INOBITEC

software for healthcare

Inobitec DICOM Server (PACS) version 2.9

USER'S MANUAL

The information contained in this User Manual belongs to INOBITEC Software FZ-LLC, Dubai Media City, Building 05, Dubai, UAE, P.O. Box 73030. The Manual is delivered to the users of the Inobitec DICOM Server (PACS) software product exclusively for the purpose of working with this product. No part of the information contained herein can be modified, used for any other purpose or delivered to any third party without the prior written consent of INOBITEC Software FZ-LLC. INOBITEC Software FZ-LLC reserves the right to alter this Manual without prior notice.

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About this Manual

This User Manual describes the functionality of Inobitec DICOM Server (PACS) (version 2.9) and provides instructions on how to use this software product.

Accepted Conventions

Names of program interface elements, key names and important notes are printed in **bold**. Image captions are printed in *italics*.

Technical Support

Technical support of Inobitec DICOM Server (PACS) users is provided by the INOBITEC Software FZ-LLC team. If you apply for technical support, please include the following information in your message:

- your computer OS name, version and bitness (you can get this information from your system administrator);

- version (e.g. 2.3.0.904);

- product code. How to find out the product code, see the section 2.1;

- information about the client.

To apply for technical support, or if you have any further questions or comments, please email us at **support@inobitec.com**

About the Product

The Inobitec DICOM Server (PACS) software product and installer does not:

- collect and transfer confidential user information;

- intercept network traffic;

- show ads;

- send spam;

- show messages not related to work;

- automatically update itself without notifying the user.

After uninstalling you do not need to restore your operating system and browser settings. Uninstalling is free of charge. Uninstalling does not adversely affect the operation of the computer and installed software. Files not related to the Inobitec DICOM Server (PACS) are not removed and changed after uninstalling. The Inobitec DICOM Server (PACS) functionality, installing, uninstalling, licensing are fully described in this User Manual on the website **inobitec.com/eng**.
License Agreement is available from the link **inobitec.com/eng/about/serverLic/**.

DICOM Server the program is officially released in two editions (for MySQL and for PostrgeSQL) and for 64-bit operating systems.

The following builds are available to be custom-built:

- for operating systems of the Linux family that are not specified in the system requirements;

- for DBMS that are not specified in the system requirements.

To order a custom build, please email **market@inobitec.com**.

DICOM Server Functionality

- Storing studies in DICOM format;

- connecting clients (modalities and software) via the DICOM protocol;

- control of clients' access to data;

- connecting network drives as storages;

- automatic compression of the downloaded data after a certain period of time;

- automatic disposal of the uploaded data after a certain period of time;

- modality worklist storage;

- connection to the regional DICOM server with the following capabilities:

    - saving studies at the regional DICOM server;

    - searching for studies at the regional DICOM server;

    - transferring files in the preferred format (Transfer Syntax);

    - checking the delivery of studies to the regional DICOM Server;

- a web console providing the following opportunities:

    - client connection settings;

    - choosing the preferred file transfer format;

    - an opportunity to add a description;

    - storage settings;

    - regional DICOM server connection settings;

    - program settings viewing;

    - view the product code and upload the license;

    - log file viewing;

    - downloading a log files archive;

    - searching for studies in the storage;

    - viewing studies in the storage;

    - manage the collection of tasks associated with studies transfer, compression, and deletion;

    - disposing of studies and series;

    - viewing and editing the list of the scheduled studies (modality worklist);

    - deleting the scheduled studies and their stepss;

    - resetting the step status for the scheduled studies;

    - studies downloading;

    - logging level settings;

- secure clients' connection to the regional DICOM server.

Trial mode restrictions:

1. Maximum number of clients connected: 2.

2. Maximum number of studies stored: 100.

3. Connection to the regional DICOM server is not available.

4. Automatic data compression is not available.

5. Automatic disposal of studies by the storage period is not available.

6. Automatic disposal of studies if there is lack of storage space is not available.

7. The import of studies to the DICOM Server through the administration web console is unavailable.

Installing, Uninstalling and Launching the Program

It is not recommended to install DICOM Server and the DBMS on the same computer.

System Requirements

The amount of free space needed for storage is to be calculated by the users themselves on the basis of the following parameters:

- average volume of data obtained from the modality, as calculated for the specific study type;

- number of studies;

- period of data storage at the server;

- data archiving.

If the DICOM Server is being installed on a virtual machine, it is recommended:

- set static MAC address on network adapters and hypervisor;

- allocate static RAM, not dynamic.

Minimum System Requirements

- **Operating System:**

  – Windows 7 x64;
  – CentOS 7 x64;

- **One of DBMS:**

  – MySQL 5.5-5.6;
  – PostgreSQL 9.4 or higher;

- **RAM:** 16 GB;

- **Free space on the disk:** 105 MB (excluding the space for data storage);

- **Processor:** clock frequency 2.5 GHz;

- **Network card** (1 Gbit/s);

- **Web browser for the web console:**

  - Microsoft Edge;
  - Google Chrome;
  - Mozilla Firefox.

  Other browsers may not display the web console correctly.

Recommended System Requirements

- **Operating System:**

  - Windows 7 x64 or higher;
  - CentOS 7 x64;

- **One of DBMS:**

  - MySQL 5.5-5.6;
  - PostgreSQL 9.4 or higher. The MD5 authorization method must be enabled in the PostgreSQL DBMS settings;

- **RAM:** 32 GB;

- **Free space on the disk:** 105 MB (excluding the space for data storage);

- **Processor:** clock frequency 3 GHz (4 cores);

- **Network card** (1 Gbit/s);

- **Hard drive with quick data access**;

- **Web browser for the web console:**

  - Microsoft Edge;
  - Google Chrome;
  - Mozilla Firefox.

  Other browsers may not display the web console correctly.

Installing the Program

Deploying the Database and Installing the DICOM Server on the Current PC Simultaneously

Below you will find links to detailed instructions for different operating systems on how to deploy the database and install the DICOM Server on the same PC simultaneously.

Attention! Before deploying the database and installing the Program at the same time, make sure that you have the DBMS administrator password and the database user password. The password field cannot be left empty.

Installing the Program on Windows

Installing the Program on Linux

MySQL Database deployment on Windows (for MySQL builds)

Attention! Before database deployment, make sure that you have the DBMS administrator password and the database user password. The password field cannot be left empty.

To deploy database on Windows, launch the command prompt and run **sql-manager.exe** utility as user.

Attention! Do not run sql-manager.exe as an administrator.

The interactive installator runs. Follow the prompts. To keep the default value shown in square brackets, press **Enter** without entering the value.

You need to install a **mysql** DBMS client to ensure the utility operation. The path to the DBMS client must be provided in the **PATH** environmental variable.

1. When prompted, enter the figure corresponding to the action you want to perform. To deploy the database, print 1 and press **Enter**.

    What do you want to do?
    1 – Deploy database
    2 – Update database
    Please enter number of the action

2. Enter the IP address of the computer with the DBMS installed (the default value is **127.0.0.1**) and press **Enter**:
    Enter database host [127.0.0.1]:

3. Enter the DBMS port (default value 3306):
    Enter database port [3306]:

4. Enter the administrator user name to access the database (default value: **root**) and press **Enter**:
    Enter database administrator user name (existing user) [root]:

5. Enter the administrator password to access the database and press **Enter**:
    Enter database administrator user password:

6. Enter the user name to access the database (default value: **PACS_USER**) and press **Enter**:
   Enter user name for DICOM Server database schema [PACS_USER]:

7. Enter the user password whose name was entered in step 6 and press **Enter**:
   Enter password for user PACS_USER:

   After successful deploy database, the following message is displayed:
   Deploying database schema complete...
   Press Enter to continue...
   Press the **Enter** button to complete.
   Attention! Make sure that the DBMS buffer is suitable for work with large amounts of data. To work with bulk data, e.g. to delete a storage containing more than 100,000 studies, the **innodb** buffer size must be increased to 64 MB by changing the **innodb_buffer_pool_size=64MB** parameter in the **mysql.ini** configuration file.

PostgreSQL Database deployment on Windows (for PostgreSQL builds)

Attention! The MD5 authorization method must be enabled in the PostgreSQL DBMS settings.

Attention! Before database deployment, make sure that you have the DBMS administrator password and the database user password. The password field cannot be left empty.

To deploy database on Windows, launch the command prompt and run **sql-manager.exe** utility as user.

Attention! Do not run sql-manager.exe as an administrator.

The interactive installator runs. Follow the prompts. To keep the default value shown in square brackets, press **Enter** without entering the value.

You need to install a **psql** DBMS client to ensure the utility operation. The path to the DBMS client must be provided in the **PATH** environmental variable.

1. When prompted, enter the figure corresponding to the action you want to perform. To deploy the database, print 1 and press **Enter**.

   What do you want to do?
   1 – Deploy database
   2 – Update database
   Please enter number of the action

2. Enter the IP address of the computer with the DBMS installed (the default value is **127.0.0.1**) and press **Enter**:
   Enter database host [127.0.0.1]:

3. Enter the DBMS port (default value 5432):
   Enter database port [5432]:

4. Enter the administrator user name to access the database (default value: **postgres**) and press **Enter**:

Enter database administrator user name (existing user) [postgres]:

5. Enter the administrator password to access the database and press **Enter**:
   Enter database administrator user password:

6. Enter the user name to access the database (default value: **PACS_USER**) and press **Enter**:
   Enter user name for DICOM Server database schema [PACS_USER]:

7. Enter the user password whose name was entered in step 6 and press **Enter**:
   Enter password for user PACS_USER:

After successful deploy database, the following message is displayed:
Deploying database schema complete...
Press Enter to continue...
Press the **Enter** button to complete.

Installing the Program on Windows

To install DICOM Server on Windows:

1. Launch the command prompt as administrator.

2. At the command prompt, run the command:
   cd <path to the Scripts folder>
   and go to the *Scripts* directory of the unpacked DICOM Server distribution.

3. Run **deploy_pacs.bat**.

The interactive installator runs. Follow the prompts. To keep the default value shown in square brackets, press **Enter** without entering the value.

1. Select where you want to install the DICOM Server (by default the server will be installed in C:\PACSServer).

   Press Enter:
   Enter the path to the folder to install the Inobitec DICOM Server (PACS) [C:\PACSServer]:

   If the folder chosen already exists, the installation will result in an error message:
   The directory <the folder chosenis already exists.
   Delete the folder or use update_pacs.bat script to upgrade
   an existing version of Inobitec DICOM Server (PACS).
   Installing Inobitec DICOM Server (PACS) failed.

2. Enter the IP address of the computer with the DBMS installed (the default value is **127.0.0.1**) and press **Enter**:
   Enter database host ip [127.0.0.1]:

3. Enter the DBMS port (default value absent):
    Enter database port:
    The port must contains only the numbers and must be not empty

    -   for MySQL DBMS, the default port value is specified in **MySQL Database deployment on Windows**
    -   for PostgreSQL DBMS, the default port value is specified in **PostgreSQL Database deployment on Windows**

4. Enter the user name to access the database (default value: **PACS_USER**) and press **Enter**:
    Enter database username [PACS_USER]:

5. Enter the user password to access the database (default value absent) and press **Enter**:
    Enter database user password:
    Attention! The password will be displayed when entered!

6. Choose if the database should be deployed on the current PC (the default value is **127.0.0.1**). Press **Y** for «Yes» and **N** for «No»:
    Deploy database on the 127.0.0.1 machine? [Y,N]?
    If you press **N**, the installation will proceed with Step 9.

7. If you have chosen to deploy the database on the current PC, enter the user name of the database administrator and press **Enter**:
    Enter database administrator user name:

    -   for MySQL DBMS, the default administrator name is specified in **MySQL Database deployment on Windows**
    -   for PostgreSQL DBMS, the default administrator name is specified in **PostgreSQL Database deployment on Windows**

8. Enter the administrator password to access the database and press **Enter**:
    Enter database administrator user password:

9. Enter the AE Title for the DICOM Server (default value: **PACS_Inobitec**) and press **Enter**:
    Enter the Inobitec DICOM server AETitle [PACS_Inobitec]:

10. Indicate if incoming connections via DICOM protocol should be accepted from any clients (press **Y** if they should be accepted and **N** if not):
    Accept associations from any AETitles? [Y,N]?

11. Indicate if insecure connection with DICOM requests processing service should be used when working with the studies storage (press **Y** if it should be used and **N** if not):
    Activate unsecured DICOM store service? [Y,N]?

12. If you have chosen the use of insecure connection, enter the port for insecure connection (default value: 3000) and press **Enter**:
   Enter the unsecured DICOM store service port [3000]:
   If you have chosen not to use insecure connection, the default value will be used.

