



VidyoTM
Personal Telepresence

APPLICATION NOTE

VidyoHealth for Telemedicine

*Extending the reach of telemedicine with
natural video communication*

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Extending the Reach of Quality Healthcare

Accessibility to quality health services is key to a thriving society. The goal of providing quality healthcare service to everyone, everywhere, in a scalable and economically viable manner, introduces a huge challenge to hospitals and healthcare providers alike. However, tremendous rewards await those who employ new technologies and practices to meet the challenge including improved patient outcomes, reduced cost of providing services, and increased efficiency and reach of specialists and other talented healthcare professionals. With an aging population in developed countries, the expansion of population to remote areas, and the rapid advances of modern medicine that lead to short supply of specialists in a given field, demand is on the rise to connect healthcare providers with patients and each other regardless of where they are physically. Providing transportation to patients or mobilizing doctors is very costly and inefficient. A new infrastructure is required to make healthcare less dependent upon geography and bring the right services to the patient regardless of where they may be.

The solution lies in a scalable, cost effective, telemedicine network that can leverage the public Internet and existing general purpose IP networks at medical facilities to enable remote doctor-patient and doctor-doctor interaction that is as close as possible to a face-to-face meeting. For remote consultation to be successful, the remote or consulting physician needs to receive a clear, high definition video of the patient and any instrumentation used during the examination, without perceivable delay. Such visual information is critical to the diagnosis process for the healthcare professional. From the patient's perspective, being able to see the practitioner's face and body language is essential in establishing trust and confidence in the physician. The traditional telepresence systems capable of providing such natural video interactions are very expensive and require costly dedicated networks, rendering them useless in the context of remote at-home healthcare.

The VidyoHealth™ solution was designed to provide a reliable, unified, high definition, multi-platform, video conferencing environment specifically geared toward facilitating real-time, face-to-face interaction between and among care providers and patients from anywhere, to anywhere, over low cost general purpose IP networks, including the public Internet. Utilizing a variety of endpoints ranging from laptop computers to telepresence room systems and the patented VidyoRouter™ architecture, VidyoHealth is designed to scale from tens to hundreds of thousands of users. The system is designed to support both individual practitioners and service providers or telemedicine organizations, which provide services to hospitals, clinics, and government healthcare and human development organizations.

Applications for VidyoHealth

- Geriatric, immobilized, and rural patient at-home care
- Mental healthcare
- Support groups
- Remote patient triage
- Remote consultation for patients & physicians
- Remote specialist consultation
- Safe infectious disease diagnosis and treatment
- Cross campus consultation for hospitals
- Distance learning & CEU

VidyoHealth at-a-Glance

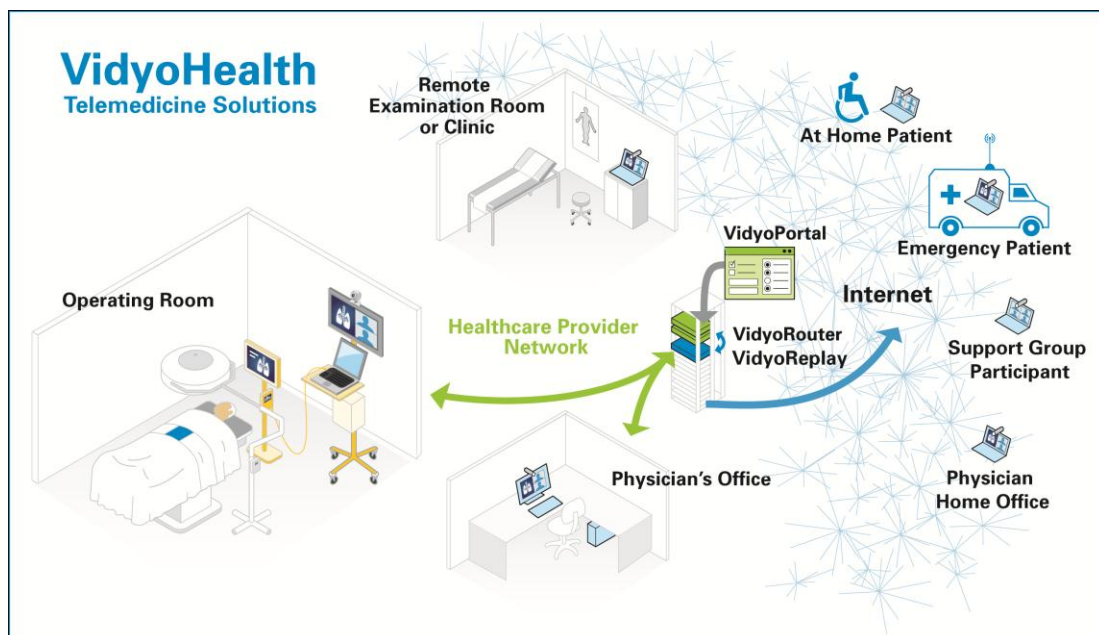
- Connect video from medical devices into Vidyo conference
- HIPAA compliant medical cart based endpoints for hospitals
- Desktop & Appliance Based endpoints
- Physician far-end control of patient camera & settings
- Consultation recording & playback
- Signaling and media encryption
- Streaming video and HD image sharing
- Industry leading, low latency, HD video conferencing, essential for remote diagnostics and patient-doctor interaction
- HD quality over existing general purpose IP networks including the Internet without any special QoS
- Call Detail Reports (CDR) to support archiving and billing

