



SIEMENS



Reference



Accelerated Examination Procedures – optimized Patient Service

Wireless Technology for Healthcare

Cabling connecting X-ray machines, detectors, and hospital networks limit the mobility during examinations. An alternative is wireless LAN. With it, the digital images can be transmitted wirelessly and reliably in real-time from the detectors to the X-ray machines and from there onscreen to the workstations of the radiologist.

Conventional X-ray imaging remains an important tool for diagnosing various diseases. Rays generated by the x-ray tube penetrate the body part to be examined to varying degrees depending on its properties. Bones absorb the x-rays to a greater extent, soft tissue correspondingly less. The respective intensities can be seen in the x-ray image as areas blackened at different levels.

For a long time, X-ray images required the exposure of film material, which was then developed so that the doctor could view the finished picture. Time- and cost-intensive analog pictures are increasingly replaced by digital images. Instead of a cassette with an x-ray film, a digital detector with electronic sensors is employed, which is placed under or behind the object for the capture. The image area is exposed with the required radiation dose. Immediately following, the detector transmits the finished image to the monitor of the X-ray machine, where it appears after only two seconds for a first diagnosis. The memory of the detector is immediately deleted and the device ready again for the next capture. For detailed evaluations, the operator, e.g., the medical-technical radiographer, then transmits the images encrypted over the hospital LAN to the picture archiving and communication system (PACS), to which the evaluation computers of the radiology department are connected.



Siemens Healthineers relies on wireless LAN in various X-ray machines. The wireless communication technology is fully integrated into the X-ray detectors. The image depicts a stationary device, the world's first twin-robotic X-ray scanner Multitom Rax.

Increasing Acceptance of Digital Radiology

Siemens Healthineers is one of the largest technology providers for the healthcare industry, and one of the leading manufacturers of medical imaging technology, laboratory diagnostics, and clinical IT solutions. The portfolio is comprised of ultrasound systems, CT scanners, angiography systems, products for laboratory diagnostics and radiotherapy, as well as X-ray systems. "Digital radiology is currently experiencing increasing acceptance, since it greatly facilitates the work and gives physicians immediate access to digital X-ray images," explains Michael Fuhrmann, product manager for digital radiography systems at Siemens Healthineers. "Clinics are also modernizing their X-ray environments to benefit from the lower radiation doses of the digital systems. Last but not least, wireless LAN technology (WLAN) lays the foundation for a more flexible use of the devices, and a more effective workflow. Thanks to WLAN, it is now possible for mobile X-ray machines to be driven directly to patients who cannot be transported."

Siemens' digital radiography solutions include mobile systems, such as the X-ray system Mobilett Mira Max, as well as stationary digital X-ray systems. These are a twin robotic X-ray scanner (Multitom Rax), a radiography system (Ysio Max), two fluoroscopic systems (Luminos DRF Max and Luminos Agile Max), and a urology device (Omnia Max). Common to all is that they work with wireless detectors and WLAN. Following the system's philosophy, the handling of all systems is equally user-friendly. The digital detectors are interchangeable; their registration is performed without manual input via the infrared interfaces of the X-ray machines. As soon as a detector establishes contact with the receiver, both devices will be able to communicate with each other.

The high ease of use of the Max product family is primarily made possible by the wireless detectors Max wi-D. "Max" stands for multiple advances in X-ray and marks the X-ray systems employing WLAN. The three kilogram light and barely 18 mm thin flat detector with an area of 35 cm x 43 cm is designed for the use with table- and wall-mounted devices, and also for unrestrained examinations with mobile x-ray systems, for example, in emergency rooms.

A smaller, wireless detector is specially designed for orthopedic and pediatric examinations. Radiologists working with the digital detectors are amazed time and time again at the high image quality of the digital X-rays, which highly accurately depict the details of bones and soft tissue structures – making it possible for them to treat patients quickly and effectively.

The detector is charged via the contacts on the back as soon as it is placed in the holder of the X-ray unit. Fuhrmann continues: “The detectors are connected to the X-ray machine via radio modules, and facilitate the work of the hospital staff thanks to their flexibility. They can be interchanged and used with all systems of the Max family.”

Powerful Encryption and Authentication Procedures

The digital X-ray images offer the same advantages as are known from digital photography. In the past, images were taken with analog X-ray machines and the films then developed in the laboratory. Until the doctors held the finished X-ray images in their hands, some time passed. If the image was exposed incorrectly or the radiation source was unfavorably positioned, the only option was to take a new image. In addition to the additional radiation dose for patient and staff, this also meant more time and cost. All this is no longer the case when using digital systems. The images can be transmitted to an evaluation PC, on which the doctor can use software, e.g., to create diagnostic details. Together with information on whether the patient was sitting, lying, or standing, as well as details about the radiation dose, the images are archived for a later use. The powerful encryption and authentication procedures employed by the systems meet the high clinical security requirements. In the run-up to the wireless LAN solution implemented by Siemens Healthineers, the project team tested various solutions. Based on the results, Fuhrmann opted for systems from the SCALANCE product range. In addition to the commissioning requiring less effort, the extremely reliable data communication, and the integrated security functions, the use of the Siemens solutions was further bolstered by the prolonged availability of the components for an additional ten years after the discontinuation. For customers, the long service life means a high degree of investment protection. Moreover, Siemens is the only provider that offers a uniform WLAN system for all countries and possesses the appropriate country-specific approvals. The close cooperation between the development departments made it possible to fulfill the high requirements in the hospital setting.

