



# TELERADIOLOGY

AVAILABLE TECHNOLOGIES IN REMOTE DIAGNOSTICS

*THE WORLD  
IN YOUR  
HANDS*





## *ACCESS YOUR MEDICAL IMAGES ANYTIME AND ANYWHERE*

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Selecting the right solution for teleradiology is crucial. Therefore, we offer you a comprehensive review of the available technologies to make your decision easier and more accurate.

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Thanks to the ongoing technology development and the sinking costs of medical diagnostic equipment, examinations based on medical images are becoming increasingly common and accessible to a large part of the population. Even remote regions are nowadays in possession of sophisticated imaging equipment.

Unfortunately, the number of radiologist and specialists trained to read those medical images is not growing at the same rate as the studies being currently produced. This generates a serious bottle-neck, which becomes even more complicated as most professionals in the radiology field tend to settle in metropolitan areas.

Besides, if a second opinion is required, the shipping of images to another specialist may involve very high costs and even the quickest means of transport can be too slow if a human life depends on it.

# TELERADIOLOGY SOLUTIONS

By implementing teleradiology systems, many hospitals and imaging centers can solve these key issues. Radiologists do not have to be present at the same location as the patients and even the largest images can be transferred in a matter of minutes. This way, hospitals and imaging centers increase their independence and flexibility as well as savings in time and resources. Additionally, they can outsource possibilities for sub-specializations while keeping high standards and eliminating bottle-necks.

Technically seen, there are two main parameters that must be taken into account for any teleradiology project:

1. The transmitted and received data must be consistent.
2. The privacy of the patient's data must be ensured either by using high-asymmetric encryption or by pseudonymizing/anonymizing the data.

At present, teleradiology programs can be implemented by using one of the following technologies:

- DICOM email using PGP encryption
- DICOM email basic
- Web-based access using data compression
- Simple web-based access
- DICOM communication, using image compression and VPN
- Direct DICOM communication using VPN

In order to help you find the appropriate teleradiology solution, we prepared a helpful guide explaining these available technologies for remote diagnostics.



# DICOM EMAIL USING PGP ENCRYPTION

This is the most secure and dynamic one of the available solutions for teleradiology.

This technology requires DICOM email servers at each facility. The data is automatically encrypted without affecting the network traffic or connection and the transmission takes place using standard POP3/SMTP protocols.

At the destination, the data will be automatically decrypted. Then, the physician can hand it over to a local PACS or view it with an integrated DICOM viewer.

This system can be used for select-

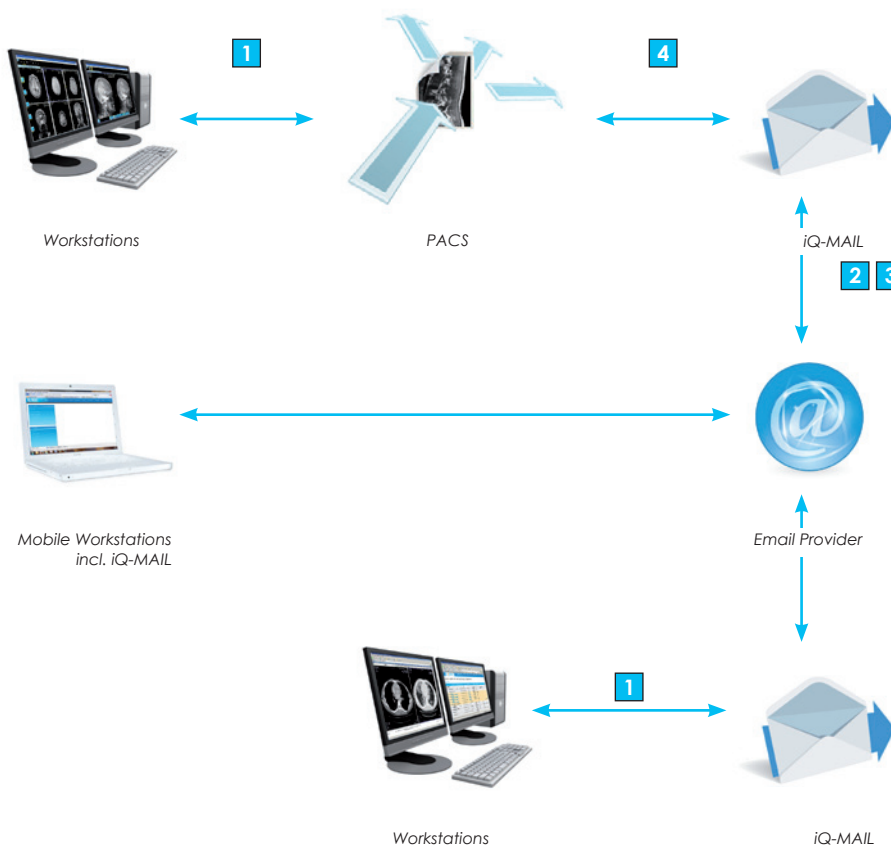
ed DICOM objects or even for complete studies of unlimited size.

