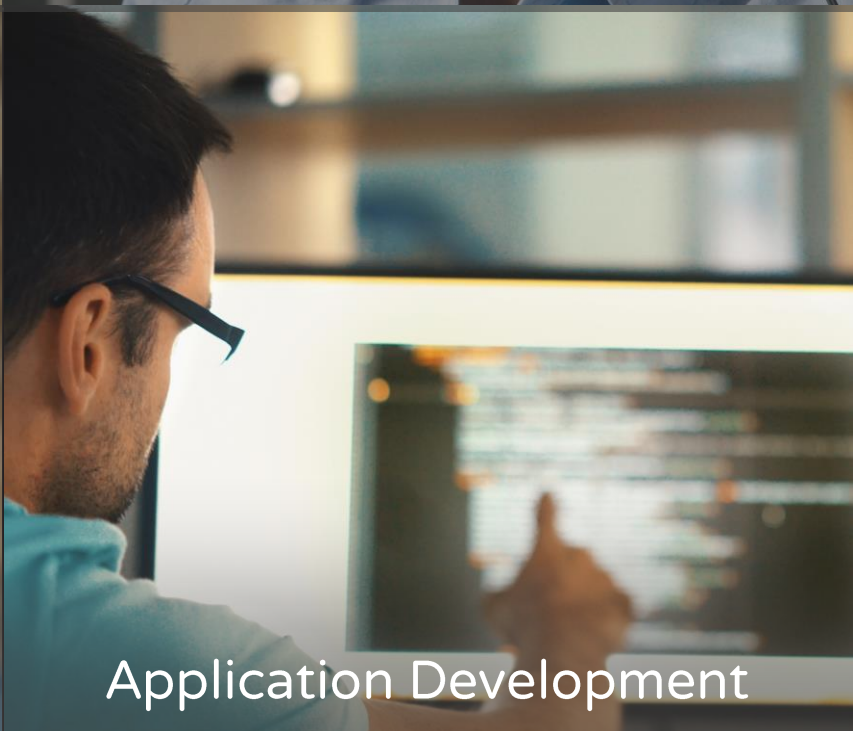
About Frozen Mountain


Telehealth


Customer Service


Remote Education


Telecommunications


Application Development

Telemedicine Customers

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tytocare
health is in your hands

Spectrum Medical

MAINCARE SOLUTIONS

GuruMD
URGENT TELEMEDICINE

appinux

STERIS

We will send you a copy of our GuruMD case study after the presentation

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The Real-Time Need

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- Telemedicine has historically been asynchronous or expensive
- The advent of mobile devices and high speed internet has accelerated the adoption and distribution of synchronous audio/video-based telemedicine
- Patients have high expectations for immediate access to their primary caregiver
- Doctors have never had to multitask more than they do today
- Specialist attendance is often cost-prohibitive

The Real-Time Challenge

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- Web & mobile enabled telemedicine video conferencing is complex
  - No two healthcare systems are the same, lots of legacy equipment, many integrations
  - Many out-of-the-box video platforms are insufficient
- Short-term and long-term business needs often require different technical solutions.
- Compliance risks and cost can be majorly impacted down the road based on video and real-time data IT infrastructure choices

The Real-Time Challenge

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- What are the key questions to ask/best practices to follow when choosing your synchronous telehealth solution?

Security

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CHALLENGE

You need a secure telemedicine platform that is easily accessible by doctors, patients, and nurses, yet is fully HIPAA compliant.

BEST PRACTICE

1. Choose a video solution that can be integrated with existing user management and authentication schemes so you avoid yet another user management platform.
2. Ensure all the right security is in use – SSL, TLS, DTLS, with 256 bit encryption.
3. Watch out for someone just saying “HIPAA compliant” – understand what they mean.
4. Make sure you select a solution that stores/transmits data within your allowed network (often limited by country)

Medical Peripheral Device Integration

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CHALLENGE

You need a telemedicine platform that can integrate with existing peripheral devices and new ones of your choice.

- Stethoscopes, glucometers, otoscopes
- EKG, pulse-ox, temperature, etc...

BEST PRACTICE

1. Ask your video solution provider about current & future peripheral device support. Can custom connectors easily be built for new devices so you can live stream ultrasounds, ECGs, multiscopes, etc?
2. Carefully investigate their *datachannel* API and its capabilities. Can it be broadcast to multiple viewers at once, and what are the limits?

Browser and Device Compatibility

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CHALLENGE

You have a BYOD strategy. Your patients use various devices and browsers and you need a video conferencing solution compatible with them all.

BEST PRACTICE

1. Find a video solution provider that supports the widest range of operating systems, platforms, and browsers. Better platform support means better options for patient and nurse access, increasing quality of care.
2. Understand the difference between support for an application (typically downloaded from an app store) and browser-only support. Can you support both, providing a progressive experience from web to app?

Video Conference Scalability

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CHALLENGE

You have multi-party use cases beyond 1-to-1 video conferencing with patients (if not today, you will tomorrow).

- Remote consultation / triage
- Connect multiple family members simultaneously
- Broadcast to teams / training sessions

BEST PRACTICE

1. Avoid video conferencing solutions that rely solely on peer-to-peer networking, as they are inherently limited.
2. Ask potential solution providers about the size and types of video conferences they support, and the performance of the devices at those scales (an often-hidden side effect of larger sessions)

Integration Options

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CHALLENGE

You need a telemedicine platform that integrates with your existing systems.

- EMR
- Existing infrastructure (Cisco, Avaya, Polycom, etc…)
- PSTN phone systems

BEST PRACTICE

1. Choose a video solution that easily exposes the underlying session data and provides mechanisms to transmit that data via HL7 & FHIR
2. Ensure the solution has a mechanism for SIP integration for existing infrastructure and PSTN
3. Be careful not to box yourself into an out-of-the-box platform

Recording

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CHALLENGE

You want to record some aspect of the synchronous consultation.

BEST PRACTICE

1. Ask how and where are your recordings stored. Gain peace of mind with end-to-end control of your data for HIPAA compliance.
2. Verify that the recording package supports individual video stream recording and flexible mixing of multi-party sessions. This ensures each patients data can be uniquely identified.

Operating Expenses

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CHALLENGE

You must minimize the ongoing operating expenses of your telemedicine platform.

BEST PRACTICE

1. Verify that your video solution is capable of *dynamically* choosing the most cost-effective connection type.
2. If you need to scale to the public, select a solution capable of automatically growing and shrinking its infrastructure on-demand.
3. Understand that bandwidth will be a significant component of your operating cost.
4. Consider the potential cost savings of operating your own infrastructure on-premise or self-hosted cloud.

Remote Areas and Poor Networks

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CHALLENGE

Your patients are connecting from locations with poor broadband connectivity or are using older-model underpowered tablets or PCs.

