PUBLIC

iQ-WEB

PD-730-156 ADMINISTRATION GUIDE

Version 6.6.2 PUB INT EN – 002R

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TABLE OF CONTENTS

1 Introduction

1.1 Scope of the document

This document represents the **iQ-WEB** Administration Guide for software version **6.6.2** provided by IMAGE Information Systems Europe GmbH.

It contains instructions concerning the configuration and set-up of the application as well as hints regarding trouble-shooting problems. The Administration Guide covers the following topics, among others:

- System requirements
- Module description
- Installing, uninstalling and migrating the software
- Licensing
- Maintenance procedures
- Software and network configuration
- DICOM/HL7 configuration
- User and privilege management
- Translation of the user interface
- Troubleshooting information

All patient names used in this administration guide are completely fictitious.

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Throughout this guide trademark names are used. Rather than putting in a trademark symbol at every occurrence of the trademark name, we state that we are using the names only in an editorial fashion and to the benefit of the trademark owner with no intention of infringing upon the trademark.

We assume no responsibility for inaccurate information or descriptions of third-party products.

Disclosure level of this document is PUBLIC (PUB), which means that this document is freely available to anyone interested, such as resellers, current end users as well as potential customers. Primary color is orange.

NOTICE

The provided data was researched with the utmost care. Nevertheless, the author does not accept any liability for the correctness, completeness and up-to-date nature of the information contained in this document. It is the responsibility of the user or the local administrator to verify the details by considering suitable sources. The author expressly disclaims liability for any provided information.

1.2 Purpose of the software

iQ-WEB is intended to be used as picture archiving and communication system (PACS) for medical images and reports. Thus, it is integrated into the medical workflow and computer network of hospitals, imaging centers and radiological practices. Primarily, iQ-WEB receives, stores and distributes imaging data and reports: Patient studies created at modalities are typically sent to iQ-WEB for storage and archiving. Radiologists, physicians and other medical personnel access data stored by iQ-WEB for reading, viewing, reviewing and reporting purposes.

> **NOTICE:**
> *When the iQ-WEB software is used not for human medicine but for **veterinary medicine**, the product does **not** fall under the European Council Directive 93/42/EEC and, therefore, does not qualify as a medical device in the EEA. The regulations of the 93/42/EEC do not apply.*

The application itself is divided into a server and a client component. The server component provides the main functionality of the intended use, i.e. the DICOM communication and the image data management including tasks such as storage and distribution. The client component's main purposes are administration and configuration of the server component, navigating the servers' content and launching image viewers like iQ-VIEW, iQ-X or iQ-4VIEW.

The software should be used by trained healthcare personnel only, like radiologists, physicians, medical technical assistants and PACS / IT administrators. The necessary information on how to use iQ-WEB is given by detailed user documentation and recurring trainings and workshops provided by the manufacturer or authorized sales partners.

iQ-WEB's functionality can be extended by various modules: DICOM viewers iQ-X and iQ-4VIEW, the HIS/RIS interface iQ-WEBX WADO, the mobile GUI iQ-WEB2GO as well as iQ-WEBX WADO HL7 and iQ-WEBX REPORT CONVERTER.

Refer to the iQ-WEB Instructions for Use for more comprehensive details regarding the purpose of iQ-WEB, for an analysis of the intended patient population and the user groups and for information about the use conditions and contraindications.

1.3 Warnings and precautions

1. Technical limitations of the software

> ⚠ **WARNING**
> *Danger of study and patient data only partially available/displayed.*
> *Although iQ-WEB accepts and stores patient data containing all sorts of special character sets, it is not able to perform case independent searches in the web GUI for non-Latin1 character sets. Performing such a search might not deliver the intended results and studies might not be displayed.*
>
> *H-No.: 1.1.5*

NOTICE:

iQ-WEB is a 64 bit application. Due to this reason it is only possible to install and run iQ-WEB on a 64 bit operating system.

2. Behavior in case of software errors/failures

⚠ **WARNING:**

Although the iQ-WEB software is subjected to extensive validation and verification procedures by the manufacturer, it is nevertheless possible that unforeseen errors or failed processing may arise during use of the software. Users should at all times be aware and warned of such eventualities. In case faulty software behavior is observed that may put a patient or the user at risk, the user is asked to immediately contact the manufacturer or local reseller. The manufacturer's contact data is stated in the user documentation and inside the application itself.

H-No.: 1.1.1 – 1.3.3

⚠ **WARNING:**

Danger of study and patient information not available.

iQ-WEB strongly relies on "Patient ID" information of DICOM data. If a received dataset doesn't contain this information the corresponding patient record may not displayed on the patient information related pages and can only be seen on study based pages. This might delay therapy decisions.

H-No.: 1.1.4

3. User competence and training

⚠ **WARNING:**

Danger of delayed diagnosis due to use errors.

The iQ-WEB software is certified as a medical device according to the European Council Directive 93/42/EEC. Before using this application, make sure that you have thoroughly read and fully understood the content of the Instructions for Use and Administration Guide, including all of the warnings and notices.

H-No.: 1.1.5, 1.1.7, 1.1.8, 1.1.10, 1.2.4

⚠ **WARNING:**

Danger of application failures or unavailability.

Only authorized and trained personnel shall install and configure iQ-WEB, such as trained PACS or IT administrators. Refer to the installation information in the Administration Guide to ensure the correct installation. An improper installation or configuration may lead to non-functioning or limited functionality of the software and could damage, affect or delete important patient health data, which can cause serious harm or death of patients.

H-No.: 1.1.1, 1.1.4, 1.2.3, 1.2.4

NOTICE:

A PDF reader must be installed on the system to open and view the iQ-WEB Instructions for Use and Administration Guide.

4. Conditions of installation and use / software environment

> ⚠ **WARNING:**
> *Danger of application failures or missing data due to misconfiguration.*
> *No special training is necessary to be able to install iQ-WEB, although general computer literacy is required. The configuration settings, however, should be made by a system administrator with technical know-how and experience concerning in-house procedures and processes for the organization. If the installation and/or configuration is performed by personnel not sufficiently qualified, this may lead to non-functioning or limited functionality of the software as well as failure of communication with other devices within the network.*
> *H-No.: 1.1.1, 1.1.4, 1.2.3, 1.2.4*

> ⚠ **WARNING:**
> *Danger of application failures or unavailability.*
> *The software application contains areas in which changes in the configuration or licensing can be made. It is recommended that only the system administrator makes such changes. Access to these sensitive areas is restricted for administrator accounts. Thus unauthorized access is impossible.*
> *H-No.: 1.1.1, 1.1.4, 1.2.3, 1.2.4*

> ⚠ **WARNING:**
> *Danger of delayed diagnosis due to high network latency.*
> *An insufficient wide area or local network speed can cause serious delays. It is strongly recommended that the appropriate network or an optional product called iQ-ROUTER be used to compress data. Refer to the document "Medical Image Data Compression Guide" for details. Improper medical data compression may affect the diagnostic accuracy of data which could cause serious damage or even death to patients!*
> *H-No.: 1.1.3*

5. Manipulated, incomplete, missing and/or compressed data

> ⚠ **WARNING:**
> *Danger of misdiagnosis due to manipulated data.*
> *The user should make sure that the whole chain of data flow from the acquisition device via DICOM routers, PACS and workstations does not affect the diagnostic accuracy of received data, e.g. regarding pixel aspect ratios, compression artifacts, slice thickness, etc.*
> *H-No.: 1.1.5, 1.1.9*

> ⚠ **WARNING:**
> *Danger of data loss or corruption.*
> *Modifying or deleting DICOM information in study data might lead to image corruption! It should only be done if absolutely necessary and only by knowledgeable personnel.*
> *H-No.: 1.1.4, 1.1.6, 1.1.7, 1.2.4*

6. Security and protection of patient data

⚠ **WARNING:**
Danger of unauthorized access to patient data.
Since iQ-WEB as a PACS system is a centralized point of storage for patient image data, it has to be ensured that the physical access to the server system is restricted to authorized personnel.
H-No.: 1.1.8

Any further warnings or precautions regarding individual functions of iQ-WEB are documented in the respective sections of the iQ-WEB Instructions for Use and the iQ-WEB Administration Guide.

1.4 Integrated software products and interfaces

iQ-WEB 6.6.2 is bundled with several integrated software products and interfaces that may be activated separately by additional licenses. This bundle is called iQ-WEBX. Refer to the table below to learn about the versions and/or additional requirements.

Software/interface name	Version/special requirements
iQ-4VIEW	Software version 2.1
iQ-X	Software version 2.2.0
iQ-WEBX WADO	Software version 3.2
iQ-WEB2GO	Software version 1.2
iQ-VIEW CALL	Requires iQ-VIEW 2.8.0.101 or higher (latest version is highly recommended)

1.4.1 iQ-4VIEW

In order to provide a zero-footprint HTML5 based web-viewer, the iQ-4VIEW software is bundled with the iQ-WEB installer. iQ-4VIEW is a full-fledged diagnostic DICOM viewer including structured reporting features. Consult the iQ-4VIEW Instructions for Use and the Administration Guide for more details regarding capabilities, configuration and administration. Within the iQ-4VIEW web interface, the documentation can be accessed via the book symbol in the top-right corner.

1.4.2 iQ-X

The software iQ-X is included into the iQ-WEB installation to provide an ActiveX-based DICOM web-viewer with optional structured reporting capability (REPORT EDITOR). For detailed information, refer to the iQ-X Instructions for Use and the Administration Guide.

Both documents are also accessible via the web interface. Within the iQ-X interface, click the "HELP" menu and choose "Admin Guide (X)" in the menu bar.

> **NOTICE:**
> *iQ-X can be used in Internet Explorer only. Other web browsers, such as Mozilla Firefox or Google Chrome, do not support the required ActiveX plugins.*

1.4.3 iQ-WEBX WADO

iQ-WEBX WADO is a software option of iQ-WEB that provides a web-based interface for RIS/HIS applications to access DICOM objects in iQ-WEB. For detailed information, refer to the iQ-WEBX WADO Administration Guide.

This Administration Guide is also accessible via the web interface. To open it, first click the "SETTINGS" menu and navigate to the "WADO" submenu. Once the WADO page is displayed, the WADO specific help instructions are available in the main menu of iQ-WEB. Click the "HELP" menu and choose "Admin Guide (WADO)" from the menu bar. Currently, the use of iQ-WEBX WADO only works with the desktop access of iQ-WEB.

1.4.4 iQ-WEB2GO

iQ-WEB2GO is an additional software option for iQ-WEB that optimizes the web interface for mobile devices. For detailed information, refer to the iQ-WEB2GO Administration Guide or the Instructions for Use. Both documents can be accessed with the "Help" button in the user interface.

1.4.5 iQ-VIEW CALL

The iQ-VIEW Call is an interface function that provides direct access to iQ-VIEW from iQ-WEB's web interface. For detailed information about iQ-VIEW, refer to the iQ-VIEW Administration Guide and the Instructions for Use.

> **NOTICE:**
> *A licensed copy of iQ-VIEW is necessary on each client where the iQ-VIEW CALL will be used. The iQ-VIEW CALL interface itself does not require a separate license.*

1.5 Specialized software tools

In addition to the software options included in the iQ-WEB 6.6.2 setup, there exist several specialized tools and interfaces that allow the realization of specific workflow scenarios. Those must be ordered and activated separately. These software products are not part of the iQ-WEBX bundle. Refer to the table below to learn about the versions and/or additional requirements.

Software/interface name	Version/special requirements
iQ-WEBX WADO HL7	Software version 1.2.0; requires at least iQ-WEBX WADO 3.1.0
iQ-WEBX REPORT CONVERTER	Software version 1.1.0
iQ-3DVIEW	Software version 3.0.0

1.5.1 iQ-WEBX WADO HL7

iQ-WEBX WADO HL7 is an interface for exchanging information between PACS and EMR/RIS/HIS. The main feature of this product is the transmission of a specific WADO link to external systems via a HL7 message. This enables the user to view and work easily with images stored in iQ-WEB using an existing HL7 message system.

For detailed information and description of the product refer to the iQ-WEBX WADO HL7 administration guide.

NOTICE:
iQ-WEBX WADO 3.2 requires at least the version 1.2.0 of iQ-WEBX WADO HL7 and vice versa.

1.5.2 iQ-WEBX REPORT CONVERTER

iQ-WEBX REPORT CONVERTER is a module for iQ-WEB that uses a state-of-the-art algorithm to automatically convert and transmit DICOM Structured Reports and HL7 text reports between information systems and iQ-WEB. This process applies to new reports as well as to corrections and additions to existing reports. The product has no graphical interface and contains a light HL7 server.

1.5.3 iQ-3DVIEW

iQ-3DVIEW is a zero-footprint 3D viewer which offers web-based 3D visualization for iQ-WEB. It runs on both tablets and desktop computers and requires no client installation.

2   System requirements

> **NOTICE:**
> *The system requirements stated below are the requirements and recommendations valid at the release of this software version and/or the release date of this document.*
> *This information is subject to change over the course of the product's life-cycle. The manufacturer will inform about updates regarding the system requirements when iQ-WEB becomes available for systems other than those defined below (e.g. newer operating systems). Contact your reseller or the manufacturer for the latest information.*
> *Keep in mind that iQ-WEB as a medical device will not automatically support any new technology that becomes available on the market. The software will have to be tested according to legal regulations before being released for such systems.*

2.1 General hardware and software requirements for the iQ-WEB server

For the **iQ-WEB server-side installation** the system requirements concerning both hardware and software are:

- Multi-core CPU > 2.00 GHz
- 16 GB RAM
- 1 GB of free space for iQ-WEB and iQ-WEBX WADO application files
- Access to sufficient storage capacity to hold the projected amount of image data
- Network connection with 1 Gbit/s
- Normal consumer display as control monitor
- Mouse and keyboard
- One of the following operating systems:
    - Windows Server 2016 Standard
    - Windows Server 2012 R2 Standard
    - Windows Server 2012 Standard
    - Windows Server 2008 R2 Standard
    - Windows 10 Pro (or higher edition)
    - Windows 8/8.1 Pro (or higher edition)
    - Windows 7 Professional (or higher edition)
  Only 64 bit platforms are supported. To be used with latest service packs. And including all Windows updates relating to redistributable packages (for Apache web server).
- Database server MySQL, version 5.7, 64 bit
- Web server Apache, version 2.4.27
- PHP, version 5.6.31
- Any PDF reader (for opening the instructions for use and administration guide)
- Software applications manufactured by IMAGE Information Systems that can optionally be used in combination with iQ-WEB 6.6.2:
    - iQ-4VIEW 2.1
    - iQ-X 2.2.0
    - iQ-WEBX WADO 3.2
    - iQ-WEB2GO 1.2
- DELL or HP hardware

2.2 General hardware and software requirements for the iQ-WEB client

For the **iQ-WEB client-side access** the system requirements concerning both hardware and software are:

- Multi-core CPU > 1.80 GHz
- ≥ 2 GB RAM
- Network connection with 1 Gbit/s
- Graphics card, resolution of ≥ 1280x768px, True Color mode (24 bit)
- Normal consumer display
- Mouse and keyboard
- One of the following operating systems:
  - Windows Server 2016 Standard
  - Windows Server 2012 R2 Standard
  - Window Server 2012 Standard
  - Windows Server 2008 R2 Standard
  - Windows 10 Pro (or higher edition)
  - Windows 8/8.1 Pro (or higher edition)
  - Windows 7 Professional (or higher edition)

  32 and 64 bit platforms are supported. To be used with latest service packs.
- One of the following web browsers:
  - Microsoft Internet Explorer ≥ 11
  - Microsoft Edge ≥ 40
  - Mozilla Firefox ≥ 54
  - Google Chrome ≥ 59
  - Safari ≥ 10
  - Opera ≥ 46
- The chosen web browser has to meet the following requirements:
  - JavaScript functionality has to be activated.
  - Cookies have to be accepted and stored.
  - An installed Flash player plugin is needed to view DICOM videos in the web interface (if Flash format is used for video conversion).
- Any PDF reader, currently available version (for opening the Instructions for Use and the Administration Guide)
- For use with diagnostic viewer: iQ-4VIEW 2.1, iQ-X 2.2.0 (see also section 2.3.1)
- For use of the iQ-VIEW call: ≥ iQ-VIEW 2.8.0.101
- For use of iQ-WEB2GO: Android ≥ 4.x or iOS ≥ 6.x device
- DELL or HP hardware

> **NOTICE:**
> *The actual amount of storage capacity needed depends on many factors. To determine the appropriate size of your PACS, visit http://www.pacscalculator.com and the IMAGE Hardware Purchasing Guide for specific details.*

> **NOTICE:**
> *Refer to the corresponding Administration Guide documents of additional software that can be connected to and used in combination with iQ-WEB, such as iQ-X, iQ-4VIEW, iQ-WEB2GO, iQ-*

⚠ **WARNING:**

Danger of application failures and/or unavailability.

Any MySQL version greater than the recommended version 5.7 might not be compatible with iQ-WEB. Contact your local reseller or the manufacturer for additional information. Incompatibilities of the MySQL database version can lead to non-functioning of the iQ-WEB database, which results in the unavailability of patient data. This may delay diagnosis processes.

H-No.: 1.1.1, 1.1.4

2.3 Additional system requirements

2.3.1 Verifying hardware and software compatibility

If using additional iQ-SYSTEM PACS software (e.g. iQ-X or iQ-4VIEW) or any third-party applications, higher system requirements may apply. We recommend consulting the respective user documentation of all software products and select the highest level. It is also possible that certain third-party applications do not support specific operating systems. In such a case, use an operating system that is referenced for all applications you wish to install.

2.3.2 Ensuring system security

It is recommended that the application is used only within a secured environment. This concerns in particular the server system, on which iQ-WEB is installed, but also extends to the web clients. A secured environment includes at a minimum:

- Firewall or router protections to ensure that only approved external hosts have network access to iQ-WEB.
- Firewall or router protections to ensure that iQ-WEB only has network access to approved external hosts and services.
- Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels (e.g. such as a Virtual Private Network (VPN)).
- A regularly updated anti-virus/malware software.

We recommend the use of up-to-date anti-virus software on the computer on which iQ-WEB is installed and/or run. The virus definitions must be updated regularly (they should not be older than 2 weeks).

Other network security procedures such as automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of these instructions.

NOTICE:

Anti-virus software or firewalls may affect the iQ-WEB software as they may accidentally block necessary application files or communication (e.g. ports). It is recommended to configure such applications accordingly to ensure faultless operation of iQ-WEB on the system. A system test should be performed before using it productively.

To keep constant power supply voltage we strongly recommend the use of an uninterruptible power supply (UPS) on the iQ-WEB server. The interposition of such a device prevents data losses and data inconsistencies that can be produced at the occurrence of fluctuations in the power supply voltage.

3 Installing the software

The iQ-WEBX 6.6.2 setup not only includes the iQ-WEB server, but some extensions as well (i.e. iQ-X, iQ-4VIEW, iQ-WEBX WADO and iQ-WEB2GO). While included in the installation, each of these additional modules still requires a specific configuration and licensing procedure.

Moreover, the iQ-WEBX 6.6.2 setup depends on 3rd party components and software. Some of these are not included in the installation package due to technical or legal reasons – most notably the MySQL database server. Hence, the installation of iQ-WEB is a three part process consisting of the following steps:

1. Installation of all mandatory Windows Updates
2. Installation of the MySQL database server
3. Installation of iQ-WEB

> **NOTICE:**
> *Before installation of iQ-WEB, it is absolutely necessary to fully update the operating system using Windows Update. Missing updates can lead to non-functioning installation.*

> **NOTICE:**
> *Before installing any components of iQ-WEB, it is recommended that any anti-virus or security software be disabled during this process to avoid interruptions.*

> **NOTICE:**
> *It is mandatory that iQ-WEB be installed with full administrative privileges on the server.*

> **NOTICE:**
> *The manufacturer does not warrant that newer versions of the 3rd-party components like MySQL, Apache and PHP will work properly with the iQ-WEB server. The installation steps described in this document may also differ in newer versions or cause errors during the installation process.*

> **NOTICE:**
> *It is recommended that iQ-WEB be installed on a dedicated server and that the server not be shared with other performance critical applications to avoid conflicts and performance reduction.*

> **NOTICE:**
> *It is mandatory that the iQ-WEB server be restarted after the installation procedure is completed to ensure a fully operational state of iQ-WEB and its components.*

3.1 Full Windows update

Because the iQ-WEB server makes use of the newest technology available, its correct installation depends on the operation system being up-to-date. This step includes all system restarts necessary to finish the update. If the operating system has not been updated for some time, several update/restart cycles may be necessary. This includes, in particular, also all updates

relating to redistributable packages. Failure to fully update the system can lead to missing or outdated system components resulting in a defunct iQ-WEB installation. Refer to the documentation of the Windows version in use for detailed instructions on performing updates.

3.2 Installation and configuration of the MySQL database server

iQ-WEB requires the installation of a MySQL Database Server in order to operate properly. IMAGE Information Systems Europe GmbH has tested and verified MySQL Community Server release 5.7 to use with iQ-WEB 6.6.2.

MySQL 5.7 can be downloaded using the following links:

▪ 64-bit OS: https://dev.mysql.com/downloads/windows/installer/5.7.html
▪ If the link above have been moved, try a manual search at: https://downloads.mysql.com/archives/community/

Once you downloaded the appropriate installation file, proceed by executing the file with administrator privileges.

During the setup you will be asked to choose the setup type. For iQ-WEB, the "Server only" installation is sufficient.
MySQL Installer initiates the configuration. Select the following options:

1. Standalone MySQL Server / Classic MySQL Replication
2. Config type: Server Machine
3. TCP/IP port: 3306
4. No additional user is required
5. Windows Service name: MySQL
6. Start the MySQL server at system startup
7. Run Windows Service as: Standard System Account
8. No Document Store required

For further installation and configuration details consult the official MySQL 5.7 documentation. https://dev.mysql.com/doc/refman/5.7/en/windows-installation.html.

3.3 Installation and configuration of iQ-WEB

Once MySQL has been installed, the installation of iQ-WEB can take place. The installation package and all available updates can be found in the "Download Center" of the manufacturer's website.

NOTICE:
The iQ-WEBX setup can also upgrade any iQ-WEBX installation version greater than or equal to version 6.3.8. If such an upgrade is intended, proceed to section 3.6 "Upgrading the application" for those instructions.

To begin the installation, execute the iQ-WEBX setup with administrative privileges and follow its instructions.

During the installation process the setup will ask for initial configuration parameters of the categories MySQL, Apache and PACS.

3.3.1 MySQL configuration

The setup will create a database for iQ-WEB named "iqweb" and an administrator account "iqwebadmin". Therefore a password for the administrator account needs to be set and the password of the MySQL root user needs to be entered to give the necessary access rights to the setup.

3.3.2 Apache configuration

The setup will install an Apache web server. Access via HTTP and/or HTTPS can be enabled and the used port for each protocol can be defined. If HTTPS shall be used, the setup can optionally create a self-signed certificate.

3.3.3 PACS configuration

The Application Entity Title that shall be used by iQ-WEB has to be defined.

Additionally, the HL7 messaging functionality can be activated. If activated, the persistence in days after that the messages will be automatically deleted can be set.

3.4 Validating the installation

To validate a successful installation, it is recommended that you performs the following steps:

- Check the Windows Service Control Manager to see if a service named "Apache" is present and running.
- Check the Windows Service Control Manager to see if a service named "iQ-WEBX" is present and running.
- Check the Windows Service Control Manager to see if a service named "MySQL" is present and running.
- Check the Windows Event Viewer Application Log for any errors referencing one of the three iQ-WEB relevant services listed above.
- Open a web browser on the server and open the URL "[PROTOCOL]://localhost:[PORT]" where [PROTOCOL] equals "http" or "https" and [PORT] equals the corresponding network port chosen during installation (e.g. http://localhost:80 or https://localhost:443).
- Click the "Here" link on the opening page to go to the iQ-WEB login area and login to the interface using the MySQL credentials of the "root" user.
- Navigate to the "Tools" page of iQ-WEB, click the "Today's Log" tab, and check the displayed log for any errors.

3.5 Launching the application

iQ-WEB itself and all of the external components (i.e. Apache web server, MySQL database server) are implemented as Windows services. In order to simplify operation of iQ-WEB, these services are configured by default to automatically launch on system startup. However, this behavior can be altered using the Windows Service Control utility. For more information on stopping and starting services, refer to section "9.3.3.1 Service maintenance".

In order to access the iQ-WEB web interface on the server machine, launch a supported web browser and open the URL "[PROTOCOL]://localhost:[PORT]" where [PROTOCOL] equals "http" or "https" and [PORT] equals the corresponding network port chosen during installation (e.g. http://localhost:80 or https://localhost:443). To access the web interface from remote machines, either the hostname or IP address of the server is necessary. Consult the iQ-WEB Instructions for Use for details concerning usage of the web interface.

3.6 Upgrading the application

iQ-WEB offers several options for upgrading old versions to the current one. Challenges to an upgrade include handling the large amount of data collected over time and the consistency of the database/storage to be processed. The following sections will describe the various options and walk through the upgrade process.