Among its major advantages are its versatility, the possibility of a fully automatic workflow and the multi-vendor support with high interoperability. Additionally, thanks to its state-of-the-art encryption algorithms, the system offers the highest security standards.

This solution is optimized for the transmission of medical images among independent healthcare providers. Since it uses standard email protocols, it may be easily integrated with any firewall requiring only minimum effort of configuration.

DICOM email using PGP encryption is also ideal for bidirectional DICOM communication. This means that reading physicians can return their protocols via email using the same platform.

IMAGE Information Systems Ltd. offers a product with these characteristics called iQ-MAIL.



**1** Either the email message (including attachments) is composed on a workstation or images are transferred directly between the PACS and iQ-MAIL.

**2** iQ-MAIL encrypts the message and sends it to the centrally located email provider via SMTP.

**3** The email message is transferred to the receiving site. There, it will be either decrypted and forwarded to the local iQ-MAIL client or rerouted to additional destinations.

**4** Since iQ-MAIL can even handle offline networks, mobile computers can receive emails at any time.

# DICOM EMAIL BASIC

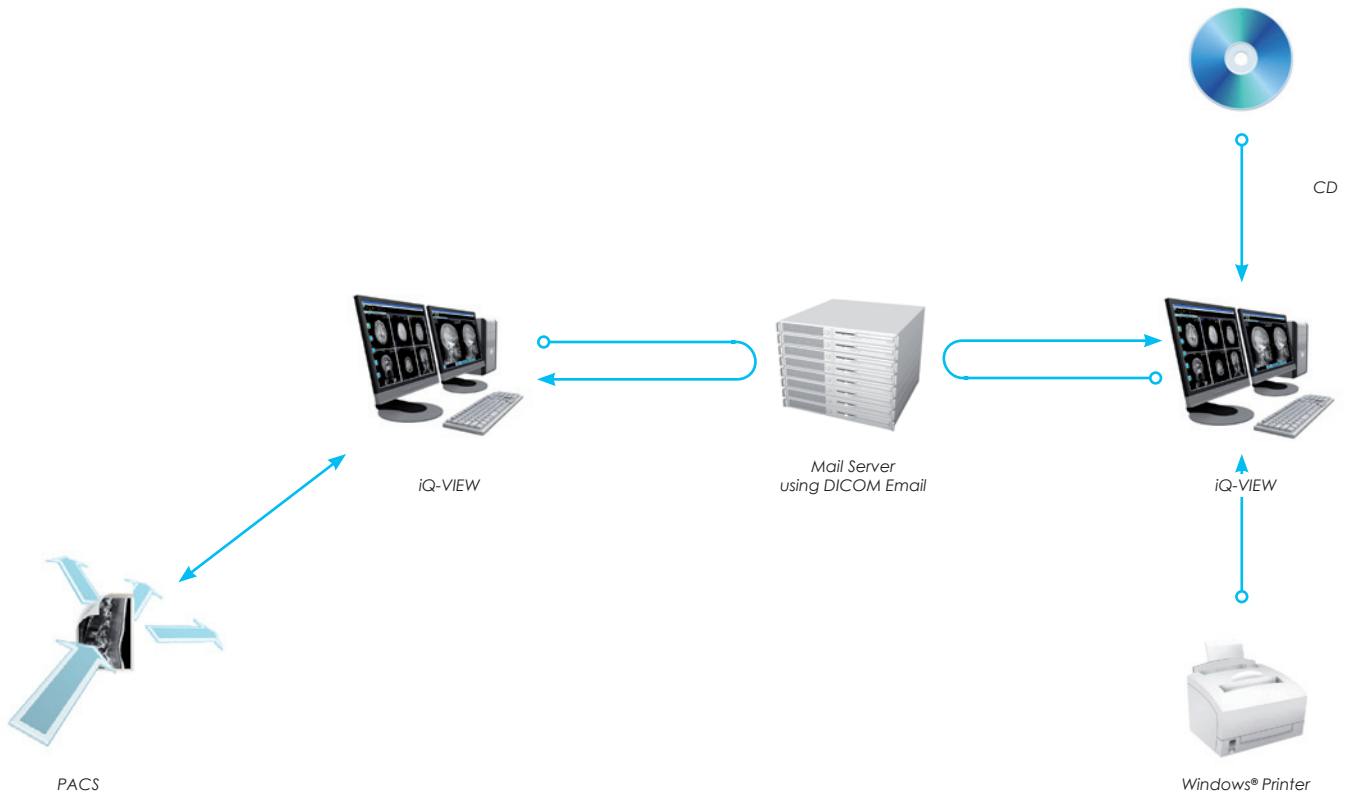
DICOM email basic is a solution to send emails manually from a DICOM node. This system can be used for any selected DICOM object.

