

SIEMENS

Reference

Industrial Communication

The Virtual Doctor is always on-site

WiMAX Communication Technology from Siemens RUGGEDCOM
for Telemedical Emergency Management in Maritime/Offshore Scenarios

The innovative telemedical application Global Health Care (GHC) AescuLink in combination with the latest communication technology makes possible the immediate emergency care of patients at remote locations such as on a ship, an oil platform, or a wind power plant. For coastal use cases such as offshore wind farms and the sea rescue, GHC AescuLink and Coast-Link™ provide virtual emergency doctor assistance around the clock (24/7). Siemens is manufacturer and supplier of the rugged WiMAX components from RUGGEDCOM, which form the basis for the telemedical application.

“We want to ensure a similar quality of care on board a ship as on land, which can also be readily transferred to employees of oil platforms, wind farms, etc.,” explains GHC director Dr. Trong-Nghia Nguyen-Dobinsky. For this, Global Health Care (GHC) – a spin-off of the Charité University Clinic in Berlin – has developed the telemedical emergency system AescuLink. It offers real-time audio and video communication as well as live-transmission of vital parameters – including ECG data, heart frequency, blood pressure, blood oxygen level, and body temperature – using wireless connections.

The solution is characterized by ease of use, low network load, and high stability against fluctuations in connection quality. These characteristics are absolutely necessary for the transmission performance and a secure diagnosis. “If a patient is picked up at sea by helicopter and flown into the clinic, a lot of time is lost – and in the end possibly even the patient,” adds Dr. Nguyen-Dobinsky.

The developers of this solution for telemedicine attached great importance to easy operation so that even medical laymen can safely handle the system. The tele-doctor assumes the responsibility for diagnosis and therapy and oversees the entire treatment. Aided by the software's remote control function, he or she guides the user step-by-step through all necessary measures. AescuLink is fitted with two cameras that transmit images via live stream to the rescue center of the clinic. In the clinic, the tele-doctor can view the emergency situation on-screen and get an impression of the patient's condition.

Thanks to the virtual presence of the tele-doctor, the critical situation, e.g., on board a ship, often improves automatically, since the live-connected doctor takes the responsibility for the extraordinary occurrence off the on-site helper's shoulders. A medical emergency is always an enormous challenge for all parties involved – and can be mentally stressful. The visual and acoustic examination is performed by the tele-doctor via live stream with the support of a medical layman. The tele-doctor constantly checks the key parameters of the diagnosis and therapy that he or she recommended. This helps to properly utilize the limited time available during an emergency, and ultimately minimizes incorrect treatments, which could result in life-threatening conditions or even death, or cause permanent damage to patients and helpers.

Successful Outcome of a close Partnership

On a seagoing vessel, a satellite connection is generally used for normal communications. The satellite antenna on the ship offsets the ship's movements by automatically aligning with the satellite transponder. For a rescue vessel, which routinely has to withstand choppy seas and severe storms, a conventional satellite antenna cannot ensure the stable connection necessary for telemedicine. In addition, limited bandwidth and large latencies are the major problems which have to be solved.

Making the telemedical emergency system usable for this special case is the result of a close collaboration by multiple institutions and companies. GHC supplied the telemedical technology, while Siemens delivered the directional radio components used on ferries, rescue ships, offshore platforms, and the onshore stations. The planning and implementation of the communication infrastructure was the responsibility of the Siemens Solution Partner Wireless Consulting.



Other coastal use cases where virtual emergency medical assistance can be employed include offshore wind farms

Sven Sternke, sales manager of the partner company, describes: "A radio station is, for example, installed in Rostock, Germany, and another one on the Danish side in Gedser. A ship operating in this area or an offshore platform located there receives its information through these two base stations. The distance between the ferry ports is about 70 km. Overlapping radio fields ensure full coverage of the sea area." Various technologies were studied by the engineers of Wireless Consulting prior to the system decision. They selected the extremely rugged and seaworthy WiMAX system RUGGEDCOM WIN from Siemens, which optimally meets the project and communication requirements, and allows for the quick implementation of a cost-effective solution.

WiMAX (Worldwide Interoperability for Microwave Access) is a standards-based broadband communication system (of the IEEE-802.16 standards) for static and mobile connections. This technical concept is operated and marketed under the brand name Coast-Link™. The high-performance broadband network communicates with outdoor receivers, whose construction can reliably withstand even the toughest maritime and offshore requirements. Thanks to their special design, the reception characteristics of the devices automatically adjust to the ship's movements – thus maintaining a constant service quality of the communication connection even when subject to severe rolling and pitching of the ship.

