Axiomtek, imedtac Collaborate on Smart iMOR-Tele Operating Room

Smart iMOR-Tele System has multiple video cameras and complete patient data monitoring to enable remote surgeries; Malaysian teaching hospital uses system for remote doctor and medical student access to procedures for learning and expanded patient care

Healthcare organizations around the world are beginning to embrace telemedicine 2.0, ushering in a new era of medical care delivered remotely via video streaming using the cloud and the Internet.

Several trends have come together to drive this expanded use of remote healthcare including an aging population that needs more care, higher speed networks, high-resolution cameras and video technology and a general acceptance of the technology by healthcare practitioners and patients.

According to the US government Dept. of Health and Human Services, the benefits of telehealth include:

- Limited physical contact reduces exposure to COVID-19 and other illnesses

- Virtual visits ensure healthcare can be delivered in remote locations or wherever its needed– at home, at work, or even in the car

- Virtual visits cut down on travel, time off from work, and the need for childcare

- Virtual healthcare tools can shorten the wait for an appointment

- Increased access to specialists who are located far away from your hometown

Telemedicine is more cost-effective and accessible for patients. Telemedicine also improves the continuity of care to provide better life quality for patients. Telemedicine can also make up for a lack of specialized medical skills in a hospital.

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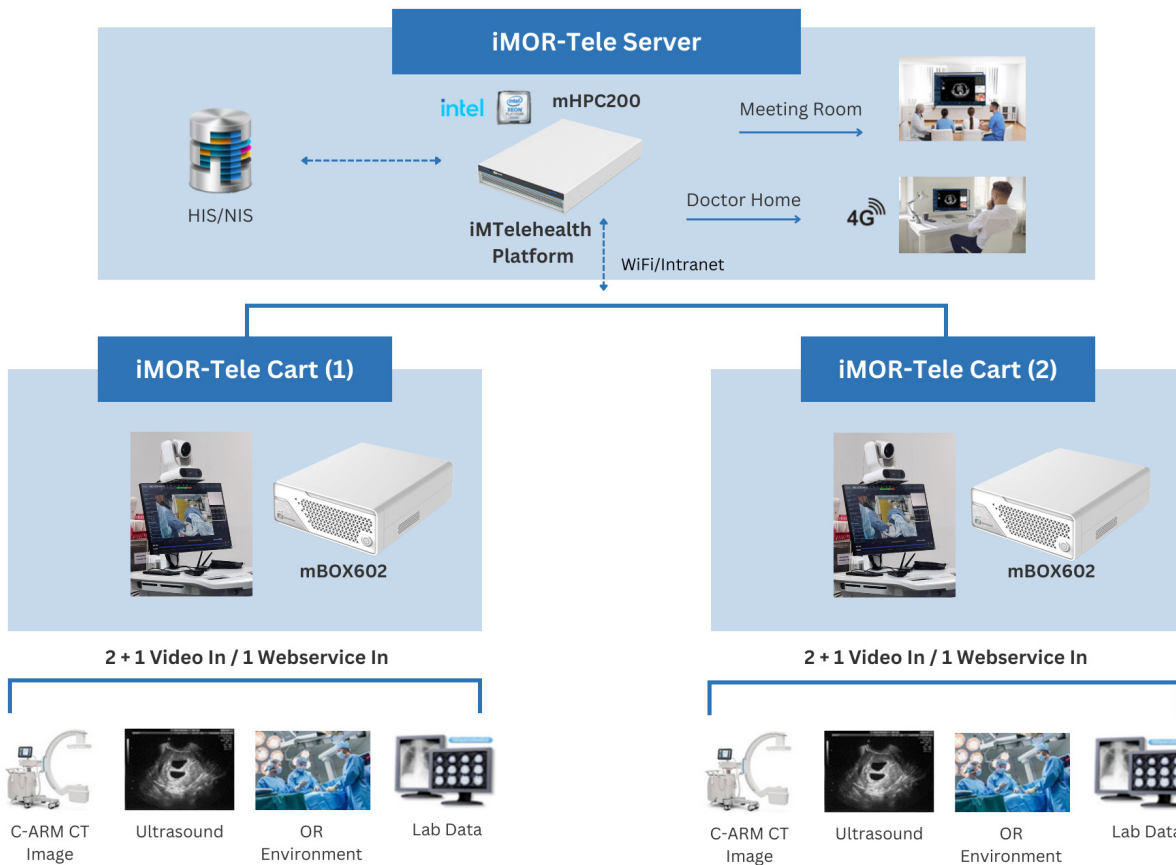
Figure 1. Example of a use case with multiple Smart iMOR-Tele Systems in use, networked to the mHPC200 for connecting to remote medical personnel.