3.6.1 Planning of an upgrade of iQ-WEB

To ensure data consistency while minimizing downtime and other workflow interruptions, it is recommended that a plan be laid out before beginning the upgrade procedure.

When an existing iQ-WEB installation needs to be upgraded, there are two strategies to consider.

3.6.1.1 Strategy A

Upgrade the existing iQ-WEB on the original server. This includes upgrading the MySQL installation as well as the iQ-WEB installation.

> **NOTICE:**
> *This method can only be used for versions ≥ 6.3.8. For an upgrade from previous versions, contact the local distributor or the manufacturer's support team at* *support@image-systems.biz.*

✓ Advantages
  ▪ All iQ-WEB configurations and settings will remain in place (users, DICOM setting, auto-routing rules, configurations etc.)

×   Disadvantages
  ▪   Significant downtime may occur depending on the database size:
    -   Estimate around 1 hour per 1 GB of MySQL database file size.
    -   The exact downtime will depend on the performance of the server and its storage system.
  ▪   No cleanup of bad data that may have accumulated over time will take place
  ▪   There is no downgrade option

3.6.1.2 Strategy B

Install iQ-WEB on a new server and migrate the old data to the new server. This requires that a new server be available for the installation.

✓   Advantages
  ▪   Avoids system downtime
  ▪   Data consistency checks may be performed while data is migrated to ensure clean data from the beginning

×   Disadvantages
  ▪   Costs of a new server
  ▪   Users, configurations, DICOM settings and other iQ-WEB options will need to be reconfigured
  ▪   Data migration time could be lengthy depending on the size of the previous PACS and the migration strategy chosen

3.6.2 Upgrade steps

In order to ensure a proper upgrade of both the MySQL database server and iQ-WEB, certain steps should be performed in a particular order. Otherwise, the upgrade may fail and lead to more complex tasks afterwards, such as restoring the configuration and reimporting images.

Follow the steps below to ensure a smooth upgrade process, a properly working system, and as little downtime of the server as possible.

There are six steps to complete the upgrade process:

1. Backup the current MySQL databases.
2. Uninstall the old MySQL version.
3. Install version 5.7.xx of MySQL server.
4. Restore the database from the backup.
5. Upgrade the restored databases.
6. Upgrade iQ-WEB.

⚠ WARNING:

Danger of application unavailability.
A valid license for version 6.6.2 is necessary to upgrade iQ-WEB properly. If the license has not yet been received, contact your local distributor on how to obtain the license BEFORE proceeding with any steps of the upgrade process. Without valid license it is not possible to start the upgrade, resulting in a longer downtime than scheduled.

H-No.: 1.1.1

NOTICE:

Only upgrades of iQ-WEB version ≥ 6.3.8 are supported. If a version lower than 6.3.8 is installed, it has to be upgraded to version 6.3.8 or 6.4.5 before upgrading to version 6.6.2.

NOTICE:

If the AE title of the iQ-WEB was renamed after the installation of the current version, use the "System" page under "Tools" from the web interface to restore its original value before proceeding with the upgrade. Otherwise, there may be issues during the upgrade process. The previous AE title name can be found under "Original AET name" on this page.

After the upgrade process finishes successfully, the AE title can be changed back to the preferred value.

NOTICE:

During the upgrade process the "root" user password of the current MySQL installation is needed.
It is recommend to have that information at hand before starting the upgrade.

3.6.3 MySQL backup

The first step in the upgrade process is to create a backup of the MySQL databases. These databases will then be restored into the new version of MySQL later.

1. Stop the iQ-WEB and Apache services to prevent incoming data during the MySQL backup and upgrade process.
2. Open the Command Prompt and browse to the current MySQL installation folder, e.g. "C:\Program Files\MySQL Server 5.5\bin".
3. Run the command below to save all databases into the "mysql_backup.sql" file:

```
mysqldump.exe -uroot -p --add-drop-table --routines --events --all-databases --force > C:\mysql_backup.sql
```

4. Enter the "root" user password when prompted.

NOTICE:

The creation of the backup may take a while, depending on the size of the database file. Additionally, the location of the backup file may be altered in the command above, if preferred, since the backup file can be very large.

3.6.4 MySQL upgrade

Once the MySQL backup has been created properly, continue with the MySQL upgrade as follows:

1. Since MySQL does not support the automatic upgrade of previous versions during installation, it is recommended that the existing MySQL Server be uninstalled first using the Windows Uninstall option in the Control Panel.
2. Once the previous MySQL is uninstalled, run the MySQL 5.7.xx Installer and Configuration Wizard as detailed in section 3.2 "Installation and configuration of the MySQL database server".

NOTICE:
It is recommended that the previous "root" password from the old iQ-WEB installation be used in this step. This way, it is not necessary to deal with multiple passwords during the upgrade process. In addition, restoring the MySQL backup (in the next section) will overwrite the password specified here.

NOTICE:
The password for the "root" user is important for several administrative tasks. For this reason, it is important that it be made available to all administrative personnel.

3.6.5 Restore MySQL backup

After the new version of MySQL has been installed and is working properly, the next step is to restore the previous databases:

1. Open the Command Prompt again and browse to the new MySQL installation folder, e.g. "C:\Program Files\MySQL\MySQL Server 5.7\bin".
2. Run the command below to import the previously created backup:

```
mysql.exe -f -uroot -p < C:\mysql_backup.sql
```

NOTICE:
If the backup file was given a different path or file name, be sure to substitute the appropriate information for "C:\mysql_backup.sql" in the command above.

3. As before, enter the "root" user password when prompted.

NOTICE:
This may take some time depending on the size of the database file.

4. After the import has completed, run the next command to finish the upgrade of the databases:

```
mysql_upgrade.exe -uroot -p
```

5. Enter the "root" user password when prompted again.

3.6.6 Upgrade of iQ-WEB

3.6.6.1 Prerequisite

<table>
<tr><td style="background-color:#1d9bd7">NOTICE:
<i>The following step is only necessary for iQ-WEB 6.3.8 installations.</i></td></tr>
</table>

In order to proceed with the upgrade, the following procedures have to be done to avoid an error during the upgrade setup.

- Stop the "Windows Font Cache Service" from the Windows Services window and set the "Startup type" to "Manual".
- Restart the system.
- Delete the font file "[iQ-WEB installation folder]\PACS\php\iui\ext-sandbox\t\android\droidsans.ttf".
- Delete the font file "[iQ-WEB installation folder]\PACS\php_css\CenturyGothic.ttf".
- Delete the font file "[iQ-WEB installation folder]\PACS\php_css\CenturyGothicBold.ttf".
- Delete the font file "[iQ-WEB installation folder]\PACS\php_css\CenturyGothicBoldItalic.ttf".
- Delete the font file "[iQ-WEB installation folder]\PACS\php_css\CenturyGothicItalic.ttf".
- Start the "Windows Font Cache Service" and set the "Startup type" back to "Automatic".

3.6.6.2 Upgrade

With the new version of MySQL running, your system is now prepared for the upgrade of iQ-WEB itself.

1. Copy the license files ("license.dat" and "license.aes") for iQ-WEB 6.6.2 that were received per mail into the same directory of the installation file.
2. Run the installer of iQ-WEB 6.6.2 and follow the instructions found in the installation wizard.
3. The setup will use the configuration of the old iQ-WEB installation also for the upgraded installation.

<table>
<tr><td style="background-color:#ed7d31">⚠ WARNING:
<i>Danger of application unavailability.
A valid license for version 6.6.2 is necessary to upgrade iQ-WEB properly. If the license has not yet been received, contact your local distributor on how to obtain the license BEFORE proceeding with any steps of the upgrade process. Without valid license it is not possible to start the upgrade, resulting in a longer downtime than scheduled.</i>
<div align="right">H-No.: 1.1.1</div></td></tr>
</table>

<table>
<tr><td style="background-color:#1d9bd7">NOTICE:
<i>See section "3.4 Validating the installation" to verify that the installation was successful and iQ-WEB is running properly.</i></td></tr>
</table>

4   Uninstalling the software

The iQ-WEB software can, at any time, be removed easily and safely from the system.

To uninstall iQ-WEB, execute the setup file again or use the "Programs and Features" menu of Windows located in the Control Panel and follow the instructions to "Uninstall a program". The instructions of the wizard will step through the rest of the process.

Uninstalling the iQ-WEBX setup will also remove all software products that were delivered with this setup besides the iQ-WEB archive software. This includes iQ-4VIEW, iQ-X, iQ-WEBX WADO and iQ-WEB2GO. Make sure that none of these applications will be needed anymore or are replaced with a new iQ-WEBX installation on a different system before proceeding with the uninstallation.

> **NOTICE:**
> *No file that was created or changed during the runtime process of iQ-WEB will be deleted. This includes image data, log files, and license information as well as database tables. This data must be deleted manually for a complete uninstall.*

MySQL must be uninstalled separately.

> **NOTICE:**
> *To uninstall MySQL, use the "Programs and Features" menu of Windows located in the Control Panel and follow the instructions to "Uninstall a program."*

5 Licensing

5.1 Licensing system

The following sections contain all necessary information about the licensing system of iQ-WEB, like the available license types and what they entail, the license activation process and the possibilities of migrating a purchased license to a different system.

The iQ-WEBX setup contains the product iQ-WEB and several other products. Each of these products has to be licensed separately.

5.1.1 License types

There exist different forms of licenses for the iQ-WEB software:

- Time-limited evaluation license (Trial license)
- Time-limited demonstration licenses (Demo license)
- Time-limited full license (Subscription license)
- Time-unlimited full license (Life-time license)

> ⚠ **WARNING**
> *Danger of application unavailability.*
> *All time-limited licenses are date-sensitive. Intended or involuntary modification of the Windows system date is handled as an attempt to tamper with the license and will invalidate a time-limited license. As a result the application can no longer be accessed. In case of date corruption, contact your local reseller. Keep in mind that the issuing of a replacement key might only be possible for a fee.*
> *H-No.: 1.1.1*

5.1.2 Time-limited evaluation license (trial)

The evaluation (trial) version of iQ-WEB is available as a free download at https://www.image-systems.biz. The evaluation license is automatically generated during the installation and runs for 30 days.

This version is limited to a maximum of 5 connected DICOM stations and 1,000,000 images stored in the database. The iQ-WEB application will not accept any DICOM communication when the license has expired or if the DICOM stations and/or the maximum number of images has been exceeded.

> **NOTICE:**
> *An evaluation (trial) license is limited to 1,000,000 images and 5 AE titles.*

5.1.3 Time-limited demonstration license

A demonstration license of iQ-WEB can be ordered by our sales partners and resellers only. This version is not for sale and is valid for 1 year. It is usually also limited in the number of connectable DICOM AE titles.

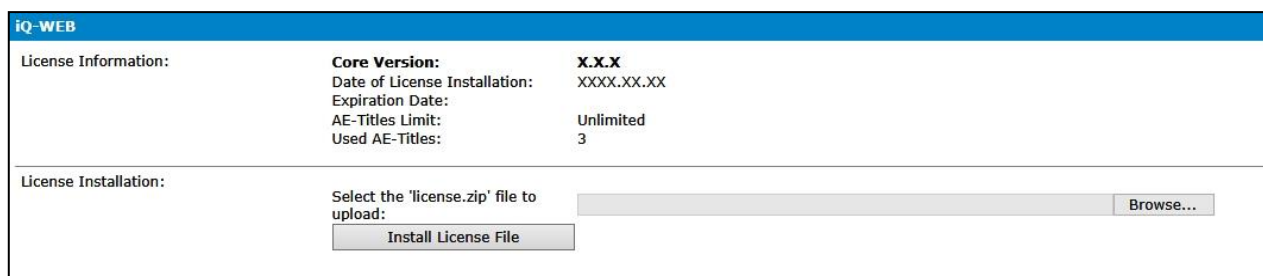### 5.1.4 Time-limited and time-unlimited full licenses

Full licenses can be obtained as life-time licenses that are not limited in time and will not expire. They can also be obtained as subscription licenses that run over a specified period of time (e.g. one year) and have to be renewed afterwards to use the software further.

All licenses are restricted to the computer where the product is installed. Contact your local distributor or license@image-systems.biz to order a license or to obtain up-to-date licensing information.

5.2 Activating the software

This section describes the licensing process for the core of iQ-WEB. For information regarding licensing of the bundled modules refer to section "9.3.4 Licensing". If there are questions about the various licenses, contact the license department of IMAGE Information System Ltd. at license@image-systems.biz.

5.2.1 Activating iQ-WEB

Figure 1 – License overview iQ-WEB

The top section of the licensing page contains the version of the iQ-WEB core and, if present, the license installation and expiration date.

To install a new license, use the "Browse" button to browse to the "license.zip" file provided by IMAGE Information Systems Europe GmbH. Then use the respective "Install License File" button to upload and apply the license. The iQ-WEB service will be stopped and started as necessary during this process to register the new license in the system.

To manually install the license, stop the iQ-WEB service and unzip the "license.zip" file. Copy the "license.dat" and "license.aes" files, and paste them into the "[iQ-WEB installation folder]\PACS\"

folder. Next, restart the iQ-WEB service. For more information on stopping and starting the service, refer to section "9.3.3.1 Service maintenance".

For licenses with a limited validity period (trial), an email reminder will be sent ten days before the expiration date to the administrator's email address to inform about the upcoming expiration. This provided that an SMTP server has been registered in "Settings → Email" and the administrator's email address has been included on the "Settings → System" page. For more information on configuring an SMTP server, see section "9.4.3 Setting up an SMTP server for email."

To verify if the license file has been installed correctly, choose any of the following steps:

1. Navigate to the Windows Event Viewer and check the "Application" log under the "Windows Logs" section. There should be an entry for iQ-WEB that states "Service started". If there is an error entry stating "Invalid license information or license has expired", try to install the license again or contact the Support team at support@image-systems.biz.
2. Visit the website of iQ-WEB and navigate to Tools → Today's Log. If there is no entry logged, install the license again or contact the Support team.
3. Check the Task Manager and look for the process named "iQ-WEBX.exe". If there is no such entry, install the license again or contact the Support team.
4. As a final step, send a test study to iQ-WEB via DICOM from another application, after configuring both stations correctly. If there is an error during the connection, try the license installation again or contact the Support team.

5.2.2 Order licenses / request support

Order Licenses/Request Support	
Step 1:	Collect and download the iQ-WEB license information in a ZIP file: [Download license information]
Step 2:	Send the license information ZIP file to your local distributor to obtain the valid license files, support, or product informati
Step 3:	Install the given license information and files received in return in the corresponding sections above.

Figure 2 – License ordering

When licenses are requested, certain information is required by the License team to process those licenses for new installations, migrations, or updates. The last area of the licensing page contains information to guide the user through the ordering process. Click the "Download license information" button to create a "LicenseInfo.zip" file. Then send this zip file to your local distributor or the License department of IMAGE Information Systems Europe GmbH to obtain the desired license(s).

5.3 Ensuring the validity of the iQ-WEB license

After the iQ-WEB software has been licensed, certain system parameters must remain consistent in order to keep the license valid and iQ-WEB accessible.

The following table contains different system settings and their influence on the license status:

Risk for license status	Changes to the system
Invalidates the license	• Renaming the computer (hostname) • Changing, removing or replacing any real or virtual network adapters (MAC addresses)
May invalidate the license	• Changing the system's main board • Replacing the primary hard disk • Adding or removing memory (RAM)
Does not affect the license	• Changing or adding IP addresses • Adding or replacing additional storage devices • Changing or adding a graphics card

6 License migration and renewal

6.1 Changing an existing license

In some cases it may become necessary to change an existing license. This may happen if:

- You wish to adjust the maximum number of DICOM nodes.
- You wish to upgrade from to time-limited to a time-unlimited license.

After you have received the new license file from your local reseller, follow the instructions described in the section 5.2 "Activating the software".

NOTICE:
Contact your local reseller for the procedures of changing an existing license.

6.2 Migrating licenses

To migrate an iQ-WEB license to another PC, a new installation of iQ-WEB is necessary. Before beginning the migration, contact your local distributor or license@image-systems.biz to generate a new license and receive further instructions on this process.

NOTICE
For replacement license a fee will be charged. Therefore, contact your reseller BEFORE you transfer your iQ-WEB license to a new computer!

7 Maintenance

The purpose of this chapter is to describe tasks that are necessary to operate iQ-WEB over long periods of time. It gives you details about how to keep the system running smoothly, how to keep sufficient free space on the hard disc (e.g. by regularly deleting old log files), how to maintain database consistency or where to take extra care in the configuration. This also includes maintenance actions that need to be performed regularly to adhere to the laws and regulations concerning medical devices.

Although iQ-WEB was designed to work as a PACS with rare manual interventions, there are a few maintenance tasks that administrative personnel must perform to ensure high performance, reliability of the product and data consistency. These manual tasks are described in the following sections.

7.1 Regular software and system restarts

As a software application, iQ-WEB is intended for frequent, but not for continuous use.

The server should be restarted on a regular time frame. A 48 hour schedule is recommended. This ensures that maximum resources are available to handle higher workloads.

7.2 Regular Windows updates

In order to keep the iQ-WEB server and its required environment (in particular the Apache web server) functional, it is recommended to download and install Windows updates regularly when they become available. This may also include optional updates, especially if they concern redistributable packages.

7.3 Protection from virus/malware infection and power loss

Computer viruses and malware hold a considerable risk. A virus/malware infection may potentially lead to data losses and to data inconsistencies. To avoid the risk of a virus infection of the server, all systems should be furnished with anti-virus software that needs to be updated regularly. Updates should be run as soon as they become available, but at least every two weeks.

Anti-virus/anti-malware checks should also be run regularly on the server where iQ-WEB is installed. It is recommended to run a check at least once a week and after virus definition updates.

> **NOTICE:**
> *Anti-virus software or firewalls may affect the workstation software as they may accidentally block necessary application files or communication (e.g. ports). It is recommended to configure such applications accordingly to ensure the faultless running of iQ-WEB on the system. A system test should be performed before using it productively.*

Potentially occurring fluctuations in the power supply can lead to data losses and data inconsistencies. Therefore, the insertion of an uninterruptible power supply (UPS) might be helpful in case the power supply voltage is not fused.

7.4 Performing regularly scheduled backups

Perform scheduled backups of DICOM data, the MySQL database, and the image file system(s) on external storage systems.

This ensures that, in the event of a disaster or hardware failure, most of the state of iQ-WEB can be restored and a minimum amount of data will be lost. In general, the shorter the period of time for which backups are scheduled, the less data is lost.

> **NOTICE:**
> *Performing scheduled backups is an important task for preventing data loss. Check your local legal restrictions for additional requirements. iQ-WEB does not manage database backup tasks automatically.*

7.5 Performing data consistency checks

Data consistency checks should be performed on a regular basis. iQ-WEB provides the necessary tools for this task:

- Perform a full data integrity check. This ensures that the database and stored DICOM data are in a consistent state and no DICOM data is missing.
- Resolve duplicate patient ID conflicts. This ensures that demographic data of patients are consistent and makes the integration with other systems much easier.

> **NOTICE:**
> *Checking data consistency is an important task for preventing data loss. Check your local legal restrictions for additional requirements.*

7.6 Ensuring sufficient hard disk space

Delete temporary files that often get left behind during irregular operations of iQ-WEB:

- **Anti-spam image files**: Due to a high number of simultaneous logins to the iQ-WEB web interface, the iQ-WEB installation subfolder "…\iQ-WEBX\PACS\php\antispam" may contain many "*.jpg" image files that have been left behind. Deleting these files regularly when no users are logged into the system helps save disk resources.
- **Temporary image and data files**: Due to a high number of simultaneous logins to the iQ-WEB web interface, the iQ-WEB installation subfolder "…\iQ-WEBX\PACS\php\images" may contain leftover image files that match the following naming schemes: "temp*.jpg" or "temp*.gif". Deleting these files regularly when no users are logged into the system helps save disk resources.

In addition, the iQ-WEB installation subfolder "…\iQ-WEBX\PACS\php\tmp" may contain leftover files. Deleting these files regularly when no users are logged into the system helps save disk resources.

- **Session files of web server**: Due to the session management system of Apache webserver, under rare circumstances, the iQ-WEB installation subfolder "…\iQ-WEBX\WWW_TMP" may contain leftover files that match the naming pattern "sess_*". Deleting these files regularly when no users are logged into the system helps save disk resources.
- **Windows temporary files**: Due to corrupt DICOM data or insufficient machine resources, one of the PC's temp folders ("…\Windows\Temp" or user based "%TEMP%") may contain leftover files that match the naming pattern "PacsOne*". Deleting these files regularly when no users are logged into the system helps save disk resources.

> **NOTICE:**
> *Before deleting any files mentioned in this section, it is best to ensure that no user or scheduled task is using them. Stopping the appropriate services before deleting the files can prevent any issues.*

Delete failed jobs that reached the maximum number of retries and are not continued by the system. (Refer to section 9.3.2 "Database maintenance" for detailed instructions.) This reduces clutter in the jobs view and allows the user to see potential issues with current jobs much easier.

> **NOTICE:**
> *Before deleting any jobs, it is best to ensure that the tasks are not currently running and that they are resubmitted afterwards, if necessary.*

7.7 Investigating application logs

Investigate the following application logs on a regular basis in order to recognize early signs of failure.

- Windows Event Viewer → Application log
- iQ-WEB log files (Refer to section 9.8.4 for details.)
- Apache log files (Refer to section 9.8.2 for details.)
- MySQL log files (Refer to section 9.8.3 for details.)

8   Folders and Registry structure

The following table lists all folders created during the installation process of iQ-WEB that might be important to administrators. The number of sub-folders stated below is limited to those with relevance for the administration of iQ-WEB. The other folders contain application and configuration files that must not be accessed or altered but are needed for the functioning of the application.

Folder	Description
…\[iQ-WEB installation folder]	iQ-WEB application root folder (by default: iQ-WEBX)
…\iQ-WEBX\Apache\	Contains the Apache web server files
…\iQ-WEBX\Apache\conf	Contains the Apache web server configuration file "httpd.conf"
…\iQ-WEBX\Apache\logs	Contains the Apache web server log files
…\iQ-WEBX\Language	Contains sub-folders with language files for every language provided for the iQ-WEB web GUI; includes one custom translation project (for later added translations)
…\iQ-WEBX\PACS\	Contains the iQ-WEB binaries and the license files of iQ-WEB
…\iQ-WEBX\PACS\export	Default directory for exported studies
…\iQ-WEBX\PACS\FailedLogin	Contains files that store information about failed login attempts
…\iQ-WEBX\PACS\import	Default directory for imported studies
…\iQ-WEBX\PACS\log	Contains all log files created by iQ-WEB
…\iQ-WEBX\PACS\php	Contains the iQ-WEB php files that are necessary to build up the web part and the license files of iQ-WEBX WADO, iQ-WEBX2GO
…\iQ-WEBX\PACS\php\doc	Contains the user documentation
…\iQ-WEBX\PACS\php\download	Contains all generated download packages of iQ-WEB
…\iQ-WEBX\PACS\php\images	Contains all full size images used for image presentation within iQ-WEB
…\iQ-WEBX\PACS\php\iqcallinstallations	Contains all generated registry files for configuring iQ-VIEW Call
…\iQ-WEBX\PACS\php\iQ-4VIEW	Contains all iQ-4VIEW related files
…\iQ-WEBX\PACS\php\iQ-X	Contains all iQ-X related files
…\iQ-WEBX\PACS\php\locale	Contains all translation files for iQ-WEB
…\iQ-WEBX\PACS\php\thumbnails	Default directory for thumbnails of iQ-WEB used in iQ-X

Folder	Description
…\iQ-WEBX\PACS\php\transcript	Contains all generated Word documents generated by transcription feature
…\iQ-WEBX\PACS\php\upload	Contains all uploaded data of iQ-WEB
…\iQ-WEBX\PHP	Contains binaries of the PHP extension and the configuration file "php.ini"
…\iQ-WEBX\WWW_TMP	Contains webserver sessions during runtime

NOTICE:

It is recommended that the archive or database files not be stored in the same folder as iQ-WEB to avoid multiple folder accesses from the different applications.

The following lists all registry keys created during the installation process of iQ-WEB that may be important to administrators. The following list contains key paths in relation to the following base paths:

- [LM_SOFTWARE]: "HKEY_LOCAL_MACHINE\SOFTWARE\"
- [LM_SYSTEM]: "HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet"

Key	Description
[LM_SOFTWARE] \IMAGE Information Systems Ltd.\iQ-WEBX\[AE Title]	Basic registry configuration for iQ-WEB where [AE Title] is replaced by the current iQ-WEB AE Title.
[LM_SOFTWARE]\ImageMagick	Configuration of module for image compression and decompression
[LM_SYSTEM]\services\Apache	Windows Service Configuration of Apache web server
[LM_SYSTEM]\services\iQ-WEBX	Windows Service Configuration of iQ-WEB DICOM and HL7 server

---

⚠ WARNING:

Danger of application failures and/or unavailability.

Manually changing the registry setting can cause severe damage to the iQ-WEB application and the operating system. It is strongly recommended that the registry keys be backed up before making changes.

H-No.: 1.1.1

9 Software administration

9.1 The core configuration

iQ-WEB comes with three components that are necessary to run properly: Apache HTTP Server, PHP and MySQL. The next sections will describe some basic settings for these components.