BEST PRACTICE

1. Choose a video solution that is capable of continuous adaptation to network bandwidth changes.
2. Ask your solution provider about how their product/service identifies and handles patients using legacy devices.

Complex Workflows

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CHALLENGE

You have a complex care workflow that needs special video controls for best patient experience.

- Virtual waiting rooms
- Breakout rooms (telepsychiatry)
- Multi-camera scenarios
- Patient data sharing (Screen sharing, annotating x-rays, live medical telemetry)

BEST PRACTICE

1. Consider that standard cloud and whitelabelled video platforms have limited capabilities.
2. Build your telemedicine solution on top of a SDK with the most powerful API possible.

Evolving Telehealth

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CHALLENGE

Adoption of synchronous video consults is increasing, your patient care strategy and competitive differentiators will evolve.

BEST PRACTICE

1. Look for video conferencing software that is extensible with a fully featured API.
2. Choose a video solution that has been architected to be completely customizable by your software development team or a trusted supplier.
3. Ask how augmented and virtual reality can be supported in the video solution.

Telehealth Case Study

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Peer-to-Peer (P2P)

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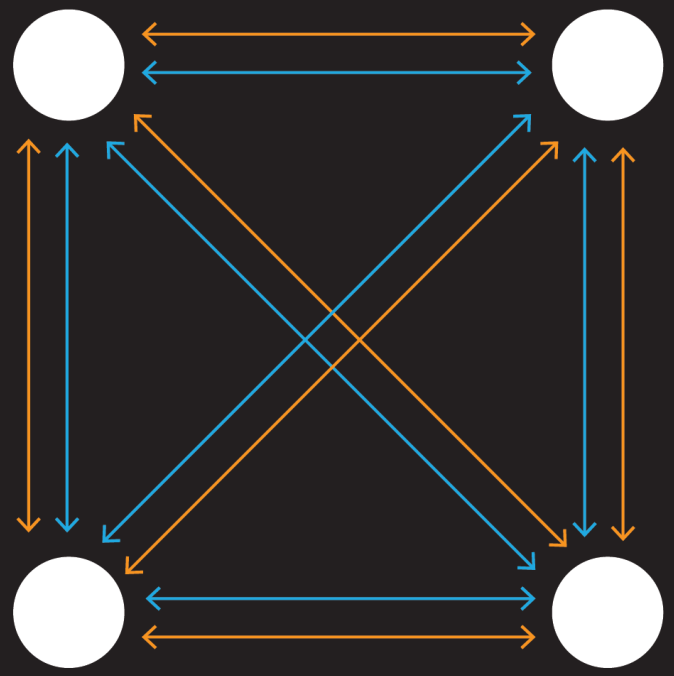

3 Upload, 3 Download streams per peer

= participant = server

PROS

- Lowest operating cost
- Excellent for simple use cases

CONS

- CPU intensive as conference grows
- Recording is difficult without a central server
- Each participant uses more network bandwidth

Selective Forwarding Unit (SFU)

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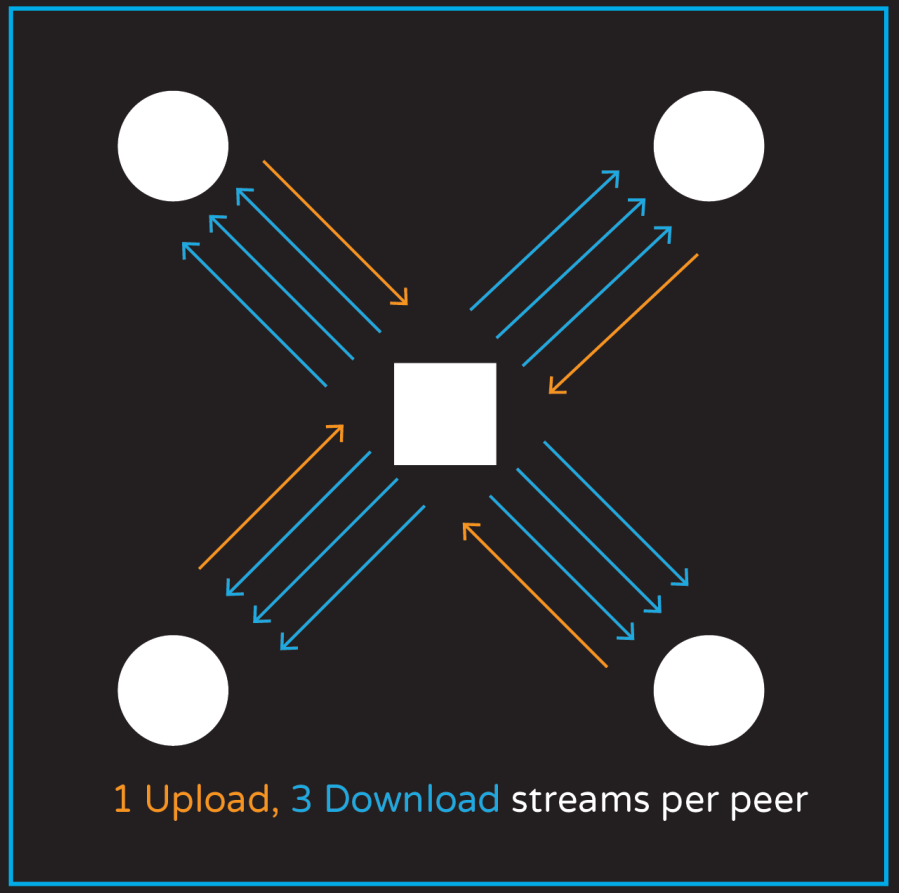

PROS

- Reduces patient upload bandwidth needed.
- Permits transcoding, recording and wider device support.

CONS

- Shifts some CPU load from the patient to the provider.