Reliable Operation even under extreme Conditions

In an emergency, the national control centers for sea rescue coordinate all available forces (e.g. navy and coast guard). While the communication between the control centers runs via WAN connections, the communication between rescue ship and ferry ports takes place via WiMAX. The coastal Coast-Link™ radio network has proven to be a reliable communication option for the closed AescuLink user group. Coast-Link™ is a 4G point-to-multipoint technology operating with an interference-free, licensed, and fixed frequency in the 3.5 GHz band. As soon as the control center reports an emergency, the rescue ship moves to the deployment location as quickly as possible. Along the way, the crew activates the AescuLink system and establishes the communication channel to the clinic and the responsible medical specialist.

RX1500 for reliable Communication

The reliable and uninterrupted operation with maximum electromagnetic immunity is ensured by various communication components. The enhanced Rapid Spanning Tree Protocol (eRSTP), with which the systems from Siemens RUGGEDCOM operate, provides for a very quick restoring of the network following a breakdown. The communication between onshore station and, for example, a rescue ship is established by a passive antenna system from Siemens RUGGEDCOM, which is mounted to the main mast of the ship. The audio and video communication is controlled by the point-to-multipoint (PtMP) base station WIN7000 at the ferry ports. The rugged and shock-resistant RUGGEDCOM router RX1500 coordinates the handling of the video streaming as well as the continuous data communication. It is installed together with a computer, on which the AescuLink solution is running, in the emergency unit of the ship. A camera transmits the recorded images via live stream to the emergency clinic.

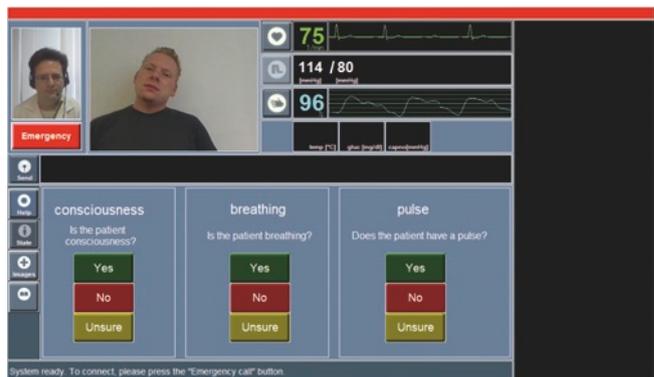
The emergency management system is already in use and has proven itself. Sales manager Sven Sternke continues: "The PtMP application is interconnected directly with our internal control center. Should a fault message appear, the service staff instantly recognizes whether a subscriber unit or an antenna has faulted, or a base station is no longer operating error-free. The causes can then often be immediately eliminated via remote maintenance."



The telemedical application GHC AescuLink in combination with the latest communication technology makes possible immediate emergency care even at remote locations

Live-Transmission of Vital Parameters from the Deployment Location of GHC AescuLink to the Clinic

In a medical emergency at sea or on an offshore platform, the nearest doctor is often far away. In such a situation, the ship's captain can divert to the next port or arrange for the rescue of the patient by ship or helicopter. In both cases, though, the rescue personnel lose valuable time until the initial treatment. "AescuLink is optimally suited for emergencies at remote locations. The doctor is connected to the on-site helpers via video conferencing and can assess the success of the treatments live. "Emergency treatments are given based on a solid medical foundation and available to patients right away and around the clock," underscores GHC director Dr. Trong-Nghia Nguyen-Dobinsky.



From the user interface of the telemedical emergency system, vital parameters are transmitted in real-time

Modern telemedical technology brings emergency medical assistance even to remote locations by means of wireless communication. In the case of life-threatening incidents, AescuLink ensures a medical consultation by doctors from the Charité University Clinic and the Trauma Hospital (specializing in emergencies) in Berlin. In combination with the RUGGEDCOM WIN 4G Broadband PtMP system, GHC's AescuLink operates reliably and demonstrates constantly high performance as a communication platform in harsh environments. The high data rate guarantees a failure-free transmission of the video stream. Thanks to the direct radio connection between the rescue centers and the user, the continuous availability of a medical specialist – and thus a fast initial treatment at the highest level – is assured. Moreover, a prioritization of this connection takes place so that the full bandwidth is available in an emergency. It is planned to further expand the broadband network – to cover an even larger area with telemedical services.

Benefits of RUGGEDCOM components at a Glance:

- Highly reliable and efficient broadband communication solution
- High-performance transmission rates for an uninterrupted image and video communication
- The extremely rugged components from RUGGEDCOM impress with their high protection rating (IP67), a wide temperature range from -40 to +75 °C while in operation, as well as absolute resistance to seawater for the use under the harshest environmental conditions
- WiMAX communication, between ferry ports and ship (see case example) – licensed frequency is used to ensure high level of wireless communication

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