9.1.1 Apache HTTP server

Apache HTTP Server is a core component of iQ-WEB that is responsible for answering all HTTP requests from the web browsers used by clients. Its configuration file "httpd.conf" can be found under "[iQWEB installation folder]\Apache\conf\". The following basic settings are essential for iQ-WEB:

- **Listen**: This parameter makes it possible to bind the service to a specific port. During the installation the value will be set to the default port 80 or to 443 if a connection via SSL is desired.
- **LoadModule**: This parameter is needed to load modules to extend the default functionality of the web server. iQ-WEB comes with a set of loaded modules, the most important one is PHP using the "php5apache2_4.dll".

The configuration file must not contain syntax errors or the service will not start.
For a detailed description of every setting, refer to the documentation at the official Apache site "https://httpd.apache.org/".

NOTICE:
The Apache HTTP Server must be restarted to adopt any changes made in the configuration. This can be achieved either via the Windows Service control, the Apache Monitor Software or the iQ-WEB interface. (See section 9.3.3 "System" for more information.)

NOTICE:
Before adjusting the file "httpd.conf," it is recommended that a backup of the file be made in case changes need to be reverted.
All current HTTP connections to a server will be closed during the restart process.
HTTP access will be unavailable until the restart process is finished.

9.1.1.1 SSL integration

Due to growing security requirements of web based applications iQ-WEB provides a mechanism to protect communication between client browsers and server using SSL technology (Secure Sockets Layer). This is a common method to encrypt traffic of web application to avoid unintended access to data. To accomplish this capability iQ-WEB requires the OpenSSL module of the Apache web server. iQ-WEB is using the OpenSSL version 1.0.2k.

For detailed reference refer to following sources:

- https://www.openssl.org/
- http://httpd.apache.org/docs/2.4/mod/mod_ssl.html.

To use SSL encryption an SSL certificate is mandatory. iQ-WEB offers the usage of two certificate types:

- Self-signed SSL certificates
- SSL certificates created by official certificate authorities

---

NOTICE:
Self-signed SSL certificates only provide limited security in comparison to SSL certificates created by official certificate authorities.

This section explains the general configuration process for using SSL encryption.

9.1.1.1.1   Certificate generation

In this section only the creation of self-signed certificates is described because signing authorities use different procedures.

iQ-WEB provides a batch script that helps generating a self-signed certificate. It is located at: "[iQWEB installation folder]\Apache\create_certificate.bat". Executing this script in this folder as a user with administrator access rights will guide the user through the generation process. The following user inputs are required during this procedure:

- Enter the PEM pass phrase twice (password for the private key for the server)

NOTICE:
At least 4 characters are required (at most 20 characters)!

- Enter the country name, e.g. "US"
- Enter the state or providence name, e.g. "New York"
- Enter the location name, e.g. "New York City"
- Enter the organization name, e.g. "ABC Company"
- Enter the organizational unit name, e.g. "IT Department"
- Enter the common name, e.g. "PACS"

NOTE:
The "Common name" must match the computer name that will be used for accessing the web interface of iQ-WEB, e.g. "PACS" or its IP address. If a dynamic DNS service is being used, like DynDNS, use the registered DNS name, e.g. "host.dyndns.org".

- Enter an email address
- Optional: Enter a challenge password
- Optional: Enter an optional company name

- Re-enter the PEM pass phrase entered at the beginning
- Once the certificate creation process has been finished successfully, all necessary files can be found within the folder "[iQWEB installation folder]\Apache\conf\ssl\".

> **NOTICE:**
> *Self-signed certificates generated with this script are valid for 365 days. The batch file "create_certificate.bat"may be edited to increase the number of days.*

> **NOTICE:**
> *iQ-WEB installer provides an option to prepare SSL configuration and run the "create_certificate.bat" directly after installing iQ-WEB for the first time.*

9.1.1.1.2 SSL configuration

In order to apply the created or provided certificates as well as setting up the SSL support, some modifications in the Apache configuration file "httpd.conf" are necessary. Open this file, which should be located at: "[iQWEB installation folder]\Apache\conf\". To configure SSL proceed with the following checklist when editing the configuration file:

- Locate string "Define USE_SSL" in the file and remove all "#" characters in front of it.

```
Define USE_SSL
#Define USE_SSL_ONLY
```

- If the SSL connection will be used solely then also locate string "Define USE_SSL_ONLY" in file and remove all "#" characters in front of it.
- Locate the following section and change the network port number to the one used for the SSL connection to the web server. (Default port is 443)

```
<IfDefine USE_SSL>
    Listen 443
</IfDefine>
```

> **NOTICE:**
> *Port is not allowed to be used by another application. Apache webserver does not start with such configuration.*

- Locate file section beginning with "#SSL Configuration" (e.g. see below)

```
#SSL Configuration
<IfDefine USE_SSL>
    LoadModule ssl_module "${SRVROOT}/modules/mod_ssl.so"
    <IfModule ssl_module>
        SSLRandomSeed startup builtin
        SSLRandomSeed connect builtin
        AddType application/x-x509-ca-cert .crt
        AddType application/x-pkcs7-crl .crl
```

```
        Mutex default
        SSLRandomSeed startup builtin
        SSLSessionCache none
        <VirtualHost *:443>
            ServerName localhost
            DocumentRoot "${DOCROOT}"
            SSLEngine On
            SSLCertificateFile "${SRVROOT}/conf/ssl/iQ-WEB-certificate.crt"
            SSLCertificateKeyFile "${SRVROOT}/conf/ssl/iQ-WEB-certificate.key"
        </VirtualHost>
    </IfModule>
</IfDefine>
```

- Edit the following bold marked strings to match the intended configuration:
  - "VirtualHost *:443"
    Change the network port number to the same SSL port used in the "Listen" clause above.
  - "ServerName localhost"
    Replace "localhost" with the name or IP address of the server according to the value used during the certificate creation ("Common Name").
  - "SSLCertificateFile" ${SRVROOT}/conf/ssl/iQ-WEB-certificate.crt"
    "SSLCertificateKeyFile" ${SRVROOT}/conf/ssl/iQ-WEB-certificate.key""
    Verify the paths and file names or replace the full file path to the generated certificate files.

9.1.1.1.3   Access to web interface

After the Apache server has restarted without errors, the SSL secured connection to the web interface of iQ-WEB can be used with a client browser as follows:

https://[Common Name]:443

Replace [Common Name] with the name entered during the certificate creation and include the correct port.

If a security warning appears stating there is a problem with the certificate, there are two explanations:

- A self-signed certificate may have been created by an untrusted authority. Nevertheless, the connection will be secure.
- The server name/address in the URL does not match the value of the "Common Name" defined during the creation of the certificate.

Unless the certificate is changed, this message will appear every time the browser is opened and the web interface of iQ-WEB is accessed. The certificate can be permanently installed (on each client) to avoid this security warning.

9.1.2 PHP

PHP extension is a core component of iQ-WEB and an extension of the Apache HTTP Server. It is responsible for generating the web interface of iQ-WEB which is then provided to the web browsers used by clients. Its configuration file php.ini can be found under "[iQWEB installation folder]\PHP\".

- **max_execution_time**: This value defines the amount of time a script will run before its execution will be terminated. By default the value is set to 120 seconds. If iQ-WEB must handle a large amount of data, certain scripts may time out. Increasing this value may solve the issue.
- **memory_limit**: This value defines how much memory can be allocated by a single script. By default, the value is set to 512 MB. If iQ-WEB must handle a large amount of data, certain scripts may reach the memory limit. Increasing this value may solve the issue.
- **upload_max_filesize**: This value defines the maximum size for any uploaded files. If large files need to be uploaded, this value must be increased.
- **post_max_size**: This value defines the maximum size for post data. It must be equal to or larger than the upload_max_filesize value. If large files need to be uploaded, this value must be increased.
- **extension**: This parameter is needed to load extensions into PHP. During the installation, all extensions needed by iQ-WEB are activated. Note that iQ-WEB requires the "php_mysqli.dll" extension that does not work with the "php_mysql.dll".

For a detailed description of the settings in PHP configuration, refer to the documentation of the official site http://www.php.net/docs.php.

NOTICE:
Apache HTTP Server must be restarted to adopt any changes in configuration.
This can be done either via the Windows Service control, the Apache Monitor Software or the iQ-WEB interface. Refer to section 9.3.3 "System" for more information.

NOTICE:
Before adjusting the file "php.ini" it is recommended that a backup of the file be made in case changes need to be reverted. All current HTTP connections to a server will be closed during the restart process. HTTP access will be unavailable until restart the process is finished.

9.1.3 MySQL

In some cases, the configuration of the MySQL database installation on which iQ-WEB relies may need to be modified. This occurs, especially, in cases where a high volume of data or a high number of simultaneous user logins are expected during operations.

The "my.ini" configuration file is typically found under the "C:\Program Files\MySQL\MySQL Server 5.7" folder.

- **max_connections**: This parameter specifies the maximum amount of concurrent sessions the MySQL server will allow. One of these connections will be reserved for a user with SUPER privileges to allow the administrator to login even if the connection limit has been reached.
- **innodb_buffer_pool_size**: This parameter specifies the size of the buffer pool used by InnoDB to cache both indexes and row data. The higher the value is set, the less disk I/O is needed to access data in tables. This parameter can only be set to up to 80% of the machine's physical memory size on a dedicated database server. When running other applications like Apache HTTP Server and iQ-WEB, reserved memory should be shared equally. If the value is set too high, competition of the physical memory may cause paging in the operating system.

MySQL is a 3rd-party prerequisite for iQ-WEB. The above adjustments must be made manually for each installation and are not configured automatically during the iQ-WEB installation process. For a detailed description of the settings in the MySQL configuration, refer to the documentation of the official site "https://dev.mysql.com/doc/#manual".

NOTICE:
MySQL Server must be restarted to adopt any changes in configuration.
This can either be accomplished via the Windows Service Control or the iQ-WEB interface.
Refer to section 9.3.3 "System"

⚠ **WARNING:**
Danger of delay of application and data availability.
Before adjusting the "my.ini" file it is recommended that a backup of the file be made in case changes need to be reverted. All current MySQL connections to a server will be closed during the restart process.
MySQL access will be unavailable until the restart process is complete.
No data can be registered in the database during this period.

H-No.: 1.1.2, 1.1.3

9.2 Using the administrative overviews

This section describes all views that are especially provided for administrative purposes or that provide information of special administrative interest. These views can be accessed via the menu bar of iQ-WEB after successfully logging in. For detailed information about the log-in process, navigation and user accessible views refer to the iQ-WEB instructions for use.

9.2.1 Jobs table – Overseeing the archive's tasks

Figure 3 – Job view

The "Jobs" page is structured in the following status-based tabbed views:

- "Completed"
- "Pending"
- "Failed"
- "Scheduled Immediately"
- "Scheduled Later"

The jobs view page in general displays the job status of the currently logged in user. For administrators, this page shows all jobs including other administrators' jobs as well. In contrast, normal users only have access to jobs they triggered. It is possible to search for specific jobs, using the search fields right beneath the table head. Jobs can be deleted or retried by clicking the respective button.

Each job table contains the following information:

- **ID**: Job ID that is generated automatically by the MySQL database
- **User**: The username that created the database job
- **AE Title**: AE title of the destination
- **Type**: Job type, e.g., "Forward", "Print", etc.
- **Class**: Hierarchy level, e.g., "Patient", "Study", "Series", etc.
- **Unique Identifier**: Unique ID in the hierarchy level, e.g., patient ID, study UID, series UID, etc.
- **Schedule**: Displays the scheduling of the job
- **Priority**: Shows the priority level of the job
- **SubmitTime**: Timestamp from when the database job is submitted
- **StartTime**: Timestamp from when the database job starts processing

- **FinishTime**: Timestamp from when the database job finishes processing
- **Status**: Success, failure or percentage value representing the jobs status
- **Retries**: Displays the number of retries the job already has
- **Details**: Any detailed errors if the database job has failed
- **Retry Interval**: Displays the interval between the retries

---

NOTICE:
In the input fields used here the wildcard characters ("", "?") are supported. Where "*" is a placeholder for any number of characters and "?" is a placeholder for one character.*

9.2.2 Using the "Journal" as activity tracker

The journal view page in general displays the tracked activities performed in an iQ-WEB system. iQ-WEB automatically logs all user activities into the "Journal" database table in a way that meets the HIPAA auditing requirements.

Figure 4 – Journal view

The following information will be displayed:

- **Date/Time**: The date and time when the activity happened
- **Username**: The name of the user that performed the event
- **Operation**: The action that the user executed
- **Level**: The subject level of this event, e.g. patient, study, series, image
- **Identifier**: The unique ID of the item that was involved, e.g. patient ID, study UID
- **Details**: Additional information about the activity

All table views on the "Journal" page include a search bar on top of each table which allows the user to filter the displayed list. This search bar provides fields to filter by the criteria, described above.

The journal is structured in the following time-based views:

- Today's Activities
- Yesterday's Activities
- This Week's Activities
- This Month's Activities
- Last Month's Activities
- All Activities

On the first day of every month, iQ-WEB will purge events that are older than 60 days. To modify this value, contact the support team.

9.2.2.1 Automatic monthly journal emails

If an SMTP server is configured (see section 9.4.3 "Setting up an SMTP server for email") and an email address for the administrator has been entered (see section 9.4.2.5 "Global settings"), iQ-WEB will send an email on the first day of every month that contains all events of the previous month.

9.3 The "Tools" menu: Manage the system maintenance

The tools menu item contains a lot of utilities that enhance working with iQ-WEB. They can be accessed via the menu bar of iQ-WEB after a successful log-in. For detailed information about the log-in process and navigation refer to the iQ-WEB Instructions for Use. The following sub-sections describe the tools that are commonly used by administrators.

9.3.1 Automatic purge storage

This feature allows the administrator to automatically purge older studies by a predefined set of rules or parameters. This feature is useful if the storage resources are limited on the server on which iQ-WEB is installed.

9.3.1.1 General automatic purging rules

Figure 5 – General purging rule configuration

Every rule is triggered when a defined event occurs. The criteria that can initiate purging are described below:

- **Storage Capacity**:
  - "Low Watermark"
    This field is defined in terms of free disk space percentage ranging from 0 to 100. For each defined archive directory, iQ-WEB will examine the corresponding disk usage information for the disk where the archive directory is located. If the free disk space percentage is lower than this defined Low Water Mark, iQ-WEB will start purging older studies on this disk.
  - "High Watermark"
    This field is defined in terms of free disk space percentage ranging from 0 to 100. The value must be higher than the value defined for the Low Water Mark. When the free disk space percentage drops below the Low Water Mark, iQ-WEB will start to purge older studies stored in the corresponding archive directory. iQ-WEB will sort the list of studies stored in this archive directory by the date the studies were received, with the oldest study on top of the list. iQ-WEB will purge studies in the sorted list (removing the oldest study first) one at a time, until the disk free space percentage rises above the defined High Water Mark. At that point, the automatic purging operation is complete.
- **Date when study was received**: iQ-WEB will purge all older studies that were received more than the defined "n" days ago.
- **Date when study was acquired**: iQ-WEB will purge all studies that have a study date older than the defined "n" days ago.
- **Source AE**: All studies that were received from the specified source AE Title will be purged.

To customize the purging procedure iQ-WEB provides the following options:

- **Scheduling**: iQ-WEB will perform automatic purging only on this scheduled hour of the day, and will not perform another purging for the same rule for the next 24 hours.
- **Purge Operations**: Allows users to control purging behavior on the following 2 levels
  - "Purge Study Operations"

Permanently delete all purged studies from the database and archive storage. The user can choose to move DICOM data files from archive storage to another location before deletion. This option makes sure that study data are still accessible, but do not consume any more online storage resources. For Windows platforms, any shared network path must be entered in the Windows UNC format (e.g. \\RemoteHost\RemotePath) instead of as a mapped drive path (e.g. Z:\Path).

- "Purge Patient Operations"
  Permanently remove patient data from the iQ-WEB database after purging the last study of a patient. If disabled, patient data is left in database for further use.

⚠ **WARNING:**

Danger of data loss.

Be sure to back up the data before using this feature as deleted data cannot be recovered. You need to make sure that only patient data and images are deleted that are no longer needed. Also consider the legal requirements in your country before using the data purging feature.

H-No.: 1.2.3

NOTICE:

Using the "Move to destination folder" will create the following folder structure after the purging operation has processed: "[defined purge folder]/[AE Title of the studies]/[StudyUID]/[SeriesUID]/images".

9.3.1.2 Automatic purging rules by DICOM data element filters

Figure 6 – Purging rules by data element filters

In addition to the general purging procedure users can also define individual DICOM data element filters with wild card patterns, so that iQ-WEB will automatically purge the matching DICOM studies based on the user-defined aging period and schedule.

- ▪ **Description**: This field contains a brief description of the defined filter pattern.
- ▪ **Data Element Tag**: This field allows the user to choose from the following DICOM tags to build a purging rules logic on:
  - Modality (0008,0060)
  - Institution Name (0008,0080)

- Referring Physician's Name (0008,0090)
- Study Description (0008,1030)
- Reading Physician's Name (0008,1060)
- Patient Name (0010,0010)

The filter patterns should be entered in the field right next to the "Data Element Tag" field. This value will be used to match against the DICOM studies stored in the iQ-WEB database. If the DICOM element contains the "^"character, it must be entered here as well. Wild card characters "*" and "?" are supported.

- **Study Age**: This field contains the age of the study. The time period is given as a number of days. iQ-WEB will purge any matching DICOM study if the study has been received prior to the defined time period. The default value is 100 days.
- **24-Hour Schedule**: The schedule when iQ-WEB should run the automatic purging by the defined DICOM data element filtering rule.
- **Patient Purge Operation**: If the checkbox is marked, the patient record in the database will be deleted if all studies of a patient have been purged.

> ⚠ **WARNING:**
> *Danger of data loss.*
> *Using the purge feature will always delete images. This includes the image file and the database entry. The operation is non-reversible. You need to make sure that only patient data and images are deleted that are no longer needed or backed up otherwise. Also consider the legal requirements in your country before using the data purging feature.*
> *H-No.: 1.2.3*

9.3.2 Database maintenance

This menu contains features that help to maintain the database of iQ-WEB.

9.3.2.1 Integrity check

Figure 7 – Integrity check

With this feature iQ-WEB will run an internal database integrity check. It will scan the image table of the database to verify that for each record in the image table the corresponding raw DICOM image file exists and that it is not empty. iQ-WEB will report any missing, empty or

corrupt raw DICOM image file found by the integrity check. This option might be useful to validate the DICOM data before and after a migration or an upgrade process.

The following options allow users to customize the check procedure:

- **Check only the DICOM Part-10 File Header**: This option will only validate the header information of the DICOM files which makes the check less time consuming.
- **Check the entire raw DICOM image file**: This option will check that the image files exist and are not empty or unreadable. This takes more time than just checking the header information
- **Using multiple threads**: This option will increase the speed of the integrity check by using multiple threads simultaneously.

9.3.2.2 Delete all patient/image data

Using this feature will delete all patients in the archive and, as a result, all patient-related data and images will be lost.

<table>
<tr><td align="center">⚠ WARNING:
<i>Danger of data loss.</i>
<i>Be sure to back up the data before using this feature as deleted data cannot be recovered. You need to make sure that you only use this feature if none of the patient data and images are needed anymore. Also consider the legal requirements in your country before using this deletion option.</i>
<div align="right">H-No.: 1.2.3</div></td></tr>
</table>

9.3.2.3 Delete database jobs

This functionality allows the administrator to delete all completed, failed and pending job entries listed at the job page of iQ-WEB.

<table>
<tr><td align="center">NOTICE:
<i>All jobs that are deleted may not be triggered again and reoccur. The user may reschedule a job again manually.</i></td></tr>
</table>

9.3.3 System

On this page, the services as well as service-related options can be managed. In addition, the station that should use the iQ-VIEW Call can be entered here.

9.3.3.1 Service maintenance

In this section, iQ-WEB provides status information and control options for all involved services of iQ-WEB.

9.3.3.1.1 Apache

Apache 2.4.27 is the web server that comes with the installation of iQ-WEB and is responsible for the presentation of iQ-WEB via the web. For the client/server communication, the PHP 5.6.31 module is used.
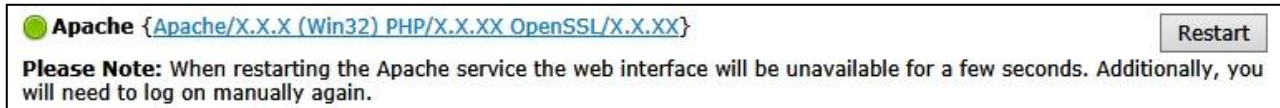
Figure 8 – Apache service

Clicking on the link next to the service status will open a website that executes the "phpinfo()" function. This page contains a detailed overview about the current PHP settings, loaded extensions and their configuration.

- **Restart**: Using this button will restart the Apache web service. This may be necessary if the configuration in the "httpd.conf" or "php.ini" has been changed.

NOTICE:
If there are errors in the "httpd.conf" or "php.ini" file, the service will not be able to start, and the configuration files must be edited. See chapter 8 "Folders and Registry structure" for their location.

NOTICE:
The web interface will be unavailable during the restart process. In addition, a manual login may be required.

9.3.3.1.2 iQ-WEB

Figure 9 – iQ-WEB service maintenance

The iQ-WEB core is responsible for the DICOM functionality and provides the files for the web interface.

- **Restart**: Using this button will restart the iQ-WEB service.
- **Start/Stop**: Using this button will start or stop the iQ-WEB service. This might be necessary if one of the listed configuration options was changed manually or if there are performance issues.

- **Log Path**: This specifies the path, where iQ-WEB is storing the DICOM and HL7 communication log files. By default the location is set to "…\[iQ-WEB installation folder]\PACS\log\" (e.g. "C:\Program Files (x86)\iQ-WEBX\PACS\log\"). This Path can be changed if necessary.

- **Log Level**: By default the log level is set to "Information". Changing it to "Debug" will increase the amount information that will be written into the log file.

- **Patient ID Conflict Resolution**: By default, if a duplicate patient ID is entered to the iQ-WEB database, it will be tagged with an additional string that contains the Source AE title and a date/time stamp when the study was received. It is also possible to either ignore the duplicate entry, so iQ-WEB will always overwrite the existing patient, or to reject the duplicate entry. In this case, iQ-WEB will reject a newly received study if there is already a study with this patient ID.
  Standard duplicate patient ID resolution is described in iQ-WEB Instructions for Use.
- **Coercion**: Enabling this option will make iQ-WEB respond with a warning if coercion was triggered. Coercion mechanism is described in iQ-WEB Instructions for Use.

- **Update Existing Entries**: In this section, overwriting existing studies can be configured if the same study arrives again. Furthermore, updating the study receive date every time the same study is received can be enabled. This is a default behavior of iQ-WEB to ensure that report and post processing workflows are applicable.

- **DICOM Network Configuration**: In this section, the DICOM AE titles as well as the DICOM port of iQ-WEB can be altered. iQ-WEB also protocols changes to AE titles to be able to undo them.

9.3.3.1.3 MySQL

The MySQL database server stores information for iQ-WEB, such as configurations, jobs, user settings, DICOM information, but not the DICOM files itself.

- **Restart**: Using this button will restart the MySQL service. This is necessary if the configuration file "my.ini" has been changed.

NOTICE:
iQ-WEB is able to obtain information from and control a MySQL service instance only if it is installed on the same machine as the Apache and iQ-WEB service.

⚠ WARNING:
Danger of delayed diagnosis due to application unavailability.
During the restart process of the MySQL service and while it is stopped, no DICOM connections or communication can occur. It will not be possible to send patient data to iQ-WEB or to retrieve data to be used at other stations. Make sure that no urgent jobs need to be performed. Pending jobs will be continued after the restart.
H-No.: 1.1.2, 1.1.3

9.3.3.2 Configure iQ-VIEW Call stations

Figure 10 – Configure iQ-VIEW Call stations

This section explains how to configure workstations to use the iQ-VIEW Call feature. The following information about the station and its local iQ-VIEW installation must be entered.

- The fully qualified hostname of the client machine (e.g. "myhostname.mydomain.local")
- The installation path of iQ-VIEW(including iQ-VIEW.exe) on the client machine (e.g. "C:/Program Files (x86)/iQ-VIEW/iQ-VIEW.exe")
- A description text (e.g. "Station 1")

By default, iQ-WEB assists by pre-filling the form with values that match the current configuration of the PC where the web page is currently being accessed. It is recommended that this configuration be done directly on the client workstation where iQ-VIEW will be called and to check the validity of the prefilled values.

If the station's hostname is not already configured to work with the iQ-VIEW Call, an "Add Station" button will appear.

Clicking on the "Add Station" button will add the station to the iQ-WEB configuration and create a registration file. This file must be applied to the client workstation's registry once. iQ-WEB will display instructions of how to do this on the screen.

In the lower part of the section, all configured stations are listed with the option to download their associated installation file again. To enable the iQ-VIEW Call feature globally and take the list of iQ-VIEW Call stations into account, refer to section 9.4.2.5 "Global settings."