Maximum Reliability of SCALANCEW Devices

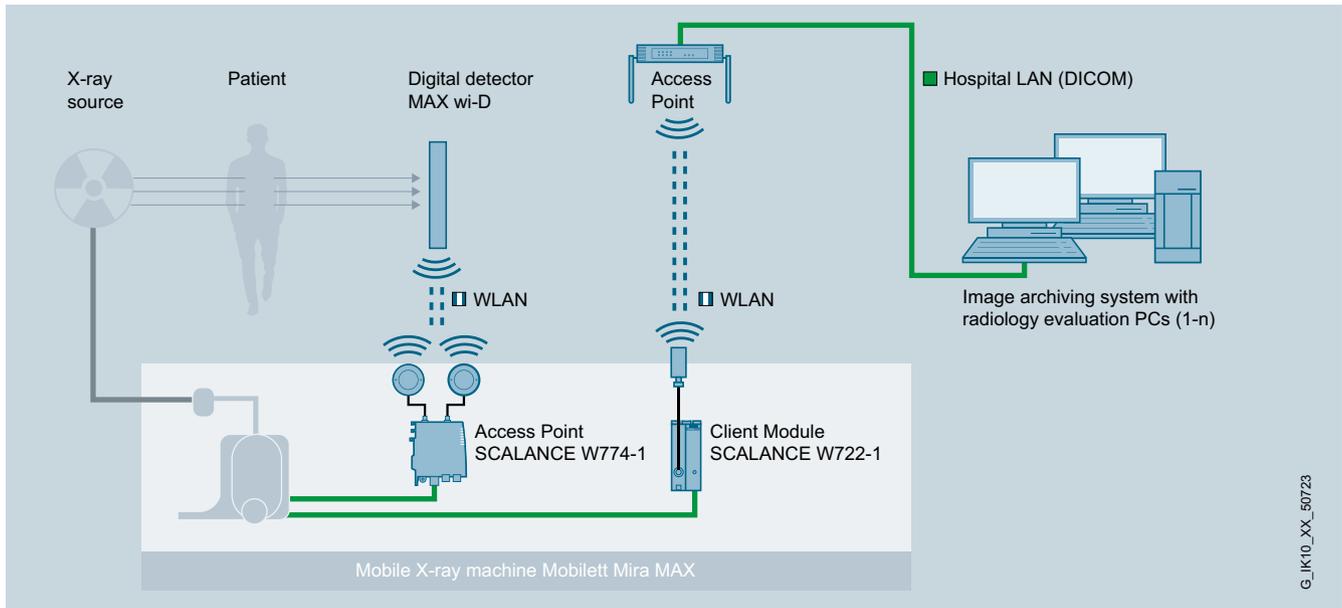
For the optimal positioning of the respective WLAN components, Siemens technicians or Siemens Solution Partners determine in advance the radio coverage in the respective application environments. Based on these measurements, each X-ray system is customized to the clinical workflow. Depending on the type of system (stationary/mobile) and the country approvals (worldwide/USA), various SCALANCE W components are installed.

Depending on the device type, the Access Points SCALANCE W774-1 or W788-1 are employed in stationary systems, which receive the images wirelessly via the radio interface in the digital X-ray detector. The further transmission to the picture archiving and communication system (PACS) takes place wire-based via the hospital LAN. There, additional evaluation PCs for the medical results are connected. The mobile x-ray systems, e.g., the Mobilett Mira Max, even operate with two separate WLANs. The Access Point SCALANCE W774-1 establishes the connection to the detector, while a Client Module SCALANCE W722-1 establishes the wireless connection to the PACS via the hospital LAN.



The SCALANCE W components from Siemens' Industrial Wireless LAN portfolio are licensed for worldwide use. They are characterized by a high availability as well as a quick and reliable real-time communication.

The Mobilett Mira Max is mobile and can be operated completely autonomously thanks to its integrated power supply. Before an X-ray technician exits the system, he locks it using the lock button on the control panel. Accessing the system again is only possible after entering one's PIN on the panel. If the mobile X-ray system is locked, it can neither unintentionally be moved nor radiation inadvertently be triggered.



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The data between the mobile X-ray machines and the PACS must be transmitted reliable and secured, despite the large number of other radio devices that can be found in a hospital – such as radio-controlled doors, mobile phones, and tablets.

The standardized protocol used for the wire-based or wireless image transmission is DICOM. The WLAN components support the WLAN standard IEEE 802.11n – ensuring a secured radio transmission of the X-ray images with data rates of up to 300 Mbps (maximum data rate for the detector). The dual-band functionality (2.4 or 5 GHz) provides more freedom in selecting the frequency. The especially rugged WLAN components in various form factors from Siemens are optimized for high vibration loads as well as high and low temperatures.

Conclusion

“Wireless communication is the ideal solution in hospitals, where rapid response and maximum flexibility are required,” judges Fuhrmann. “SCALANCE network components reliably transmit the X-ray images in real-time. With digital imaging, the treating physicians get the X-ray image in seconds for making accurate diagnoses.” The wirelessly communicating detectors greatly accelerate the image acquisition and shorten the time to the finished image compared to X-ray films. Aided by digital radiography, the hospital staff is able to treat more patients during the same time period. In addition, all parties involved are exposed to considerably lower radiation doses. Radiologists have immediate access to the centrally stored images. Fuhrmann expects digital radiography in conjunction with wireless LAN communication to be the standard in hospitals within a few years – due to the enormous advantages.

Security information

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept. For more information about industrial security, please visit <http://www.siemens.com/industrialsecurity>

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