13. Indicate if insecure connection with the DICOM requests processing service should be used when working with the study worklist (press **Y** if it should be used and **N** if not):
   Activate unsecured DICOM MWL service? [Y,N]?

14. If you have chosen the use of insecure connection, enter the port for insecure connection (default value: 3001) and press **Enter**:
   Enter the unsecured DICOM MWL service port [3001]:
   If you have chosen not to use insecure connection, the default value will be used.

15. Indicate if secure connection with the DICOM requests processing service should be used when working with the studies storage (press **Y** if it should be used and **N** if not):
   Activate secured DICOM store service? [Y,N]?

16. If you have chosen the use of secure connection, enter the port for secure connection (default value: 3100) and press **Enter**:
   Enter the secured DICOM store service port [3100]:
   If you have chosen not to use insecure connection, the default value will be used.

17. Indicate if secure connection with the DICOM requests processing service should be used when working with the modality worklist (press **Y** if it should be used and **N** if not):
   Activate secured DICOM MWL service? [Y,N]?

18. If you have chosen the use of secure connection, enter the port for secure connection (default value: 3101) and press **Enter**:
   Enter the secured DICOM MWL service port [3101]:
   If you have chosen not to use insecure connection, the default value will be used.

19. Enter the limit of free disk space in megabytes (default value: 2048) and press **Enter**:
   Enter free space storage limit [2048]:

20. Enter the port for the HTTP service (default value: 8000) and press Enter:
   Enter the HTTP service port [8000]:

21. Enter the user name to access the web console (default value: **Admin**) and press **Enter**:
   Enter the WebAdmin user name [Admin]:

22. Enter the user password to access the web console (default value absent) and press **Enter**:
   Enter the WebAdmin user password:
   Attention! The password will be displayed when entered!

23. Enter the name under which the service will be registered in the operating system (default value: PACSServer) and press **Enter**:
    Enter the Inobitec DICOM Server (PACS) service name [PACSServer]:

    After that the files will be copied in the designated folder. After the files have been copied, a service with the designated name is created. If a service with such a name already exists, the installation will result in an error message.

    If in Step 6 you chose to deploy the database on the current PC, a message will pop up notifying you of a successful or failed attempt to deploy the database.

    If the attempt to deploy the database has failed, you have to detect and correct the error, and then run the **sql-manager.exe** script manually in compliance with the terms of the section named **MySQL Database deployment on Windows** or **PostgreSQL Database deployment on Windows**.

24. Indicate if dependency on DBMS service should be added (press **Y** if it should be added and **N** if not):
    Add dependency from DBMS service? [Y,N]?

25. If you have chosen to add the dependency, enter the DBMS service name (default value absent) and press **Enter**:
    Enter DBMS service name:

    After successful installation, the following message is displayed: *«Installing Inobitec DI-COM Server (PACS) completed»*.
    Press any button to complete the installation.
    If at the time of installation the service launch dependence has not been established, use the following command:
    sc config PACSServer depend=MySQL
    where **PACSServer** is the name of the Inobitec DICOM Server (PACS) service and **MySQL** is the name of MySQL DBMS service.

MySQL Database deployment on Linux (for MySQL builds)

Attention! Before database deployment, make sure that you have the DBMS administrator password and the database user password. The password field cannot be left empty.
To deploy database on Linux, launch the command prompt and run **sql-manager** utility as user.
Attention! Do not run the sql-manager utility as a superuser.
The interactive installator runs. Follow the prompts. To keep the default value shown in square brackets, press **Enter** without entering the value.
You need to install a **mysql** DBMS client to ensure the utility operation. The path to the DBMS client must be provided in the **PATH** environmental variable.

1. When prompted, enter the figure corresponding to the action you want to perform. To deploy the database, print 1 and press **Enter**.

   What do you want to do?
   1 – Deploy database
   2 – Update database
   Please enter number of the action

2. Enter the IP address of the computer with the DBMS installed (the default value is **127.0.0.1**) and press **Enter**:
   Enter database host [127.0.0.1]:

3. Enter the DBMS port (default value 3306):
   Enter database port [3306]:

4. Enter the administrator user name to access the database (default value: **root**) and press **Enter**:
   Enter database administrator user name (existing user) [root]:

5. Enter the administrator password to access the database and press **Enter**:
   Enter database administrator user password:

6. Enter the user name to access the database (default value: **PACS_USER**) and press **Enter**:
   Enter user name for DICOM Server database schema [PACS_USER]:

7. Enter the user password whose name was entered in step 6 and press **Enter**:
   Enter password for user PACS_USER:

After successful deploy database, the following message is displayed:
Deploying database schema complete...
Press Enter to continue...
Press the **Enter** button to complete.
Attention! Make sure that the DBMS buffer is suitable for work with large amounts of data. To work with bulk data, e.g. to delete a storage containing more than 100,000 studies, the **innodb** buffer size must be increased to 64 MB by changing the **innodb_buffer_pool_size=64MB** parameter in the **mysql.ini** configuration file.

PostgreSQL Database deployment on Linux (for PostgreSQL builds)

Attention! The MD5 authorization method must be enabled in the PostgreSQL DBMS settings.
Attention! Before database deployment, make sure that you have the DBMS administrator password and the database user password. The password field cannot be left empty.
To deploy database on Linux, launch the command prompt and run **sql-manager** utility as user.

Attention! Do not run the sql-manager utility as a superuser.
The interactive installator runs. Follow the prompts. To keep the default value shown in square brackets, press **Enter** without entering the value.

You need to install a **psql** DBMS client to ensure the utility operation. The path to the DBMS client must be provided in the **PATH** environmental variable.

1. When prompted, enter the figure corresponding to the action you want to perform. To deploy the database, print 1 and press **Enter**.

   What do you want to do?
   1 – Deploy database
   2 – Update database
   Please enter number of the action

2. Enter the IP address of the computer with the DBMS installed (the default value is **127.0.0.1**) and press **Enter**:
   Enter database host [127.0.0.1]:

3. Enter the DBMS port (default value 5432):
   Enter database port [5432]:

4. Enter the administrator user name to access the database (default value: **postgres**) and press **Enter**:
   Enter database administrator user name (existing user) [postgres]:

5. Enter the administrator password to access the database and press **Enter**:
   Enter database administrator user password:

6. Enter the user name to access the database (default value: **PACS_USER**) and press **Enter**:
   Enter user name for DICOM Server database schema [PACS_USER]:

7. Enter the user password whose name was entered in step 6 and press **Enter**:
   Enter password for user PACS_USER:

After successful deploy database, the following message is displayed:
Deploying database schema complete...
Press Enter to continue...
Press the **Enter** button to complete.

Installing the Program on Linux

You must to install the following packages in the Linux operating system for the DICOM Server to work:

For MySQL builds	For PostgreSQL builds
qt5-qtbase qt5-qtbase-common qt5-qtbase-gui gd minizip qt5-qtbase-mysql mariadb-libs	qt5-qtbase qt5-qtbase-common qt5-qtbase-gui gd minizip qt5-qtbase-postgresql postgresql-libs

If any libraries are missing in the system, the **deploy_pacs.sh** script will list them. To continue installing the DICOM Server, install the packages containing these libraries.

To install DICOM Server on Linux:

1. Launch the terminal.

2. Run the command:
   cd <path to the Scripts folder>
   and go to the *Scripts* directory of the unpacked DICOM Server distribution.

3. Run **deploy_pacs.sh** as superuser.

After starting, the installator will check for installed dependencies. If the dependencies are not installed, the installation will result in an error message:

Dependency check...
Follow components are requered for Inobitec DICOM Server (PACS) and absent:
libgd.so.2 => not found
libminizip.so.1 => not found
Install the dependencies and try to install Inobitec DICOM Server (PACS) again. Install the

dependencies and run the script again. If all the dependencies are installed, then the *All dependencies are satisfied.* message will be displayed.

1. Enter the IP address of the computer with the DBMS installed (the default value is **127.0.0.1**) and press **Enter**:
   Enter database host ip [127.0.0.1]:

2. Enter the DBMS port (default value absent):
   Enter database port:

   - for MySQL DBMS, the default port value is specified in **MySQL Database deployment on Linux**
   - for PostgreSQL DBMS, the default port value is specified in **PostgreSQL Database deployment on Linux**

3. Enter the user name to access the database (default value: **PACS_USER**) and press **Enter**:
   Enter database username [PACS_USER]:

4. Enter the user password to access the database (default value absent) and press **Enter**:
   Enter database user password:

5. Choose if the database should be deployed on the current PC (the default value is **127.0.0.1**). Press **Y** for «Yes» and **N** for «No»:
   Deploy database on the 127.0.0.1 machine? [Y,N]?
   If you press **N**, the installation will proceed with Step 8.

6. If you have chosen to deploy the database on the current PC, enter the user name of the database administrator and press **Enter**:
   Enter database administrator user name:

   - for MySQL DBMS, the default administrator name is specified in **MySQL Database deployment on Linux**

   - for PostgreSQL DBMS, the default administrator name is specified in **PostgreSQL Database deployment on Linux**

7. Enter the administrator password to access the database and press **Enter**:
   Enter database administrator user password:

8. Enter the AE Title for the DICOM Server (default value: **PACS_Inobitec**) and press **Enter**:
   Enter the Inobitec DICOM server AETitle [PACS_Inobitec]:

9. Indicate if incoming connections via DICOM protocol should be accepted from any clients (press **Y** if they should be accepted and **N** if not):
   Accept associations from any AETitles? [Y,N]?

10. Indicate if insecure connection with DICOM requests processing service should be used when working with the studies storage (press **Y** if it should be used and **N** if not):
    Activate unsecured DICOM store service? [Y,N]?

11. If you have chosen the use of insecure connection, enter the port for insecure connection (default value: 3000) and press **Enter**:
    Enter the unsecured DICOM store service port [3000]:
    If you have chosen not to use insecure connection, the default value will be used.

12. Indicate if insecure connection with the DICOM requests processing service should be used when working with the study worklist (press **Y** if it should be used and **N** if not):
    Activate unsecured DICOM MWL service? [Y,N]?

13. If you have chosen the use of insecure connection, enter the port for insecure connection (default value: 3001) and press **Enter**:
    Enter the unsecured DICOM MWL service port [3001]:
    If you have chosen not to use insecure connection, the default value will be used.

14. Indicate if secure connection with the DICOM requests processing service should be used when working with the studies storage (press **Y** if it should be used and **N** if not):
    Activate secured DICOM store service? [Y,N]?

15. If you have chosen the use of secure connection, enter the port for secure connection (default value: 3100) and press **Enter**:
    Enter the secured DICOM store service port [3100]:
    If you have chosen not to use insecure connection, the default value will be used.

16. Indicate if secure connection with the DICOM requests processing service should be used when working with the modality worklist (press **Y** if it should be used and **N** if not):
    Activate secured DICOM MWL service? [Y,N]?

17. If you have chosen the use of secure connection, enter the port for secure connection (default value: 3101) and press **Enter**:
    Enter the secured DICOM MWL service port [3101]:
    If you have chosen not to use insecure connection, the default value will be used.

18. Enter the limit of free disk space in megabytes (default value: 2048) and press **Enter**:
    Enter free space storage limit [2048]:

19. Enter the port for the HTTP service (default value: 8000) and press Enter:
    Enter the HTTP service port [8000]:

20. Enter the user name to access the web console (default value: **Admin**) and press **Enter**:
    Enter the WebAdmin user name [Admin]:

21. Enter the user password to access the web console (default value absent) and press **Enter**:
    Enter the WebAdmin user password:

22. Enter the name under which the service will be registered in the operating system (default value: pacsserver) and press **Enter**:
    Enter the Inobitec DICOM Server (PACS) service name [pacsserver]:

23. Enter the user starting the DICOM Server (default value: **pacs**) and press **Enter**:
    Enter the user name for starting Inobitec DICOM Server (PACS) service [pacs]:

24. If the DBMS for the DICOM Server has been installed on the same PC, enter the DBMS service name and press **Enter**:
    Enter the DBMS service name (leave blank if the database is not deployed on this computer):

    If in Step 5 you chose to deploy the database on the current PC, a message will pop up notifying you of a successful or failed attempt to deploy the database.

    If the attempt to deploy the database has failed, you have to detect and correct the error, and then run the **sql-manager** script manually in compliance with the terms of the section named **MySQL Database deployment on Linux** or **PostgreSQL Database deployment on Linux**.

    After that the files will be copied in the designated folder After the files have been copied, a service with the designated name is created. If a service with such a name already exists, the installation will result in an error message.

After successful installation, the following message is displayed: *«Installing Inobitec DI-COM Server (PACS) completed».*

If at the time of installation dependence of the service on the DBMS service has not been established, you need to edit the service file to establish it. The file name matches the name under which the DBMS service was registered in the operating system (default value: **pacsserver.service**).