> **NOTICE:**
> *The iQ-VIEW Call uses the accession number of a study to retrieve the images. In order to work properly, the accession number should not contain any spaces.*

> **NOTICE:**
> *For the iQ-VIEW Call to work, all pop-up blockers in the web browser must be disabled for the URL of iQ-WEB. The iQ-VIEW Call has been tested with Internet Explorer 10-11, Google Chrome browser on iQ-VIEW Version 2.8 and later.*

9.3.4 Licensing

This section describes the licensing process for the core of iQ-WEB and all its modules. If there are questions about the various licenses, contact the license department of IMAGE Information System Ltd. at license@image-systems.biz.

9.3.4.1 iQ-WEB

For a description of the licensing process iQ-WEB's core, refer to chapter 5 "Licensing".

9.3.4.2 iQ-4VIEW

The second section of the licensing page displays the version of iQ-4VIEW and the current hardware fingerprint. If a valid license is installed, the registered name, license type, license key, date of key creation, number of days installed and days left until expiration will be shown here. Installing and resetting the license can be done in this section using the respective buttons.

In the appropriate textboxes, enter the registration name and the license key provided by the License team of IMAGE Information Systems Europe GmbH and click "Install license."

To manually install an iQ-4VIEW license, use the command line tool of Windows to execute the "LicGen.exe" program in the "/php/iQ-4VIEWlicgen" folder passing the "registration name" and "key" as parameter.

For example:
```
C:\iQWEB\PACS\php\iQ-4VIEW\licensing\LicGen.exe install <registration name> <key>
```

9.3.4.3 iQ-X, iQ-WEBX report editor

The third section of the licensing page displays the version of iQ-X and the current hardware fingerprint. If a valid license is installed, the registered name, license type, license key, date of key creation, number of days installed and days left until expiration will be shown here. Installing and resetting the license can be done in this section using the respective buttons.

In the appropriate textboxes, enter the registration name and the license key provided by the License team of IMAGE Information Systems Europe GmbH and click "Install license." Licenses that unlock the features of the Report Editor should be installed in this section as well.

To manually install an iQ-X license, use the command line tool of Windows to execute the "LicGen.exe" program in the "php" folder using the "register" parameter.

For example:
```
C:\iQWEB\PACS\php\LicGen.exe register
```

Using this command will open a window that displays the hardware fingerprint. In addition, the name and key given by the license department can be entered and applied here.

9.3.4.4 iQ-WEB2GO

The fourth section of the licensing page contains the iQ-WEB2GO module version number as well as the license version number. To install the license via the web interface, browse for the "web2go.lic" file provided by the License team of IMAGE Information Systems Europe GmbH, and use the "Install License File" button to upload the license.

To manually install the license, copy the "web2go.lic" file and paste it into the "[iQ-WEB installation folder]\iQWEB\PACS\php" folder.

9.3.4.5 iQ-WEBX WADO

The fifth section of the licensing page contains the iQ-WEBX WADO module version number, license version number, as well as the creation and expiration date of the license. To install the license via the web interface, browse for the "wado.lic" file provided by the License team of IMAGE Information Systems Europe GmbH, and use the "Install License File" button to upload the license.

To manually install the license, copy the "wado.lic" file and paste it into the "[iQ-WEB installation folder]\PACS\php" folder.

9.3.4.6 Order licenses/request support

Order Licenses/Request Support

Step 1:	Collect and download the iQ-WEB license information in a ZIP file: Download license information
Step 2:	Send the license information ZIP file to your local distributor to obtain the valid license files, support, or product informati
Step 3:	Install the given license information and files received in return in the corresponding sections above.

Figure 11 – License ordering

When licenses are requested, certain information is required by the License team to process those licenses for new installations, migrations, or updates. The last area of the licensing page contains information to guide the user through the ordering process. Click the "Download license information" button to create a "LicenseInfo.zip" file. Then send this zip file to your local distributor or the License department of IMAGE Information Systems Europe GmbH to obtain the desired license(s).

9.3.5 Today's log

This page displays the content of the current log file with the most recent event on top refreshing itself every 30 seconds. Using the download button will download the complete log file which is currently in use. Log entries are color coded to enhance readability.

- Black - Information log entries
- Blue - Debug log entries
- Orange - Warning log entries
- Red - Error log entries

The log level can be changed under "Tools" → "System" (see section 9.3.3.1.2 "iQ-WEB"). Changing the log level from standard level "Information" to "Debug" can help to find all kinds of issues that may occur during operations of iQ-WEB. The log files are stored in the folder that has been chosen during the configuration of iQ-WEB. By default the path is "[iQ-WEB installation folder]\PACS\log\[AET]".

Figure 12 – Today's log

9.3.6 Live monitor

This page displays all active DICOM connections, incoming as well as outgoing. If there are active connections, it is possible to interrupt. This will instantly cancel the action and close the connection.

Figure 13 – Live monitor

9.4 The "Settings" menu: configuring the behavior of iQ-WEB

9.4.1 Managing user accounts in iQ-WEB

iQ-WEB comes with an extensive user management system providing user privilege management, user groups and additional administrator user management.

After the successful installation of iQ-WEB, there are already two users in the user database.

The first one is the super-user "root" which is the administrator account that was set up during the MySQL configuration. This account has every access privilege existing in iQ-WEB.

The other is the "dicom" user that has been created during the initial configuration of iQ-WEB. This account is strictly for internal use, and, therefore, it is not possible to use this account to get access to the web interface of iQ-WEB.

9.4.1.1 Privacy attributes

Medical images and reports are sensitive information that should not be accessed by unauthorized people. For that reason, iQ-WEB provides a privacy attribute mechanism to handle the access to patient/study data between different users of the system. For each patient/study the following states can be specified:

- **Public**: If a patient or a study is marked as public, all images within the studies and the corresponding patient can be accessed by any iQ-WEB user account, without requiring any privileges.
- **Private**: If a patient or a study is marked as private, all images within the studies are private as well. To get access to these images, you must either have the global "View" permission, or your last name and first name must match the Referring Physician's Name or the Reading Physician's Name of the patient/study. In addition, members of a user group will have access to private patients/studies when the group description matches the predefined value set in the user group options. Refer to section 9.4.1.4 "Creating user group accounts" for more details.

NOTICE:
The privacy state can be defined on the patient level, which is inherited by all studies of the patient, and on the study level directly. It is represented by a lock icon in the study and patient views. For a detailed description, refer to the Instructions for Use.

9.4.1.2 Creating, modifying and deleting individual user accounts

User accounts can be added, modified or deleted in the "User account" section under menu item "SETTINGS" → "Users" by using the respective buttons. When adding or modifying user accounts, the following information can be specified:

- **User Information**
  - "Username": Assign a unique username for the person who needs access to iQ-WEB.
  - "Password": This is the password for the username mentioned above.
  - "Allow user/group to change his password": Unchecking this revokes the user's permission to change his password.

NOTICE:
If you disable this setting, the user cannot renew expired passwords by himself and will need administrative assistance. Check your password expiration settings if disabling this setting.

  - "First Name": First name of the user, limited to 20 characters
  - "Last Name": Last name of the user, limited to 20 characters
  - "Middle Name": Middle name of the user, limited to 20 characters
  - "User Email Address": Enter the email address of the user and choose whether or not this user will receive an email notification when a new study has arrived where the user's first and last name match the defined referring physician name in the study. (For this option to work, an email server must be defined in "Settings\Email". See section 9.4.3 "Setting up an SMTP server for email" for more information.)

Figure 14 – User information in user accounts

▪ **Group Membership**: This section defines which user group(s) the user belongs to. A user can be a member of more than one user group at a time.

Figure 15 – User group membership in user accounts

NOTICE:
Only existing groups can be chosen for user group membership.

▪ **General Privilege Settings**: This section defines a list of privileges users have when using iQ-WEB and its additional software options (i.e. iQ-4VIEW, iQ-X and iQ-WEBX WADO9.

With the permission levels described in the table below, three categories of users can be defined:

Category	Description
Administrator users	These are the user accounts created at "Administrator Accounts" in the Settings → Users page in iQ-WEB. They have access to the same system-level configuration information as the user "root".
Power users	These are the user accounts with the "Modify" and "View" permissions enabled. Such users have access to all public and private patients/studies in the database. They can also modify and delete existing database records.
Regular users	These accounts are usually created for the referring physicians or reading physicians. They do not have the permission to "View" and only have access to the public patients/studies or the private patients/studies, who's Referring/Reading Physician Name matches the Last Name and First Name of the user profile.

For each user the following access privileges can be managed by an administrator account.

Access privilege	Description
View	Required to view private patients/studies
Modify	Required to change database attributes
Forward	Required to forward images stored in iQ-WEB to a remote AE
Query	Required to query remote Query/Retrieve SCP application entities
Move	Required to retrieve images from remote Query/Retrieve SCP application entities
Download	Required to download iQ-WEB images from a web browser using the "Download Content" button
Print	Required to print images on DICOM printers
Export	Required to export images stored in local iQ-WEB database to DICOM Standard Part 10 formatted directory and files with DICOMDIR directory information
Import	Required to import external DICOM formatted directory and/or raw image files into iQ-WEB database
Upload	Required to upload text files, PDF/Word documents, audio/video clips, etc. into iQ-WEB database
Monitor	Required to access system monitoring activities such as system logs, live monitors, etc.
Mark	Required to mark a study as either Read or Unread
Change Storage Location	Required to change the storage location of DICOM studies
Structured Reports	Required to create DICOM Structured Reports in iQ-X/iQ-4VIEW
Secondary Capture	Required to create secondary capture images in iQ-4VIEW
Create WADO Link	Required to create WADO links for individual studies

General Privilege Settings	
View Privilege:	☐ Enable privilege to view private patients/studies stored in the iQ-WEB database.
Modify Privilege:	☐ Enable privilege to modify the iQ-WEB database tables.
Forward Privilege:	☐ Enable privilege to forward images stored in the iQ-WEB database to **all** configured remote AEs.
	Enable privilege to forward images stored in the iQ-WEB database to remote AEs specified in list below only:
	N/A -Add Application Entity
Query Privilege:	☑ Enable privilege to query remote Query/Retrieve SCP applications.
Move Privilege:	☑ Enable privilege to move images stored in remote Query/Retrieve SCP applications.
Download Privilege:	☑ Enable privilege to download images from web browsers.
Print Privilege:	☑ Enable privilege to print images from web browsers.
Export Privilege:	☑ Enable privilege to export studies for DICOM-compatible media interchange.
Import Privilege:	☑ Enable privilege to import images from DICOM-formatted media or directory.
Upload Privilege:	☐ Enable privilege to upload files such as notes, Word/Pdf documents, audio/video clips, etc.
Monitor Privilege:	☐ Enable privilege to access system monitoring activities such as system logs, live monitors, etc.
Mark Privilege:	☐ Enable privilege to mark a study as read or unread.
Change Storage Location Privilege	☐ Enable privilege to change storage location of received DICOM studies.
Structured Reports Privilege:	☐ Enable privilege to create DICOM Structured Reports in iQ-X/iQ-4VIEW.
Secondary Capture Privilege:	☐ Enable privilege to create DICOM Secondary Capture images in iQ-4VIEW.
Create WADO Link Privilege:	☐ Enable privilege to create WADO links for individual studies.

Figure 16 – General user privileges

> **NOTICE:**
> *The super-user "root" has all of the permissions mentioned in the table above and is allowed to maintain MySQL installation.*

▪ **Advanced Privilege Settings**: In the Advanced Privilege Settings section it is also possible to grant more granular access rights to the users. This is accomplished with User Access Filters which allow user the access to patients/studies according to matching DICOM elements. This extends the standard matching mechanism of Referring and Reading Physician Name. This mechanism also allows the combination of matching DICOM elements with a standard logical conjunction.

Figure 17 – Advanced user privilege settings

The following elements are supported as filtering attributes:
- "Source AE-Title"
- "Referring Physician Name"
- "Reading Physician Name"

- "Institution Name"

Using more than one filter will combine all criteria with a logical AND (&&).

> **NOTICE:**
> *It is only possible to choose values for these elements that already exist in the database.*

9.4.1.3 Searching for user accounts

This option is not available when using LDAP synchronization. Refer to section 9.4.1.10 for details regarding this feature.

Users can be filtered based on the following criteria:

- Username
- First Name
- Last Name
- Middle Name
- Email

When a search is performed, the system will determine if the search string is contained within the user criteria. The search results will replace the user list. If no results are returned, the list will be empty. To show all existing users again, use the "Back" link.

9.4.1.4 Creating user group accounts

When using LDAP synchronization, this option is only available if groups are already defined on the LDAP server. Refer to section 9.4.1.10 for details regarding this feature.

User group accounts are an administrative mechanism to combine iQ-WEB user accounts and make it easier to specify view privileges for all of them at once. It can also be used as a shared user account.

User group accounts can be added, modified or deleted in the "User Group Accounts" section under menu item "SETTINGS" → "Users".

User group accounts are set up like a normal user account, but there are three additional options: Group Description, Group Share and Substring Group Matching.

Figure 18 – User group settings

- **Group Description**: This option allows a DICOM attribute to be chosen and a value defined. Every user in the group has access to patients or studies where the defined value matches the value of the DICOM attribute of the patient/study exactly.
  The currently supported DICOM attributes are:
  - "Institution Name (0008,0080)"
  - "Patient ID (0010,0020)"
  - "Other Patient ID (0010,1000)"
  - "Patient Comments (0010,4000)"
  - "Accession Number (0008,0050)"
  - "Source AE (0002,0016)"
  - "Study Description (0008,1030)"
- **Group Share**: If this option is enabled, the "View" access of any user in this group is being shared with all other users of this group. iQ-WEB will check all members of the group to determine whether users of the group can access that private patient/study. If a user of this group has a matching last name/first name with either the Referring or the Reading Physician of a private patient/study, and Group Share is enabled for the group of that user, then all other users of this group will have access to the same private patient/study.
- **Substring Group Matching**: If this option is enabled, iQ-WEB will check whether the value entered in Group Description is a substring of the chosen DICOM attribute of the patient/study, instead of using an "exact-matching" method to allow access to a private patient/study.

9.4.1.5 Creating administrator accounts

Administrators have every access privilege that can be given individually to normal users. In addition, they have the ability to add or modify user accounts. Furthermore, there are functions in iQ-WEB that can only be used and set up by administrator accounts like "Automatic Purging" or the options on the "DICOM" page.

Such accounts can be added, modified or deleted in the "Administrator Accounts" section under menu item "SETTINGS" → "Users".

9.4.1.6 Configuring the behavior for failed login attempts

This option is not available when using LDAP synchronization. Refer to section 9.4.1.10 for details regarding this feature.

Under menu item "SETTINGS" → "Users", the behavior following failed login attempts can be configured in section "Failed Login Attempts".

iQ-WEB records all failed login attempts either caused by using a wrong username or a wrong password. The attempts will be listed in this section. Additionally, the amount of failed attempts will be shown as well as the option to reset/delete the records of failed attempts. After a configured number of failed attempts in a specified time, iQ-WEB will block the user from logging into iQ-WEB (see section 9.4.2.5 "Global settings"). This is a security mechanism to prevent automated intrusion attempts.

Figure 19 – Failed login attempts

NOTICE:
It is possible to reset the login attempts manually by deleting the respective files under "[iQ-WEB installation folder]\PACS\FailedLogin" (default installation path). To do so, access to the file system with appropriate permissions is needed.
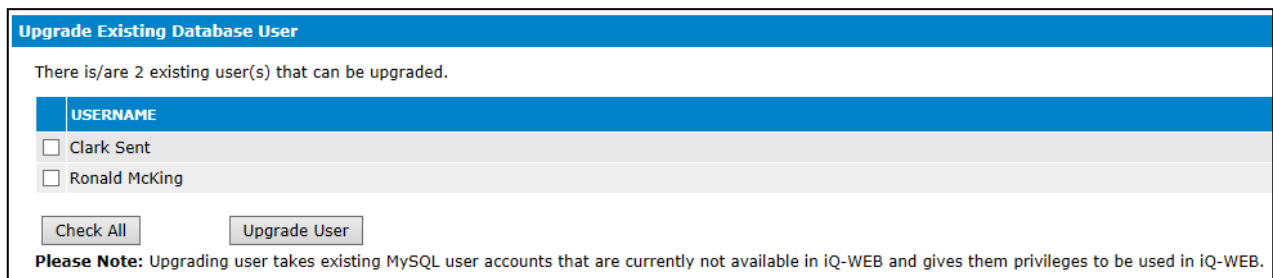
9.4.1.7 Upgrading existing database users

This option is not available when using LDAP synchronization. Refer to section 9.4.1.10 for details regarding this feature.

Go to menu item "SETTINGS" → "Users" into section "Upgrade Existing Database User" in order to upgrade user accounts that can only be found in the MySQL database but have no access to the iQ-WEB web interface.

This feature allows administrators to take existing MySQL user accounts, which may exist because of an incorrectly performed upgrade or due to a manipulation of the database, and make them available in iQ-WEB.
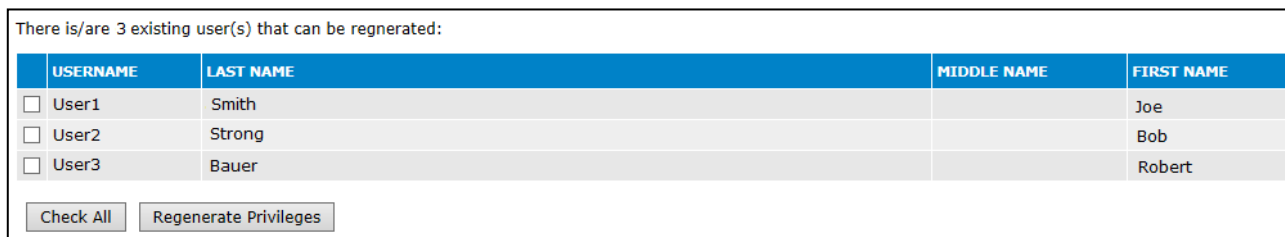
Figure 20 – Upgrade user

Select the user account you wish to upgrade by marking the checkbox in front of the entry and click "Upgrade User". You can use the "Check All" button to perform the upgrade for all found user accounts.

9.4.1.8 Regenerating existing iQ-WEB users

This option is not available when using LDAP synchronization. Refer to section 9.4.1.10 for details regarding this feature.

With this feature, administrators are able to update the database access privileges of existing iQ-WEB users. This might be necessary, because some users originate from old iQ-WEB installations. In that case, they have no access to new database tables or columns and will not be able to use the complete functionality of iQ-WEB.

Under menu item "SETTINGS" → "Users", to section "Regenerate Existing iQ-WEB User". Click the button "Regenerate All Users Privileges" to get a list of all iQ-WEB users. Select the user whose privileges need to be regenerated and click "Regenerate Privileges". Use the "Check All" button to perform the action on all users.
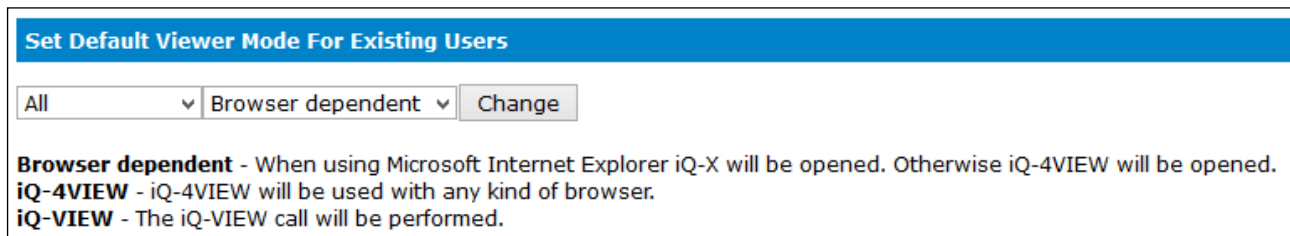

Figure 21 – Regenerate user

9.4.1.9 Set default viewer mode for existing users

iQ-WEB is able to launch different viewers from its web interface, each focusing the needs of different user groups. This feature allows to change the viewer launched for an existing selected user or all existing users. Newly added users will always have the system-wide default value of "browser dependent".

Go to menu item "SETTINGS" → "Users" into section "Set Default Viewer Mode For Existing Users" for a global viewer mode setting.

The available options are:

- **Browser dependent**: Launches iQ-X on Internet Explorer and iQ-4VIEW on all other web browsers
- **iQ-4VIEW**: Always launches iQ-4VIEW
- **iQ-VIEW**: Calls a local iQ-VIEW to receive and display the selected images/studies

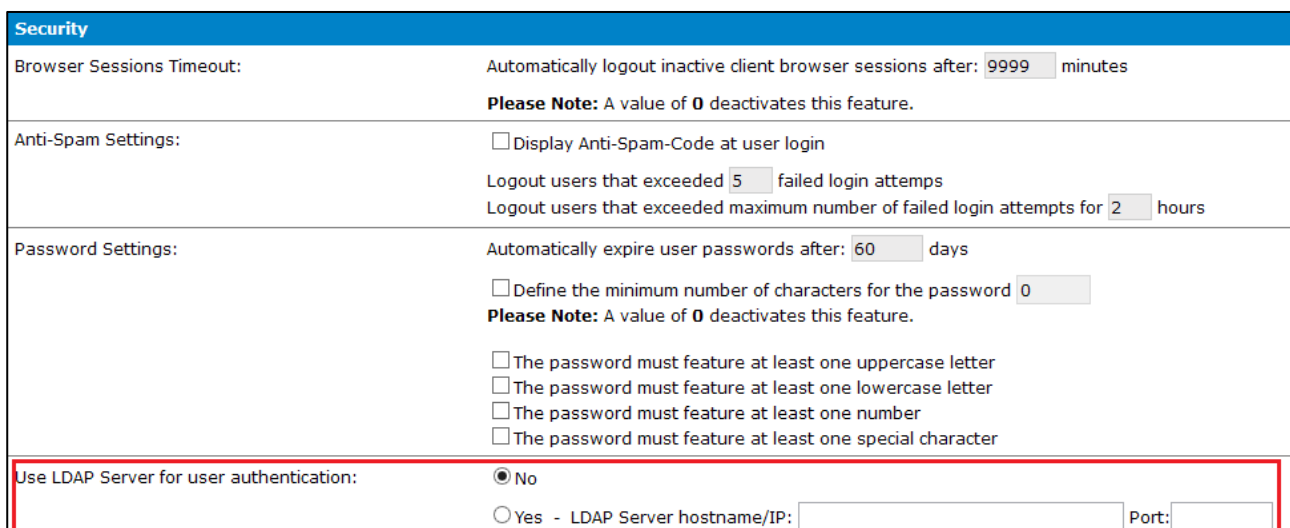*Figure 22 – Default viewer mode for existing users*

NOTICE:
Use this feature with great caution, to avoid inaccessible viewers:
The viewer launch still depends on valid licensing for the selected module.
Setting the same viewer for all users is appropriate in special situations only.
The iQ-VIEW option exclusively works for users with configured iQ-VIEW Call and located at a machine with a working iQ-VIEW instance.

9.4.1.10 Integrating the iQ-WEB user account management with a remote LDAP server

If enabled in the Configuration page (see Section "System Configuration"), The iQ-WEB server can also integrate with a remote LDAP server and synchronize with all the user accounts from the LDAP server, so that these users can also access the iQ-WEB interface without a second set of user authentication (user name and password).

This option is enabled under menu item "SETTINGS" → "System". Go to section "Security".

Figure 23 – Setting up LDAP for user authentication

By default, the setting is disabled. Select "Yes" and enter the hostname or IP address of the LDAP server in your network and its port. Confirm with the button "Modify Configuration" at the end of the page.

NOTICE:

Make sure that an LDAP synchronization is really a good choice for your workflow. It will not be possible to mix LDAP-synchronized accounts with user accounts created in iQ-WEB. If you have users accessing iQ-WEB outside of LDAP, the use of this option would lead to a deletion of their user accounts every time a synchronization with the LDAP server is performed (in case of new accounts or deletion of accounts).