VidyoHealth

The VidyoHealth solution makes it easy and affordable for healthcare providers to deploy high definition (HD) and low latency Vidyo Conferencing to everywhere examination, operation, or consultation needs to take place, both within a medical facility and at remote locations such as patient homes, clinics, other hospitals or physician home offices.

VidyoHealth System Components

- **VidyoDesktop™** software client for Mac, Windows, or Linux
- **VidyoPortal** is an Intel x86-based appliance that provides web-based management services
- **VidyoRouter** is an Intel x86-based appliance that provides the software-based multi-point VidyoLines, call processing and routing functionality
- **VidyoReplay** is an optional webcasting and recording appliance that allows users to watch a Vidyo conference in real-time or at any time after the conference
- **VidyoRoom™** systems, with or without HIPAA compliant mobile medical carts
- **VidyoGateway** is optionally available to enable connectivity between the Vidyo ConferencingSM system and legacy H.323 or SIP end points.



CHALLENGES TODAY	VIDYOHEALTH
Lack of assured video quality to residential areas	Delivers telepresence quality over the Internet using PCs people already have
Maintaining privacy over unsecured networks	End-to-end encryption provides HIPAA compliant security to the home
Telepresence enables natural communication but is cost prohibitive	Distance patients can be connected for as little as \$5 each and infrastructure ~1/10 th the cost of telepresence
Video conferencing can be difficult to use	Provides touch screen option
Ongoing staff education	Recording and streaming provides for one time presentation to be reviewed again at anytime
Awkward delays frustrate patient doctor interaction	Delay equivalent to the public switched telephone network for natural interaction
Interoperability is a challenge	Designed to interoperate with legacy video devices, medical applications and devices

Privacy

All data streams in the conference are encrypted. The VidyoHealth virtual examination rooms, where the patients and the doctors “meet,” are locked automatically and can be opened only by the owners of the rooms. When a patient is in a virtual room, anyone who wants to join the room has to “knock on the door” and will be let in to the Vidyo room only if confirmed by the doctor who owns the room. This way the privacy of the patient is protected from intentional or unintentional intrusion, just as if she were to lock the door in a physical examination room. VidyoHealth also supports multiple medical practices on the same system, each maintaining full privacy from other “tenants” on the system via simple system administration. Residents of the same tenancy can receive information about the availability of their peers. This information is not available to other tenants.

Administrative Efficiency

All sessions may be recorded automatically or on-demand, including all doctor-patient interaction and visual input from medical devices, for further consult and EMR archival. Call Details Records (CDRs) are generated and VidyoReplay™ recording links can be emailed in order to be able to bill the healthcare insurance or the patient for the remote session. In addition, with patient permission, recorded sessions can be played back for CEU (continuing education unit) sessions and analyzed by trained doctors. These

CEU sessions can also be conducted via the VidyoHealth system, again saving doctor's time and reducing cost.