The file is created when the program is being installed. By default, it is placed in the */etc/systemd/system/pacsserver.service*

To establish dependence on the DBMS service, add the following line at the end of the *[Unit]*:

After=<service name>.service

To find the service name, use the *systemctl* command. Below you will find an example of a **pacsserver.service** file.

```
[Unit]
Description=Inobitec DICOM Server (PACS)
After=network.target

[Install]
WantedBy=multi-user.target

[Service]
Type=simple
User=pacs
Group=pacs
PermissionsStartOnly=true
ExecStart=/srv/PACSServer/bin/pacs_server -cfg /srv/PACSServer/conf/
srv_settings.ini
TimeoutSec=300
WorkingDirectory=/srv/PACSServer/bin
```

Launching the Program

Dependency on other services

If the DBMS is not available when the DICOM Serverstarts, then DICOM Server exits with the error. If the DBMS become unavailable during DICOM Server working, then DICOM Server logs the **ERROR** level message but does not exit.

Launching on Windows

You can launch DICOM Server as service in two ways:

1. using the **Services** window. Use you operating system manual.

2. using the

   > sc start <service name>

   command. For the default service name («PACSServer») the command looks like

   > sc start PACSServer.

   Run it as administrator.

Launching on Linux

The command depends on operating system. E.g., use
 # systemctl start <service name>
in CentOS 7. For the default service name («pacsserver») the command looks like
 # systemctl start pacsserver

Command Line Parameters

Command line syntax:
[<program_path>]\pacs_server < --cfg <serverconfig_path> | --reset-uploaded-flag] | --help | --version | --product-key >

-h, --help: information about command line parameters is displayed; the program shuts down;

--reset-uploaded-flag: the Upload flag is unchecked for all the series that were to be sent to the regional DICOM server; the program shuts down;

--reset-compressed-flag: the Compressed flag is unchecked for all the series that were to be compressed; the program shuts down;

-v, --version: DICOM Server version is displayed; the program shuts down;

-p, --product-key: product code is displayed; the program shuts down;

-c, --cfg <serverconfig_path>: the path to the main configuration file (serverconfig_path) is specified.

Example:
C:\PACSServer\PACSServer.exe --cfg C:\PACSServer\srv_settings.ini

Updating the Program

Attention! Database updating may take a long time!

Attention! If after updating the DICOM Server cannot be launched as the configuration file does not have the required parameters, add the missing parameters manually.

Make backups before updating the database

When updating, the physical size of the database can grow dramatically. Before updating, make sure that there is enough free space on the hard disk where the database files are stored. The additional space taken during the update will subsequently be used to store new data, so for some time after the update, the size of the database will not increase

How to update a database from any version

To update the database to the current version, you should apply all the listed database schema updates in the specified order: 1.4.0, 1.4.1, 1.4.2, 1.4.3, 1.5.2, 2.0.0, 2.1.0, 2.4.0, 2.5.0. Updade scripts for previous versions are located in the **Scripts\previous_versions** folder.

For example, if you have version 1.4.3 installed, then to update to version 2.9.0 you need to run database update scripts for versions 1.5.2, 2.0.0, 2.1.0, 2.4.0, 2.5.0 from the **previous_versions** folder, and then upgrade to version 2.9.0 according to the section on updating the database for the desired DBMS and operating system.

Update MySQL Database on Windows (for MySQL builds)

Attention! If the version of the DICOM Server installed is earlier than 2.4.0 then read the procedure for updating the database (see Section How to update a database from any version)

To update database on Windows, launch the command prompt and run **sql-manager.exe** utility as user.

Attention! Do not run sql-manager.exe as an administrator.

The interactive installator runs. Follow the prompts. To keep the default value shown in square brackets, press **Enter** without entering the value.

You need to install a **mysql** DBMS client to ensure the utility operation. The path to the DBMS client must be provided in the **PATH** environmental variable.

1. When prompted, enter the figure corresponding to the action you want to perform. To update the database, print 2 and press **Enter**.

   What do you want to do?
   1 – Deploy database
   2 – Update database
   Please enter number of the action

2. Enter the IP address of the computer with the DBMS installed (the default value is **127.0.0.1**) and press **Enter**:
   Enter database host [127.0.0.1]:

3. Enter the DBMS port (default value: 3306):
   Enter database port [3306]:

4. Enter the user name to access the database (default value: **PACS_USER**) and press **Enter**:
   Enter user name for DICOM Server database schema [PACS_USER]:

5. Enter the user password whose name was entered in step 4 and press **Enter**:
   Enter password for user PACS_USER:

6. Make sure the database is updated to version 2.5.0
   To continue the process of updating database press the **Y** key on keyboard or **N** to cancel and press **Enter**:
   Make sure the database is updated to version 2.5.0
   Proceed? [y/n]:

   After successful update of database to version 2.9.0, the following message is displayed:
New version is 2.9.0
Updating database schema...
Updating database schema complete
Press Enter to continue...
   Press the **Enter** button to complete.

Update PostgreSQL Database on Windows (for PostgreSQL builds)

   Attention! If the version of the DICOM Server installed is earlier than 2.4.0 then read the procedure for updating the database (see Section How to update a database from any version)
   To update database on Windows, launch the command prompt and run **sql-manager.exe** utility as user.
   Attention! Do not run sql-manager.exe as an administrator.
   The interactive installator runs. Follow the prompts. To keep the default value shown in square brackets, press **Enter** without entering the value.
   You need to install a **psql** DBMS client to ensure the utility operation. The path to the DBMS client must be provided in the **PATH** environmental variable.

1. When prompted, enter the figure corresponding to the action you want to perform. To update the database, print 2 and press **Enter**.

   What do you want to do?
   1 – Deploy database
   2 – Update database
   Please enter number of the action

2. Enter the IP address of the computer with the DBMS installed (the default value is **127.0.0.1**) and press **Enter**:
   Enter database host [127.0.0.1]:

3. Enter the DBMS port (default value: 5432):
   Enter database port [5432]:

4. Enter the user name to access the database (default value: **PACS_USER**) and press **Enter**:
   Enter user name for DICOM Server database schema [PACS_USER]:

5. Enter the user password whose name was entered in step 4 and press **Enter**:
   Enter password for user PACS_USER:

6. Make sure the database is updated to version 2.5.0
   To continue the process of updating database press the **Y** key on keyboard or **N** to cancel and press **Enter**:
   Make sure the database is updated to version 2.5.0
   Proceed? [y/n]:

After successful update of database to version 2.9.0, the following message is displayed:
New version is 2.9.0
Updating database schema...
Updating database schema complete
Press Enter to continue...
Press the **Enter** button to complete.

Update Program on Windows

To update DICOM Server on Windows, launch the command prompt as administrator and run **«update_pacs.bat»**. The interactive installator runs. Follow the prompts. To keep the default value shown in square brackets, press **Enter** without entering the value.
Enter the path to the installed DICOM Server (by default the server is installed in C:\PACSServer) and press **Enter**:
Enter the path to Inobitec DICOM Server [C:\PACSServer]:
After a successful program update, the following message is displayed: *«Update Inobitec DICOM Server (PACS) completed»*.
Press any button to complete.

Update MySQL Database on Linux (for MySQL builds)

Attention! If the version of the DICOM Server installed is earlier than 2.4.0 then read the procedure for updating the database (see Section How to update a database from any version)

To update database on Linux, launch the command prompt and run **sql-manager** utility as user.
Attention! Do not run the sql-manager as a superuser.
The interactive installator runs. Follow the prompts. To keep the default value shown in square brackets, press **Enter** without entering the value.

You need to install a **mysql** DBMS client to ensure the utility operation. The path to the DBMS client must be provided in the **PATH** environmental variable.

1. When prompted, enter the figure corresponding to the action you want to perform. To update the database, print 2 and press **Enter**.

   What do you want to do?
   1 – Deploy database
   2 – Update database
   Please enter number of the action

2. Enter the IP address of the computer with the DBMS installed (the default value is **127.0.0.1**) and press **Enter**:
   Enter database host [127.0.0.1]:

3. Enter the DBMS port (default value: 3306):
   Enter database port [3306]:

4. Enter the user name to access the database (default value: **PACS_USER**) and press **Enter**:
   Enter user name for DICOM Server database schema [PACS_USER]:

5. Enter the user password whose name was entered in step 4 and press **Enter**:
   Enter password for user PACS_USER:

6. Make sure the database is updated to version 2.5.0
   To continue the process of updating database press the **Y** key on keyboard or **N** to cancel and press **Enter**:
   Make sure the database is updated to version 2.5.0
   Proceed? [y/n]:

AAfter successful update of database to version 2.9.0, the following message is displayed:
New version is 2.9.0
Updating database schema...
Updating database schema complete
Press Enter to continue...
Press the **Enter** button to complete.

Update PostgreSQL Database on Linux (for PostgreSQL builds)

Attention! If the version of the DICOM Server installed is earlier than 2.4.0 then read the procedure for updating the database (see Section How to update a database from any version)

To update database on Linux, launch the command prompt and run **sql-manager** utility as user.

Attention! Do not run the sql-manager as a superuser.

The interactive installator runs. Follow the prompts. To keep the default value shown in square brackets, press **Enter** without entering the value.

You need to install a **psql** DBMS client to ensure the utility operation. The path to the DBMS client must be provided in the **PATH** environmental variable.

1. When prompted, enter the figure corresponding to the action you want to perform. To update the database, print 2 and press **Enter**.

   What do you want to do?
   1 – Deploy database
   2 – Update database
   Please enter number of the action

2. Enter the IP address of the computer with the DBMS installed (the default value is **127.0.0.1**) and press **Enter**:
   Enter database host [127.0.0.1]:

3. Enter the DBMS port (default value: 5432):
   Enter database port [5432]:

4. Enter the user name to access the database (default value: **PACS_USER**) and press **Enter**:
   Enter user name for DICOM Server database schema [PACS_USER]:

5. Enter the user password whose name was entered in step 4 and press **Enter**:
   Enter password for user PACS_USER:

6. Make sure the database is updated to version 2.5.0
   To continue the process of updating database press the **Y** key on keyboard or **N** to cancel and press **Enter**:
   Make sure the database is updated to version 2.5.0
   Proceed? [y/n]:

After successful update of database to version 2.9.0, the following message is displayed:
New version is 2.9.0
Updating database schema...
Updating database schema complete
Press Enter to continue...
Press the **Enter** button to complete.

Update Program on Linux

Attention! Before updating the program version 2.5.0 or earlier, check if the package qt5-qtbase-mysql or qt5-qtbase-postgresql (depending on the DBMS used) has been installed and install it if required.
You will find the complete list of packages required for the DICOM Server operation on Linux in the Section called **Installing the Program on Linux**.
To update DICOM Server on Linux, launch the command prompt as superuser and run **«update_pacs.sh»**. The interactive installator runs. Follow the prompts.
After a successful program update, the following message is displayed: *«Update Inobitec DICOM Server (PACS) completed»*.

Uninstalling the Program

Uninstalling the Program on Windows

To uninstall the DICOM Server on Windows, launch the command prompt as administrator and run **uninstall_pacs.bat**. The interactive script runs. Follow the prompts. To keep the default value shown in square brackets, press **Enter** without entering the value.

If the **PATH** environment variable does not contain a path to the DBMS client, the script will prompt you to enter it. Enter a path without quotes; there are even spaces in the path.

1. Confirm or cancel uninstallation (press **Y** to confirm and **N** to cancel):
   Do you really want to uninstall Inobitec DICOM Server (PACS)? This action can not be aborted.

2. Enter the name under which the service is registered in the operating system (default value: PACSServer) and press **Enter**:
   Enter the Inobitec DICOM Server (PACS) service name [PACSServer]:

3. Enter the path to the installed DICOM Server (by default the server is installed in C:\PACSServer) and press **Enter**:
   Enter the path to the folder where Inobitec DICOM Server (PACS) is installed [C:\PACSServer]:

4. Confirm or cancel database deletion (press **Y** to confirm and **N** to cancel):
   Do you want to delete database schema?

5. If you have chosen to delete database, enter the IP address of the computer with the DBMS installed (the default value is **127.0.0.1**) and press **Enter**:
   Enter database host ip [127.0.0.1]:

6. Enter the DBMS port (default value for PostgreSQL: 5432, for MySQL: 3306):
   Enter database port [5432]:
   Enter database port [3306]:

7. Enter the administrator user name to access the database (default value: **root**) and press **Enter**:
   Enter postgres administrator user name (existing user) [postgres]:
   Enter mysql administrator user name (existing user) [root]:

8. Enter the administrator password to access the database (default value absent) and press **Enter**:
   Enter postgres administrator user password:
   Enter mysql administrator user password:

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9. Confirm or cancel database user deletion (press **Y** to confirm and **N** to cancel):
   Do you want to delete database schema user?