Under menu item "SETTINGS" → "Users" you will now see a new section called "LDAP Connection", where you need to configure the details of your LDAP server and the mapping for the individual attributes:
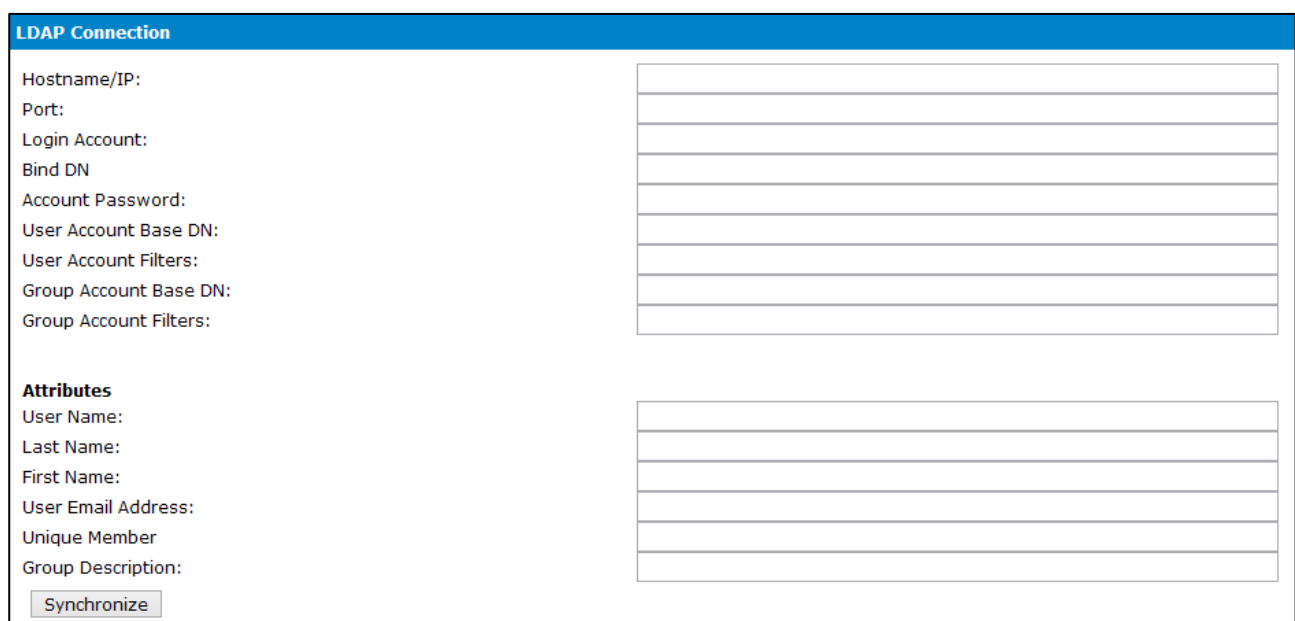

Figure 24 – Configuring the LDAP connection

The "Hostname/IP" and "Port" fields are already filled in due to the configuration on the "System" page. Enter the missing details. The items "Group Account Base DN" and "Group Account Filters" must only be filled in if you also want to synchronize user groups defined on the LDAP server and use them in iQ-WEB.

NOTICE:

Note that it will not be possible to set up user groups in iQ-WEB for LDAP-synchronized users. If you need to group users for the workflow in iQ-WEB, you need to set up these user groups on your LDAP server before synchronizing the systems.

Under "Attributes", you need to enter the matching parameters. Use the parameter as it is defined on your LDAP server, e.g. "Last Name" as "lastname" or "First Name" as "givenname".

After you are done, click the "Synchronize" button to start the user account synchronization between iQ-WEB and the configured LDAP server.

Once the synchronization is complete, the "Users" page will show a list of all available user accounts. You can now configure the privilege settings for every synchronized user account. See section 9.4.1.2 for details on modifying accounts.

9.4.2 Configuring global system settings

Under the menu item "SETTINGS", the "System" page allows you to define the global settings for the iQ-WEB server. For easier orientation, the configuration options are sorted by topic.

9.4.2.1   Storage

iQ-WEB stores DICOM data as it is received into folder structures and registers the data into the database. The following storage settings are global and can be overwritten by specific DICOM node configurations. For more details refer to section 9.5.1 "DICOM".

▪ **Default Short-Term Archive Directory**: This is the directory where all the images received will be stored unless a specific short-term archive directory has been defined for a source AE.

▪ **Default Long-Term Archive Directory**: This is the location where all images will be moved if automatic aging is configured and executed unless a specific long-term archive directory has been defined for a source AE.
▪ **Default Archive Directory Format**: This option controls the hierarchy under the designated archive directory.
  - "Flat": Received images are stored under %assigned directory%/YYYY-MM-DD-WEEKDAY/[sub-folders]
  - "Hierarchical": Received images are stored under %assigned directory%/YYYY/MM/DD/WEEKDAY/[sub-folders]
  - "By Study Instance UID": Received images are stored under %assigned directory%/%StudyInstanceUID%/[sub-folders]

9.4.2.2 Automatic aging

Automatic aging is a feature that is intended to help separating most recently stored DICOM data from data which is older. To achieve this, automatic aging moves images form the short-term archive to the defined long-term archive. To enable this feature, enter the amount of days and setup a schedule by defining a weekday and a time. iQ-WEB will move images that were received more than the specified number of days ago according to the schedule given.

Automatic Aging	
Setup:	☐ Age images received more than 0 days ago
	Automatic Aging moves data from the default Short-Term Archive directory to the default Long-Term Archive directory according to the schedule above.
Aging Schedule:	Run Automatic Aging weekly on every Sunday ▾ At this time of day: 12:00 AM ▾

Figure 25 – Automatic aging setup

Examples:

- **Flat**: On 01/25/2013 all images should be aged to the directory "C:/longterm". There are images that were received on 01/20/2013. During the automatic aging process the images will be moved to the directory "C:/longterm/2013-01-25/2013-01-20/[images]".
- **Hierarchical**: On 01/25/2013 all images should be aged to the directory "C:/longterm". There are images that were received on 01/20/2013. During automatic aging process the images will be moved to the directory "C:/longterm/2013/01/25/2013/01/20/[images]".
- **By Study Instance UID**: On 02/20/2013 all images should be aged to the directory "C:/longterm". There are images that were received on 01/20/2013. During automatic aging process the images will be moved to the directory "C:/longterm/2013/02/20/[Study Instance UID]/[images]".

9.4.2.3 Security

This section includes information regarding global security settings.

- **Browser Session Timeout**: This value defines the time that must pass before an inactive browser session on a client machine will be logged out. This is a security feature designed to prevent unintended access to iQ-WEB and its data on a publically available client machine.

NOTICE:
A value of 0 deactivates this feature.

- **Anti-Spam Settings**: You can configure the following settings to prevent outside web bots from spamming the server with automated login attempts.
  - "Display Anti-Spam Code":
    If this setting is enabled an anti-spam security code contained in an image will be generated for each user login. Users must enter this anti-spam code, as well as their password, to log into the system.
    (In previous versions, this function could be modified by using the "antispam.code" file in the "[iQ-WEB installation folder]/PACS/" subfolder of iQ-WEB.)
  - "Maximum login attempts":
    Users will have a defined maximum number of login attempts until they must wait a specified amount of time for their next login.
  - "Waiting time until next login":
    Users that exceeded the maximum number of failed login attempts will have to wait the specified number of hours until they are allowed to login again or an administrator resets their failed login attempts.
- **Password Settings**: You can configure the following settings related to the password security. Available options are:
  - Automatically expire the user password after X days
  - Minimum number of characters for the password
  - Password must feature at least one uppercase letter
  - Password must feature at least one lowercase letter
  - Password must feature at least one number
  - Password must feature at least one special character
- **Use LDAP Server for user authentication**: You can decide whether to set up the individual users in iQ-WEB or to synchronize users with an LDAP server. Refer to section 9.4.1.10 for details.

9.4.2.4 Administrative

This section includes information regarding settings addressing especially the administrator.

- **Administrator's Email Address**: Here you can specify one or more email addresses, e.g. the email of the PACS administrator. Email addresses must be separated by a comma, a semicolon or a space to be recognized properly. All system-generated emails, including reports, notifications etc. will be delivered to these email addresses.

- **Statistic Report Emails**: Administrators can subscribe to the following automatically generated statistics sent to the administrator's email address. These reports contain statistic information about received studies in a period of time.
  - Daily statistical report emails
  - Weekly statistical report emails
  - Monthly statistical report emails
  - Monthly journal report emails
- **PHP Runtime Executable**: In this field, the full path of the PHP executable must be entered. By default, the path is "[iQ-WEB installation folder]/PHP/php.exe".
- **Thumbnail Directory**: This path defines the directory for storing converted thumbnail JPEG/GIF images. iQ-WEB will automatically add a "thumbnails" sub-folder to the entered directory. By default, the path is "[iQ-WEB installation folder]/PACS/php".
- **Web Images**: This path defines the directory for storing converted JPEG/GIF web images. iQ-WEB will automatically add an "images" sub-folder to the entered directory. By default, the path is "[iQ-WEB installation folder]/PACS/php".

9.4.2.5 Global settings

This section includes information regarding global settings such as notification, workflow, date/time, and language/character set.

- **Notifications**: You can enable an email notification system that sends an email to registered user's email address about any failed job submitted by that user.
- **Date and Time Formats**: You can switch between the global display format of the date and time:
  - United States format (YYYY-MM-DD HH:MM:SS)
  - European format (DD.MM.YYYY HH:MM:SS)
- **Workflow**: You can configure the following global settings that will influence the user's workflow of iQ-WEB in this section.
  - "Bypass series level and display all images of a study directly"
    This setting disables the series level view when navigating from study level view to the image level view.
  - "Enable automatic conversion of received DICOM images into thumbnail/full-size JPEG/GIF images"
    By default iQ-WEB generates thumbnail/full-size JPEG/GIF images on demand if they are necessary for the web interface display. The setting switches this behavior so that iQ-

WEB automatically generates thumbnails when receiving new DICOM data, whether they will actually be needed or not.
- "Automatically mark studies or patients as read when opening in a viewer"
  iQ-WEB allows to setup a workflow where opening a study in a viewer will mark the study as read to track progress.
- "Display a blank version of EasyWEB page"
  Users initially see a blank EasyWEB page after logging in and must enter search criteria to display any studies. In previous versions, this function was modified by using the "easyWebpage.code" file in the "[iQ-WEB installation folder]/PACS/" subfolder of iQ-WEB.
- "Enable Philips ISP call on EasyWEB page"
  This option allows a connection to the Philip's IntelliSpace Portal, if available. Contact support@image-systems.biz for further details.

▪ **Convert received DICOM Video into Web Video Format**: By default, this option is disabled. If you are handling DICOM videos in your institution, you can let iQ-WEB convert these into a supported web video format after reception. The following formats are available:
  - WebM
  - MP4
  - SWF (for this format a Flash player must be installed on the iQ-WEB client viewing these videos)
  - "No": Disables the automatic video conversion.
  The field **Conversion Options** allows you to further specify the video conversion, using specific parameters. The use of this feature is optional. You can find a list of possible options at https://ffmpeg.org/ffmpeg.html#Video-Options.

▪ **Specific Character Set**: This option changes the display of a specific character set in the web interface. When presenting patient names in the web interface especially, this option forces the client web browser to interpret the web interface delivered by the web server using the selected encoding. If "Default" is selected, the browser will try to automatically detect the correct encoding. This depends on consistent DICOM encoding. The following character sets are supported:

Character set	Standard
Latin Alphabet Part 1	ISO-8859-1 / ISO_IR 100
Latin Alphabet Part 2	ISO-8859-2 / ISO_IR 101
Latin Alphabet Part 3	ISO-8859-3 / ISO_IR 109
Latin Alphabet Part 4	ISO-8859-4 / ISO_IR 110
Latin Alphabet Part 5	ISO-8859-9 / ISO_IR 148
Russian	ISO-8859-5 / ISO_IR 144
Arab	ISO-8859-6 / ISO_IR 127
Greek	ISO-8859-7 / ISO_IR 126
Hebrew Logical Order	ISO-8859-8 / ISO_IR 138
Thai	TIS-620 / ISO_IR 166
Japanese JIS X 0201 Katakana	ISO-2022-JP / ISO_IR 13
Japanese JIS X 0201 Romaji	ISO-2022-JP / ISO_IR 14
Latin Alphabet Part 1 with code extension	ISO-8859-1 / ISO 2022 IR 100

Character set	Standard
Latin Alphabet Part 2 with code extension	ISO-8859-2 / ISO 2022 IR 101
Latin Alphabet Part 3 with code extension	ISO-8859-3 / ISO 2022 IR 109
Latin Alphabet Part 4 with code extension	ISO-8859-4 / ISO 2022 IR 110
Latin Alphabet Part 5 with code extension	ISO-8859-9 / ISO 2022 IR 148
Russian with code extension	ISO-8859-5 / ISO 2022 IR 144
Arab with code extension	ISO-8859-6 / ISO 2022 IR 127
Greek with code extension	ISO-8859-7 / ISO 2022 IR 126
Hebrew Logical Order with code extension	ISO-8859-8 / ISO 2022 IR 138
Thai with code extension	TIS-620 / ISO 2022 IR 166
Japanese JIS X 0201 Katakana with code extension	ISO-2022-JP / ISO 2022 IR 13
Japanese JIS X 0208 Kanji with code extension	ISO-2022-JP / ISO 2022 IR 87
Japanese JIS X 0212 Supplementary Kanji with code extension	ISO-2022-JP / ISO 2022 IR 159
Korean with code extension	EUC-KR / ISO 2022 IR 149
Unicode	UTF-8 / ISO _IR 192
Simplified Chinese	GB2312 / GB 18030

Figure 26 – Character sets

NOTICE:
Due to browser limitations, it is not possible to use more than one character set at the same time. The language and regional settings of the operating system used also influence the correct display of character sets. The only way to display characters from different languages at once is by using Unicode.

NOTICE:
If a translation is used for the iQ-WEB user interface, it is mandatory that the character set used in the translation file matches the settings in the iQ-WEB user interface to ensure a comprehensive display.

- **Choose Language**: This setting will change the language of the web interface for all clients. If "Auto" is selected, the individual client browser settings will be taken into account. Most modern browsers allow specifying a priority list of preferred languages.
  iQ-WEB provides a mechanism to translate into custom languages. By default only German, English, Spanish and Russian are included in the installation routines. Administrators can specify a custom language if the language is note included by default. For more details refer to section 9.7 "Translating the iQ-WEB user interface".

NOTICE:
Logging out and in again may be required to fully apply the language settings. If iQ-WEB doesn't find the appropriate language files to match the setting it will switch back to the default English language.

9.4.2.6 iQ-4VIEW

- **User Session Timeout**: This option determines the amount of minutes of user inactivity that shall pass before the concurrent user slot will be freed. For details concerning concurrent licensing, refer to iQ-4VIEW's documentation.
- **Image Generation**: By enabling this option, iQ-WEB will initiate the generation of images used by iQ-4VIEW for all received DICOM image data. Furthermore, an amount of days can be defined after that these created images shall be deleted. A value of 0 will deactivate the image deletion.

9.4.2.7 Upload

- **Maximum Upload File Size**: This value defines the maximum amount of Mbytes that can be uploaded using actions like "Upload DICOM Image."

> **NOTICE:**
> *In order to apply this setting, the corresponding values in the php.ini must also be configured. The values for "upload_max_filesize" and "post_max_size" will need to be modified.*

> **NOTICE:**
> *If the option "Upload Attachments" is set to "Store uploaded attachment into database table directly," the my.ini of the database must be altered. The value for "max_allowed_packet" will need to be modified.*

- **Upload Directory**: This is the directory for storing attachments and DICOM images uploaded by users.
- **Storage Option**: This option defines how uploaded attachments should be stored. Either into the database table directly or under the above defined "Upload Directory".

9.4.2.8 Auto-scan import

If this feature is enabled, it allows iQ-WEB to automatically scan a configured directory and import files found with the "*.dcm" filename extension into iQ-WEB.

- **Source Directory**: The path to the directory that should be scanned must be entered here.
- **Destination Folder**: Automatically imported images will be stored in this folder.
- **Scan Interval**: This value defines how often the "Source Directory" should be scanned for new images. The value is entered in seconds.

> **NOTICE:**
> *Paths entered must be accessible by the iQ-WEB server system. A mapped drive or UNC path may be used here. Make sure that the Windows user for both the Apache and the iQ-WEBX service have the required permissions to access and read/write in the directories.*

9.4.2.9 Worklist

Besides the core feature of iQ-WEB to archive DICOM image data it can process DICOM modality worklist data. This section provides global settings for handling this worklist data.

- **Aging Period for Purging**: Worklist records that were received more than the specified number of days ago will be purged automatically.
- **Reconciliation Feature**:
  - "Patient Reconciliation"
    If enabled, iQ-WEB will use the demographic information of patients (Patient ID, Patient Name, and Date of Birth) from the DICOM Modality Worklist data to match these studies with the same information of the received DICOM studies. Patient names in the studies will be corrected automatically if any discrepancy is found.
  - "Study Reconciliation"
    If enabled, iQ-WEB will use study-related information (Referring Physician's Name and Requesting Physician's Name) from the DICOM Modality Worklist data to match these studies with the same information of the received DICOM studies. Referring physician's name and/or requesting physician's name in the studies will be corrected automatically, if any discrepancy is found.
- **Auto-Scan for Worklist Data**: If enabled, iQ-WEB will automatically observe a defined directory for DICOM Modality Worklist files and import the data into the database.
  - "Auto-Scan Source Directory"
    iQ-WEB will scan any text file in this source directory and import the properly formatted worklist data into the database.
  - "Scan Interval"
    This value defines how often the "Source Directory" should be scanned for new images. The value is entered in seconds.

9.4.2.10 HL7

In this section, the automatic conversions of incoming HL7 ORM messages to DICOM Modality Worklist records can be activated. How the HL7 segments match the worklist fields is stated in the table below.

Currently this mapping cannot be modified.

DICOM modality worklist data	HL7 ORM message field
Patient Name (0x00100010)	PID-5

DICOM modality worklist data	HL7 ORM message field
Patient ID (0x00100020)	PID-3
Accession Number (0x00080050)	ORC-2
Scheduled AE Station Title (0x00400001)	ORC-4
Requested Procedure ID (0x00401001)	OBR-4
Scheduled Procedure Start Date (0x00400002)	OBR-36
Scheduled Procedure Start Time (0x00400003)	OBR-36
Modality (0x00080060)	OBR-44.2

9.4.3 Setting up an SMTP server for email notifications

This section allows an administrator to configure an SMTP server that iQ-WEB will use for sending outgoing emails.

Such emails are:

- Statistic report emails
- Monthly system journal
- Notifications for referring physicians when a new study arrives
- Trial expiration notification
- Sending images in JPEG

Click the "Add" button to open the configuration site that allows you to set up email notifications and contains the following items:

- **Hostname or IP Address of SMTP Server**: In this field, the hostname or the IP address of the SMTP server must be entered.
- **Port Number of SMTP Server**: Represents the TCP port number the SMTP server listens to. Default port is 25. This will change when enabling SSL/TLS.
- **Encryption**: Gives the option to encrypt the email transmission with TLS or SSL.
- **Connection Timeout**: Defines the time period after which the connection attempt will be aborted if there is no response from the SMTP server. Default is 10 seconds.
- **Description of SMTP Server**: Is used to enter a short description of the STMP server. This item is not required.
- **System Email Address**: This is the email address that iQ-WEB uses as sender and that will be displayed in the "From" field in outgoing emails.
- **Sender Name**: This will be the name that used in the "FROM" field of all emails that are sent using this SMTP server.
- **Authentication Type**: Defines the authentication with which the SMTP server is contacted. The following authentication types are possible:
  - None: No other configuration is required.
  - LOGIN, PLAIN, CRAM-MD5: A valid username and a password are required.
  - NTLM: A valid username and a password as well as a hostname of the NTLM workstation are required.

Figure 27 – SMTP configuration

Once an SMTP server is configured and applied, the configuration will be listed. A test email can be sent to a self-determined address in order to verify the connection. Use the "Edit" link to modify the configuration and the "Delete" button to remove a configured SMTP server.

	SMTP SERVER	TCP PORT	ENCRYPTION	CONNECTION TIMEOUT	DESCRIPTION	FROM EMAIL ADDRESS	FROM PERSON NAME	AUTHENTICATION	EDIT
☐	smtp.address	25	None	10 Seconds	Identifying name	iq-web@yourinstitution.com	iQ-WEB Notification	LOGIN	Edit

Check All Delete Send Test-Email to:

Figure 28 – SMTP server list

9.4.4 Configuring routing of DICOM data and HL7 messages

9.4.4.1 Setting up automatic routing of DICOM objects

In addition to forwarding patients, studies, or series manually from the iQ-WEB web user interface, you can define automatic routing table entries to forward images automatically based on the following rules.

Go to the menu item "SETTINGS" and select the entry "Routing" from the sub-menu. Use the "Add" button under the first table "DICOM Routing Entry(ies)" to add a new DICOM routing rule.

Figure 29 – Adding DICOM routing rules

After one or more rules were added, they will be displayed in the list, where they can also be edited ("Edit" link) or disabled/enabled ("Disable"/ "Enable" link). Use the available buttons under the table to add further rules, to delete selected rules or to disable/enable all rules at once.

Figure 30 – DICOM routing overview

9.4.4.1.1   Defining the main routing criteria

Figure 31 – DICOM routing criteria

- **Source AE Title**: Enter the AE title of the station from which received images shall be routed automatically to a destination. You can use the drop-down list to select from the number of configured AE titles.
- **Key Attribute**: This option is used to define a matching pattern, including wild-card characters "*" and "?", to match against a DICOM attribute tag of a received image. If the pattern string matches the attribute, iQ-WEB will route the received image to the defined destination. Currently the following DICOM attributes are supported:
    - Institution Name (0008,0080)
    - Referring Physician Name (0008,0090)
    - Patient ID (0010,0020)
    - Protocol Name (0018,1030)
    - Performing Physician's Name (0008,1050)
    - Reading Physician's Name (0008,1060)
    - Operator's Name (0008,1070)
    - Study Description (0008,1030)
    - Series Description (0008,103E)
    - Accession Number (0008,0050)
    - Modality (0008 ,0060)
- **Applying the logical AND operator (&&) to both criteria above**: Selecting this criteria will only route images to their destination if both criteria above match their defined pattern.
- **Applying the advanced logical expression**: You can configure an advanced logical expression as an automatic routing rule. This expression can consist of one or more key matching patterns as well as the logical operators AND (&&) and OR (||).

9.4.4.1.2 Setting up the destination station for routing

- **Forward to this destination AE**: Select the AE Title where the images should be sent. The combo box lists all application entities defined at the "DICOM" page.
- **Copy received images to destination folder**: iQ-WEB will copy the received images into the specified destination folder instead of forwarding them to a destination AE.

NOTICE:
The entered path must be accessible by the iQ-WEB server system. A mapped drive or UNC path may be used here. Make sure that iQ-WEB has the required permissions.

9.4.4.1.3 Defining an hourly schedule for automatic routing

Automatic routing schedules by the 24-hour clock with four different options to choose.

- **Immediately**: Images will be routed as soon as they were received.
- **From – To**: Images matching the routing criteria and that will be received during the defined time window will be evenly distributed in batches and then routed at every full hour (e.g. 9:00 am, 10:00 am etc.) during the time frame. Images received outside of the schedule window will not be routed. This is useful to avoid peaks in server performance and network usage.

- **Precisely at**: All matching images will be routed during the defined hour. If there are too many images scheduled to forward during these 60 minutes, then the remaining routing jobs will stay in the "submitted" state and will be processed the next day on the same scheduled hour.
- **Immediately, but only during the hourly window**: Unlike the normal "From – To" schedule, this option will not distribute the routing evenly, instead it will route the images as soon as they are received.
- **Delayed until the following hourly window**: With this option, all images received by iQ-WEB will be scheduled for routing, but the routing itself will only take place during the specified time-frame.

9.4.4.1.4 Defining a weekday schedule for automatic routing

The weekday schedule is combined with the hourly schedule above to determine when or if iQ-WEB should forward the received images. Every day in a 7 day week can be chosen.

9.4.4.1.5 Purging original data after automatic routing to a destination

Select whether or not the images should be deleted after the routing. By default, no purging will take place.

9.4.4.1.6 Specifying retries for failed routing jobs

This time interval in hours specifies the time delay iQ-WEB will wait before retrying a failed job again. By default, it is set to 0 which means that there will be no delay.

9.4.4.1.7 Prioritizing the routing jobs

This option allows you to set a priority to every routing rule. This ensures that more important routing jobs are processed faster than those with a lower priority. Enter a value into the available input field. A higher priority value will result in faster processing. Jobs with higher values will be processed before routing jobs with lower priorities.

9.4.4.1.8 Miscellaneous settings

- **Forward existing oldest studies to destination**: If selected, iQ-WEB will forward the "n" existing oldest studies in addition to the newly received study. If a negative number is entered, iQ-WEB will also route the "n" newest study.
- **Wait "n" minutes for all instances of the study to be received, and forward the entire study instead of individual images**: Selecting this checkbox lets iQ-WEB wait for the specified "n" minutes for all images of the study to be received, then forward the entire study via a single DICOM association to the destination.

- **Wait "n" minutes for all instances of the series to be received, and forward the entire series instead of individual images**: Selecting this checkbox lets iQ-WEB wait for the specified "n" minutes for all images of a series (from a study) to be received, then forward the entire series via a single DICOM association to the destination. All series of a study will be handled this way.
- **Do not use the AE-Title assigned to iQ-WEB**: The AE title of the source AE or a user defined AE title can be chosen when sending the images to the destination AE.

> **NOTICE:**
> *It may be necessary for the user defined AE Title to be recognized by the destination AE. Otherwise, a connection attempt might be rejected.*

- **Preferred DICOM Transfer Syntax when sending to destination AE**: This option allows you to define a specific transfer syntax that will be proposed when routing DICOM data from iQ-WEB to the destination station. If accepted by the target station, iQ-WEB will convert the data before sending. Select the transfer syntax you wish to use from the drop-down list.

9.4.4.1.9   Example routing rules

- Route by source AE Title
- Source AE Title: Scanner
- Destination AE Title: IQSERVER
- Hourly schedule: Immediately
- Weekly schedule: every day
- Auto purge: No

With the routing rule given above, all images received from the AE "Scanner" will be automatically routed to AE "IQSERVER" immediately after they are being received. The received images will be kept in the iQ-WEB database after they are routed to the destination AE.