Multipoint Control Unit (MCU)

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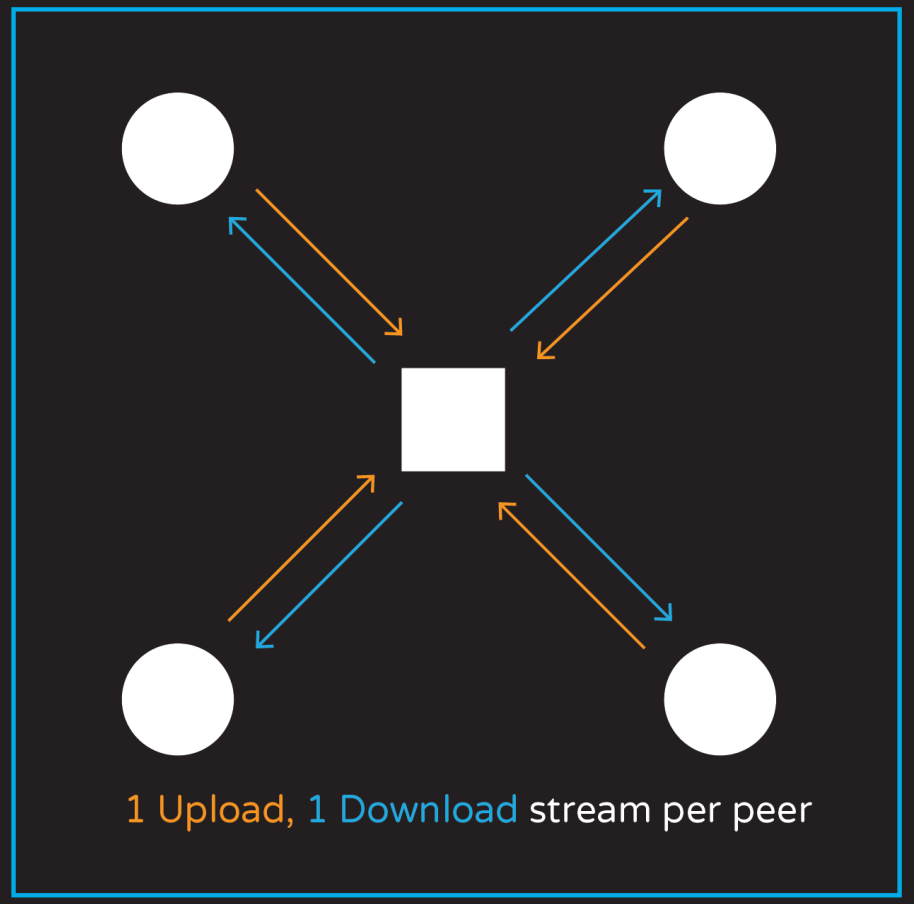

PROS

- Allows older devices and rural patients with poor internet connectivity to actively participate.

CONS

- Requires additional server CPU power for mixing audio/video into single streams.

Telehealth Case Study

A nurse is remotely monitoring a patient

- ☑ Medical peripheral device data integration

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Telehealth Case Study

The system detects an abnormality in the patient's vital signs.

- ☑ Medical peripheral device data integration

= upload = audio = medical data = server

= download = data = telephone

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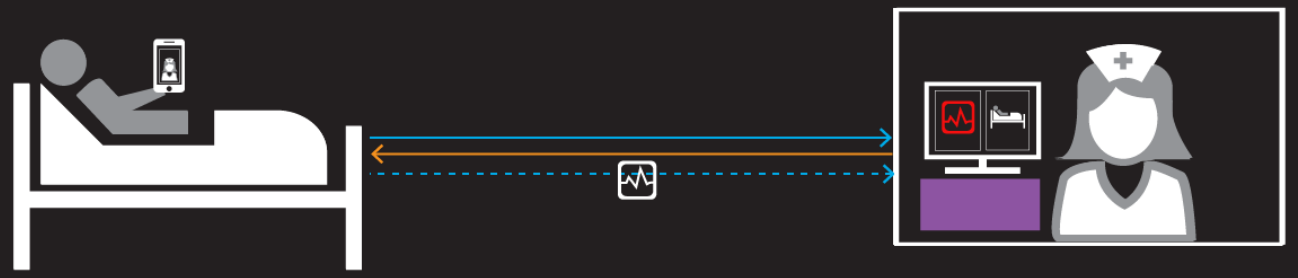
Telehealth Case Study

The nurse begins a video call with the patient.

- ☑ Secure audio/video via SSL, TLS, DTLS, with 256 bit encryption



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= download = data = telephone

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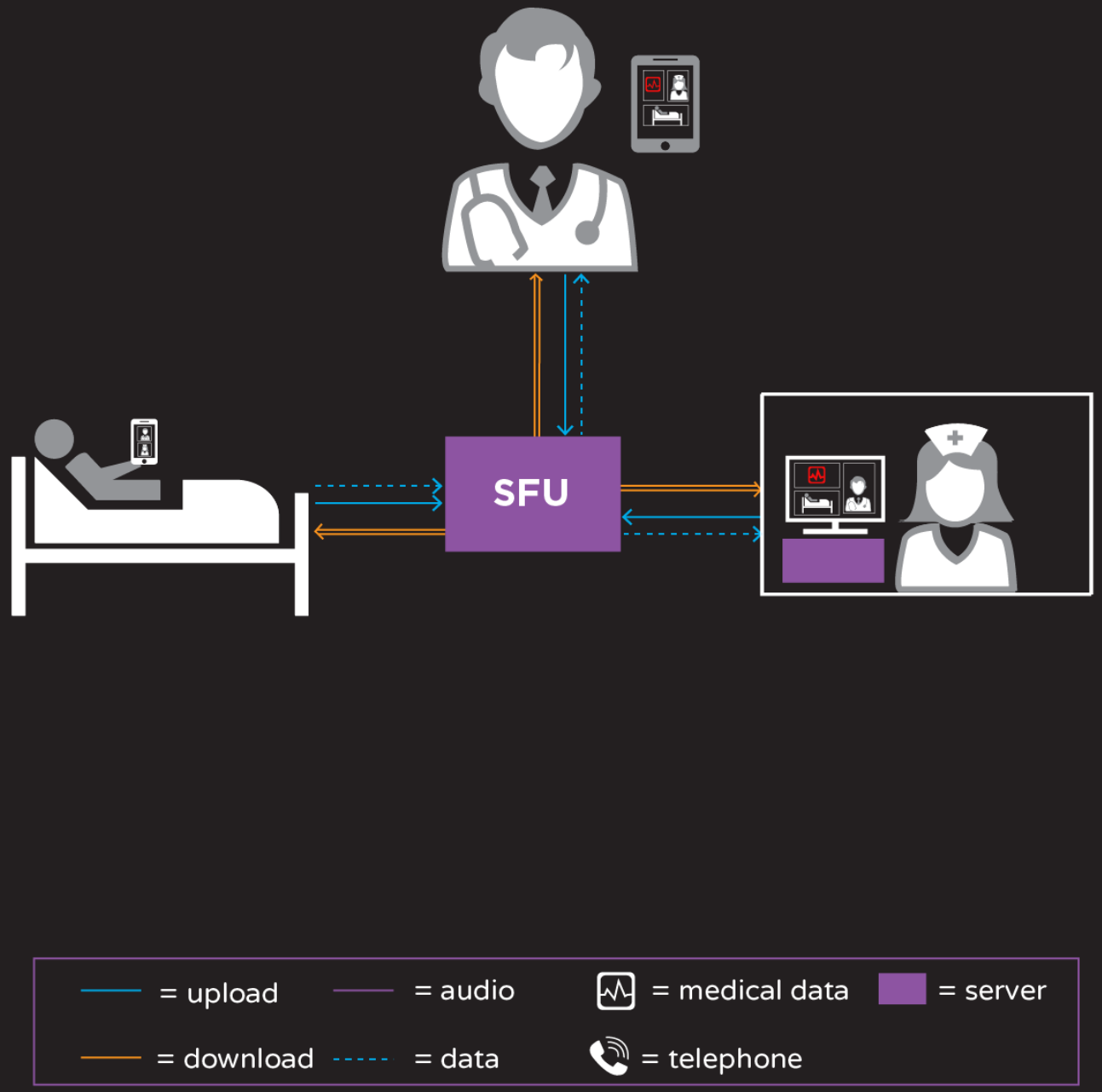
Telehealth Case Study

The nurse establishes a video consultation with the patient's primary physician.