10. If you have chosen to delete the database user, enter the user name to access the database (default value: **PACS_USER**) and press **Enter**:
    Enter postgres user name for Inobitec DICOM Server (PACS) db scheme [PACS_USER]:

Press any button to complete.

Uninstalling the Program on Linux

To uninstall the DICOM Server on Linux, launch the command prompt as administrator and run **uninstall_pacs.bat**. The interactive script runs. Follow the prompts. To keep the default value shown in square brackets, press **Enter** without entering the value.

If the **PATH** environment variable does not contain a path to the DBMS client, the script will prompt you to enter it. Enter a path without quotes; there are even spaces in the path.

1. Confirm or cancel uninstallation (press **Y** to confirm and **N** to cancel):
   Do you really want to uninstall Inobitec DICOM Server (PACS)? This action can not be aborted. [y/n]

2. Enter the name under which the service is registered in the operating system (default value: pacsserver) and press **Enter**:
   Enter the Inobitec DICOM Server (PACS) service name [pacsserver]:

3. Confirm or cancel database deletion (press **Y** to confirm and **N** to cancel):
   Do you want to delete database schema? [y/n]

4. If you have chosen to delete database, enter the IP address of the computer with the DBMS installed (the default value is **127.0.0.1**) and press **Enter**:
   Enter database host ip [127.0.0.1]:

5. Enter the DBMS port (default value for PostgreSQL: 5432, for MySQL: 3306):
   Enter database port [5432]:
   Enter database port [3306]:

6. Enter the administrator user name to access the database (default value: **root**) and press **Enter**:
   Enter postgres administrator user name [postgres]:
   Enter mysql administrator user name [root]:

7. Enter the administrator password to access the database (default value absent) and press **Enter**:
   Enter postgres administrator user password:
   Enter mysql administrator user password:

8. Confirm or cancel database user deletion (press **Y** to confirm and **N** to cancel):
Do you want to delete database user? [y/n]

9. If you have chosen to delete the database user, enter the user name to access the database (default value: **PACS_USER**) and press **Enter**:
Enter postgres user name for PACS db scheme [PACS_USER]:

Getting Started

To avoid problems with the DICOM Server, do the following before you start working with the program:

1. Limit the access to the computers with the program installed in order to protect the patients' personal data.

2. If you need to receive data from the modality, check the modality connection settings by downloading test data.

Before starting a procedure that requires flawless operation of the DICOM Server, do the following:

1. If there is an uninterruptible power supply unit, make sure it is in working order.

2. Check the connected DICOM servers availability; depending on the tasks to be performed, check the ability to upload, download and search for data.

Chapter 1

DICOM Server Management Web Console

The web console allows you to:

- connect clients and manage access rights;

- search for and disposing of studies and certain series;

- view studies;

- manage scheduled studies and their stages;

- customize and manage storages;

- manage the collection of tasks associated with studies transfer, compression, and dele-
tion;

- set up Web Viewer connection;

- view and download log files;

- view and edit the settings;

- view the product code and upload the license.

1.1 Logging into the DICOM Server Administration Web Console
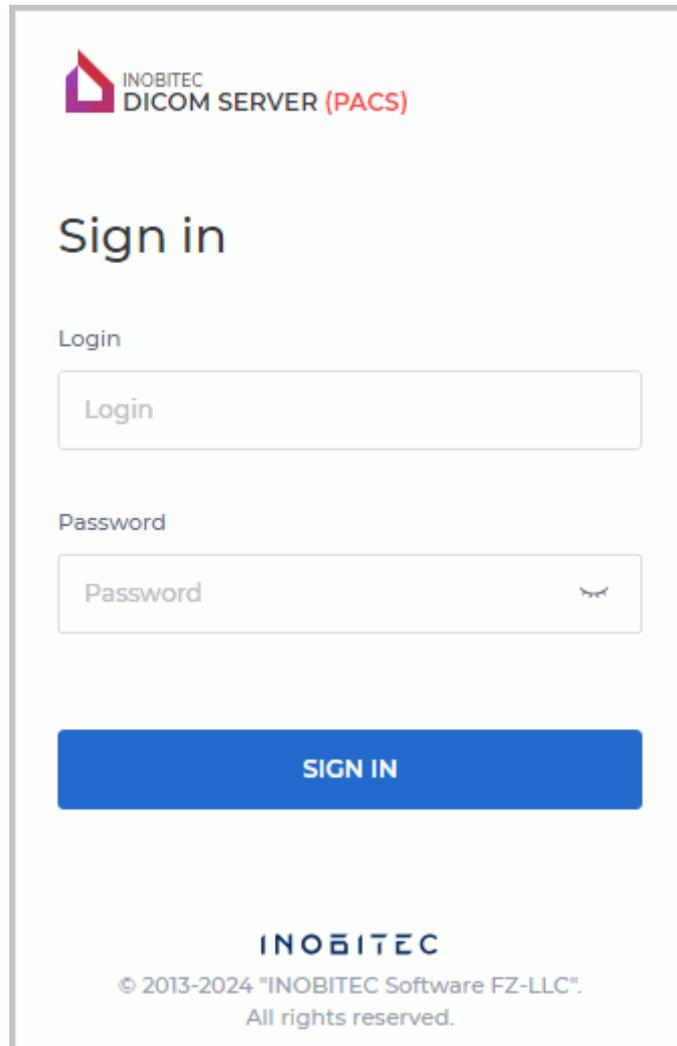
Figure 1.1: Logging into the web console

To use the web console, you need to start the DICOM Server and to set the web console access in the system. To enable access from other devises, you need to open the DICOM Server HTTP port in the firewall.

To open the web console, type
http://<computer address or name>:<HTTP DICOM Server port>
in the browser's address bar, e.g.: *http://192.168.1.2:8000*. In the pop-up box (Fig. 1.1), print the user name (login) and password, and then click the **SIGN IN** button.

Main menu of the web console of the DICOM Server is swown in Fig. 1.2.
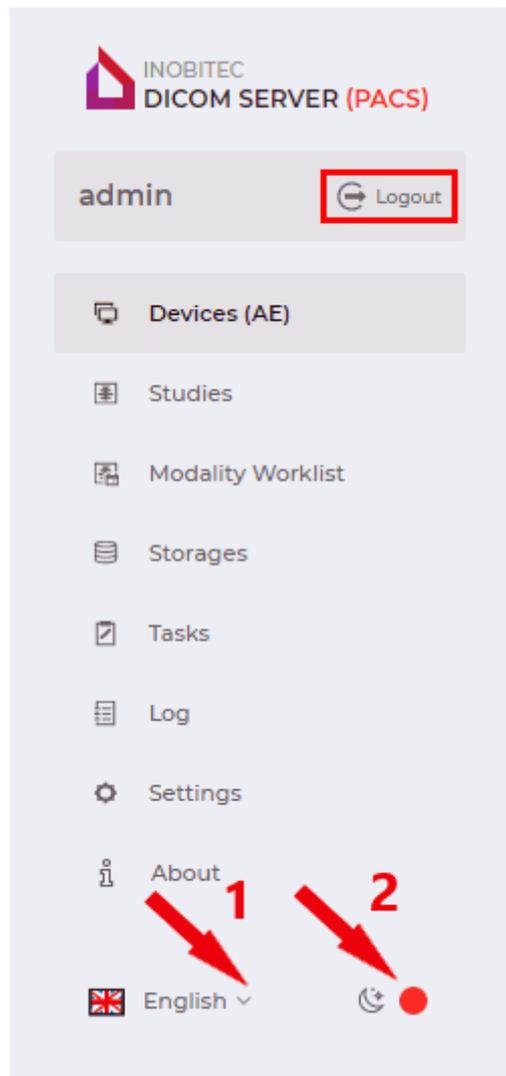
Figure 1.2: Web Console intefrace settings

To change the interface language, click the language selection button in the lower left corner (marked with number «1» in Fig. 1.2). To change the page background click the switch marked with number «2» in Fig. 1.2.

To log out from the web console, click the **Logout** button on the main menu (see the red box in Fig. 1.2).

1.2   Devices

After you have entered the web console, you will see the **Devices (AE)** tab (see Fig. 1.3).

You can connect various DICOM devices to the DICOM Server to provide for downloading, transfer, and quick access to the studies stored.

On the **Devices (AE)** tab, the clients' access to the data is restricted.

Figure 1.3: Devices (AE) Tab

In the table representing the connected client devices, the connection parameters are displayed. For details on the parameters display options, see Section 1.11.1. Client devices may be sorted by the values provided in one of the columns (see Section 1.11.2).

1.2.1 Adding a Client DICOM Device

To add a client to the list, proceed as follows:

1. Open the **Devices (AE)** page and go to the **DICOM** tab.

2. Click the **CREATE** button.

3. In the dialog box that pops up (Fig. 1.4), provide the following information on the client (device or program):

    (a) enter the client's AE title in the box named **AE Title**;

    (b) enter the client's IP address or domain name in the box named **IP or FQDN**. The maximum FQDN size is 255 characters, 63 characters for each domain name. The admissible characters are: uppercase and lowercase Latin letters, dot «.», and hyphen «-»;

    (c) enter the client's DICOM port in the box named **Port**;

    (d) tick the check box named **UPLOAD** to enable the client to upload data to the DICOM Server;

    (e) tick the check box named **MWL** (Modality Worklist) to enable the client to access MWL at the DICOM Server. **Attention: To enable MWL search you also need to tick the FIND check box**.

(f) tick the check box named **DOWNLOAD** to enable the client to download data from the DICOM Server;

(g) tick the check box named **FIND** to enable the client to search for data at the DICOM Server;

(h) tick the check box named **USE TLS** to use secure connection. In the **Certificate file** field, the certificate status is displayed. If there is no certificate, the «Not selected» status will be shown in this field. If required, upload the certificate file (for details see Section 1.2.2).

When a new certificate is uploaded, the previous certificate is deleted. If you delete a device from the list of clients, the respective certificate file will be deleted. After uploading a new certificate, restart the server to apply the changes.

(i) add a brief description of the device or software to the **Description** field. The description must not exceed 128 characters. This field can be left blank;

(j) from the **Preferred TS** (Transfer Syntax) drop-down list, choose the format in which images will be uploaded to the device by C-GET and C-MOVE methods. When choosing the preferred TS, consider the device capabilities, the acceptable image compression level, and the current archiving settings at the server.

The available transfer syntax options are:

- **As it is**;
- **Little Endian Implicit** (UID 1.2.840.10008.1.2);
- **Little Endian Explicit** (UID 1.2.840.10008.1.2.1);
- **Big Endian Explicit** (UID 1.2.840.10008.1.2.2);
- **Deflated Explicit VR Little Endian** (UID 1.2.840.10008.1.2.1.99);
- **JPEG Baseline** (UID 1.2.840.10008.1.2.4.50);
- **JPEG Lossless, Non-hierarchical, 1st Order Prediction**
  (UID 1.2.840.10008.1.2.4.70);
- **JPEG-LS Lossless** (UID 1.2.840.10008.1.2.4.80);
- **JPEG-LS Lossy (Near-lossless)** (UID 1.2.840.10008.1.2.4.81);
- **JPEG 2000 (Lossless only)** (UID 1.2.840.10008.1.2.4.90);
- **JPEG 2000 (Lossless or Lossy)** (UID 1.2.840.10008.1.2.4.91);
- **RLE Lossless** (UID 1.2.840.10008.1.2.5).

4. To save the changes, click the **SAVE** button under the settings section, to cancel, click **CANCEL**. If an invalid value is entered, a warning appears below the corresponding field.

If the **USE TLS** box is checked but the certificate has not been uploaded, the **SAVE** button will be disabled.

Figure 1.4: Adding a new client

If needed, you can add one more client.

If the maximum number of clients and WADO devices provided for by the license has been reached, the **CREATE** button becomes inactive. The total number of client connections available is displayed in the right-hand upper corner and determined by the type of the license (see Section 2).

To check the client's availability with a **C-ECHO** command, click the
Echo ·)) button in the column. In the lower right corner, the result of the operation pops up.

If you have failed to send a **C-ECHO** command to the DICOM Server, check the connection settings for DICOM Server and the client. Analyze the log files for the DICOM Server and the client. If all the parameters are correct, check the firewall settings for the computer with the DICOM Server.

To change the settings of the existing client, click the ✎ **Edit** button.

To delete a client, select it in the table, click the ⑪ **Remove** button and choose **REMOVE** or **CANCEL** in the dialog box to confirm or cancel the deletion.

To update the data in the table, click the ↻ **Refresh** button.

1.2.2 Setting up a Secure DICOM Connection via the TLS protocol

A Secure DICOM Connection provides for secure data transfer across the network via the TLS protocol. The DICOM Server interface provides for an opportunity to manage the server and clients' certificates.