- Route by key attribute
- Key Attribute Tag: Referring Physician's Name (0008, 0090)
- Matching Pattern: John D*
- Destination AE Title: DCMTK
- Hourly Schedule: 1:00 A.M.
- Weekly Schedule: Tuesday
- Auto Purge: Yes

With the above routing rule, all images received with the referring physician names such as "John Doe" or "John David" will be automatically routed to AE "DCMTK" at 1:00 a.m. local time on Tuesdays. (However, received images with referring physician names such as "Dr. John Doe" or "Mr. John David" do not match the defined routing pattern string, and, therefore, will not be routed.) The images received will be purged after they have been routed successfully to the destination AE "DCMTK."

9.4.4.2 Setting up automatic routing of MPPS messages

In addition to forwarding patients, studies, or series manually from the iQ-WEB web user interface, you can define automatic routing table entries to forward images automatically based on the following rules.

Go to the menu item "SETTINGS" and select the entry "Routing" from the sub-menu. Use the "Add" button under the second table "Modality Performed Procedure Step (MPPS) Routing Entries" to add a new MPPS routing rule.

Figure 32 – Adding MPPS routing rules

After one or more rules were added, they will be displayed in the list, where they can also be edited ("Edit" link) or disabled/enabled ("Disable"/ "Enable" link). Use the available buttons under the table to add further rules, to delete selected rules or to disable/enable all rules at once.

There is/are 3 Modality Performed Procedure Step (MPPS) Routing Entries defined:

	SOURCE AE	KEY ATTRIBUTE	MATCH PATTERN	DESTINATION AE	HOURLY SCHEDULE	WEEKDAY SCHEDULE	PRIORITY	MORE OPTIONS	EDIT	EN/DISABLE
☐	AutoScan	N/A		SERVER	Immediately	Any Day	0	0	Edit	Disable
☐	IQSERVER	Modality (0008,0060)	CR	SERVER	Immediately	Any Day	5	0	Edit	Disable
☐	Any	Performing Physician's Name (0008,1050)	Schmidt^Klaus	SERVER	Immediately	Any Day	0	0	Edit	Disable

Check All | Add | Delete | Enable All | Disable All

Figure 33 – MPPS routing overview

9.4.4.2.1 Defining the main routing criteria

Figure 34 – MPPS routing criteria

▪ **Source AE Title**: Enter the AE title of the station from which received MPPS messages shall be routed automatically to a destination. You can use the drop-down list to select from the number of configured AE titles.

- **Key Attribute**: This option is used to define a matching pattern, including wild-card characters "*" and "?", to match against a key attribute of a received MPPS message. If the pattern string matches the attribute, iQ-WEB will route the received message to the defined destination. Currently the following key attributes are supported:
  - Modality (0008 ,0060)
  - Accession Number (0008,0050)
  - Study ID (0020,0010)
  - Scheduled Procedure Step ID (0040,0009)
  - Requested Procedure ID (0040,1001)
  - Performed Procedure Step ID (0040,0253)
  - Performed Station Name (0040,0242)
  - Performed Location (0040,0243)
  - Performed Station AE Title (0040,0241)
  - Performed Procedure Step Start Date (0040,0244)
  - Performed Procedure Step Start Time (0040,0245)
  - Performed Procedure Step End Date (0040,0250)
  - Performed Procedure Step End Time (0040,0251)
  - Performed Procedure Step Status (0040,0252)
  - Performing Physician's Name (0008,1050=
- **Applying the logical AND operator (&&) to both criteria above**: Selecting this option will only route MPPS messages to their destination if both criteria above match their defined pattern.

9.4.4.2.2   Setting up the destination station for routing

Here, you have to select the AE Title of the station where the MPPS messages should be sent. The station can be chosen from the drop-down list that contains all currently configured AE titles.

9.4.4.2.3   Defining an hourly schedule for automatic routing

Automatic routing schedules by the 24-hour clock with four different options to choose.

- **Immediately**: The MPPS messages will be routed as soon as they were received.
- **From – To**: Messages matching the routing criteria and that are received during the defined time window will be evenly distributed in batches and then routed at every full hour (e.g. 9:00 am, 10:00 am etc.) during the time frame. Messages received outside of the schedule window will not be routed. This is useful to avoid peaks in server performance and network usage.
- **Precisely at**: All matching messages will be routed during the defined hour. If there are too many messages scheduled to be forwarded during these 60 minutes, then the remaining routing jobs will stay in the "submitted" state and will be processed the next day on the same scheduled hour.
- **Immediately, but only during the hourly window**: Unlike the normal "From – To" schedule, this option will not distribute the routing evenly, instead it will route the messages as soon as they are received.

- **Delayed until the following hourly window**: With this option, all messages received by iQ-WEB will be scheduled for routing, but the routing itself will only take place during the specified time-frame.

9.4.4.2.4 Defining a weekday schedule for automatic routing

The weekday schedule is combined with the hourly schedule above to determine when or if iQ-WEB should forward the received MPPS messages. Every day in a 7 day week can be chosen.

9.4.4.2.5 Specifying retries for failed routing jobs

This time interval in hours specifies the time delay iQ-WEB will wait before retrying a failed job again. By default, it is set to 0 which means that there will be no delay.

9.4.4.2.6 Prioritizing the routing jobs

This option allows you to set a priority to every routing rule. This ensures that more important routing jobs are processed faster than those with a lower priority. Enter a value into the available input field. A higher priority value will result in faster processing. Jobs with higher values will be processed before routing jobs with lower priorities.

9.4.4.2.7 Miscellaneous settings

- **Do not use the AE-Title assigned to iQ-WEB**: The AE title of the source AE or a user defined AE title can be chosen when sending the messages to the destination AE.

> **NOTICE:**
> *It may be necessary for the user defined AE Title to be recognized by the destination AE. Otherwise, a connection attempt might be rejected.*

9.4.4.3 HL7 message routing

If the HL7 message listener is installed, administrators can define automatic routing rules to forward HL7 messages based on certain criteria described below.

	SOURCE APPLICATION	KEY ATTRIBUTE	MATCH PATTERN	DESTINATION APPLICATION	SCHEDULE	EDIT	EN/DISABLE
☐	Station1	N/A		Station2	Immediately	Edit	Disable
☐	Any	Message Type	ADT^A04	Station2	From 12:00 AM To 11:00 PM	Edit	Disable

There is/are 2 HL7 Message Routing Entry(ies) defined:

Check All · Add · Delete · Enable All · Disable All

Figure 35 – HL7 routes

9.4.4.3.1 Routing criteria

- **Source application name**: If selected, the defined application name will be used as the string in the "Sending Application" field in the MSH message header.
- **Key in message header**: If this is selected, the administrator can define a pattern that will be compared to a key in the message. If it matches, iQ-WEB will forward the message. Currently, the following keys are supported:
  - "Message type"
  - "Receiving application"
  - "Receiving facility"
  - "Sending facility"

9.4.4.3.2 Destination HL7 application

This is the destination application where the messages should be routed to. The application must be defined on the "HL7" page.

9.4.4.3.3 Schedule

The HL7 routing can be scheduled with the following options:

- **Immediately**: Messages will be forwarded to the destination HL7 application as soon as they are received.
- **From – To**: Images matching the routing criteria and that will be received during the defined time window will be evenly distributed in batches and then routed at every full hour (e.g. 9:00 am, 10:00 am etc.) during the time frame. Images received outside of the schedule window will not be routed.
- **Precisely at**: All matching images will be routed during the defined hour. If there are too many images scheduled to forward during these 60 minutes, then the remaining routing jobs will stay in the "submitted" state and will be processed the next day on the same scheduled hour.

Figure 36 – HL7 route setup

9.5 Setting up DICOM and HL7 communication

9.5.1 DICOM

Figure 37 – DICOM overview

On this page, the configuration of the DICOM nodes can be done. At the top of the page iQ-WEB's own DICOM information is listed consisting of the AE Title, the port number and the hostname. In addition, the maximum number of supported application entity nodes, restricted by the license, is shown.

NOTICE:
For security reasons iQ-WEB rejects DICOM traffic of source DICOM AEs which are not listed on this site.

In general iQ-WEB can act as STORE SCU/SCP, STORAGE COMMITMENT SCU/SCP, Q/R SCU/SCP, WORKLIST SCU/SCP and PRINT SCU in DICOM communication contexts. For a detailed overview about the supported DICOM transactions, refer to the DICOM Conformance Statement of the current version of iQ-WEB.

9.5.1.1 Add or modify a DICOM node

9.5.1.1.1 Global settings

For establishing a working DICOM network connection it is necessary to identify a station and specifying its network address parameters. This section allows specifying the basic parameters iQ-WEB need to address a station for a DICOM network connection.

- **Description**: This field is for a short description of the DICOM node.
- **Application Entity Title**: The AE title of the remote application must be entered here.
- **Hostname**: The hostname of the remote AE must be entered here if no IP address is defined.
- **IP Address**: This field is for the IP address of the remote AE.
- **Port Number**: TCP port number of the remote AE is defined here.
- **Database Access**: If access is disabled, iQ-WEB will reject any association requests with the specified application entity title.

9.5.1.1.2   Storage

Beside the global storage settings, it is possible to configure the storage location of the incoming files for every single DICOM node.

- **Short-Term Archive Directory**: This is the directory where all the received images of this DICOM AE will be stored.
- **Default Long-term Archive Directory**: This is the location where all images of this DICOM AE will moved if automatic aging is configured and executed.
- **Default Archive Directory Format**: This option controls the hierarchy under the designated archive directory.
  - "Flat"
    Received images are stored under %assigned directory%/YYYY-MM-DD-WEEKDAY/[sub-folders of the archive]
  - "Hierarchical"
    Received images are stored under %assigned directory%/YYYY/MM/DD/WEEKDAY/[sub-folders of the archive]
  - "Study Instance UID"
    Received images are stored under %assigned directory%/%StudyInstanceUID%/[sub-folders]
- **Automatic Aging**: Automatic aging moves images from the short-term archive to the defined long-term archive. To enable this feature, enter the amount of days of how old an image could be. The scheduling of the aging is the same as defined on the "Configuration" page.

9.5.1.1.3   DICOM transfer

Figure 38 – DICOM transfer settings

- **Maximum Number of Simultaneous Connections**: This value defines the maximum number of simultaneous outgoing connections the iQ-WEB server will establish to the remote AE.
- **Preferred Transfer Syntax**: This section defines the preferred transfer syntax (TS) when iQ-WEB sends images to this AE or receives images. A compression ratio or compression quality value can be specified for lossy compression algorithms to specify data compression to a level where visual quality of image data is not influenced.

There are three major differences between transfer syntaxes. Some use no compression and handle images as they are. Some use a lossy compression while others use a lossless compression. Using a lossless transfer syntax (TS) will most likely not alter the image quality, but could save time and disk space (faster transmission and smaller file size). Using a lossy TS can influence image quality if the ratio or percentage is too high to be considered diagnostic.

Refer to the DICOM Conformance Statement of iQ-WEB that comes with the installation for a detailed list of supported transfer syntaxes.

▪ **Separate DICOM Presentation Context**: If this option is activated, iQ-WEB uses a new presentation context for each transfer syntax. This context contains only one transfer syntax and the default transfer syntax "Little Endian Implicit".

9.5.1.1.4   DICOM command settings

iQ-WEB can be configured so that it allows defined DICOM actions of AEs only if an attribute value matches the defined filter value. These filters can be set up for the DICOM actions C-MOVE, C-STORE, and C-FIND and, in addition, WORKLIST-FIND. Currently, the supported filters work differently on certain DICOM levels (patient, study, series, and image). See the following tables for a detailed list.

Query/retrieve level: Patient

Command	Institution Name	Referring Physician	Reading Physician
C-STORE	✓	✓	✓
C-FIND	✓	✗	✗
C-MOVE	✓	✗	✗

Query/retrieve level: Study

Command	Institution Name	Referring Physician	Reading Physician
C-STORE	✓	✓	✓
C-FIND	✓	✓	✓
C-MOVE	✓	✓	✓

Query/retrieve level: Series

Command	Institution Name	Referring Physician	Reading Physician
C-STORE	✓	✓	✓
C-FIND	✗	✗	✗
C-MOVE	✗	✗	✗

Query/retrieve level: Image

Command	Institution Name	Referring Physician	Reading Physician
C-STORE	✓	✓	✓
C-FIND	✗	✗	✗
C-MOVE	✗	✗	✗

Multiple filter keywords can be entered for the DICOM attributes and multiple DICOM attributes can be used as filters. The character "*" can be used for wildcard strings. See the following filter examples below:

C-FIND:
Institution Name: Springfield General ; Capital City
Referring Physician: Schmidt^James^^^

If the DICOM application uses a C-FIND on iQ-WEB, iQ-WEB will only show studies that contain "Springfield General" or "Capital City" in their institution name and having "Schmidt, James" as referring physician.

9.5.1.1.5   Application type

Figure 39 – DICOM application type

- **Query/Retrieve SCP Server**: If checked, this AE Title can be queried directly from iQ-WEB.
  - "Synchronization"
    If this option is enabled, iQ-WEB will synchronize itself with the AE at the defined schedule on a 24 hour basis. Below are the following detailed settings for synchronization:
    ➢ Synchronize all studies from the remote AE to iQ-WEB database.
    ➢ Synchronize only the studies performed during the last "n" days from the remote AE to iQ-WEB database.
    ➢ Update already existing studies in the local iQ-WEB database to match remote ones. This is useful if the studies have been updated or edited on the remote station.
    ➢ Push all iQ-WEB local studies to the remote AE during the synchronization process.

> ⚠ **WARNING:**
> *Danger of delayed diagnosis due to application unavailability.*
> *The synchronization feature of iQ-WEB may impact the performance of the network and the iQ-WEB system itself, especially when scheduling frequent synchronizations and when both storage systems contain a huge amount of data. This can lead to delays in performing regular tasks, such as sending or retrieving images to or from iQ-WEB. It is advised that synchronizations be carefully planned. A good practice is to plan synchronizations for time periods when the workload is very low or near zero.*
> *H-No.: 1.1.2, 1.1.3*

- **Modality Worklist SCP Server**: This option defines whether the AE is a Modality Worklist SCP Server. If enabled, worklist information can be retrieved from this AE. This can be done by using the "Query Worklist" link that appears in the Application Type column on the DICOM page. iQ-WEB also tries to get worklist information automatically by polling the Modality Worklist SCP server every 10 minutes.

  This polling interval can be configured by adding or changing the following registry setting: *"[LM_SOFTWARE]\IMAGE Information Systems Ltd.\iQ-WEBX\[AE Title]\WorklistPollInterval"* of type RegDWORD 32 bit where the decimal number value represents the interval in minutes.

  Additionally, if iQ-WEB receives DICOM N-EVENT-REPORT Study Scheduled event notifications from remote Detached Study Management SCP applications, iQ-WEB will query any defined Modality Worklist SCP application entity(s) for the relevant study information contained in the Study Scheduled event report notification

  By default, iQ-WEB queries the remote Worklist SCP with a Scheduled Procedure Start Date filter of today's Date. iQ-WEB can be configured to also query for procedures scheduled for the last N days as well by adding or changing the following registry setting: *"[LM_SOFTWARE]\IMAGE Information Systems Ltd.\iQ-WEBX\[AE Title]\WorklistPollPeriod"* of type RegDWORD 32 bit where the decimal number value represents the last N days to query. Value of "-1" can be set to order iQ-WEB to query all scheduled worklist data.

  When iQ-WEB retrieves worklist information for a scheduled patient and the scheduled AE station is defined in the list of DICOM Application Entities, then iQ-WEB will automatically push any pre-existing studies of this patient containing the same modality information to the scheduled AE station. This way, the scheduled AE station doesn't have to fetch any prior studies manually from iQ-WEB. This Pre-Fetching feature is enabled by default. To disable it, the following registry setting must be defined: *"[LM_SOFTWARE]\IMAGE Information Systems Ltd.\iQ-WEBX\[AE Title]\PrefetchStudiesFromWorklist"* of type RegDWORD 32 bit where the decimal number value represents two states. "0" disables prefetching and "1" enables it.

▪ **Print SCP Server**: Activating this option, makes it possible to use this AE as a DICOM print server. It is mandatory that this machine acts as standard DICOM PRINT SCP in the network.

▪ **Storage Commitment SCP Server**: If this option is enabled, iQ-WEB requests a Storage Commitment Report for any image sent to this AE.

9.5.1.1.6   Receiving options

Figure 40 – DICOM receiving options

▪ **New Study Email Notification**: If this option is activated, iQ-WEB will send a notification via email to users if a study is received with this user registered as the referring physician.

▪ **iQ-X Compression**: When delivering DICOM images to a remote web browser for the iQ-X ActiveX plug-in, especially via a WAN connection, users often find the need for speeding up the image transfer between the iQ-WEB and the remote browsers. In this case, administrators can enable the iQ-X Compression of iQ-WEB for each source AE, by selecting one of the DICOM compression transfer syntaxes listed below:

- "JPEG Lossless Transfer Syntax"
  If this value is selected, iQ-WEB will compress any received image using the DICOM "JPEG Lossless Compression (Selection Value 1, Process 14)" transfer syntax (UID 1.2.840.10008.1.2.4.70), and will save the compression image with the ".ls" filename extension.

- "JPEG Lossy Transfer Syntax"
  If this value is selected, iQ-WEB will compress any received image using the DICOM "JPEG Baseline Lossy Compression" transfer syntax (UID 1.2.840.10008.1.2.4.50) for 8-bit images, and the DICOM "JPEG Extended Lossy Compression" transfer syntax (UID 1.2.840.10008.1.2.4.51) for 12-bit images. Both types of compressed images will be saved with the ".ly" filename extension.
- "Runtime Length Encoding (RLE) Transfer Syntax"
  If this value is selected, iQ-WEB will compress any received image using the DICOM "RLE compression" transfer syntax (UID 1.2.840.10008.1.2.5), and will save the compression image with the ".rle" filename extension.
- "JPEG2000 Part-1 Lossless Only Transfer Syntax"
  If this value is selected, iQ-WEB will compress any received image using the DICOM "JPEG2000 Part-1 Lossless Only" transfer syntax (UID 1.2.840.10008.1.2.4.90), and will save the compression image with the ".j2k" filename extension.
- "JPEG2000 Part-1 Lossless Or Lossy Transfer Syntax"
  If this value is selected, iQ-WEB will compress any received image using the DICOM "JPEG2000 Part-1 Lossless or Lossy" transfer syntax (UID 1.2.840.10008.1.2.4.91), and will save the compression image with the ".j2k" filename extension. The compression ratio or image quality of the JPEG2000 Lossy compression is controlled for each source AE if this transfer syntax is selected.

With the above iQ-X Compression feature enabled, iQ-WEB will first check if any of the compressed images is available when delivering DICOM images to the web browsers. It will prefer the compressed images over the original images when transferring the images to the remote browsers. In this section a compression ratio or compression quality value also can be specified for lossy compression algorithms to limit data compression to level where visual quality of image data is not influenced. For detailed information about best compression depending to the use cases refer to the document Medical Image Data Compression Guide Flyer.

- **Anonymization**: Studies received by this AE will be anonymized with the rules given by the selected anonymization template.
- **Transcription**: If this option is enabled and a transcription template is selected, users can download Microsoft Word templates with DICOM information automatically filled in.

9.5.1.1.7 Delivery options

- **Job Queue Priority**: This field defines the job queue priority when processing database jobs with this destination AE. Database jobs with a higher priority destination AE will be processed before those jobs with a lower priority.

9.5.1.1.8 Miscellaneous

- **Mark Studies as Read**: Activating this option lets iQ-WEB mark every study received from this AE as read.
- **Assign Received Studies to Web Users**: This option allows the administrator to select one or more iQ-WEB users to be given access to all patients, studies, series, or images received from this AE. This is effective even if the assigned users have no "View" permission to access

private studies, or their last and first names do not match the "Referring Physician's Name" or the "Reading Physician's Name" in the DICOM study received.

9.5.1.2   Remove a DICOM node

DICOM nodes can be removed by marking them on the DICOM page and clicking the "Delete" button.

9.5.1.3   How to test DICOM communication

There are three simple steps to ensure that iQ-WEB is able to communicate with a remote DICOM station.

1. **Network ping the remote station**
   To ensure there is a network connection between the stations needing DICOM communication, the followings steps can be performed:

   - Open a command line console in Windows
   - Enter the command "ping [IPADDRESS/HOSTNAME]" where "IPADDRESS" is the IP address and "HOSTNAME" is the hostname of the remote station.
   - Execute the command

   If there is no reply from the station, check the network setup of both stations, and retry the command after making any changes. If the command is successful, continue with step 2.

2. **C-ECHO to the remote station**
   If the remote station is entered in the DICOM list of iQ-WEB, a DICOM C-ECHO can be performed using the "Echo" link. If the C-ECHO fails, check the AE Title, IP address/hostname, and port entered for the DICOM entry. In addition, check the firewalls of both stations to see if the appropriate ports are open. After making any changes, retry the C-ECHO. When the C-ECHO is successful, continue to step 3.

3. **Send a Study via DICOM**
   The last step is to send a study from the remote station to iQ-WEB and vice versa. If the send fails, set the logs to the highest available level then try sending again. Check the logs afterwards for any hints. Be sure to set the logs back to "Information" when troubleshooting is finished.

9.5.2 HL7

There is/are 2 HL7 Application(s) defined:

	APPLICATION	FACILITY	DESCRIPTION	HOST	IP ADDRESS	PORT NUMBER	MAXIMUM CONNECTIONS	EDIT
☐	HL7Station	Facility42	N/A	N/A	192.168.0.6	5574	10	Edit
☐	Station2	Facility	Description	Hostname	N/A	546	10	Edit

[Check All]   [Delete]   [Add]

Figure 41 – HL7 station overview

This page is only visible if the HL7 message listener is installed. Administrators can add, modify or delete defined HL7 applications.

For detailed information about the supported HL7 message types and their structure, refer to the HL7 Conformance Statement of the current version of iQ-WEB.

9.5.2.1 Configure an HL7 application

To configure a HL7 application, several values must be entered.

- **Application name**: Represents the name of the HL7 application that sends or receives the HL7 messages
- **Facility**: Institution where the HL7 message comes from or is sent to
- **Description**: A short description of the HL7 application
- **Hostname**: Hostname of the HL7 application
- **IP Address**: IP address of the HL7 application
- **Port Number**: TCP port number of the HL7 application
- **Maximum Number of Simultaneous Connections**: Defines the maximum number of allowed connection to this HL7 application
- **ORU Report Message for Newly Received DICOM Studies**: If enabled, iQ-WEB will send an HL7 ORU^R01 message to this HL7 station each time a new study is received by iQ-WEB. This message contains a link to the received study in the "Observation Value" field.

9.5.2.2 How to test HL7 communication

To ensure a working communication between the stations, follow the steps below:

1. **Network ping the remote station**
   To ensure there is a network connection between the stations needing HL7 communication, the followings steps can be performed:

   - Open a command line console in Windows
   - Enter the command "ping [IPADDRESS/HOSTNAME]" where "IPADDRESS" is the IP address and "HOSTNAME" is the hostname of the remote station.
   - Execute the command

   If there is no reply from the station, check the network setup of both stations and retry the command after making any changes. If the command is successful, continue with step 2.

2. **Send a message via HL7**
   The last step is to send a message from the remote station to iQ-WEB and route it back. If the send fails, set the logs to the highest available level then try sending again. Check the logs afterwards for any hints. Be sure to set the logs back to "Information" when troubleshooting is finished.

9.6 Possible migration scenarios

The following sections describe the different options for migrating hardware, software and DICOM data to iQ-WEB.

Section 9.6.2 "MySQL database backup" gives instructions on how to back up and restore databases from iQ-WEB installations. Hints and tips for hardware changes in regards to storage are found in section 9.6.3 "Change of storage volumes". Section 9.6.4 "iQ-WEB to iQ-WEB server migration" presents various scenarios of an iQ-WEB migration, and section 9.6.5 "Any PACS to iQ-WEB migration" covers methods on how to proceed if a migration from a different vendor's PACS to iQ-WEB is necessary.

Before starting, consider that iQ-WEB registers the path to DICOM images and other metadata in a MySQL database. An image can only be displayed properly if the database storage path and the physical file location match.

It is mandatory that the person performing the migration be in possession of all necessary usernames and passwords, e.g. a Windows administrative account, admin access to the source PACS, and iQ-WEB "root" and "dicom" user passwords.

9.6.1 Migration checklist

Make sure that the following list is complete prior to the beginning of the migration process. This will keep the process running smoothly by not having to start and stop to collect data.