- ☑ Record any audio/video stream



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Telehealth Case Study

Primary physician consults with a specialist for advice while the nurse observes.

☑ Complex workflows

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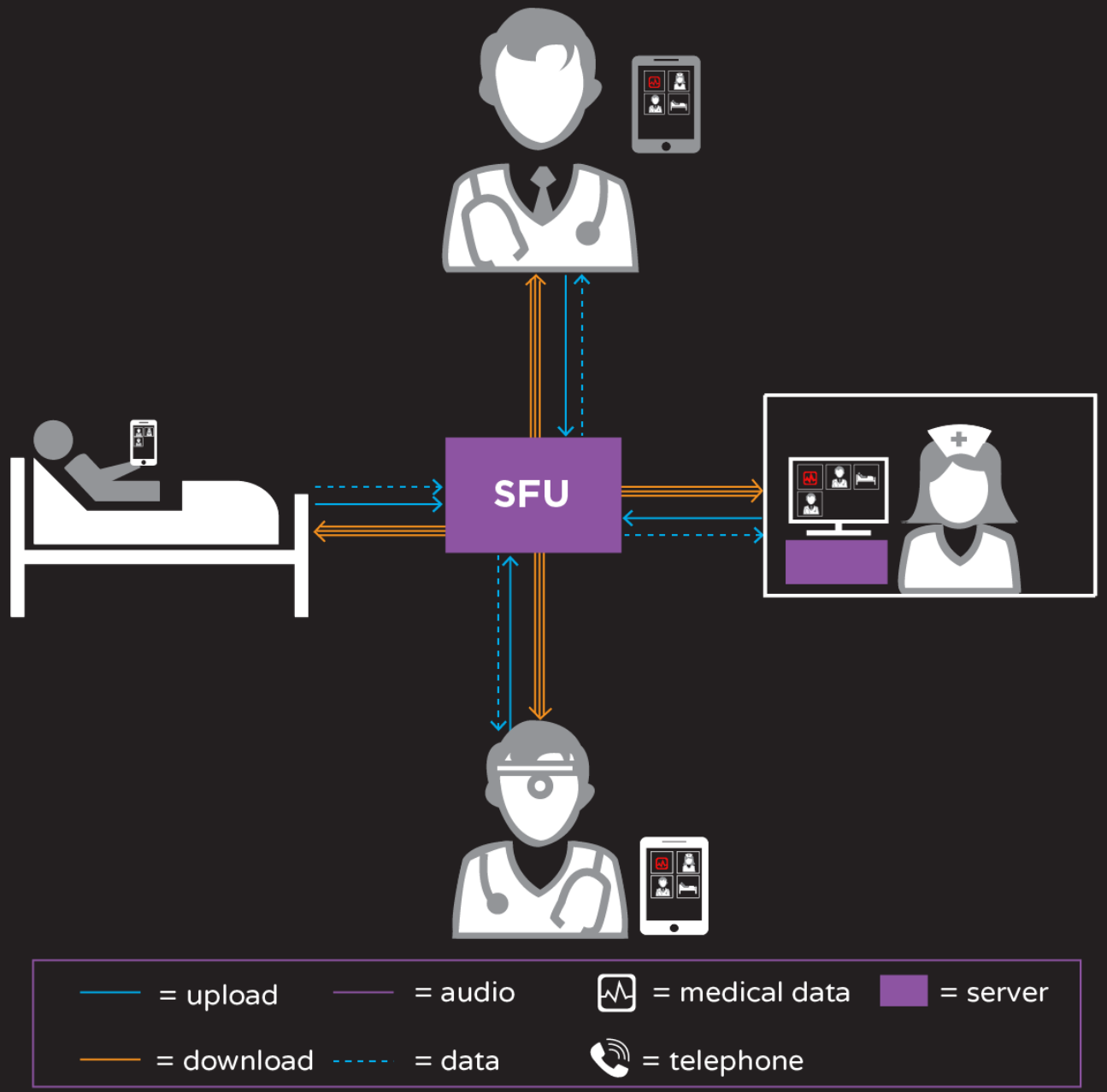

Telehealth Case Study

Evaluation suggests that patient needs to be transferred to the hospital for additional testing.