To encode the data transferred across the network, the DICOM Server uses the TLS protocol. For that purpose, a copy of the client root certificate is saved on the computer with the

DICOM Server, and a copy of the DICOM Server root certificate is saved on the computer with the client. For details see Section 1.10.2.

In the dialog box for setting up and editing the clients' connections, follow the steps listed below to set up a secure DICOM connection:

1. Tick the check box named **USE TLS** to use secure connection (Fig. 1.5). In the **Certificate file** field, the certificate status is displayed. If there is no certificate, the «Not selected» status will be shown in this field.

2. To upload a certificate file, click the ↑ **Upload** button. In the dialog box, select the file and click **Open**. After the certificate has been uploaded, you will see the «Uploaded» tatus in the **Certificate file** field.

3. Click the **SAVE** button under the settings section. The changes will be applied after restarting the server. If the **USE TLS** box is checked but the certificate has not been uploaded, the **SAVE** button will be disabled.

4. To delete a certificate, click the 🗑 **Delete** button.
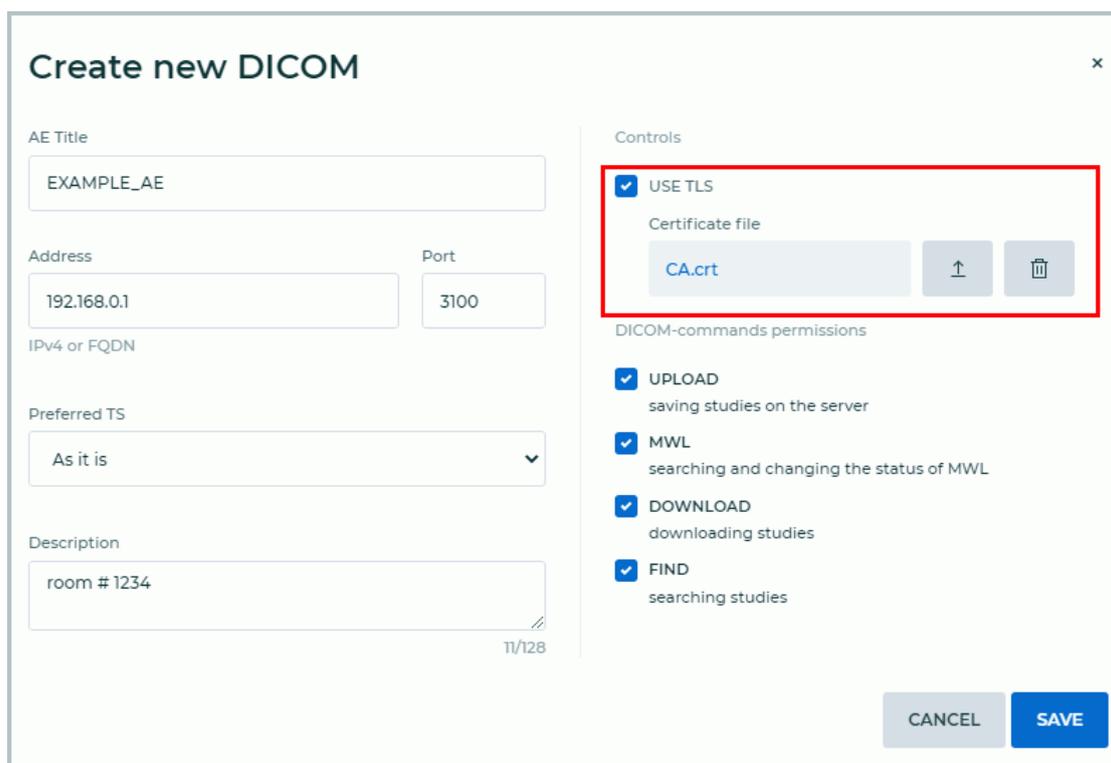
Figure 1.5: Setting a secure DICOM connection

After changing the parameters of the **USE TLS** box or the certificate, restart the DICOM Server to apply the changes.

1.2.3 Adding WADO Devices

To add a WADO device to the list, proceed as follows:

1. Open the **Devices (AE)** page and go to the **WADO** tab.

2. Click the **CREATE** button.

3. In the dialog box that pops up (Fig. 1.6), provide the following information on the WADO device:

   (a) enter the device's IP address or domain name in the box named **Address**. The maximum FQDN size is 255 characters, 63 characters for each domain name. The admissible characters are: uppercase and lowercase Latin letters, dot «.», and hyphen «-»;

   (b) tick the check box named **UPLOAD** to enable the device to upload data to the DICOM Server. Enabled by default;

   (c) tick the check box named **DOWNLOAD** to enable the device to download data to the DICOM Server. Enabled by default;

   (d) tick the check box named **FIND** to enable the device to search data to the DICOM Server. Enabled by default.

4. To save the changes, click the **SAVE** button, to cancel, click **CANCEL**. If an invalid value is entered, a warning is displayed below the input field, the input field frame becomes red.

Figure 1.6: Create new WADO

If needed, you can add one more client.

If the maximum number of clients and WADO devices provided for by the license has been reached, the **CREATE** button becomes inactive. The total number of client connections available is displayed in the right-hand upper corner and determined by the type of the license (see Section 2).

To check the device's availability with a **C-ECHO** command, click the
Echo ·)) button in the column. In the lower right corner, the result of the operation pops up.

If you have failed to send a **C-ECHO** command to the DICOM Server, check the connection settings for DICOM Server and the client. Analyze the log files for the DICOM Server and the client. If all the parameters are correct, check the firewall settings for the computer with the DICOM Server.

To change the settings of the existing WADO device, click the ✎ **Edit** button.

To delete a WADO device, select it in the table, click the ⛋ **Remove** button and choose **REMOVE** or **CANCEL** in the dialog box to confirm or cancel the deletion.

To update the data in the table, click the ↻ **Refresh** button.

1.2.4 Connecting the Workstation as a Client for Inobitec DICOM Viewer Program

Let us assume that the DICOM Server has the following parameters:

- **IP address**: 192.168.1.10;

- **DICOM port**: 3000;

- **AE Title**: PACS_Inobitec.

Inobitec DICOM Viewer Program has the following parameters:

- **IP address**: 192.168.1.20;

- **IP address**: 11112;

- **AE Title**: Viewer_Inobitec.

To set the connection, proceed as follows:

1. Add a client with the following parameters to the **Devices (AE)** table on the DICOM Server web console (for the settings see Section 1.2.1):

    (a) **AE TITLE**: Viewer_Inobitec;
    (b) **IP or FQDN**: 192.168.1.20;
    (c) **PORT**: 11112;
    (d) Tick the **UPLOAD** check box.

2. In Inobitec DICOM Viewer, add a connection to DICOM Server with the following parameters:

    (a) **Server type**: DICOM;
    (b) **Server mode**: C-MOVE or C-GET;
    (c) **Character set**: UTF-8;
    (d) **Client name (SCU)**: Viewer_Inobitec;
    (e) **Service name (SCP)**: PACS_Inobitec;
    (f) **Host server name or IP**: 192.168.1.10;

(g) **Server port**: 3000;

3. Add the required permissions to the firewall on both computers.

4. To check the settings, send a C-ECHO command from the DICOM Server management web console to Inobitec DICOM Viewer and back.

Upload the studies to the DICOM Server in compliance with the provisions of the client's user manual. If the uploading process results in an error, analyze the DICOM Server log file (section 1.7). Explanation of some log file entries:

1. `[ INFO ] All devices have no free space`
   The storage is either inactive or full. Check the storage settings.

2. `[ INFO ] Disk <storage path> is enabled but unavailable`
   The specified storage does not exist.

1.2.5 Setting up a Secure Connection with Inobitec DICOM Viewer as the Client

Let us assume that the DICOM Server has the following parameters:

- **IP address**: 192.168.1.10;

- **DICOM port of secure storage**: 3100;

- **AE Title**: PACS_Inobitec.

Inobitec DICOM Viewer Program has the following parameters

- **IP address**: 192.168.1.20;

- **DICOM port**: 11212;

- **AE Title**: Viewer_Inobitec.

To set the secure connection, proceed as follows:

1. Add a client with the following parameters to the **Devices (AE)** table on the DICOM Server web console (for the settings see Section 1.2.1):

   (a) **AE Title**: Viewer_Inobitec;

   (b) **IP or FQDN**: 192.168.1.20;

   (c) **Port**: 11212;

   (d) tick the check box **USE TLS**, upload the root certificate file of the Inobitec DICOM Viewer Program (for details see Section 1.2.2).

2. Activate secure DICOM listener service in the Inobitec DICOM Viewer Program with the following parameters:

   (a) in the dialog box **Network->Services->Secure DICOM Listner...** to enable the secure DICOM listener service, check the **Enable**box;

    (b) **AE Title**: Viewer_Inobitec;

    (c) **Port**: 11212;

    (d) in the **Trusted peer certificates** add to the list the root certificate of the DICOM Server;

    (e) in the **Certificate** box set the paths to the public key certificate files and private key of the Inobitec DICOM Viewer Program;

    (f) to save the current settings for all the users of this PC, check the **Shared settings (for all users)** box. It can only be done if the Inobitec DICOM Viewer Program was launched by a user with administrator privileges. The users who do not have administrator privileges cannot check or uncheck this box.

3. In the **Server list** of the Inobitec DICOM Viewer Program add a new PACS server with the following parameters:

    (a) **Server nickname**: enter the server name t e.g., DICOM Server;

    (b) **Server type**: DICOM;

    (c) **Server mode**: C-MOVE or C-GET;

    (d) **Character set**: UTF-8;

    (e) **Client name (SCU)**: Viewer_Inobitec;

    (f) **Service name (SCP)**: PACS_Inobitec;

    (g) **Server host name or IP**: 192.168.1.10;

    (h) **Server port**: 3100;

    (i) to enable the secure connection mode, check the **Use secure mode (TLS)** box in the server parameters dialog box. By doing this, you will activate the **TLS Settings** button for secure mode setup;

    (j) In the **TLS Settings** dialog box:

- add a root certificate of the DICOM Server as a trusted partner certificate;
- to enable verification of the trusted (root) certificate at the time of establishing a connection with the DICOM Server, check the **Verify peer certificate** box;
- to authenticate the client when connecting, check the **Authentication of the client** box and click **Choose**;
- in the **Certificate and private key** dialog box set the paths to the public key certificate file and private key file of the Inobitec DICOM Viewer Program;

4. Add the required permissions to the firewall on both computers.

5. To check the settings, send a C-ECHO command from the DICOM Server management web console to Inobitec DICOM Viewer and back.

1.3 Studies

❌ **This function cannot be used for establishing a diagnosis**

The web console allows you to search for and view study images, as well as to import and delete studies or series of studies. To open the page for viewing studies, click the **Studies** button.

In the **Studies** table, you will find the information on the studies saved on the DICOM Server. For details on the data display settings, see Section 1.11.1. he studies may be sorted by the values provided in one of the columns (see Section 1.11.2).

Figure 1.7: Study search and viewing page

1.3.1 Study Panel

The study panel is highlighted in the Fig. 1.7 in red. The panel shows the studies in the storage. At the bottom of the panel, you can see the navigation buttons, the number of pages and the numbers of current studies.

|<	Button that brings you back to the first page of the study list
<	Button that brings you back to the previous page of the study list
>	Button that brings you to the next page of the study list
>|	Button that brings you to the last page of the study list

The number of studies shown on a page may be selected from the **On the page** dropdown

list. By default, 15 studies are shown on a page.

To update the studies list, click on the ↻ **Refresh** button.

To download a study, check the respective box on the study list and click the **DOWNLOAD** button. The study is packed. The **DOWNLOAD** button is activated if only one study has been selected.

To delete a study, proceed as follows:

1. Check the box for the study on the study panel. To select all the studies on the page, check the box in the table header.

2. Click the 🗑 **Remove** button above the study list. If none of the studies has been selected, the **Remove** button is inactive.

3. In the dialog box that pops up, click **REMOVE** to delete or **CANCEL** to cancel the action.

> ❌ **A study that has been deleted cannot be restored!**

1.3.2 Series Panel

The series panel is highlighted in the Fig. 1.7 in green. To see a study series, select this series on the series panel. The following information is displayed for each series:

- **Name**;

- **Modality**;

- **Number of images**.

If the series description is too long, the complete description will be shown as a tooltip when you mouse over the respective thumbnail.

To download a study series, proceed as follows:

1. Select the study on the study panel.

2. Select the series on the series panel.

3. Click the ↓ **Download** button on the series panel, to the left of the thumbnails. The series will be zipped. If none of the series has been selected, the **Download** button will be inactive.

To delete a study series, proceed as follows:

1. Select the study on the study panel.

2. Select the series on the series panel.

3. Click the 🗑 **Remove** button on the series panel, to the left of the thumbnails. If none of the series has been selected, the **Remove** button will be inactive.