- Installation executable (MySQL and iQ-WEBX setup files)
- All mandatory usernames and passwords to access the source and target systems:
  - System account to access the server(s), e.g. Windows Administrator account
  - PACS account to access the old PACS and, if necessary, configure the applications, e.g. iQ-WEB/MySQL "root" account
- Remote access (e.g. Team Viewer), if applicable
- All mandatory license information for a new iQ-WEB server and, if applicable, the previous iQ-WEB installation
  - License information downloaded from the "Tools" → "Licensing" page in iQ-WEB

> **NOTICE:**
> *The License team will send detailed steps on how to migrate a license once a new license is ordered for the new system.*
> *Contact the Support team at any time at support@image-systems.biz in case of doubts or questions about the migration.*

> **NOTICE:**
> *Study notes and image notes must be migrated manually. The study/image note itself is stored in the database and can be migrated with a MySQL database backup. Attachments within study/image notes must be copied manually. These are stored in the upload folder which, by default, is located at "[iQ-WEB installation]\PACS\php\upload".*

9.6.2 MySQL database backup

MySQL Community Server is a free downloadable open source database that is supported by an active community of developers and enthusiasts. Even though we do not provide in-depth support for MySQL, we will help with console commands and resolve arising issues in MySQL as they relate to iQ-WEB.

9.6.2.1 MySQL backup syntax

By using special MySQL commands, MySQL databases can be backed up. For a general iQ-WEB installation, two databases are used, one for MySQL itself and one for iQ-WEB.

A backup of both databases is recommended to maintain all iQ-WEB settings, image records, the MySQL settings, and created user accounts. The generated backup files can be used to easily reimport settings and configuration into the new iQ-WEB installation.

The following examples show the basic MySQL commands needed to back up databases.

From the Start button in Windows, type "cmd" in the "Run" text box to display the "cmd.exe" program at the top of the program list. Right-click the "cmd.exe" program and choose "Run as Administrator" from the menu that appears. This will open the command line prompt with extended administrator rights.

Navigate to the MySQL installation folder (default: "C:\Program Files\MySQL\MySQL Server x.x\bin").

In order to back up the correct databases and ensure that all appropriate databases have migrated successfully, begin by double checking the database names in MySQL. First, connect to MySQL using the command:

```
mysql –u root –p
```

Then execute:

```
show databases;
```

This will show a list of databases within MySQL. Make a note of the database names, then type:

```
exit
```

to exit out of MySQL and return to the main command prompt. Next, execute the "mysqldump" command described below to back up the necessary databases.

Documentation about the "mysqldump" command can be found using the following link:

MySQL Server Documentation (version 5.7.x)
https://dev.mysl.com/doc/refman/5.7/en/mysqldump.html

There are two approaches to backing up databases in MySQL. They can be backed up individually or all at once. It is our recommendation that all the databases be backed up at once to ensure that both the MySQL and the iQ-WEB databases are included. The first example shows how to export all the databases together, while the second exports only a single database.

1. **Export all databases**

    For the iQ-WEB migration, use the following command to capture all the necessary databases:

```
mysqldump.exe -uroot -p --add-drop-table --routines --events --all-databases --
force > C:\mysql_backup.sql
```

    Running this command with the proper values creates a backup of all the databases and stores them as "backup.sql" on the "C:" drive.

2. **Export a single database**

    Alternatively, databases can be backed up individually and stored in separate files. If this method is chosen, be sure to back up both the "mysql" and iQ-WEB databases. The iQ-WEB database will most likely be named the same as the AE Title of iQ-WEB.

```
mysqldump.exe -uroot -p --add-drop-table --routines --events –force [DATABASENAME]
> C:\mysql_backup.sql
```

    Running this command with the proper values creates a backup of the specified database and stores it as "backup.sql" on the "C:" drive. Be sure to use different file names for the individual database backups or they may be overwritten without warning.

9.6.2.2 MySQL restore syntax

Once MySQL backups have been created, they may be imported into a new installation of iQ-WEB for migration purposes by using the "mysql" command with the following syntax:

```
mysql.exe -uroot –p < C:\backup.sql
```

Running this command will restore the contents of the specified file ("C:\backup.sql") into MySQL. Any existing databases and tables with the same name in MySQL will be overwritten without warning during this process.

> **NOTICE:**
> *Make sure that the same MySQL version is used when importing the backup. Otherwise, the commands may function differently due to changes in MySQL itself.*

9.6.3 Change of storage volumes

9.6.3.1 Adding storage to an existing storage device

1. Extending the space of a storage device

While the archive gets bigger, the currently available disk space probably should be extended. Follow the instructions of the storage system manufacturer to add new hard disks or to exchange hard disks with larger ones. Once the space of the storage system has been extended, iQ-WEB will automatically use this extended storage as long as the path to the main archive directory is kept as it was.

Make sure that the previously stored images are still accessible after extending the storage system. The manufacturer of the storage system may offer instructions on how to keep the previous content.

2. Using an additional storage device

On the other hand, an additional storage device could be added to the server. Assuming the initial storage device has already exceeded its disk space, the path of the short term archive can simply be changed to the newly attached storage device.

Consider that from now on all new images will be saved to the new storage device. However, examining images stored on the old storage is still possible as long as the path does not change.

Another option is to use the new storage device as the long term archive. Using this feature, iQ-WEB will automatically move images from the short term to the long term archive according to the date the images were received.

3. Using different storage devices/partitions for different modalities

A new storage device can be added or a new partition used to store the images from one specific modality. In this case, a custom path will need to be entered for the modality on the "Communications\DICOM" page. From this point forward, all images received from this modality will be stored on the new storage device/partition while images from all other modalities will continue to be stored on the initial storage device/partition configured for the whole PACS.

9.6.3.2 Storage migration and replacement

The following scenario assumes that the DICOM images are stored on a different physical drive or storage system than the iQ-WEB or MySQL installation.

It is important to transfer all DICOM data to the new storage device before shutting down the old one. Be sure to preserve the directory structure during this process.

One possible transfer option is the simple file-based transfer, where the archive (including subfolders) can be copied to the new storage system, e.g. by using Windows and its integrated "Explorer". If necessary, access restrictions that have been changed during the copy process can be re-applied afterwards.

Another option is the creation of an image of the current archive which will be restored afterwards on the new storage device.

Most importantly, the mounted drive letter of the new storage device must be the same as the old one. If an NAS is used that can be accessed via TCP/IP, it should be assigned to the old storage system's IP address to keep the migration as simple as possible.

Once this procedure has been finished, iQ-WEB will automatically use the new storage system as long as the configured paths match the old ones.

In order to keep the downtime of iQ-WEB as low as possible, the following steps should be kept in mind:

1. Start a database integrity check to ensure all entries in database link to an image file.
2. Stop the iQ-WEBX service to prevent receiving new images.
3. Attach the new storage device and configure it to be accessible like the previous device.
4. Once the storage device is configured properly, start the iQ-WEBX service again.
5. Start the migration process and transfer the images from the previous device.
6. Start a database integrity check when migration process is finished to ensure all entries in database link to an image file.

This procedure has the advantage that the server is able to receive images after a short downtime. The drawback is that old images are not accessible as long as they are not physically available on the new system.

9.6.4 iQ-WEB to iQ-WEB server migration

For a step by step guide for upgrading an iQ-WEB installation, refer to section 3.6 "Upgrading the application".

9.6.4.1 Migration to new hardware while keeping existing storage volumes

The best way to migrate iQ-WEB to new server hardware depends on where the images are stored. Using separate storage devices for the software itself and the images is the easiest way and may significantly speed up the process of migration. Simply remove the devices where the images are stored from the old hardware and attach it to the new hardware.

The first step in the process is to set up the operating system on the new hardware followed by MySQL and iQ-WEB.

> **NOTICE:**
> *The License team will send detailed steps on how to migrate a license once a new license is ordered for the new system.*

The next migration steps depend on whether a backup of the MySQL database is available or not.

1. Having a backup of a MySQL database

If there is a backup of a previous MySQL database, this can simply be reimported into the newly installed database system.

> **NOTICE:**
> *Be sure that the same MySQL version is used for the import that has was used for the export.*

Once the import is complete, iQ-WEB will operate exactly as it did on the old server. This includes retaining any server settings, access to DICOM images, as well as previously created user accounts.

Do note that this method will only work when the target machine uses the same paths as the previous server. The DICOM images, especially, need to be located in the same file structure and path as they were on the previous server. For example, a new path to the images will be overwritten by a reimport of the MySQL database backup and the images will not be accessible by the PACS or the connected client.

2. No backup of a MySQL database

If there is no backup of the previous MySQL database system, all iQ-WEB settings as well as all user accounts will need to be set up manually. Additionally, in order to rebuild the image database, all DICOM files will need to be reimported. This is done via the import feature of the "Tools" tab in the main web interface menu.

> **NOTICE:**
> *Consider that reimporting all images can consume a significant amount of time depending on the total number of images involved.*

9.6.4.2 Migration to new hardware using new storage volumes

1. MySQL migration

▪ Having a backup of the MySQL database
If there is a backup of a MySQL database, it can be simply reimported to the newly installed database system. Once the import is done, iQ-WEB will operate exactly like on the old server. This includes server settings as well as previously created user accounts.
If it is planned to transfer the DICOM data from the old storage device to the new one via a file based operation, the option of restoring the MySQL databases will also give instant access

to the transferred images. Therefore, if a NAS is used, remember to keep the previous folder structure and drive letter or IP address.

- No backup of the MySQL database
  If there is no backup of the MySQL database, all iQ-WEB settings as well as all user accounts must be set up manually. Furthermore, the DICOM images will need to be reimported to completely rebuild the database. See the following section for more details about importing possibilities.

2. DICOM data migration

The file-based migration option requires transferring all DICOM mages manually from the old server to the new installation before the restore process can be started.

- File based operation with a MySQL backup
  In order to use the benefits of the MySQL backup, make sure that the path to the images remains the same on the new server after restoring the MySQL backup. If a NAS is used, the folder structure as well as the drive letter or IP address must match the previous configuration.
  Once the file transfer has been completed and the database has been restored, instant access to the images is possible.

- File based operation without a MySQL backup
  If no MySQL backup is available, all DICOM images must be reimported from the new storage device. This is done via the import feature of the "Tools" tab in the main web interface menu. Consider that a reimport can consume a significant amount of time depending on the total number of images involved.

- DICOM based operation
  In order to use the DICOM based transfer, simply connect both iQ-WEB servers properly and proceed with the required option mentioned below. This procedure may take a significant amount of time depending on the number of images and the bandwidth of the network.

- Using C-STORE
  In order to transfer the DICOM images using the C-STORE, select all available studies and forward them to the new PACS. This procedure transfers the images to the new storage device and registers the images in the database of the new iQ-WEB server.

- Using C-MOVE
  If the C-MOVE will be used, configure the old iQ-WEB to act as a "Query/Retrieve SCP Server" within the new iQ-WEB installation at the "DICOM" page. Now the old PACS can be queried from the new one and studies can be pulled over. This procedure transfers the images to the new storage device and registers the images in the database of the new iQ-WEB server.

- Using synchronization
  Similar to the C-MOVE configuration, setup the old iQ-WEB server as a "Query/Retrieve SCP Server" within the new iQ-WEB installation and activate the synchronization feature at the

"DICOM" page. Afterwards, the new installation will initiate the synchronization with the old iQ-WEB and will start to pull the images automatically.

9.6.5 Any PACS to iQ-WEB migration

If images will be migrated from a PACS of a different vendor, there are several options described below. Some options might not be available. The file based migration would be fastest because there is no overhead of the DICOM communication during the process. The images are either copied and imported or just imported into iQ-WEB, but the import might not work if the images are stored in a proprietary format. Even though the DICOM based migration is slower, it might solve such incompatibilities. Additional limitations might apply to the DICOM based migration such as a limited number of studies that can be transferred at once.

9.6.5.1 File access to previous PACS or storage system

If there is access to the images that have been stored by the previous PACS server, the images can simply be copied to the new iQ-WEB server or kept in the current storage system and registered to the iQ-WEB.

Afterwards, start an import job in iQ-WEB to import all images from their new or previous location. This is done via the import feature of the "Tools" tab in the main web interface menu. Consider that the import can consume a significant amount of time depending on the total number of images that are imported.

9.6.5.2 DICOM access to previous PACS

If DICOM access is available to the PACS itself, the usual DICOM communication possibilities can be used to transfer images to iQ-WEB. Depending on the access possibilities and general options, various other ways can be used. For example, if iQ-WEB cannot be added into the configuration of the previous PACS to allow DICOM communication, the details of another, already configured, station can be used temporarily.

For more information about the possible functions, consult the DICOM Conformance Statement of the previous PACS and compare it to iQ-WEB.

- C-STORE
  If iQ-WEB can be added as a new DICOM node within the previous PACS, all images can simply be transferred to iQ-WEB using C-STORE. Depending on the possibilities offered, studies may be transferred all at once or in smaller portions.

- C-FIND and C-MOVE
  iQ-WEB can be used to manually search (C-FIND) for the studies that are stored on the previous PACS and transfer them (C-MOVE) to iQ-WEB. To enable this possibility in iQ-WEB, configure the PACS as a "Query/Retrieve SCP Server".

- Synchronization
  Similar to "C-FIND and C-MOVE" is the approach to use the synchronization feature offered by iQ-WEB. Instead of manually searching for studies, the synchronization automatically queries the remote station and retrieves studies on a scheduled basis.

9.6.6 Virtualized environment

Using a virtualized environment probably represents the most sophisticated solution of all. A virtual machine containing iQ-WEB and the MySQL database is stored as a single file on a storage system together with the DICOM files. The virtual machine technology makes it possible to run this virtual machine in any server hardware. There is no need to reinstall any software or to reconnect to the data as long as Windows points to the DICOM files directly those either are stored within the virtual environment or on external storage devices. For general advice about using iQ-WEB in virtualized environment, refer to section 9.8.7 "Virtualization environment and distributed systems."

The migration of another PACS installation to iQ-WEB on a virtual machine works in the same way as the migration to a dedicated physical server. Refer to the respective section within this document.

9.6.7 Known issues

- Import job is shown in the "Job Status" page, but it does not start
  The iQ-WEB license is eventually expired or is not valid anymore. Check the log files of iQ-WEB for more information.

- Moving images stops at a certain amount of images
  The newly installed iQ-WEB is still running as a trial license, thus it has a limit of 1,000,000 images. To proceed with the migration, order a full license for the new server and continue the import after the full license has been applied.

- Import job is not showing progress percentage
  The amount of DICOM images is probably very big. Therefore, importing such an amount will take a very long time. Simply refresh the job status page after several hours passed. Also, the big import job should be split in several smaller jobs by importing single directory only. Additionally, check the log of iQ-WEB to determine the progress. Access the log files directly from the file system, because several files may have been created.

9.7 Translating the iQ-WEB user interface

The default language of iQ-WEB is English. As mentioned in section 9.4.2.5 "Global settings," the administrator can customize translation of iQ-WEB. If the bundled languages English, German, Spanish and Russian are not appropriate for the use case, administrators can specify a custom language. These sections will describe the customization procedure and the toolsets for the two following scenarios.

1. Adapt the existing bundled language files and change some entries.
2. Create a completely new language file to support a not bundled language.

9.7.1 Translation toolset

The translation mechanism of iQ-WEB is based on the PHP extension named "getText". All translatable strings of iQ-WEB will be extracted out of the source by this extension. A translation project file with "*.po" file extension will be created which a translator can use to translate. Find more details about translation projects in the following section.

To start a translation, the following prerequisite software is needed to open and edit translation projects and create translations for iQ-WEB:

- **PHP extension "getText"**: This extension must be enabled in the PHP configuration to make iQ-WEB translation possible. This is done by default installation process.
- **Poedit**: Tool for editing "*.po" translation project files and generating "*.mo" translation files for iQ-WEB.

> **NOTICE:**
> *Poedit is a 3rd-party freeware software and is not included in the installation package of iQ-WEB. It can be downloaded at: http://www.poedit.net/.*

Figure 42 shows an overview of the Poedit GUI for explaining the terms used in the following sections. The GUI consists of 5 parts:

1. Menu bar
2. Toolbar
3. Overview table
4. Translation input
5. Status bar
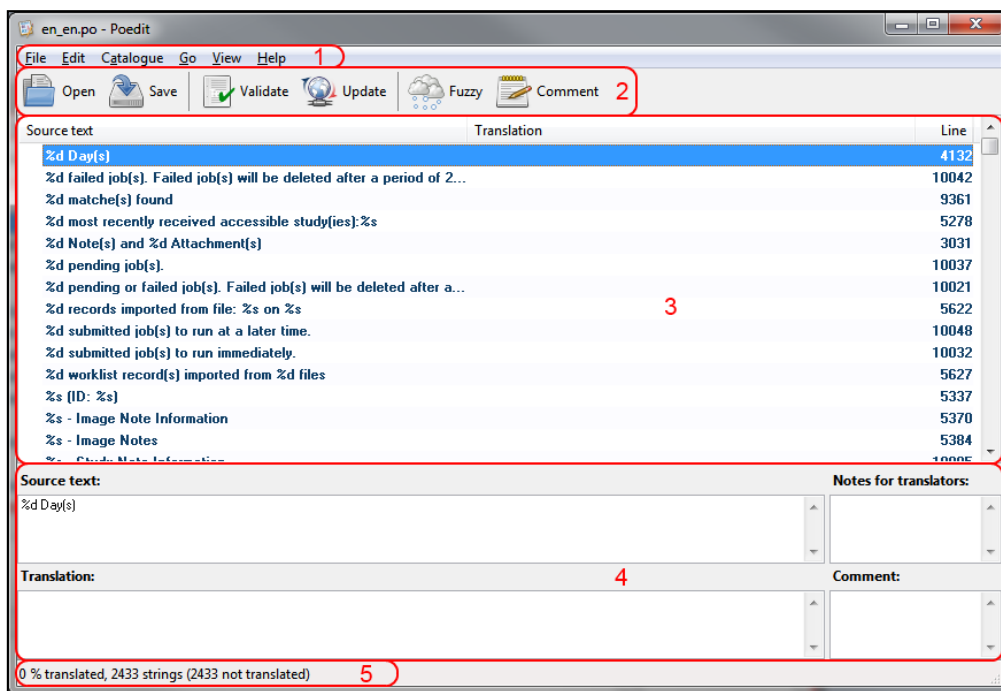
Figure 42 – Poedit GUI overview

9.7.2 Translation projects

iQ-WEB is bundled with a set of translation projects to give the administrator the opportunity to customize the translation. These translation projects are containing all translatable strings of iQ-WEB, iQ-WEB2GO, iQ-WEBX WADO. iQ-X provides no translation options and is limited to an English user interface. (Refer to iQ-X Administration Guide for details.)

iQ-WEB translation projects with the file extension "*.po" are located in iQ-WEB installation folder. The subfolder is named "Language" and contains the following translation projects:

- **Custom**: This translation project is for realizing custom translations which are not bundled with iQ-WEB.
- **Empty**: This translation project is a reference project with no translation for backup purpose.
- **German**: This translation project is for customization of bundled German translation.
- **Russian**: This translation project is for customization of bundled Russian translation.
- **Spanish**: This translation project is for customization of bundled Spanish translation.

> **NOTICE:**
> *Translation projects of iQ-WEB version 6.6.2 include all translatable strings of iQ-WEB2GO and iQ-WEBX WADO, and are not fully compatible with prior versions. If translation files are applied that are not compatible with the targeted version, the translation may not be comprehensive.*

9.7.3 Translation workflow

This section explains how to create a custom translation for iQ-WEB. The starting point of the example workflow is the bundled "Custom" translation project. The same procedure can be applied when customizing other bundled translation projects for modifying bundled translations.

1. Choose a language into which iQ-WEB should be translated. (E.g. French)
2. Open the "Custom" translation project in Poedit.
3. Set up the Catalog properties to values matching the chosen language.
4. This setting can be entered in Poedit via the menu bar entry called "Catalogue."
   As shown in Figure 43, the following values can be changed where the numbered ones are essential for a correct and working iQ-WEB translation:
   - **Project name and version**: This value can be changed but it is recommended that an appropriate value be chosen to identify the version and project of the translation.
   - **Team**: This value can be changed and is intended to identify the translation team.
   - **Team's e-mail address**: This value can be changed and is intended to identify the translation team contact.
   - **Language**: The value must be of the following structure: [2 digit language code according to ISO 639]–[2 digit country code according to ISO 3166] (E.g. fr-fr, po-br)
   - **Charset**: The value must be a charset that is capable of representing the chosen language. It also must match the charset configuration of iQ-WEB. (Refer to section 9.4.2.5 "Global settings")
   - **Source code charset**: The value must always be UTF-8.
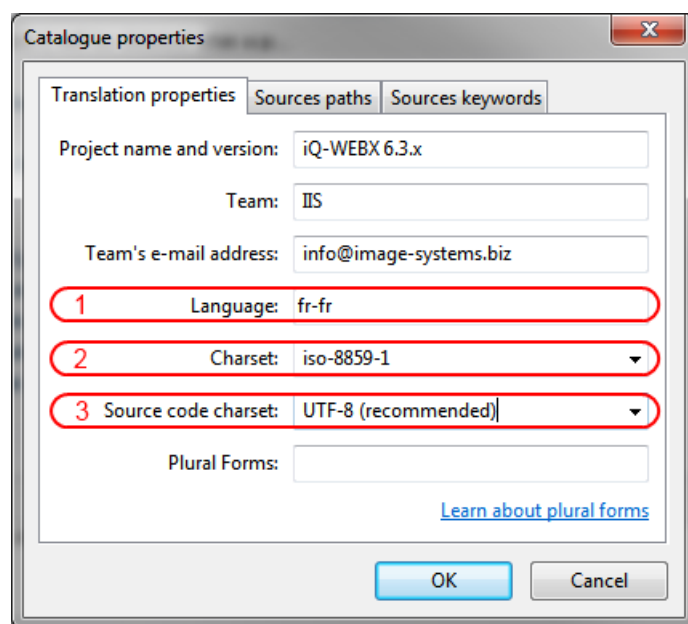
Figure 43 – Poedit catalogue properties

5. Translate all phrases listed in the overview table by selecting each of them and entering a translation for the currently selected source text in the translation input. The status bar will provide an overall status of the translation. Translating personnel can also provide explanations in comments for each entry if needed.

NOTICE:

The following special symbols in the source text must be preserved in the translation:
%s, %d, %08x, \", ', \\', ^
The position of special symbols can be changed, but the order of multiple occurrences must be preserved.

NOTICE:

Translations that are marked as fuzzy are not included in the generated translation file and will remain in the original English language.

NOTICE:

Empty translation entries will remain in the original English language.

NOTICE:

Do not use the "Update from sources" function in the toolbar and menu bar of Poedit. Because some parts of the PHP files of iQ-WEB are encrypted, Poedit is not able to find all translatable texts. Some translatable text may be lost when this action is performed.

6. Save the translation project with the translation. To save, use the corresponding menu bar or toolbar item in Poedit. Poedit is configured by default to generate language files with "*.mo" file extensions automatically when saving project files. These are located in the same folder where the project files are stored.
7. Copy the generated language file to the corresponding location in the iQ-WEB installation folder.
   - "custom.mo" to [iQ-WEB installation]\PACS\php\locale\custom\LC_MESSAGES
   - "de_de.mo" to [iQ-WEB installation]\PACS\php\locale\de_de\LC_MESSAGES
   - "ru_ru.mo" to [iQ-WEB installation]\PACS\php\locale\ru_ru\LC_MESSAGES
   - "es_es.mo" to [iQ-WEB installation]\PACS\php\locale\es_es\LC_MESSAGES
   - "en_en.mo" to [iQ-WEB installation]\PACS\php\locale\en_en\LC_MESSAGES
8. Configure the corresponding language in the iQ-WEB web interface while logged in as an administrator. (Refer to section 9.4.2.5 "Global settings.")
9. Verify the completeness and correctness of the translation by using a user account.

9.8 Troubleshooting

These sections explain administrative tasks that may need to be resolved during the normal operations of iQ-WEB.

⚠ WARNING:

Danger of patient mix.
The following tasks and procedures are only allowed to be performed by qualified administrative personnel to ensure valid patient information. If there are any questions or uncertainties contact your local distributor or info@image-systems.biz.
A unique patient ID must always be used for each patient. While one patient may have more than one patient ID, one specific patient ID should never be applied to more than one patient. Otherwise, data from several patients may be merged.

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9.8.1 Patient ID conflict resolution

A patient ID conflict happens if there are two patient IDs for a certain patient or different dictions of the patient name for a certain patient ID in different studies. Reasons may be typos, different syntaxes or dictions used for patient names by devices, or untrained staff entering data.

iQ-WEB offers three automatic and four manual options for the system administrator to resolve conflicts of patient identities.

9.8.1.1   Automatic options

The three automatic options only update the iQ-WEB database, without modifying DICOM data.

9.8.1.1.1   Ignore duplicate patient ID conflicts

iQ-WEB offers to have an incoming study with a Patient ID conflict overwrite the existing patient demographics with the new demographics from the DICOM header of the new study in the database, only. This procedure can be used only in a RIS/PACS environment using a DICOM modality worklist to all devices without unidentified patients (where the patient identity might change during the stay), e.g. in imaging centers. The advantage of this approach is that patient ID conflicts can be easily avoided and patient name changes can be updated automatically in the PACS database. This way is robust against different dictions of a patient. The risk of this approach is that patient data may become unavailable by database search for name or date of birth if there are typos in the patient ID. In the latter case, lost studies can be found e.g. via searches for the study date and modality.