- ☑ Integrate with existing EHR and legacy systems

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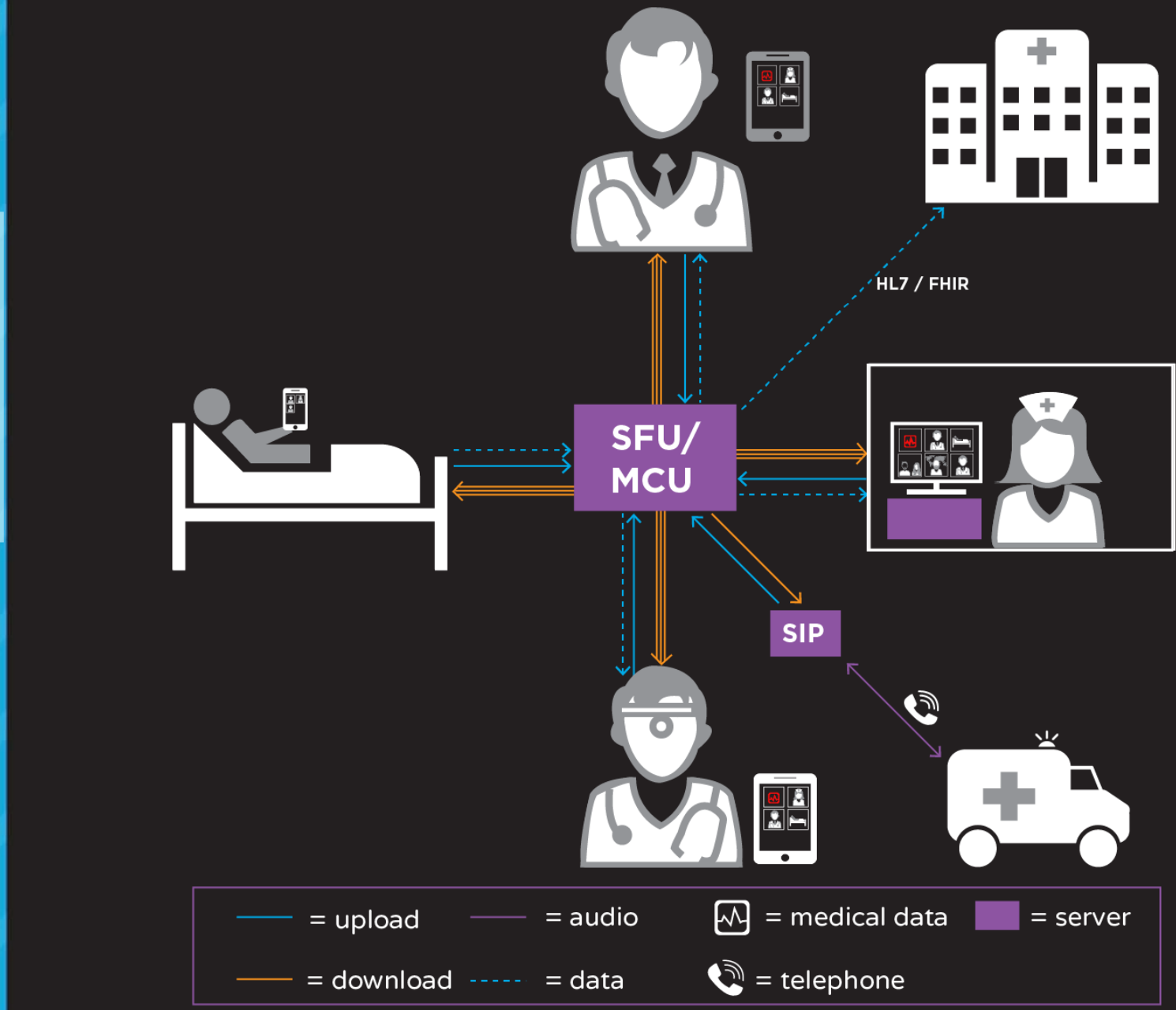

Telehealth Case Study

Patient needs translation assistance and a remote translator in a rural community joins the conversation.

- ☑ Handles poor networks in distant locations

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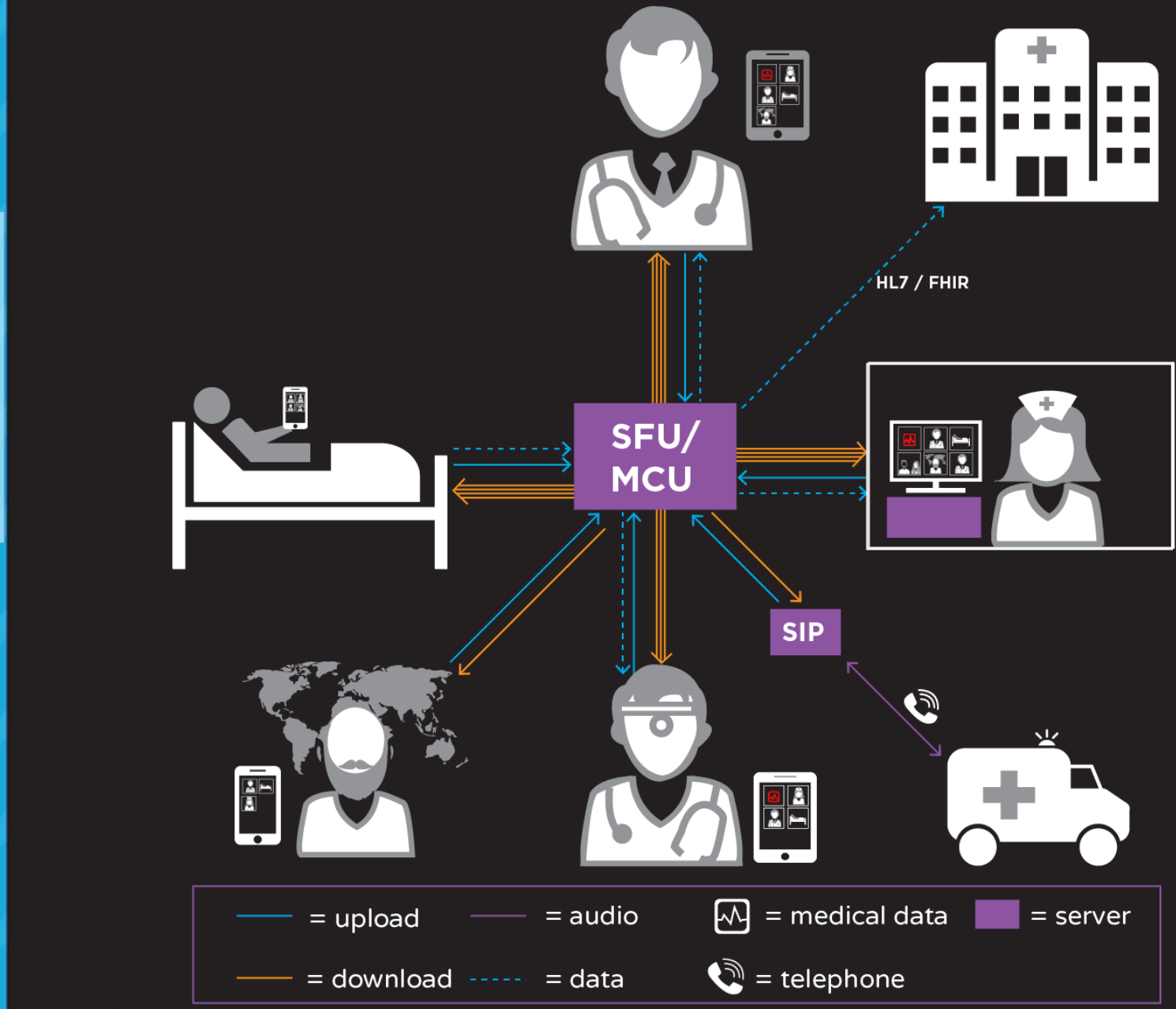

Telehealth Case Study

Patient's family members join video conference via web browser.