4. In the dialog box that pops up, click **REMOVE** to delete the selected series or **CANCEL** to cancel the action.

> ❌ **A study series that has been deleted cannot be restored!**

1.3.3 Opening a Series

To view the series images, proceed as follows:

To open a series from the tab for viewing studies, select the series you need on the series panel and double-click the left mouse button. The image of the series opens in a new tab (Fig. 1.8). If there are any other images open in the **DICOM Viewer** tab, they will be closed.

To open a series from the **DICOM Viewer** tab, select the series you need and double-click the left mouse button.

To go from one image of the series to another, scroll the mouse wheel or move the bar on the right-hand side of the image viewing window.

Figure 1.8: The **DICOM Viewer** tab

The window width and level (W/L) values for the series are taken by the DICOM Server from the following tags: *0x0028, 0x1050 WindowCenter* and *0x0028, 0x1051 WindowWidth*. If no values have been provided for these tags, the window width and level (W/L) values will be calculated by the DICOM Server on the basis of the data provided by the series image. In some cases, this may lead to inaccurate display of the series thumbnails and the images opened from the administrator web console.

1.3.4 Study Search

The search panel is shown in Fig. 1.9.
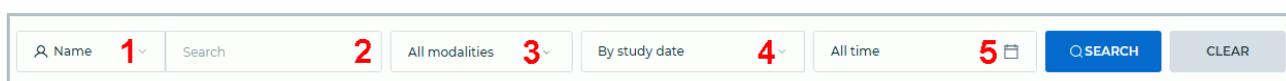
Figure 1.9: Search panel

One of the following search criteria should be selected from the dropdown list (number 1 in Fig. 1.9):

- **Name**. To search for a name that does not start with the entered characters, put an asterisk at the beginning: «*John»;

- **Patient ID** (similar to search by name);

- **Accession number** (similar to search by name).

The search query must be entered in the **Search** field (number 2 in Fig. 1.9). The maximum size of the text in the **Search** field is 128 characters. Special symbols and national scripts may be used. The field may be empty. If the search query is too long for the field, it is cropped and the omission points are shown at the end of the line. The complete text of the search query will be shown in a balloon tip.

To search for studies by modality, select the relevant modalities on the **All modalities** drop-down list (number 3 in Fig. 1.9). All the modalities are selected by default (the **Select all** button is active, see Fig. 1.10 «a»). The user may select any combination of modalities (see Fig. 1.10 «b»). To cancel the chosen modality, click the button once again.

Click **OK** to confirm or **CANCEL** to cancel.

a)   b)

Figure 1.10: Search by modality

The user may search for studies by the study date or by the patient's date of birth. This criterion should be chosen on the drop-down list (number 4 in Fig. 1.9), and the search period depends on it.

If you choose the **By study date** criterion, the following options will be available on the drop-down list (number 5 in Fig. 1.9) for selecting the search period:

- **All time** (by default);

- **Today**;

- **Yesterday**;

- **Last week**;

- **Last month**;

- **Last year**;

- **Exact date**. Fill in the field in YYYYY-MM-DD format;

- **Interval**. Fill in the field in YYYYY-MM-DD — YYYYY-MM-DD format.

The date can also be selected using the calendar.
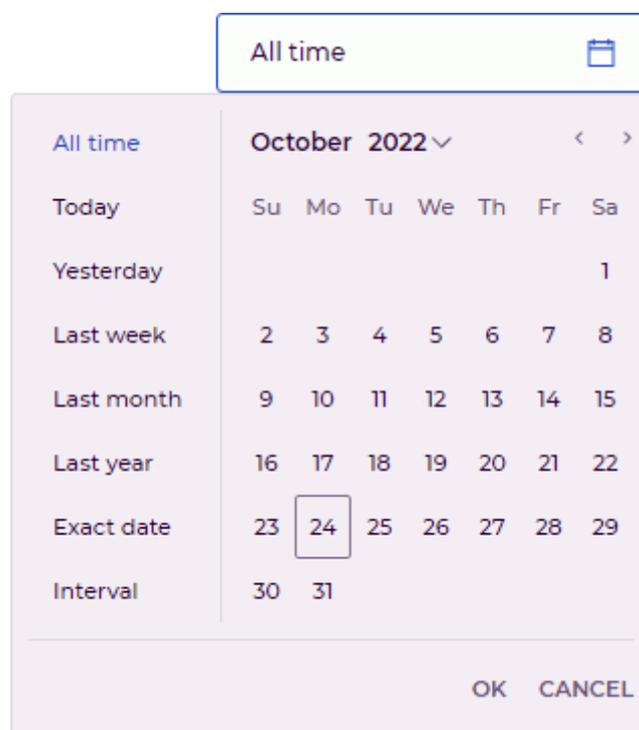
Figure 1.11: The options available for the **By study date** *criterion*

Click **OK** to enter the date or **CANCEL** to cancel.

If the date entered is incomplete or if the user chooses another option on the list, the field is cleared.

If you choose the **By patient birthdate** criterion, there will be only two options available on the drop-down list for selecting the search period (number 5 in Fig. 1.9): **Exact date** and **All time** (Fig. 1.12). Fill in the field in YYYYY-MM-DD format. The date can also be selected using the calendar.
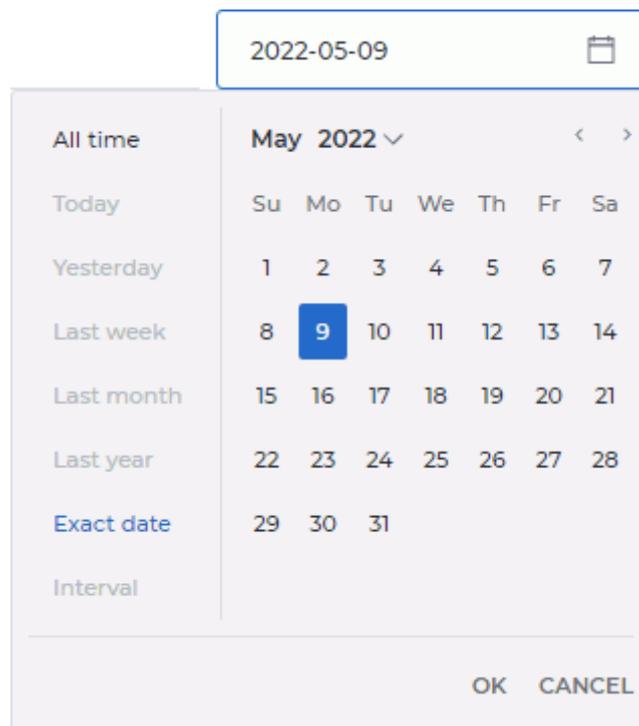
Figure 1.12: The options available for **By patient birthdate**

Click **OK** to enter the date or **CANCEL** to cancel.

If the date entered is incomplete or if the user chooses another option on the list, the field is cleared.

After the relevant fields have been filled, click the **SEARCH** button. To reset the search criteria, click **CLEAR**.

1.3.5   Import of Studies

The function is unavailable in trial mode

There are two ways to import studies to the DICOM Server through the administration web console:

1. Click the **IMPORT** button in the **Studies** tab. In the dialog box that pops up, select the folder with the studies and click **Open**.

   > **Attention! It may take time to calculate the number of the files imported. Wait until a dialog box for confirming files import appears.**

   In the dialog box that pops up, click the **Upload** button. To cancel the action, click **Cancel**.

2. While holding the left mouse button, drag the folder with the studies from the explorer window to the study panel in the **Studies** tab. . When the user is dragging a folder to the study panel, the study panel is converted into a receive window where a **DROP YOUR**

FOLDER HERE message is displayed. Release the mouse button inside the selected area.

Only a folder with subfolders may be dragged. Separate files or text fragments will not be accepted. If a file cannot be dragged, the cursor is displayed as ⊘ .

When files are imported, an import status panel (see the blue box in Fig. 1.7) is displayed on the **Studies** page. On other DICOM Server pages, the import status panel is shown on the main menu of the administration web console. The import status panel will be displayed until the page is updated or the DICOM Server is relaunched.

The statuses shown on the import status panel are:

Preparing...	The number of files to be imported is calculated
3 of 4 71	The files are imported. The panel shows the number of files imported, the total number of files and the progress animation
1 of 5 ✕	The cursor is placed over the progress animation, and a button for cancelling import is shown on top of the progress wheel. To cancel the files import, click the ✕ button. Import may be cancelled while the files are being calculated or imported
Finishing...	The process of files import is being completed
Canceling...	The import of files is being canceled
Import canceled ⊘	The import of files has been canceled by the user
Import error ⊗	The import has resulted in an error. Click the mouse on the status panel to view the report. In the **Import results** dialog box that pops up, (see the Fig. 1.13) **Not imported** tab for the files that have not been imported
Show result ✓	The import has been completed successfully. To view the import results, click the mouse on the status panel. In the **Import results** dialog box that pops up, (see the Fig. 1.13) **Imported** and **Not imported** tabs for the results
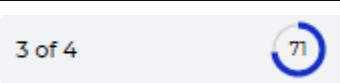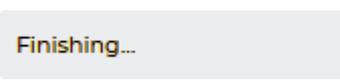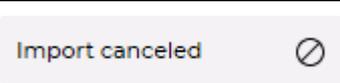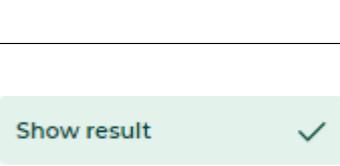
No files can be added to the current import session. To import more files, wait until the import procedure is completed or cancel the files import.

The import results will be shown as a table in the **Imported** and **Not imported** tabs of the **Import results** dialog box (see Fig. 1.13). The number of lines on the page may be selected from the **On the page** drop-down list. 15 lines are shown on the page by default.

Figure 1.13: The **Import results** *dialog box*

Files import may result in an error in the following cases:

- if there are no files in the folder chosen by the user. In this case, a warning **The chosen folder does not contain any files** will appear in the right-hand bottom corner and the status shown on the import status panel will not be changed;

- if the size of the folder with the files exceeds 1GB. A warning **Transferred folder size exceeds 1 GB** will appear in the right-hand bottom corner. In this case, the files to be imported should be divided into several groups;

- if the files cannot be saved on the server. In this case, a warning **Failed to save the files on the server** will appear in the right-hand bottom corner and the status shown on the import status panel will be changed to **Error report**.

1.4 Modality Worklist

The administrator web console provides an opportunity to manage the list of scheduled studies. To open the scheduled studies page, click the **Modality Worklist** button.

Figure 1.14: «Modality Worklist» page

In the **Modality Worklist** table, you will find the information on the studies saved on the DICOM Server. For details on the data display settings, see Section 1.11.1. The studies may be sorted by the values provided in one of the columns (see Section 1.11.2).

1.4.1 Searching for Scheduled Studies

You can search for scheduled studies using the search panel. The search criteria are chosen as described in Paragraph 1.3.4.

1.4.2 Scheduled Studies Panel

The scheduled studies panel is highlighted in the Fig. 1.14 in red. On this panel, you can see the scheduled studies that have been found. The studies are marked with labels of different colors. The color of the label depends on the status of the study stage (see Fig. 1.15).

Figure 1.15: Example of a marked study

The scheduled studies for which all the stages have been completed (have the **COM-PLETED** status), are marked with green ▶ . If the stages of a scheduled study have the **MISSED**, **DISCONTINUED**, or **CANCELED**, but not **SCHEDULED** or **IN_PROGRESS** status, the study is marked with orange ▶ .
The studies having stages with the **SCHEDULED** or **IN_PROGRESS** status are not marked.

At the bottom of the panel, you see the navigation buttons, the number of pages, and the numbers of the studies on the current page.

The number of studies shown on a page may be selected from the **On the page** dropdown list. By default, 15 studies are shown on a page.

|<	Button that brings you back to the first page of the study list
<	Button that brings you back to the previous page of the study list
>	Button that brings you to the next page of the study list
>|	Button that brings you to the last page of the study list

To update the scheduled studies list, click on the ↻ **Refresh** button.

1.4.3 Clearing the Modality Worklist

To delete all the completed or deleted studies from the modality worklist, click the **Delete the completed studies** ✂ button on the **Modality Worklist** page.