9.8.1.1.2   Patient reconciliation

This automatic conflict resolution based on patient ID and date of birth of queried DICOM modality worklist data can be used for sites that have a completely automatic workflow of patient demographics and use a DICOM modality worklist with all devices which might have unidentified patients or patients with changed identities during the stay, e.g. hospitals, emergency units, urgent care centers. The advantage of this approach is that it can manage different patient name codings, typos, and it allows the automatic reconciliation of patient names (e.g. for marriage or changed identity). The risk is that incorrect patient IDs in the master system will be applied to the PACS database automatically. Some devices use non-standardized date formats where this approach might not work.

9.8.1.1.3　Reject duplicate patient ID conflicts

This option of iQ-WEB offers an automatic rejection of incoming studies with a Patient ID conflict. It is not recommended that this option be used for regular patient services as it might cause data loss.

9.8.1.2　Manual options

iQ-WEB offers four options to manually resolve conflicts of patient identities by the system administrator. All manual options update both the PACS database and the DICOM objects. Manual patient ID conflict resolutions will be applied to the database and the DICOM objects after midnight. The main risk of manual conflict resolution is that conflict studies might temporarily not be found via patient ID queries (e.g. for RIS/EMR/HIS PACS integrations) until the conflict is resolved manually.

9.8.1.2.1　Keep existing patient ID: XXXXX and use this patient name

There are two options under this heading:

- **Option 1**: When a study is received by iQ-WEB showing a different name than the one currently registered in the database for the given patient ID, iQ-WEB will overwrite the previously registered patient name and date of birth with the information from the incoming study. This workflow can be used if both the database and the DICOM objects shall be manually updated with new patient demographics.

- **Option 2**: The second option causes iQ-WEB to keep the existing patient information over the incoming study information. It is recommended that this workflow be used if the patient demographics in the iQ-WEB database are consistent and inconsistent data, including typos, is received without worklist matching. The risk is that actual name changes, e.g. due to marriage, are not updated in the database.

9.8.1.2.2　Save duplicate using a new patient ID

The system administrator assigns a new patient ID to the incoming study. This default conflict resolution can be used at sites where patient data are entered manually into devices and DICOM modality worklists are not used. This scenario can usually be found at smaller sites. The risk of this approach is that manual misidentifications might make datasets unavailable.

9.8.1.2.3　Keep existing patient ID: XXXXX and overwrite the patient name and date of birth with data from modality worklist record

iQ-WEB will query the DICOM modality worklist for the patient ID. It will then overwrite the previously registered patient name and date of birth in iQ-WEB as well as the incoming DICOM study with the information from the worklist. This conflict resolution can be used at sites with a

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completely automatic workflow using a DICOM modality worklist (including temporarily unidentified patients, e.g. in urgent care). The advantage of this approach is that it can manage different patient name encodings and typos, allowing the automatic change of patient names during the patient's stay. It further updates DICOM objects as well. The risk of this option is that incorrect patient IDs in the master system will be applied to the PACS database.

> **NOTICE:**
> *All manual patient ID conflict resolutions apply to both the database and the DICOM objects. If there are any questions about dealing with patient ID conflict resolution, do not hesitate to contact your authorized iQ-SYSTEM PACS dealer or the manufacturer.*

9.8.2 Webserver debugging

During the operation or configuration of iQ-WEB, the following issues may need to be resolved in the Apache webserver and its PHP extension:

- An invalid configuration results in the Apache service not starting
- The web interface is not accessible for client browsers

The following actions may help locate the origin of the issue and pinpoint a specific support request.

1. Increase the level of the log output
   - Locate the "LogLevel" string in the httpd.conf and set it to a higher level of error reporting. Possible values include: "debug," "info," "notice," "warn," "error," "crit," "alert," and "emerg" where "debug" represents the maximum level of output into the log file.
   - Locate the "error_reporting" string in the php.ini and set it to a higher level of error reporting. Possible values are explained in the comments section of the file where "E_ALL | E_STRICT" represents the maximum level of output into the log file.
2. Restart the Apache webserver after saving the changes to the Apache and PHP configurations.
3. Try to reproduce the issue to ensure that it is documented in the log files.
4. Locate and examine the following log files:
   - **Apache Accesslog**: Documents all requests to the webserver and its resulting state.
     Located in: [iQ-WEB installation folder]\Apache\logs\access.YYYY-MM-DD.log
   - **Apache ErrorLog**: Documents all operational status information of the webserver and its modules based on the configured log level.
     Located in: [iQ-WEB installation folder]\Apache\logs\errors.YYYY-MM-DD.log
   - **PHP ErrorLog**: Documents all PHP runtime errors that occur based on the configured log level.
     Located in: [iQ-WEB installation folder]\Apache\logs\php_errors.log

> **NOTICE:**
> *Apache log files are created on a daily basis.*

> **NOTICE:**

Logging data at higher levels can result in a large amount of data, especially when logging is enabled for a long period of time. It is strongly recommended that the log level be decreased or that logging is disabled after the troubleshooting process.

9.8.3 Database debugging

During the operation or configuration of iQ-WEB, the following issues may need to be resolved in MySQL:

- An invalid configuration results in the MySQL service not starting
- iQ-WEB states that a connection to the MySQL database cannot be established
- The MySQL service consumes a lot of resources and processing time during operations
- iQ-WEB slows down due to long MySQL response times

The following actions may help locate the origin of the issue and pinpoint a specific support request.

1. Enable the different logging stages of MySQL
   - Add the following options to the "mysqld" section in the "my.ini" file and set the appropriate values based on the descriptions below.

   ```
   log-output=FILE
   log-error="MySQL_error.log"
   general-log=1
   general_log_file="MySQL.log"
   slow-query-log=1
   slow_query_log_file="MySQL_slow.log"
   long_query_time=10
   ```

   - The "Error Logging" section allows a filename to be specified where MySQL will log status messages about errors, warnings, and notices.
   - The section starting with "general-log" allows the MySQL general query log to be enabled by setting its value to 1 and specifying a filename for the "general_log_file." The resulting log will contain all queries made in all database connections to the server.
   - The section starting with "slow-query-log" allows the user to enable the slow query log of MySQL by setting its value to 1 and specifying a filename for the "slow_query_log_file". The resulting log contains all slow queries made in all database connections to the server if the response time of the system exceeds the "long_query_time" value (seconds).

2. Restart the MySQL service after saving the changes to the MySQL configuration file.

3. Try to reproduce the issue to ensure that it is documented in the log files.
   - Locate and examine the log files named in the MySQL configuration. These will be located in the MySQL data directory.

For a detailed description of the logging settings in the MySQL configuration, refer to the documentation at the official MySQL site "http://dev.mysql.com/doc/#manual."

> **NOTICE:**
> *Detailed logging of MySQL operations can result in a large amount of data, especially when logging is enabled for a long period of time. It also decreases the overall performance of the server per operation. Therefore, it is strongly recommended that the log level be decreased or that logging is disabled after the troubleshooting process.*

9.8.4 iQ-WEB debugging

During the operation or configuration of iQ-WEB, the following issues may need to be resolved:

- An invalid configuration results in iQ-WEB not starting
- DICOM/HL7 communication is interrupted because of failures
- General application errors occur
- iQ-WEB license errors occur.

The following actions may help locate the origin of the issue and pinpoint a specific support request.

1. Increase the level of the log output
   - Log into iQ-WEB as an administrator or "root" user.
   - Go to the "Tools" page and locate the "System" tab in the iQ-WEB web interface and switch the log level to "Debug" as shown in section 9.3.3.1.2.

2. Try to reproduce the issue to ensure that it is documented in the log files.

3. View the log in the iQ-WEB web interface ("Tools\Today's Log") or locate and examine the current day's log file(s) at the configured log path for iQ-WEB. This is typically found in C:\Program Files (x86)\iQ-WEBX\PACS\log\[AETitle] where "[AETitle]" matches the name of the AE Title for iQ-WEB. This daily log contains operational state information about iQ-WEB and information about DICOM communication. The log file names use the following naming convention: iQ-WEBX-[Weekday].log. The log folder also contains several other extra log files for special purposes like HL7, Email notifications, purging, and auto conversion of information.

> **NOTICE:**
> *iQ-WEB log files are created daily and are split if they exceed the default 100MB size limit. If the log exceeds this limit, new numbered files will be created to continue logging for the day*

> **NOTICE:**
> *Logging data can result in a large amount of data especially when logging is enabled for a long period of time. It is strongly recommended that the log level be decreased or that logging be disabled after the troubleshooting process.*

9.8.5 DICOM/HL7 debugging

This section contains a checklist for tracking DICOM and HL7 connection issues using iQ-WEB as a participant.

1. To exclude any general networking issue as the origin of a DICOM or HL7 issue, follow the advice in section 9.8.6.3 "Network."
2. Verify that a valid license is installed for iQ-WEB.
3. Verify that all network adaptors used for communication are running and correctly installed.
4. If wired connections are used, verify the correct connection of the cables.
5. Verify the correctness of all AE Title and port configurations of all participating nodes used and send a DICOM ECHO in all communication directions.

For details about the DICOM or HL7 compliance of iQ-WEB, refer to the "DICOM Conformance Statement" and "HL7 Conformance Statement" contained in the iQ-WEB installation.

9.8.6 Integration

9.8.6.1 Transcription

Setup transcription feature of iQ-WEB requires a few prerequisite steps to take to ensure full functionality.

1. A licensed copy of Microsoft Word Version 2003 or above must be installed on the machine iQ-WEB is installed on with COM/OLE automation feature enabled.

2. The PHP extension "com_dotnet" must be enabled in the PHP configuration. To achieve this, follow the steps below:
   - Open the "php.ini" configuration file and locate the last call similar to the pattern "extension=".
   - Add line "extension=php_com_dotnet.dll" below the last entry, if not already exists. By default iQ-WEB already adds this line.
   - Add following lines to configure the extension correctly, if not already exists.

   ```
   [COM]
   ...
   com.allow_dcom = true
   ...
   com.autoregister_typelib = true
   ```

Due to the fact that the iQ-WEB server is using Microsoft Word by default in "System" user context and the user rights management some machines may show up the following issue:

- If the transcription feature is used by clients several Word processes are started and left open.

To solve this issue it is necessary to log into the Windows server as an administrator and create a "Desktop" named folder in the following Microsoft Windows system folders:

- %WINDOWS%\System32\config\systemprofile
- %WINDOWS%\SysWOW64\config\systemprofile

9.8.6.2 Data consistency

To ensure data consistency of DICOM data delivered to iQ-WEB from various sources, there are several options for correcting the data:

> **NOTICE:**
> *To effectively achieve data consistency in a PACS like iQ-WEB, it is best to configure the DICOM modalities and other DICOM application entities in a consistent manner. Then test the configuration with sample data similar to the actual data that will be used.*

1. Receiving DICOM data that does not contain a tag or contains an empty tag Patient ID (0010,0020) can lead to some empty views in iQ-WEB. To solve this issue iQ-WEB offers an advanced configuration. Add the following registry key to iQ-WEB registry structure.
   [LM_SOFTWARE]\IMAGE Information Systems Ltd.\iQ-WEBX\[AE Title]
   "ReplaceNullPatientId" with value 1(Type: RegDWORD 32 bit)
   This replaces the empty or missing tag with the value of the tag Study Instance UID (0020,000D) which is mandatory according to the DICOM standard. Refer to chapter 8 "Folders and Registry structure" for more details about iQ-WEB registry structure.

2. iQ-WEB also offers the coercion feature to correct DICOM data according to configured rules. For detailed information about how to use the coercion feature refer to the iQ-WEB Instructions for Use.

3. Another way of correcting patient and study metadata is the Patient- and Study-reconciliation feature. It corrects the data in comparison to a DICOM modality worklist. For detailed information refer to section 9.4.2.9 "Worklist" and the iQ-WEB Instructions for Use.

4. The most flexible and performant way to correct DICOM data according to configured rules is the product iQ-ROUTER which can be set up to act as an intermediate link between sending DICOM station and iQ-WEB.

> **NOTICE:**
> *iQ-WEB also offers a tool to examine the raw header data of DICOM data sets. Users can navigate to the images view in the web interface and inspect an overview or detailed header dump of the selected DICOM dataset. This a powerful tool to verify the consistency of DICOM data.*

9.8.6.3 Network

This section contains suggestions for integrating iQ-WEB into a network environment and advice on debugging specific issues.

1. To identify any networking issues, refer to the logs of all DICOM/HL7 software involved in the workflow. For usage of the iQ-WEB log, refer to sections 9.8.2, 9.8.3, and 9.8.4. Set the logs to the highest available level to receive more detailed information.

2. To check the network configuration of all participating machines, use the Windows command line tool "ipconfig." Using this tool, the hostname, IP, and subnet configurations can be validated to match the iQ-WEB configuration.

3. It is recommended that the Windows command line tools "ping" and "telnet" be used to check the accuracy of the IP, hostname and Port configuration, and to ensure that no intermediate network node is interrupting network communication.

> **NOTICE:**
> *A fully reliable and stable network infrastructure is essential to attain all the benefits of iQ-WEB.*

4. It is recommended that the server's firewall configuration be checked to ensure smooth network communication. The following rules are recommended on the iQ-WEB server:

   - Allow incoming and outgoing TCP connection for the configured DICOM Port (default: 1234)
   - Allow incoming and outgoing TCP connection for the configured HL7 Port (default: 7777)
   - Allow incoming and outgoing TCP connection for the configured web interface Port (default http: 80 or default https: 443)
   - Allow incoming and outgoing TCP connection for the MySQL Port
     This is only necessary if the database is installed on a separate machine. (default: 3306)

> **NOTICE:**
> *The only incoming and outgoing TCP connection allowed on client machines should be the web interface port.*

5. If hostnames are used instead of fixed IP addresses throughout the iQ-WEB configuration, ensure that the DNS server response times are low and the response is always accurate. Otherwise, an optimal iQ-WEB performance cannot be guaranteed.

6. If IPv4 or hybrid IPv6/IPv4 networks are used, there may be delays when accessing the web interface directly on the server where iQ-WEB is installed. If this issue occurs, it may be solved by changing the Windows host file configuration of the server to directly map IP address 127.0.0.1 to the "localhost" hostname. The host file configuration can be found by default in c:\Windows\System32\drivers\etc\hosts.

For detailed instructions, contact your local IT administrative personnel.

9.8.7 Virtualization environment and distributed systems

Modern operating systems offer the capability to work in a virtualized environment. This can make maintenance and backup tasks more reliable and easy to achieve. iQ-WEB itself can have its tasks distributed across multiple servers. (E.g. put the iQ-WEB installation and DICOM storage on two separate machines.) In this section, the advantages and disadvantages of running iQ-WEB in a virtual environment are discussed and general advice is given.

The main advantage of virtual machines (VMs) is the independence of the physical environment. Linux may serve as the host's main operating system while Windows runs in a virtual environment on the same server. Windows is required to be the operating system on the virtual machine running iQ-WEB. Working with a cluster of servers as the host, the virtual environment is even more reliable, and hardware changes are possible with virtually no PACS downtime. With the ability to create snapshots of virtual machines, these systems offer an integrated backup solution.

Keep in mind that the host system for the virtual machine must be more powerful than a dedicated server since at least two operating systems will be running on the same hardware. They share resources such as disk-space, IO times, RAM, CPU time, and network capacity. This becomes even more critical in cases where multiple virtual machines share the same physical hardware. It is also important to keep in mind that if components like the database, storage, and the iQ-WEB installation are distributed over multiple VMs, the work load on the network infrastructure between them will be elevated, in addition to the normal traffic on the network serving the clients.

Because of hardware sharing, the use of virtual machines is not recommended for installations with lots of DICOM traffic, unless the host is powerful enough to serve all storage and retrieve requests within a reasonable time.

9.8.8 Thumbnail and image generation

iQ-WEB modules extracts thumbnails and full resolution images out of the raw DICOM files in a format convenient for web interfaces. These images are used in the following places:

- iQ-WEB image view, online image processing view, image matrix view (Refer to the iQ-WEB Instructions for Use)
- iQ-X thumbnail bar (Refer to the iQ-X Instructions for Use)
- iQ-WEB2GO series page, image page (Refer to the iQ-WEB2GO Instructions for Use)

Due to a large variety of DICOM image compression formats, iQ-WEB may not be able to extract the data due to compatibly issues with the data storage algorithms used. The following steps show how to identify and help debug this issue.

When navigating to the specific image view, an error sign will appear instead of the preview image.

To get information about the error generated, move the mouse over the image and a text will appear that displays the error description.

> **NOTICE:**
> *This method of identifying the issue also works if the iQ-X module doesn't show the correct images in the thumbnail bar and the iQ-WEB2GO module doesn't show images on its pages.*

If the error is related to the image and compression format, refer to the "Medical Image Data Compression Guide" for detailed information.

9.8.9 License troubleshooting

This section describes how to identify issues with the licenses of iQ-WEB and its modules.

9.8.9.1 Core license

An invalid iQ-WEB core license can be recognized by the following events and states:

- The Application Log in Windows Event Viewer contains an error after (re)starting the iQ-WEBX service - "Invalid license information or license has expired."
- Windows process manager (in Task Manager) shows fewer processes containing the name "iQ-WEBX" than expected. With a valid license, the following processes should be visible:
  - "iQ-WEBXSrv.exe"
  - "iQ-WEBX.exe"
  - "iQ-WEBXHL7.exe" (if HL7 feature of iQ-WEB is enabled)
- No DICOM connection can be established from or to iQ-WEB (except C-ECHO).
- The iQ-WEB webpage footer contains an expiration warning.

> **NOTICE:**
> *If an administrative Email address and an SMTP server are set up correctly, iQ-WEB will send license expiration warnings.*
> *(Refer to sections 9.4.2.5 "Global settings" and 9.4.3 "Setting up an SMTP server for email" for configuration.)*

Reasons for an invalid iQ-WEB core license are as follows:

- License exceeds its limitations
  - Time limitation (if Trial, Demo or time-limited full license)
  - Number of images (if Trial)
  - Number of AE titles
  - Number of installed instances (default: 1)
- License file was not installed correctly
- Wrong type of license was ordered
- Too many hardware components on the machine changed
- The network configuration of the machine changed
- The time or date of the machine was changed

For detailed instructions or help on licensing issues, contact your local distributor or license@image-systems.biz.

9.8.9.2 iQ-X license

An invalid iQ-X license can be recognized by the following events and states:

- The "EasyWEB" page and other "Views" do not display the "Show" button as enabled
- The "EasyWEB" page does not display the " 👁 " icon for each study
- iQ-X REPORT EDITOR cannot be opened in iQ-X
- After navigating the iQ-WEB web interface to the "License" tab of the "Tools" page, the corresponding section of that page contains information about a license expiration.

> **NOTICE:**
> *If iQ-X is used with concurrent licensing, users may not be able to log in if the number of current active users exceeds the number of concurrent users in the license. This does not invalidate the license! As soon as the number of active users drops below the limit, logging in will be possible again. For extending the number of concurrent users, contact your distributor or license@image-systems.biz.*

Reasons for an invalidated iQ-X license are as follows:

- License exceeds its limitations: Time limitation (if Trial, Demo or time-limited full license)
- License file was not installed correctly
- Wrong type of license was ordered
- Too many hardware components on the machine changed
- The time or date of the machine was changed

For detailed instructions or help on licensing issues, contact your local distributor or license@image-systems.biz.

9.8.9.3 iQ-WEB2GO and iQ-WEBX WADO licenses

The iQ-WEB modules iQ-WEB2GO and iQ-WEBX WADO rely on the same license mechanism. An invalid license for these modules can be recognized by the following events and states:

- If a user tries to access the following feature pages of the module, a white page or error message appears:
  - The WADO link generator of iQ-WEBX WADO is not accessible
  - WADO calls to iQ-WEB lead to the above described behavior
  - The login to iQ-WEB2GO is not working
- After navigating the iQ-WEB web interface to the "License" tab of the "Tools" page, the corresponding section of that page contains information about a license expiration.

Reasons for an invalid iQ-WEB2GO or iQ-WEBX WADO licenses are as follows:

- License exceeds its limitations
  - Time limitation (if Trial, Demo or time-limited full license)
- License file was not installed correctly
- The PHP configuration does not include the required SourceGuardian extension

> **NOTICE:**
> *To prove that the SourceGuardian configuration is working correctly, navigate to "Tools" →*
> *"System" and access the link next to the Apache status display. This will display an*
> *informational page that lists various settings used by Apache.*
> *(Refer to section 9.3.3.1.1 "Apache" for details.)*

- Too many hardware components on the machine changed
- The network configuration of the machine changed
- The time or date of the machine was changed

For detailed instructions or help on licensing issues, contact your local distributor or license@image-systems.biz.

9.8.10 Network troubleshooting

iQ-WEB and its components strongly rely on the underlying network infrastructure. For this reason, inconsistently configured or undersized network configurations may lead to delays when using iQ-WEB and its components and modules. This section will specify techniques to identify and fix common issues found in certain network architectures.

9.8.10.1 Hostname resolution

iQ-WEB strongly relies on a complete hostname resolution within the network in which it is running. This applies to both the server and the client and is especially important in hostname based features like the using the iQ-VIEW call. Inconsistent DNS configuration can result in delays when using iQ-WEB. To identify such issues, follow the instructions below and contact the local IT administrators.

- Open a windows command line interface on a client machine that is experiencing delays.
- Retrieve the hostname by executing the following command:
  `"hostname"`
- Test resolving the IP address of this host by typing the following command where "MY_CLIENT_HOSTNAME" is the hostname of the client. Measure the response time:
  `"nslookup MY_CLIENT_HOSTNAME"`
  If the response time equals the same delay of iQ-WEB, there is a timeout issue with the local DNS service.
- Repeat the same command using the hostname of the server and measure the response time.
  `"nslookup MY_SERVER_HOSTNAME"`

If the response time equals the same delay of iQ-WEB, there is a timeout issue with the local DNS service.
- Compare the response times of executing the ping command to the iQ-WEB server using the Hostname and then the IP address of the server.
  `"ping MY_SERVER_HOSTNAME"`
  `"ping MY_SERVER_IP"`
  If there is a time difference between both ping response times similar to the experienced delay, there is a timeout issue with the local DNS service.

9.8.10.2 IPv6 compatibility

Currently iQ-WEB and its components are not fully IPv6 compliant. For this reason, a working IPv4 configuration is mandatory to use iQ-WEB. Due to the fact that modern operating systems like Windows 7, Windows Server 2008, and above prepare IPv6 as primary network interface, iQ-WEB instances installed on such systems may experience delays or slowness when accessing the web interface pages in a browser.

To solve these delays, follow the steps below on the iQ-WEB server where MySQL is installed:

- Stop the Apache, iQ-WEBX, and MySQL services in this order.
- Locate the MySQL configuration file named "my.ini". The default location of "my.ini" in 64 bit installations of MySQL is: C:\Program Files\MySQL\MySQL Server 5.7).
- Open the file in a text editor (like Notepad) and locate the "Server Section" marked with the following string:
  `"[mysqld]"`
- Below this section, add the following option in a new line. (Don't include the quotes.):
  `"bind-address=::"`
- Save and close the file.
- Restart the MySQL, iQ-WEBX, and Apache services in this order.
- Verify the working state of iQ-WEB by logging into the web interface and checking the current log display.

10 Abbreviations and acronyms

Abbreviation	Meaning
AE	Application Entity
AET	Application Entity Title
C-ECHO	DICOM command for verifying the DICOM connection between devices
C-FIND	DICOM command for search of studies
C-MOVE	DICOM command for move of studies
COM	Component Object Model, is a binary-interface standard for software by Microsoft
CPU	Central Processing Unit
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communication in Medicine
DNS	Domain Name System
EEA	European Economic Area
EEC	European Economic Community
GUI	Graphical User Interface
HIPAA	Health Insurance Portability and Accountability Act
HIS	Hospital Information System
HTML	Hyper-Text Mark-up Language
HTTP	Hyper Text Transfer Protocol
ID	Identifier
IO	Input-Output
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
LDAP	Lightweight Directory Access Protocol
LDAP CN	Lightweight Directory Access Protocol Common Name
LDAP DN	Lightweight Directory Access Protocol Distinguished Name
LDAP RDN	Lightweight Directory Access Protocol Relative Distinguished Name
MOVE SCU	C-Move as Service Class User
NEMA	National Electrical Manufacturers Association
OLE	Is an inter-process communication mechanism created by Microsoft
PACS	Picture Archiving and Communication System
PHP	PHP: Hypertext Preprocessor

Abbreviation	Meaning
Q/R SCP	Query/Retrieve as Service Class Provider
Q/R SCU	Query/Retrieve as Service Class User
RAM	Random Access Memory
RIS	Radiology Information System
SCP	Service Class Provider
SCU	Service Class User
SSL	Secure Sockets Layer
STORE SCP	DICOM store as Service Class Provider
STORE SCU	DICOM store as Service Class User
STORAGE COMMITMENT SCP	DICOM store as Service Class Provider
STORE COMMITMENT SCU	DICOM store as Service Class User
TCP	Transmission Control Protocol
UI	Graphical User Interface
UID	Unique identifier

11 List of shortcuts

Not applicable.

12 Annex

Not applicable.

13 List of figures

14 Index