- ☑ Maximum browser and device compatibility

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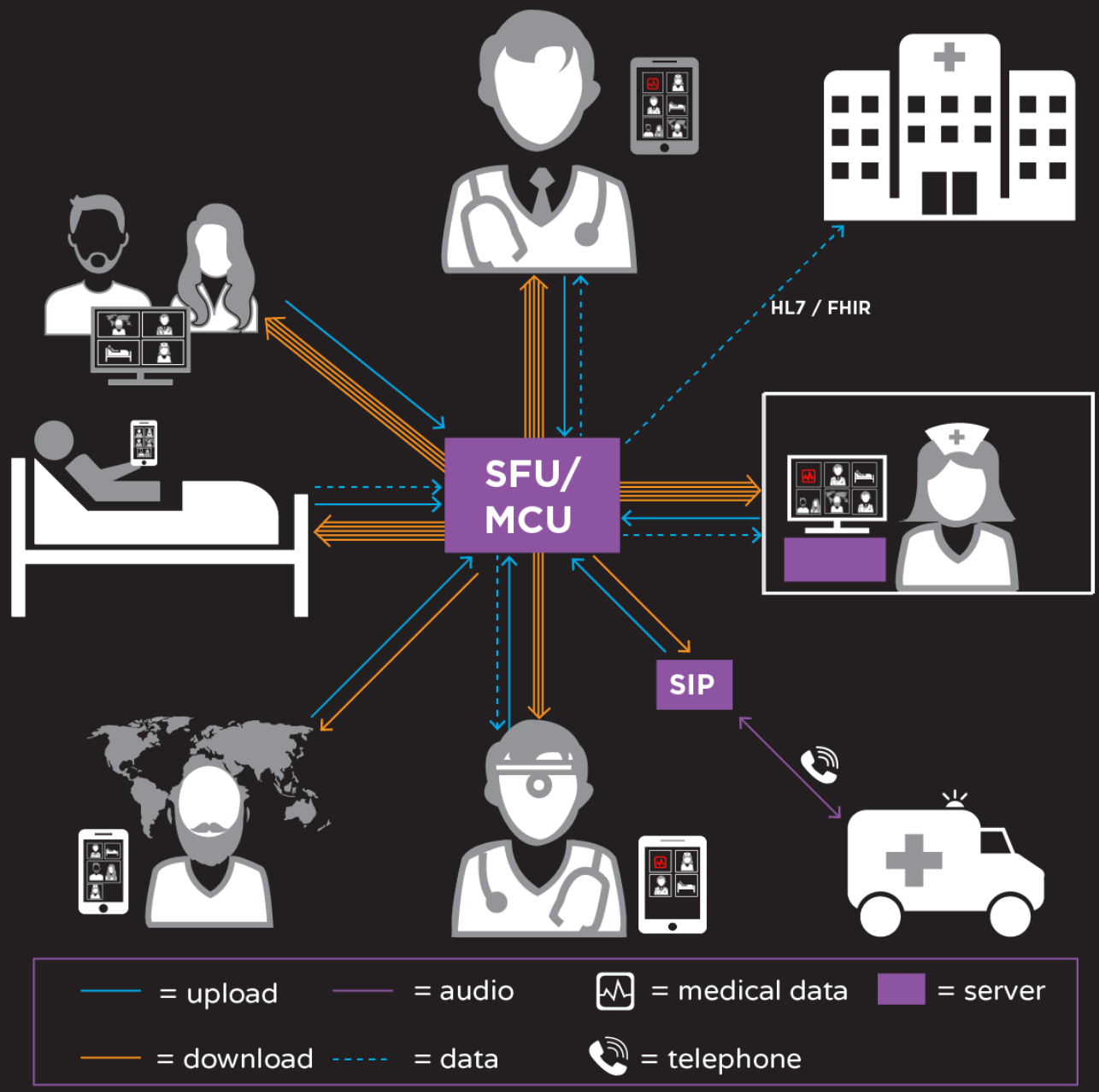

Telehealth Case Study

Specialist recognizes an excellent teaching opportunity and begins a live broadcast to medical students.

- ☑ Scale to large audiences and multiple simultaneous sessions

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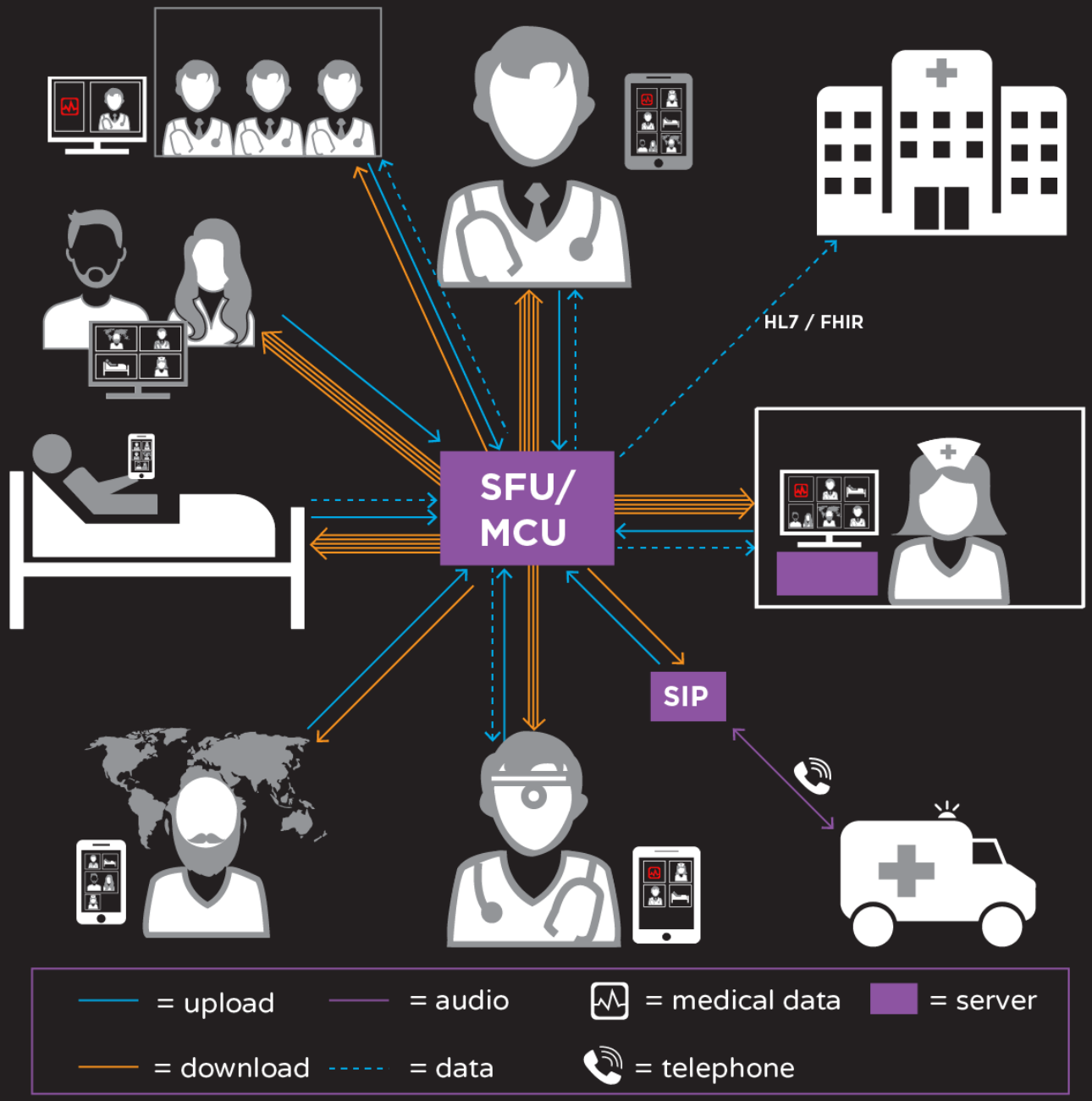

Telehealth Case Study

Audio/video connection topology is dynamically changed dependent on number of participants and connection quality.