❌ **The deletion of studies and their steps cannot be cancelled**

In the **Clear the MWL** dialog box (Fig. 1.16) that pops up, click **REMOVE** to delete or **CANCEL** to cancel.
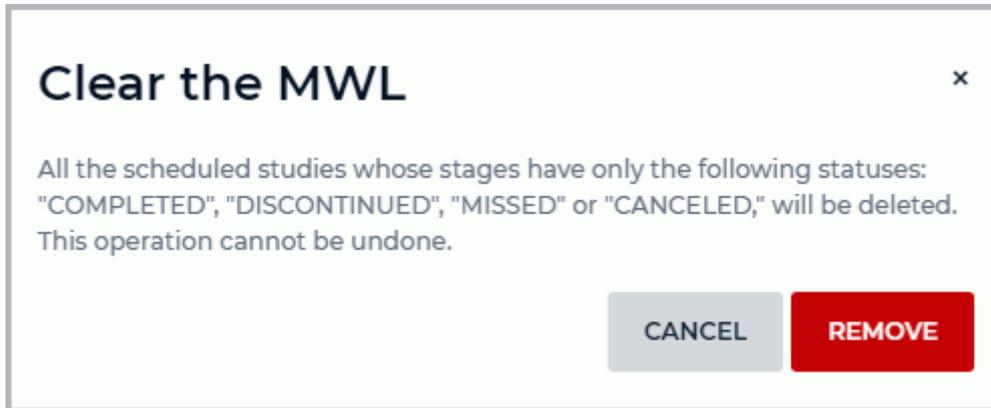

Figure 1.16: **Clear the MWL** *dialog box*

After deletion has been confirmed, all the scheduled studies having stages with the **COMPLETED**, **DISCONTINUED**, **MISSED**, or **CANCELED** status will be deleted. The deleted data cannot be restored.

1.4.4 List of the Scheduled Procedure Steps

The list of the steps of the scheduled study is highlighted in the Fig. 1.14 in green. To view the list of the steps of the scheduled study, select the study on the study panel. You will see the list of the steps of the selected study at the bottom of the panel, under the navigation buttons.

1.4.5 Deleting Scheduled Studies

❌ **Attention! The deletion of scheduled studies and their steps cannot be cancelled!**

To delete a scheduled study, proceed as follows:

1. Check the box for the study on the study panel. To select all the studies on the page, check the box in the table header.

2. Click the **Remove** 🗑 button above the list. If none of the studies has been selected, the **Remove** button is inactive.

3. In the dialog box that pops up, click **REMOVE** to delete the selected studies or **CANCEL** to cancel the action.

To delete a steps of a scheduled study, proceed as follows:

1. Select a scheduled study on the study panel.

2. In the list of steps, select a step of the scheduled study.

3. Click the **Remove** ⟦Ⅱ⟧ button. If the study comprises several steps, only the selected step will be deleted. When you delete the last step of the scheduled study, the study is deleted from the study panel.

4. If required, repeat steps 2 and 3.

If you attempt to delete a scheduled study or one of its steps with «IN_PROGRESS» status, a dialog box will pop up, in which you will have to confirm the deletion.

1.4.6 Resetting the Step Status

If a hardware or software failure occurs at some step of the study, the step status may be reset to **SCHEDULED**. To reset the status to **SCHEDULED**, proceed as follows:

1. Select a scheduled study on the study panel.

2. In the list of steps, select a step of the scheduled study. The status of this step must be different from **SCHEDULED**.

3. Click the ⟲ **Reset** button.

1.5 Storages

Study data accepted by Inobitec DICOM Server (PACS) is stored in the storage. The storage is in a folder (folders) on a local or network drive.

Attention! To map a network drive on Windows, launch the DICOM Server as application mode from the command prompt as administrator. For details see the Command Line Parameters section.

Depending on the settings provided, data may be kept on the DICOM Server or an unlimited or a limited period of time. It may be compressed or stored as is. The DICOM Server storages can be managed from the **Storages** tab (see Fig. 1.17) on the web console.

The table shows the storage parameters. For details on the parameters display options, see Section 1.11.1. The storages may be sorted by the values provided in one of the columns (see Section 1.11.2).
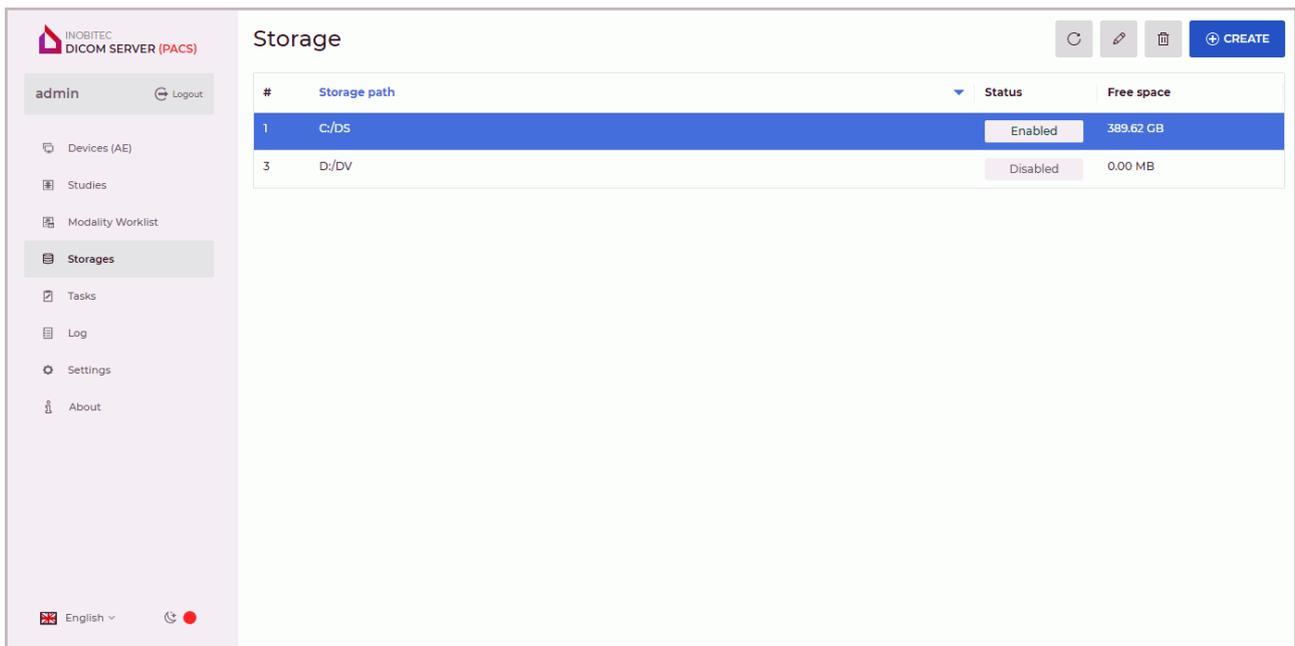
Figure 1.17: Storage management page

1.5.1 Storage Settings

You need to create a storage folder yourself. The folder must have a write permission for the user starting the DICOM Server. On Linux you need to enter the name of this user during installation.

To create a new storage, proceed as follows:

1. Click the **CREATE** button.

2. In the **Create new storage** dialog box (Fig. 1.18) make the following entries in the data entry line:

   • enter the path to the storage folder in the **Storage Path** box. It is not recommended to provide the path to a folder containing files.

   • tick the **Enabled** check box to make this folder active.

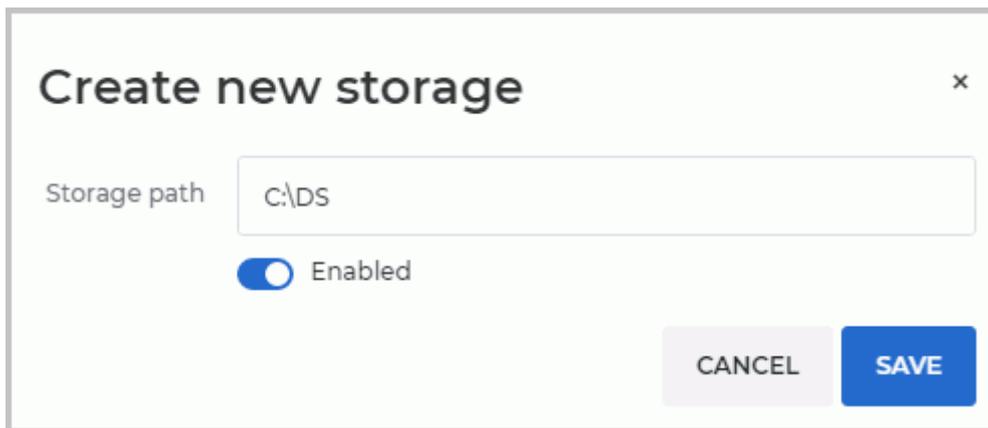3. To save the changes, click the **SAVE** button, to cancel click the **CANCEL** button.

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Figure 1.18: The **Create new storage** *dialog box*

⚠ **On Windows, the path to the network storage must be provided in UNC format.**

Below, you can see some examples of UNC paths.

```
\\192.168.0.8\storage
\\nas-storage\pacs
\\nas.organization.com\storage
```

If needed, add another folder path.

Storage folders can be enabled or disabled. Enabled folders do not save new files; they do not check for free space. In this case, the search and downloading of studies is carried out even from enabled storage folders.

To change the parameters of the existing paths to the storage folders, select it in the table, click the ✏ **Edit** button.

⚠ **The data kept in the storage and in the database may be lost through the hard drive damage, improper users' activities, or third-party software impact. To avoid data loss, back up the data.**

⚠ **Periodically check the amount of free space on the hard disk drive where storage is placed**

To delete the path to a storage folder, select it in the table, click the 🗑 **Remove** button. To delete the data saved in the folder, check the **Remove all storage files** box. Click **REMOVE** or **CANCEL** in the dialog box to confirm or cancel the deletion.

If you delete a storage without deleting the data, the links to the study files will be deleted from the database. The study files will remain in the file system, but they will become inaccessible. If you add the storage folder once again, the links to the study files will not be restored.

To update the data in the table, click the ↻ **Refresh** button.

If the **Storages** table displays a zero in the **Free space** column for any path, you need to check the path, access rights and the amount of free space.

If there are several storage folders, the data are saved in the first active folder available on the disk with enough free space. You need to set the limit of free space on each disk (2048 MB by default). The column **FREE SPACE** in the web console shows the total amount of free

space on the disk, regardless of the limit. If the folder remains less space such data will be saved in another folder. If there isn't enough free space for saving the data (with allowance for the limit), If such a folder is unavailable, the saving procedure will result in an error.

> **Do not create storage folders on the same hard disk partition**

When receiving files, they are placed in a temporary folder before saving to the storage folder. The current path to the temporary folder is displayed in the web console in the line **Temp folder** in the page **Settings** in the block **Store service settings**. By default, the system temporary folder is used.

If for some reason access to the temporary folder is not possible (for example, the access rights are manually changed), then loading the studies to DICOM Server will fail.

> **Make sure that the hard disk partition on which the temporary folder is located has enough free space. Otherwise, DICOM Server will not be able to accept files, perform automatic data compression, and allow downloading archives with studies and program protocols in the web console**

To change the location of the temporary folder:

1. In the **configuration file** change the temporary folder parameter. If this parameter is missing, add it.

2. Restart DICOM Server.

DICOM Server can send emails in case of problems with storage availability, reaching the limit of free space or file saving errors. For details see Section 1.10.1.

1.5.2   Data Storage Transfer

The storage contains study data only. The information required for the files content display is stored in the database, so if a part of the information is lost, the study search, loading and display become impossible.

To transfer a storage without the risk of losing access to the data available, significant inconvenience for the users, or disabling the DICOM Server for a long time, proceed as follows:

1. Make a backup copy of the database, a system snapshot etc.

2. Disable data upload to the DICOM Server (uncheck the **UPLOAD** box for all the clients, see Section 1.2.1) and wait until the current uploads are completed. The opportunity to download data will still be available.

3. Disable data upload to the regional DICOM Server, as well as the functions of archiving and disposing of old images.

4. Uncheck the **Enabled** box for the storage.

5. Copy the whole storage folder to a new location.

6. Change the folder path for the existing storage. **Attention! Do not delete the old storage or create a new one. It will result in problems with file access!** If data are being downloaded at the time when the path is changed, the process is not interrupted.

7. Enable data upload to the regional DICOM Server, as well as the functions of archiving and disposing of old images.

8. Check the **Enabled** box for the storage.

If access to storage folders is denied as a result of deletion of entries from the **Storages** table, restore the database using the backup copy. Note that the studies uploaded after the backup copy creation are inaccessible.

1.6 Storage Maintenance Schedule

The DICOM Server storage maintenance schedule provides the user an opportunity to manage the process of collecting the tasks associated with study files transfer, compression, and deletion. The schedule may be used to manage the hardware and network load.

You can manage the tasks collection process on the **Tasks** page of the weekly schedule (see Fig. 1.19). The schedule provides for the time of task collection rather than task performance. If the time provided for task performance is up but there are some tasks left in the queue, the process of task performance will go on until the queue is empty. The tasks on the schedule are performed on a weekly basis. The schedule is not deleted when there are no tasks to be performed.