A standard email infrastructure supports the transmission, which makes the system fast, secure (when using encryption), cost-saving and also very stable when working through firewalls.

There is medium-level privacy protection when using DICOM email basic; the system does not show standardized regulations for signatures.

DICOM email basic is optimal for the transmission of medical images between low frequented point-to-multipoint independent healthcare providers, like small imaging centers with low imaging traffic. With DICOM email basic it is further possible to enable bidirectional DICOM communication.

DICOM viewers like iQ-VIEW do already include DICOM email as one of their features.



# WEB-BASED ACCESS USING DATA COMPRESSION

This solution can be connected to any existing PACS, which distributes the respective medical images either through a DICOM proxy or directly to the web server. The function of the DICOM proxy is to precompress the images before handing them over to the web server and, if necessary, to perform a pseudonymizing/anonymizing procedure on the studies.

The studies are then available on the web via SSL (https web-link).

Web-based access using data compression allows the possibility to link selected studies/reports with full interactivity. The system is comparable to in-house access and is generally very fast.

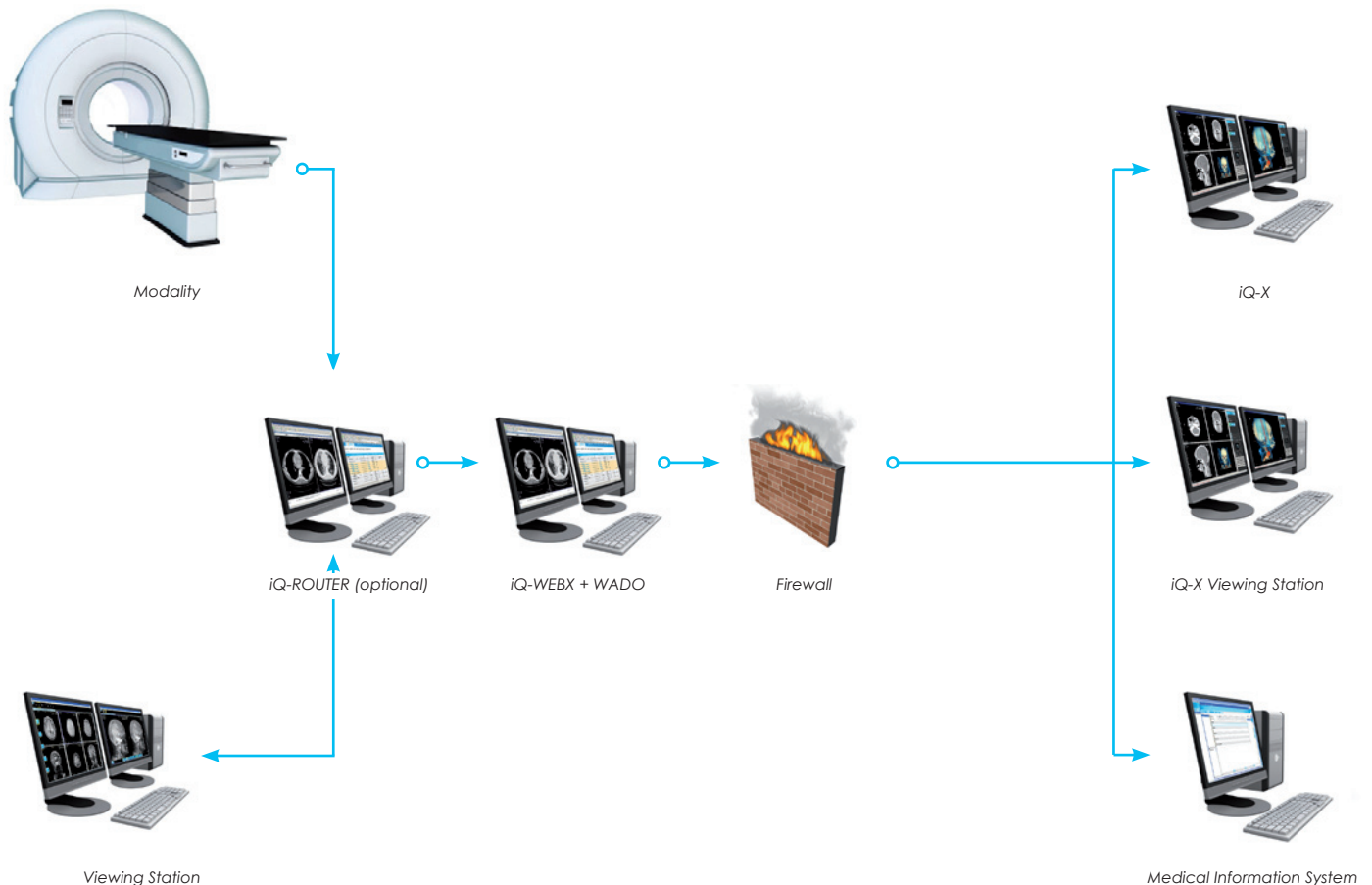
Access to the system involves medium security. Additionally, the patients' privacy protection level is very good and remote storage of images is not required.

Users should be aware that image data compression may limit the diagnostic quality depending on the selected method.

Users behind firewalls require open SSL web ports.

This solution is recommended for emergency support provided by remote physicians, for remote reading, remote-office or inhouse distribution of studies in large facilities.

The products offered by IMAGE Information Systems Ltd. for web-based access using data compression are iQ-WEBX for the PACS and iQ-ROUTER for the optional DICOM proxy.



# WEB-BASED ACCESS

The web-based access solution is based on an existing PACS, which distributes the respective studies via http or https web-links.

Using web-based access, a secure connection (depending on the access rights and methods) can be established giving the user the possibility to link selected studies/reports with full interactivity.