- ☑ Cost optimized connection architecture

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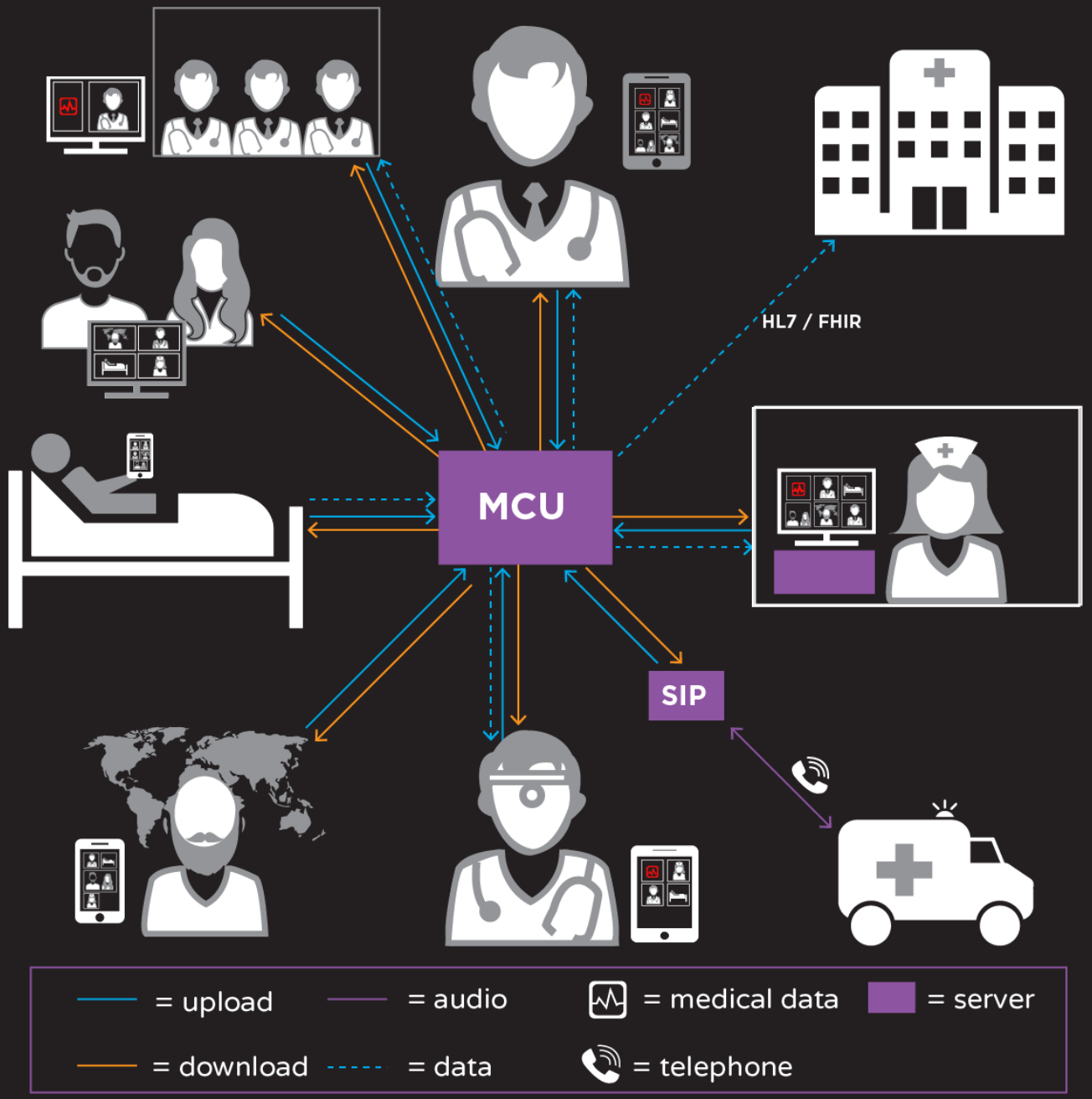

Telehealth Case Study

- ☑ Security
- ☑ Medical Peripheral Device Integration
- ☑ Browser and Device Compatibility
- ☑ Video Conference Scalability
- ☑ Integration Options
- ☑ Recording
- ☑ Operating Expenses
- ☑ Remote Areas and Poor Networks
- ☑ Complex Workflows