Smart iMOR-Tele Expands Telemedicine

To expand the use of telemedicine for advanced treatments – such as remote surgery – requires advanced diagnosis, monitoring and communications technology based on medical-grade computers, special software and the ability to stream live high-resolution video of the patient while also displaying vital signs and readings from specialized equipment.

Axiomtek has partnered with imedtac to develop the Smart iMOR-Tele System, a mobile system designed for use in bringing medical resources to a patient in the context of surgery, ICU, quarantine, and other remote care delivery.

The Smart iMOR-Tele System provides a complete mobile remote diagnosis system that can be wheeled into a patient's room and allow remote doctors and nurses to provide high quality, comprehensive remote care and instant multi-party communication with patients via the cloud.

The functionality for the system is provided by the imedtac iMOR-SDB operating room (OR) integration software and the imedtac iMTelehealth Platform video transport software running on Axiomtek mBOX602 medical edge system. The Axiomtek mHPC200 medical server is also used to connect

multiple smart tele systems and provide streaming video to medical professionals.

Other aspects of the Smart iMOR-Tele System include:

Pan-tilt-zoom (PTZ) high-definition cameras: These can be used for video conferencing and also to share video of a patient's condition to remote medical professionals. The remote medical professional can control the PTZ camera. High-resolution video streaming enables doctors, nurses and patients to communicate as naturally as if they were in the same room.

Medical grade monitors: These are either 21 or 32 inches in diagonal, offering the screen size to support up to two camera feeds as well as all of the patient's vital signs.

Video connections: The Axiomtek mBOX602 edge computing system used for the Smart iMOR-Tele System features one HDMI-in source and one DisplayPort connection that supports up to three video sources from medical imaging devices such as endoscope, ultrasound, computerized tomography (CT) / magnetic resonance imaging (MRI), etc.

Webservice connection: The Axiomtek mBOX602 supports a connection to the hospital information service (HIS) /

nursing information service (NIS) or picture archiving and communication system (PACS).

As seen in Figure 1, multiple systems can be connected together to share data and tie into other conferencing systems using Wi-Fi and 4G/LTE to connect with medical experts wherever they may be.

OR Integration Provided by IMOR-SDB

The iMOR-SDB operating room integration system contributes video routing and data integration capabilities to the Smart iMOR-Tele System for efficient use of video in smart operating rooms. Running on the mBOX602, the iMOR-SBD is capable of integrating multiple videos and information systems into a single dashboard. These integrated resources include PACS, vital sign monitors, and others.

In surgical applications, the system provides the following benefits:

- Integration of surgery data
- Allow OR staff to efficiently manage surgical processes and query post-operative data records
- Enable optimized remote conference with high definition live streaming
- Improves patient care
- Flexible video routing and documentation

The system also includes the ability for medical professionals to leave color-coded tags on the progress bar in between sign-in, time-out and sign-out. This can be used, for example, to mark when anesthetic is administrated or where special attention is required. This meets the surgical safety checklist specification that is developed by the World Health Organization (WHO).

For contactless data input, the system can be operated using either voice control or hand gestures which also reduces tedious data entry.

imedtac iMTelehealth Platform Software

The other software functionality needed for the Smart iMOR-Tele System is provided by the imedtac iMTelehealth Platform software which also runs on the mBOX602 edge computing system. imedtac iMTelehealth Platform brings the ability to integrate patient information, video and vital signs into one platform and to make that information available for virtual consultations with specialists in other departments or other medical facilities or even the homes of medical professionals.

The iMTelehealth Platform Software offers the following benefits for patients:

- Set up is quick, just plug in and connect to the wireless network and connect the medical monitoring systems
- Uses private cloud to protect patient information
- Supports video / audio conferencing including connections to 1080p HD cameras
- Medical grade server and cart - can be cleaned with 75% alcohol
- Compatible with wide range of vital sign monitoring devices

mBOX602 Provides a Complete OR Solution

The Axiomtek mBOX602 edge computing system (see Figure 2) is mounted on the back of the Smart iMOR-Tele System and provides the compute foundation for the Smart iMOR-Tele System's features. Axiomtek's medical computing systems are fully customizable to suit the needs of a wide range of medical industry applications, with high-performance CPUs, extensive storage capabilities, rich I/O expandability, and various form factors from board level to system integration, plus multiple safety and medical certifications.