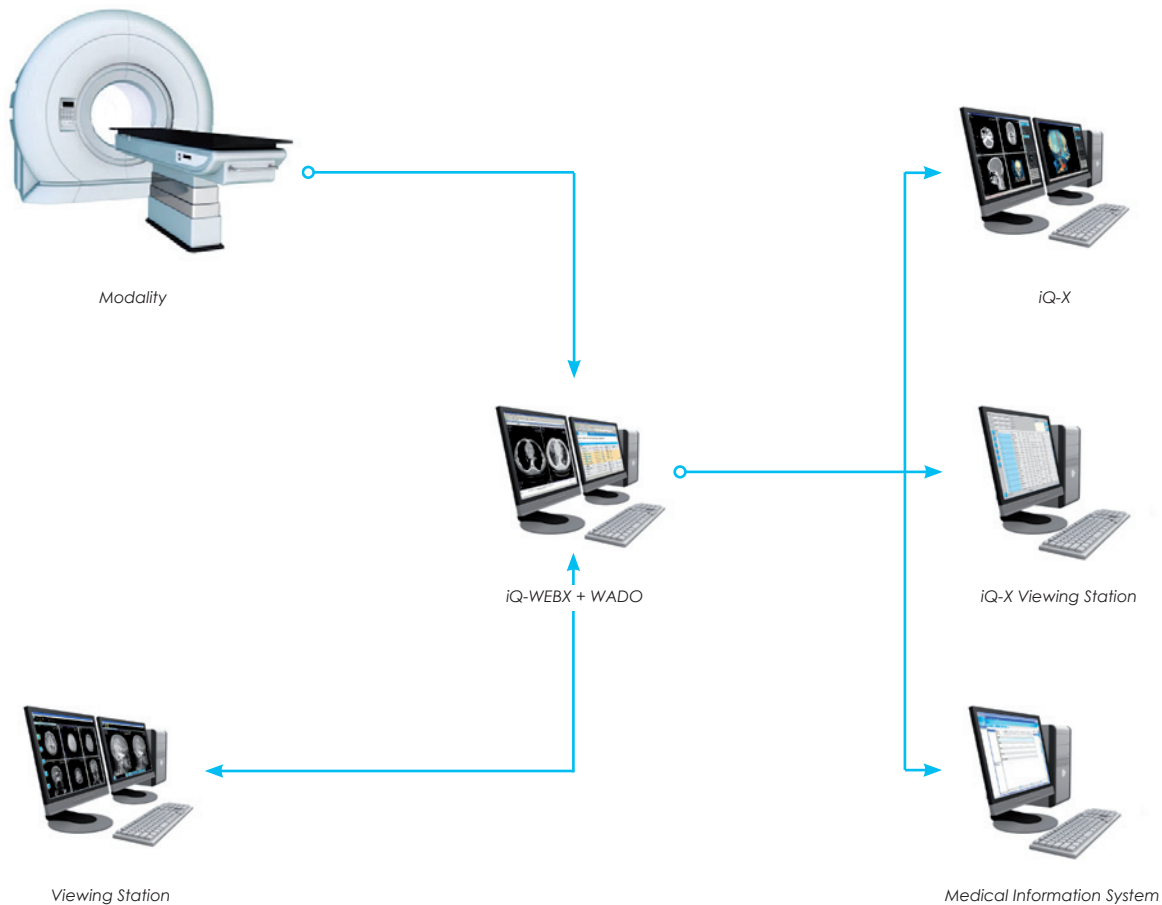
The protection of the patients' privacy is very good and remote storage of images is not required.

When using firewalls, ports for WEB or SSL should be open.

Web-based access is recommended for in-house reading or transmission to referring physicians, e. g. in a hospital.

The file transfer in this kind of solution takes place in pull-mode, i. e. there are waiting times for the images to be loaded. The DICOM communication is unidirectional, i. e. it is optimized for querying of data.

iQ-WEBX, the PACS of IMAGE Information Systems Ltd., is ideal for web-based access.



# DICOM COMMUNICATION USING IMAGE COMPRESSION AND VPN

This solution uses standard DICOM nodes (IP, AET) on both communication sides. The communication of DICOM protocols takes place by using a compression proxy between the modalities on each site.