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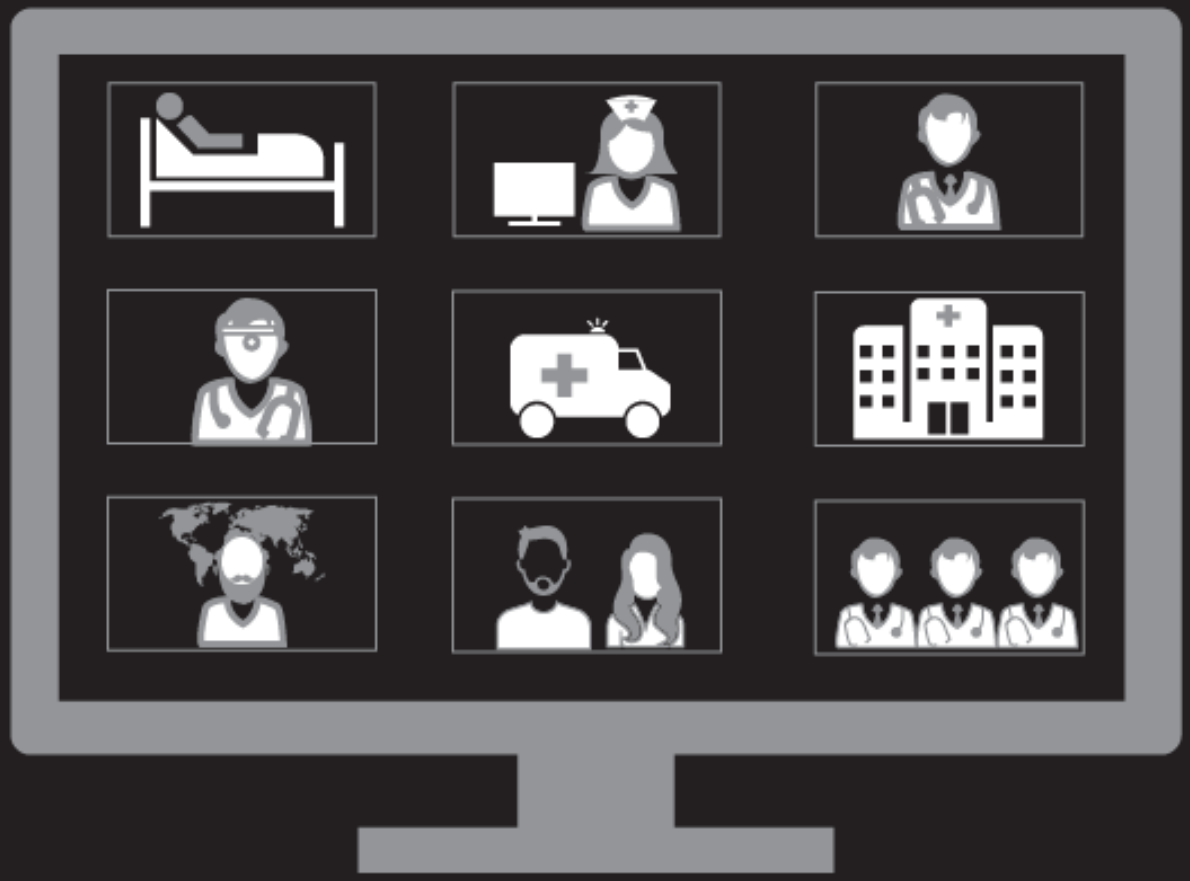

Introducing LiveSwitch

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LiveSwitch Does it All

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BEST PRACTICE	
☑ Security	*Can be integrated with existing user management and authentication schemes. Uses SSL, TLS, DTLS, with 256 bit encryption.*
☑ Medical Peripheral Device Integration	*Can easily build custom connectors for new devices and datachannel API can broadcast to multiple viewers at once.*
☑ Browser and Device Compatibility	*Supports Windows, Linux, MacOS, iOS, UWP-HoloLens, Java, Xamarin, Android, Firefox, Internet Explorer, Chrome, Safari, Edge*
☑ Video Conference Scalability	*Can dynamically scale between P2P, SFU, & MCU connections dependent on the number of participants and device limitations.*

LiveSwitch Does it All

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BEST PRACTICE	
☑ Integration Options	*Exposes the underlying session data and provides mechanisms to transmit that data via HL7 & FHIR. Supports SIP Integration.*
☑ Recording	*Supports individual video stream recording and the flexible mixing of multi-party sessions.*
☑ Operating Expenses	*Capable of dynamically choosing the most cost-effective connection type and can be hosted on-premise or in a self-hosted cloud.*
☑ Remote Areas and Poor Networks	*Can continuously adapt to network bandwidth changes and instabilities.*

LiveSwitch: Hybrid Topology

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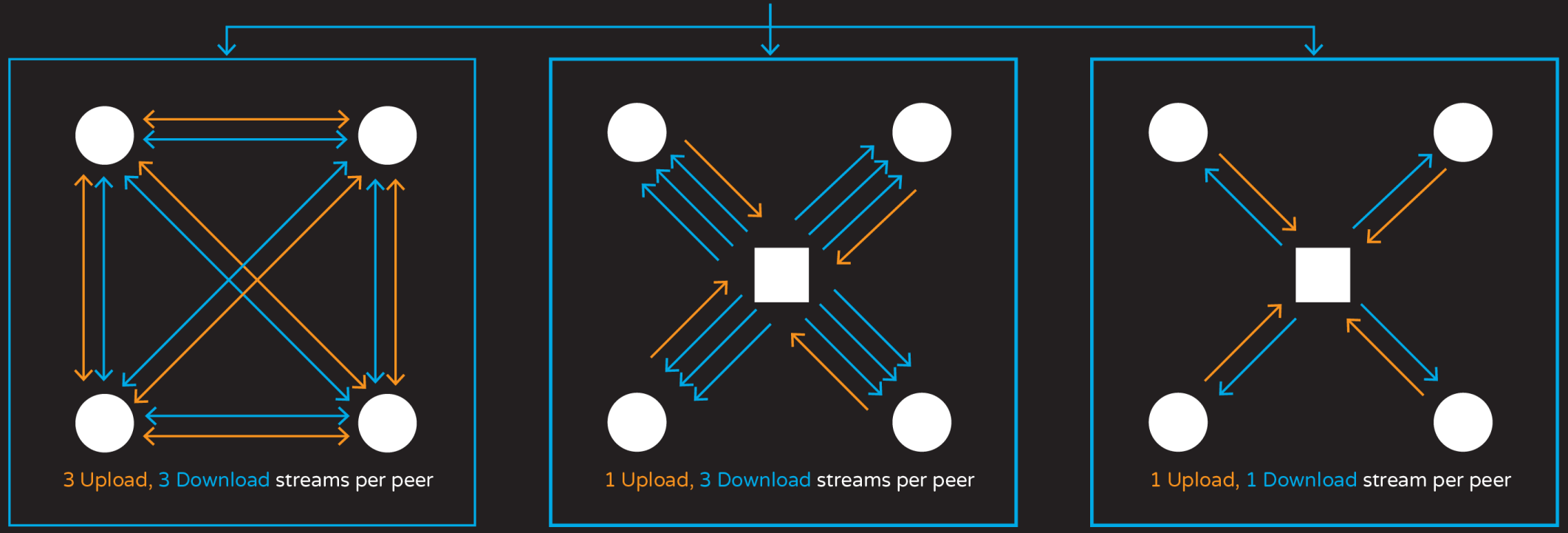
liveswitch™
WebRTC Server



= participant = server

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LiveSwitch: Unparalleled Flexibility

- On-premise and private cloud
- Peripheral device integration & data streaming
- Voice, Video, Text Chat & Messaging
- Hybrid P2P, SFU, and MCU minimizes your platform operating expenses
- VoIP/SIP Phone system integration
- Selectively record some or all A/V streams
- Share screens & whiteboards, with annotating
- Widest platform support - BYOD
- Completely scalable
- Incredibly powerful API

Professional Services

Assessments
- Architecture assessment and a complete project plan and budget

FastStarts
- Receive a Senior Developer for five days to start your project

Projects
- Complete telemedicine platform design and development and integration

- If your organization is interested in applying some of these best practices – We can help.

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Contact Us to Discuss Implementing Best Practices for Your Telemedicine Solution

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