The embedded mBOX602 family of specialized edge computing systems meets IEC60601-1 medical product safety standards and is designed with the compute power for medical imaging applications, such as computer-aided diagnosis, outpatient terminal and surgical video streaming, and biometric analysis.

The medical grade systems are designed for longevity, which ensures a long life cycle for the hospital. The system is based on a single-board computer architecture for small size, low maintenance costs and power efficiency.

The mBOX602 features a sleek and clean chassis that fits in with other hospital equipment. The flat design also puts the heat sink under the unit which makes cleaning easier and avoids the chassis being covered by dust.

Figure 2. Front view of Axiomtek mBOX602.

The mBOX602 is powered by 13th Gen Intel® Core™ i7/i5/i3 processors. Certain high performance mBOX602 edge computing systems utilize Intel processors that are optimized for a wide range of workload types and performance levels, all with the consistent, open, Intel architecture. From the top-end 13th Gen Intel® Core™ i7 processors to the value-packed Intel® Core™ i3 processors, Intel® Core™ processors let compute platforms do more. The mBOX602 features a PCIe x16 slot for graphic processing unit (GPU) or frame grabber.

Figure 3. Front view of Axiomtek mHPC200.

Axiomtek mHPC200

The Axiomtek mHPC200 server is used in the Smart iMOR-Tele System application to process data from different operating rooms and receive the hospital data from remote healthcare professionals and send to each operating room. The server provides the compute power needed for multiple Smart iMOR-Tele System applications.

The servers are designed in a 2U high rackmount form factor and feature dual data center-class Intel® Xeon® Gold 6226R processors with Intel® C621 platform controller hub (PCH). These processors and controllers are designed to perform heavy computation and imaging analytics workloads for clinical diagnosis and laboratory research. The medical server supports fast memory (DDR4-2666 ECC DIMM) with a capacity of up to 384 GB, along with 4TB U.3 SSD to deliver 3G/2.9G RW performance.

The server also provides three PCIe x16 Gen 3.0 slots where users can install Intel architecture GPUs or FPGA accelerators to increase processing power for running AI imaging tasks.

Smart iMOR-Tele System Helps PPUM Provide World-Class Care

PPUM, the University of Malaya Medical Centre, is a government-funded teaching hospital and medical school located near Kuala Lumpur, Malaysia. PPUM uses the Smart iMOR-Tele System for improved patient care and also to stream procedures to classrooms so that medical students can see the latest techniques in action as part of their curriculum.

PPUM has installed the Smart iMOR-Tele System in its operating theater to connect to multiple cameras to view surgical procedures from multiple angles. The wireless and mobile nature of the system means it can be installed in a new surgical room without the interruption that would be needed to install wiring for the system.

"The Smart iMOR-Tele System helps us to stay ahead of the trend for remote medicine while we still fulfill our mission as one of Malaysia's premiere medical universities by providing students access to surgeries for learning. The Smart iMOR-Tele System solution presents all of the data that the doctor needs to monitor by making optimal use of the latest wireless and cloud technologies. We are grateful to Axiomtek and imedtac for this innovation."

—PPUM Administrator

Figure 4. Smart iMOR-Tele System in use at PPUM.

Conclusion

Innovations in telemedicine are needed to provide better care and meet the health needs of patients all over the world. For remote surgeries, this means bringing as much of the OR as possible to the remote medical professional. Axiomtek and imedtac have set the state of the art in remote medical systems with the Smart iMOR-Tele System, which uniquely provides all the information needed by a remote healthcare provider. This includes realistic video feeds, conferencing with other professionals and a screen that also includes vital indicators and feeds from specialized medical systems. This system provides all the tools needed for the expanded use of telemedicine for complicated procedures.

Learn More

- Axiomtek mHPC200
- Axiomtek mBOX602
- imedtac Home Page
- imedtac iMTelehealth
- iMOR-SDB OR Integration Solution
- Intel® Core™ Processor Family
- Intel® Xeon® Scalable processors

intel.