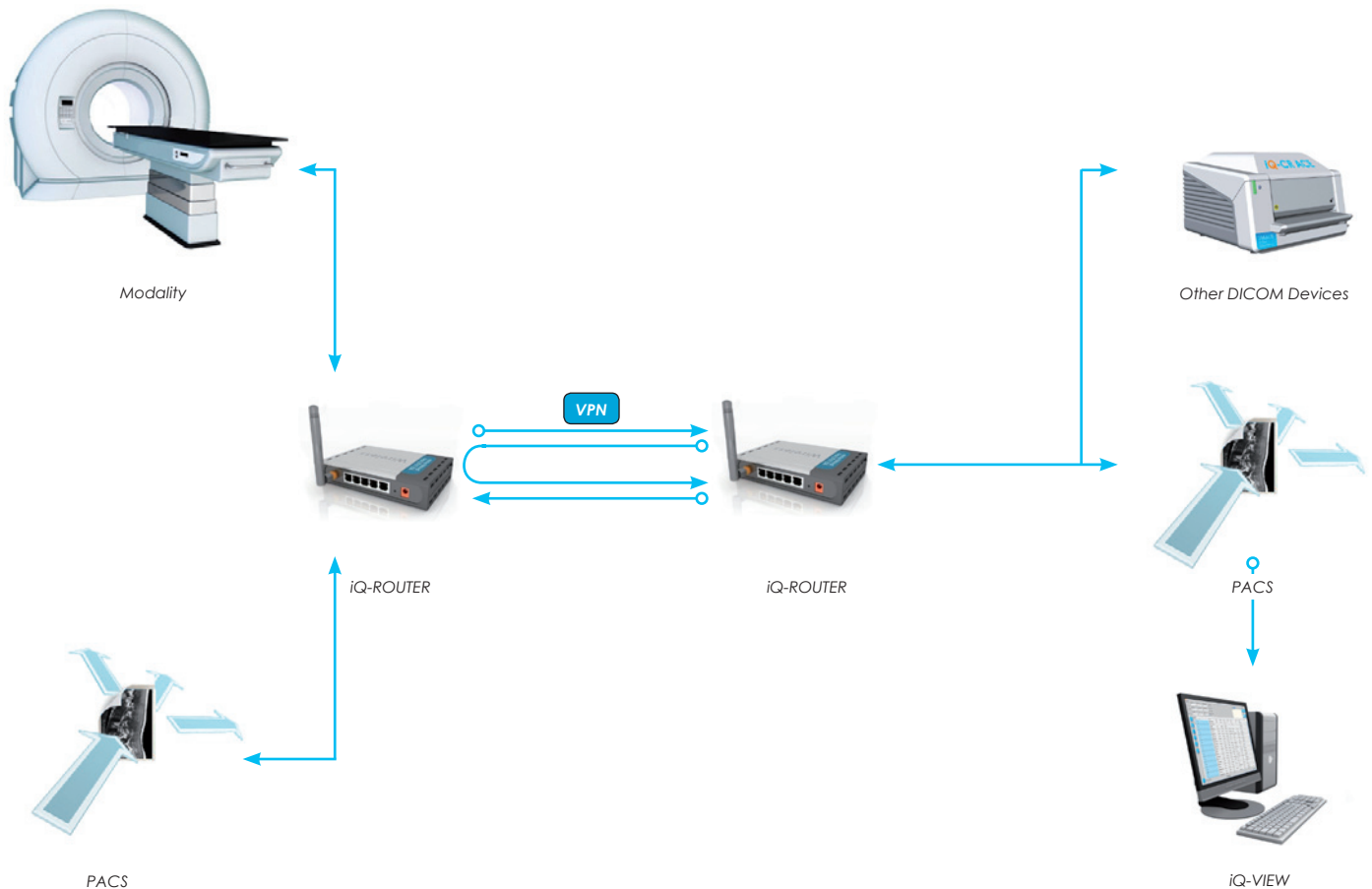
The great advantage of this process is that it can be 2 to 8 times faster than the bandwidth transmission rate, if lossless compression is used. In case of lossy compression, the transmission speed can increase 10 to 50 times. When using transfer in push-mode, objects can be available at distant sites if required.

The security of the system is high, while the level of privacy protection is medium, since only the VPN transmission tunnel is encrypted.

This kind of solution is very complex to install in networks with many nodes. Additionally, the configuration of firewalls can be complicated and VPN support is required for wide area networks. Usually the use of VPN technology is directly connected to license fee.

This system is optimal for any highly frequented and/or time-critical connection between imaging centers. The communication can be bi-directional.

IMAGE Information Systems Ltd. offers a product called iQ-ROUTER for optimizing DICOM communication using image compression and VPN.