Low Operational Costs

The Vidyo™ solution does not require dedicated networks with special Quality of Service (QoS) between the main hospital and the remote locations. Standard residential-grade broadband connections are enough to deliver a reliable HD quality user experience. A participant from a home office can use a standard residential broadband (cable or DSL) and regular PCs or laptops with low cost webcams and still maintain the natural high definition experience. The solution is designed to support mass deployment, so the organization can connect hundreds of thousands of patients and healthcare providers to its network, making them available for consultation at anytime, without the need to physically travel to see the patients.

Flexible Configuration

The Vidyo solution is designed for both on-premises as well as hosted service. The hospital may choose to host the service at an external data center or even buy the service from a conferencing service provider. There are both software based endpoints that can be installed on existing desktops and appliance based endpoints for fixed room application.

Delivering Personalized Healthcare Cost Effectively

VidyoHealth enables a wide range of applications for both telehealth service providers and healthcare providers alike. All of the applications have one thing in common – improved patient outcomes at lower cost than the current in-person only model. While VidyoHealth is not intended to replace in-person medicine, it provides a powerful complement to it, empowering healthcare providers to eliminate the inefficiencies and patient discomfort associated with unnecessary office visits.

Video Triage - Eliminating Unnecessary Office Visits

Frequently, patients who don't feel well aren't sure if their conditions require a doctor's attention or not. Using personalized at home telemedicine will enable the patient to connect to a local emergency room or doctor on shift and receive initial consult and triage for her/his condition. Visual communication is essential for such scenarios to establish the necessary confidence on both the doctor's and the patient's side about the accuracy of the remote diagnosis. In many cases such a session will save a trip to the local emergency room, lowering healthcare cost and improving the life of the patient.

At Home Telemedicine For Mental Healthcare

The recurring nature of regular meetings between patient and service provider combined with the absence of the need for hands-on examination makes mental healthcare an ideal application for at-home telemedicine. The natural experience enabled by VidyoHealth's low latency and high definition video, along with the safety and familiarity of the patient's home, makes the telemedicine meeting between the patient and the psychiatrist even more appealing in most cases than a physical meeting at the doctor's office. The tool also makes family therapy sessions possible, even when some members have busy travel

schedules or are living in separate residences. VidyoHealth's ability to connect a large number of participants from their respective homes into a moderated video conference, provides a convenient platform for support groups. Travel is eliminated and people can join from an environment that they are comfortable in.

At Home Medicine for Geriatric and Immobilized Patients

VidyoHealth enables healthcare institutions to provide at home medicine to hundreds of thousands of patients. Patients that require access to nurses or doctors can connect from the comfort of their homes, using their home computers or low cost accessories provided to them by the service provider. Sessions can be prescheduled with relevant doctors or nurses or ad-hoc emergency calls when the patient condition worsens. The system provides an intuitive user interface that is as simple as a phone. All configuration and management is done remotely. The patient or in-home nurse or family member may also connect different medical devices to the system to provide the remote doctor with telemetry and visual data required for the remote diagnosis. The doctor may also play instructional videos for the patients. Doctors can handle multiple virtual sessions concurrently in separate virtual meeting rooms, switching from one patient to another as needed. A session may start with a nurse – patient interaction. When ready for the doctor's professional opinion or diagnosis, the nurse simply invites the physician into the virtual examination room. The doctor may also add to the conference a specialist to receive a second opinion – all from their hospital or home offices, without the need to travel anywhere. All of these sessions can be recorded for ongoing assessment of the patient's progress or, with appropriate permissions, for the physician to share as a real-world case study with interns and residents at the hospital.

Maximizing Physician Expertise - Remote Consultation

There are many use cases for the VidyoConferencing solution in hospitals. Some will enhance the existing remote diagnosis infrastructure, others will extend the reach to places where visual consultation was impossible or impractical before, but all will enable physicians, who are core to the hospital's success, to effectively provide their services everywhere in the most cost-efficient manner.

Remote Diagnosis for Rural Emergency Departments and Clinics

Expand the reach of your specialists by providing emergency diagnosis and consultation services to rural hospitals and clinics. When a patient is brought into the Emergency Department of the remote hospital, the local doctor or nurse will have immediate access to specialists from your hospital for life-saving consultation. The local doctor can share with the specialist any medical information – high definition images or video, and telemetry from local medical devices. The remote specialist receives in real time a high definition and high frame rate video of the patient and can interact with the patient in the most natural way as close as it can get to being physically next to the patient. All this is possible over the public Internet using a standard broadband connection, with no need for expensive dedicated networks.