# TELERADIOLOGY SOLUTIONS AT A GLANCE

	DICOM EMAIL USING PGP	DICOM EMAIL BASIC	WEB-BASED ACCESS USING COMPRESSION	WEB-BASED ACCESS	DICOM COMMUNICATION USING IMAGE COMPRESSION & VPN
<b>Principal Functionality</b>	Selected DICOM objects or complete studies transferred with dedicated infrastructure	Selected DICOM objects zipped, incl. DICOMDIR (Supp 113)	Distribution of compressed images via https web-link	Image distribution via https web-link	Configuration of standard DICOM parameters (IP, AET) on both sides, Communication of DICOM protocol using a compression proxy between the modalities
<b>Advantages</b>	Easy to handle, Fully automated, Workflow possible, Multi-vendor support with high interoperability	Standard mail-infrastructure can be used, Fast, Low costs	Secure connection, Links to selected studies/reports with full interactivity, Comparable with in-house access, Very fast	Secure connection, Links to selected studies and reports	Can be 2-4 times faster than the bandwidth using lossless and 10-50 times faster using lossy compression, Transfer in push-mode, Objects available at distant site when needed
<b>Possible issues</b>	Some overhead due to mail-protocol and near inly-transfer	No standardized regulation for signature	Image compression	Transfer in pull-mode (waiting for images)	Complex work to install networks with many nodes
<b>Security</b>	Very high, State-of-the-art encryption	High	High (Depending on access rights / method)	High (Depending on access rights / method)	High
<b>Patient's Privacy protection level</b>	Very high, Includes advanced signatures	Medium	High (No storage at remote site required)	High (No storage at remote site required)	Medium
<b>Firewall integration</b>	Easy (standard email)	Easy (standard email)	Can be complex (VPN support)	Moderate (SSL)	Can be complex (VPN support)
<b>Best for</b>	Transfer of DICOM objects between independent healthcare providers	Low frequented point-to-multipoint teleradiology solutions	Emergency support, Home office, Remote office	Access for in-house reading or referring physician	Any highly frequented and/or time-critical connection between imaging centers
<b>DICOM Communication</b>	Bidirectional	Bidirectional	Unidirectional	Unidirectional	Bidirectional
<b>Products that support this technology</b>	iQ-MAIL	iQ-VIEW	iQ-WEBX + optional iQ-ROUTER	iQ-WEBX	iQ-ROUTER

# OUR COMPANY AT A GLANCE

IMAGE Information Systems is a British-German company group, which offers complete, easy-to-use and affordable solutions for the most demanding customers in the field of medical imaging.

Thousands of satisfied clients all over the world are profiting from our state-of-the-art products for PACS, RIS, nuclear medicine, medical displays, X-ray solutions, 3D processing and teleradiology.

We have pioneered several innovations to the market: We are the first worldwide PACS vendor to introduce true 12 bit grayscale display technology for a visibly better quality of CR, DR and CT studies. We are the world's first provider of a fully automatic nuclear heart reconstruction. Our DICOMReader has the highest available read-in rate of patient CD-ROMs ensuring virtually full compatibility with almost all available imaging modalities and vendors.

IMAGE Information Systems provides the 2nd largest digital imaging user forum on earth with more than 20,000 registered users.

To learn more about us and our products, please visit our web site.



[www.image-systems.biz](http://www.image-systems.biz)

## OUR SOLUTIONS FOR YOUR IMAGING NEEDS

<b>iQ-VIEW</b>	The radiology reading station
<b>iQ-VIEW 3D</b>	3D post-processing workstation
<b>iQ-STITCH</b>	Tool for the creation of full spine and full leg images
<b>iQ-CAPTURE</b>	Add-on hardware module for capturing images from analog video sources
<b>OrthoView™</b>	Add-on module for orthopedic templating and trauma planning
<b>DICOMReader</b>	Read any DICOM CD into your PACS
<b>iQ-WEBX</b>	PACS server for storage, teleradiology and image distribution
<b>iQ-WEBX WADO</b>	Simplifying the workflow
<b>iQ-PRINT</b>	DICOM paper print server
<b>iQ-ROBOT</b>	Automatic burning and labeling of patient CDs and DVDs
<b>iQ-ROUTER</b>	Image compression for teleradiology and workflow management
<b>iQ-WORKLIST</b>	DICOM worklist server optimizing your workflow
<b>iQ-MAIL</b>	Simple teleradiology using DICOM email
<b>iQ-NUC</b>	Complete package for nuclear image processing
<b>iQ-RIS</b>	The smooth radiology information system
<b>IMAGE DISPLAYS</b>	Medical diagnostic displays
<b>iQ-CR ACE</b>	Efficiency in CR