Now imagine that the specialist has discovered that the patient may be suffering from another injury and requires the opinion of his colleague who just finished his shift and is now at his home. With VidyoHealth the doctor can call into his colleague's PC at his home office and connect him into the video conference. The doctor at home receives a perfect video stream of the patient, the specialist and the medical devices

as is seen in high definition by all the participants. This session can also be recorded for ongoing patient management and to facilitate the transition between doctors when necessary. All of this delivered as an ad-hoc connection over a residential IP connection into a PC or a laptop.

Vidyo vs. MCU-Based Legacy Solutions

	VIDYOHEALTH	LEGACY MCU-BASED
Average Cost per Concurrent Use Port	\$950 for VidyoDesktop; \$0 for VidyoRoom	\$6,000
Scalability	Thousands -Flexible Software-based VidyoLines -Up to 100 concurrent HD multi-point VidyoLines per low cost VidyoRouter	Limited -Fixed Hardware-based ports -Up to 40 simultaneous HD multi-point ports per high cost MCU
Accessibility	Ubiquitous -Designed for high performance over public Internet	Limited -Requires QoS enhanced networks for acceptable performance
Investment Protection	Standard x86 Hardware -Remotely Software upgradeable	DSP-based Hardware -Hardware replacement upgrades
Latency	Comparable to Wire-line Phone Service -Natural Interaction with as low as 180ms of latency	Comparable to Satellite-Routed Call -Unnatural Interaction - Latency in excess of 400 ms
Multi-point Performance	HD at All End-points - Clean, non-transcoded video quality	Mix of SD and HD end-points - Degraded video quality due to transcoding

Why Should I Choose Vidyo?

When considering which video conferencing solution will best meet your institute's telemedicine needs, the key factors include functionality, quality of patient - doctor interaction, scalability, accessibility, investment protection, cost and multi-point performance.

Vidyo's ability to deliver remarkable multi-point performance over the public Internet from standard Macs and PCs, utilizing software-enabled VidyoLines on its VidyoRouter, uniquely positions VidyoHealth to easily scale, servicing thousands of patients and care providers for a fraction of the cost of an MCU-based solution. Legacy MCU-based solutions do not scale well since they are hardware limited, require costly QoS enhanced lines to achieve mediocre performance, and are heavily laden with up front equipment expense. Additionally, since they are DSP-based hardware platforms, legacy MCU-based systems are prone to obsolescence and have to be replaced to implement significant new features. Even over QoS enhanced IP networks, which make widescale desktop deployment unrealistic, the transcoding MCU-

based H.264/AVC system still underperforms Vidyo's H.264 Scalable Video Coding (SVC) solution since transcoding degrades video quality and adds latency to the video stream, resulting in unnatural communication experiences. Vidyo's solution avoids transcoding by handling encode/decode at the endpoints and delivers rate-matching through simple routing decisions of the encoded packets.

Both Vidyo and legacy MCU-based systems will create greater bandwidth demand wherever the VidyoRouter or MCU are located. However, with the Vidyo architecture, the VidyoRouters may be strategically placed in dispersed hosting facilities where bandwidth may be grown on demand to help minimize or eliminate the impact of growth in video traffic on your facility's IP network.

Conclusion

Personalized telemedicine for the masses clearly represents a huge opportunity and equally big challenge to healthcare providers and governments. The technology to enable such service in an economically viable way was not available prior to VidyoHealth. A high definition, low latency user experience supports more accurate diagnosis with less mistakes, higher patient satisfaction and better patient outcomes, all at significantly reduced costs compared to traditional office visits. VidyoHealth makes unified access to user friendly, multi-point, HD desktop video conferencing available to all your patients and physicians at their residence or in your facilities via the public Internet and general purpose IP networks – all in one simple package that you can afford. Anytime, anywhere, any network, for everyone. At home personalized medicine that works. That's Vidyo.

For more information: www.vidyo.com/1.866.99.VIDYO