Figure 1.19: Storage maintenance schedule page

You can provide the settings for tasks transfer, archiving, and deletion in **Forwarding**, **Archiving** and **Deletion** tabs. The schedule is provided separately for each type of tasks.
There are three ways to add new tasks to the schedule:

- click the ⊕ **Create** button on the page with the schedule;

- left-click on the selected cell of the table with the schedule;

- with the cursor, select the cells you need while holding the left mouse button.

In the **New task** dialog box (see Fig. 1.20), select or change the day of week, as well as the time provided for the beginning and the end of the task performance. The time provided for the performance of a task must be divisible by 1 hour.
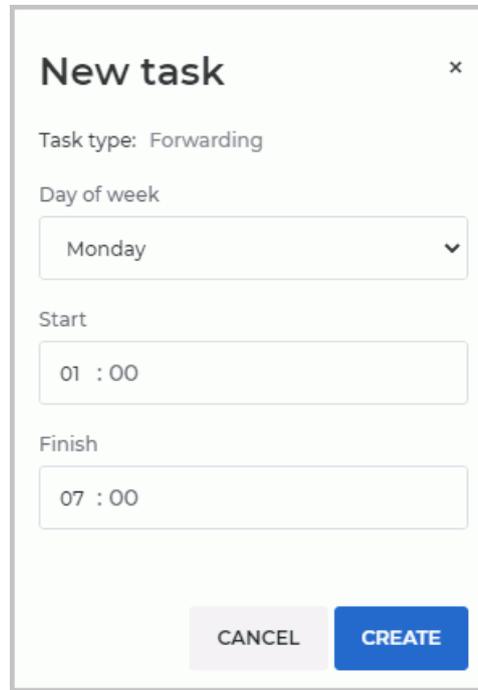

Figure 1.20: «New task» dialog box

To create a new task, click the **CREATE** button. To cancel, click **CANCEL**.

Create tasks for other days of week and time intervals in the same way.

The blocks of tasks on the schedule are inactive and shown in grey. The tasks may be activated from the respective tabs on the **Tasks** page:

- to enable transfer of tasks, check the **Enable connection** box in the **Forwarding** tab (for details see Section 1.6.1);

- to enable study compression, in the **Archiving** tab, select the suitable option from the **Compression level** drop-down list (for details see Section 1.6.3);

- to enable series collection and deletion upon expiration of a certain period of time, go to the **Deletion** tab and enter a positive value in the **Store days** field (for details see Section 1.6.4).

To delete a task, left-click on the task selected. In the pop-up box with the task description (see Fig. 1.21) click the **DELETE** button.
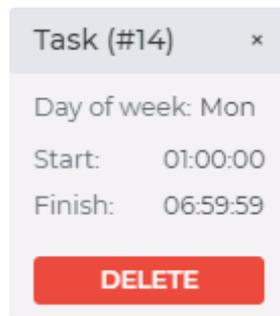
Figure 1.21: Pop-up box with the task description

Confirm the deletion by choosing **DELETE** in the confirmation dialog box. To cancel the deletion, choose **CANCEL**.

1.6.1 Setting the Transfer of Studies to the Regional DICOM Server

The function is unavailable in trial mode

To provide the settings required to enable Inobitec DICOM Server (PACS) to send studies to the regional DICOM Server, proceed as follows:

1. Open the **Tasks** page and go to the **Forwarding** tab.

2. Create a schedule for studies forwarding (see Section 1.6).

   Attention! When you add or delete a studies forwarding schedule, you do not activate/deactivate the forwarding function. To activate/deactivate this function, check/uncheck the respective box.

3. To enable/disable the forwarding studies to the regional DICOM server, check/uncheck the **Enable connection** box (is highlighted in the Fig. 1.22 in red). The box is unchecked by default.
   If the **Enable connection** box is unchecked, all the fields, buttons and checkboxes in the **Forwarding** tab will be inactive. The blocks of forwarding tasks on the schedule will be shown in grey.

4. Enter the AE Title of the regional DICOM server (16 latin characters max., case sensitive) in the **AE Title** box.

5. Enter the DICOM port of the regional DICOM server (a whole number greater than zero) in the **Port** box.

6. Enter the IP address of the regional DICOM server or domain name in the **IP-address** box. The maximum FQDN size is 255 characters, 63 characters for each domain name. The admissible characters are: uppercase and lowercase Latin letters, dot «.», and hyphen «-»;

7. To enable/disable the secure connection, tick/untick the check box **Use TLS**. In the **Certificate file** field, the certificate status is displayed. If there is no certificate, the «Not selected» status will be shown in this field. If required, upload the certificate file (for details see Section 1.2.2).

   When a new certificate is uploaded, the previous certificate is deleted. If you delete a device from the list of clients, the respective certificate file will be deleted. After uploading a new certificate, restart the server to apply the changes.

8. To enable/disable search at the regional DICOM Server, tick/untick the check box **Use extended search**.

   - To perform search for the client DICOM Server and then for the regional DICOM Server, tick the **Use extended search** box. The results of local and distant search will be combined.

   - If the **Use extended search** box is not checked and there are studies at the client DICOM Server meeting the search criteria, no search will be performed at the regional DICOM Server. If there are no studies at the client DICOM Server meeting the search criteria, search will be performed at the regional DICOM Server.

9. From the **Preferred TS** (Transfer Syntax) drop-down list, choose the format in which files will be uploaded to the device by C-GET and C-MOVE methods. When choosing the preferred TS, consider the device capabilities, the acceptable image compression level, and the current archiving settings at the server.

   The available transfer syntax options are:

   - **As it is**;
   - **Little Endian Implicit** (UID 1.2.840.10008.1.2);
   - **Little Endian Explicit** (UID 1.2.840.10008.1.2.1);
   - **Big Endian Explicit** (UID 1.2.840.10008.1.2.2);
   - **Deflated Explicit VR Little Endian** (UID 1.2.840.10008.1.2.1.99);
   - **JPEG Baseline** (UID 1.2.840.10008.1.2.4.50);
   - **JPEG Lossless, Non-hierarchical, 1st Order Prediction**
     (UID 1.2.840.10008.1.2.4.70);
   - **JPEG-LS Lossless** (UID 1.2.840.10008.1.2.4.80);
   - **JPEG-LS Lossy (Near-lossless)** (UID 1.2.840.10008.1.2.4.81);
   - **JPEG 2000 (Lossless only)** (UID 1.2.840.10008.1.2.4.90);
   - **JPEG 2000 (Lossless or Lossy)** (UID 1.2.840.10008.1.2.4.91);
   - **RLE Lossless** (UID 1.2.840.10008.1.2.5).

10. To enable/disable the confirmation of the files delivery to the regional DICOM Server, check/uncheck the **Delivery check (Storage Commitment)** box. As a result, you will get a list of UIDs that have been successfully saved/have not been saved on the regional DICOM Server.

11. To save the changes, click the **SAVE** button under the settings section, to cancel, click **CANCEL**.

Restart the DICOM Server for applying changes.

If the **Use TLS** box is checked but the certificate has not been uploaded, the **SAVE** button will be disabled.

Figure 1.22: **Forwarding** *tab settings panel*

If you change the parameters of connection to the regional DICOM Server, the series that have already been forwarded will not be processed for a second time. To start the series forwarding procedure once again, restart Inobitec DICOM Server (PACS) with the required parameter (for details see the configuration file) section, or click the **RESTART** button under the settings section of the web console.

1.6.2   Regional DICOM Server

A regional DICOM server is a DICOM server to which other (client) servers are connected. The studies from client servers are uploaded to the regional server, and such client servers

may search the regional server for data. To use Inobitec DICOM Server (PACS) as a regional DICOM server, add clients' DICOM servers to the table on the **Devices (AE)** page (see Section 1.2).

1.6.3 Studies Archiving Settings

Compression is the process of data conversion associated with reduction of data size and potential loss of quality. The quality of images depends on the coder/decoder used for compression.

> **The Compression is associated with vanishing of losing details, which can have negative effect on diagnostics quality.**

If the DICOM Server works as a client, the series will not be compressed until they are sent to the regional DICOM server (for details see Section 1.6.1).

Compression is disabled by default. To enable compression proceed as follows:

1. Open the **Tasks** page and go to the **Archiving** tab.

2. Create data archiving tasks schedule (see Section 1.6).

   Attention! When you add an archiving schedule, you do not activate the archiving function. To activate this function, select an archiving option from the «Compression Level» drop-down list. To deactivate the archiving function, choose «Without compression».

3. Choose one of the options from the **Compression Level** drop-down menu (is highlighted in the Fig. 1.23 in red):

   - **Without compression** (by default);
   - **Save Source Codec**;
   - **Prefer RLE compression**;
   - **Prefer Deflated Little Indian Explicit**;
   - **Prefer JPEG Lossless**;
   - **Prefer JPEG Lossy**;
   - **Prefer JPEG-LS Lossless**;
   - **Prefer JPEG-LS Lossy**;
   - **Prefer JPEG2000 (Lossless only)**;
   - **Prefer JPEG2000 (Lossless or Lossy)**.

4. In **Uncompressed store days** field, provide the number of days after which the data will be compressed. If you have chosen **Without compression**, this field should be ignored.

5. To the save changes, click the **SAVE** button under the settings section, to cancel, click **CANCEL**.
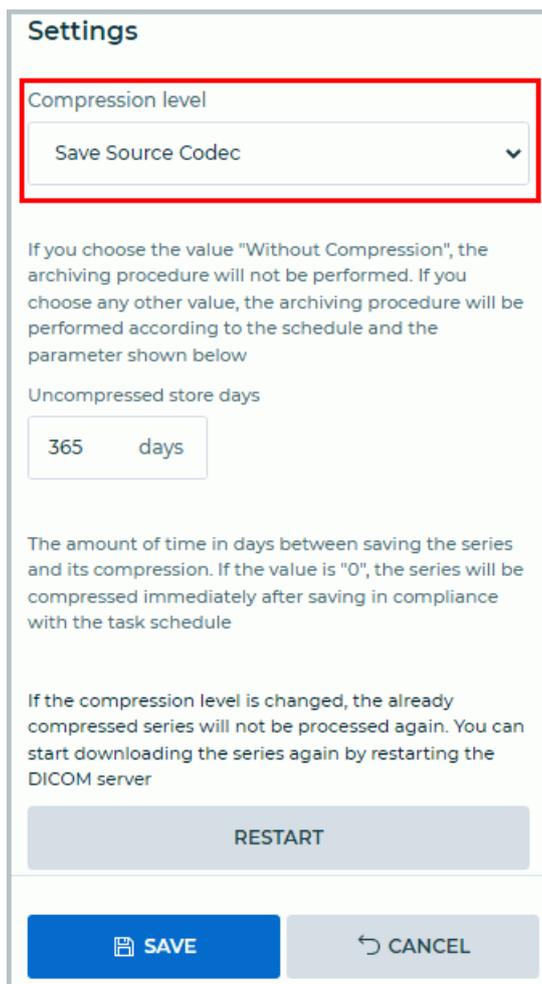
*Figure 1.23: The **Archiving** tab settings panel*

If you choose any option except **Without compression** from the **Compression Level** drop-down list, a warning message (Fig. 1.24) will pop up when you click the **SAVE** button.
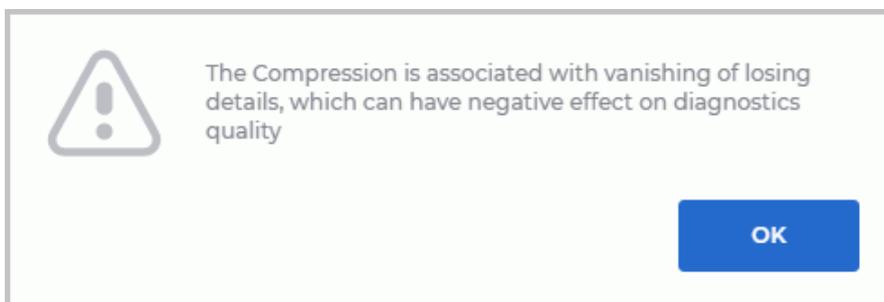

*Figure 1.24: A warning message notifying the user of the possible image
quality loss after compression*

The series storage period in its initial state is calculated from the date it was uploaded to the Inobitec DICOM Server (PACS). If new images are added to an already compressed series,

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the series will be re-processed.

If the compression level changes, already compressed series will not be processed again. You can start the series compression procedure anew by clicking the **RESTART** button.

If the same series complies with the requirements for compression and for deletion, it will be deleted.

1.6.4   Data Deletion Settings

In DICOM Server web console, you can provide the settings for data deletion from a storage.

❌   **Data deleted when this feature is turned on cannot be restored**

The series storage period is calculated from the date the series was uploaded to the server. Series for removal are collected from all storages.
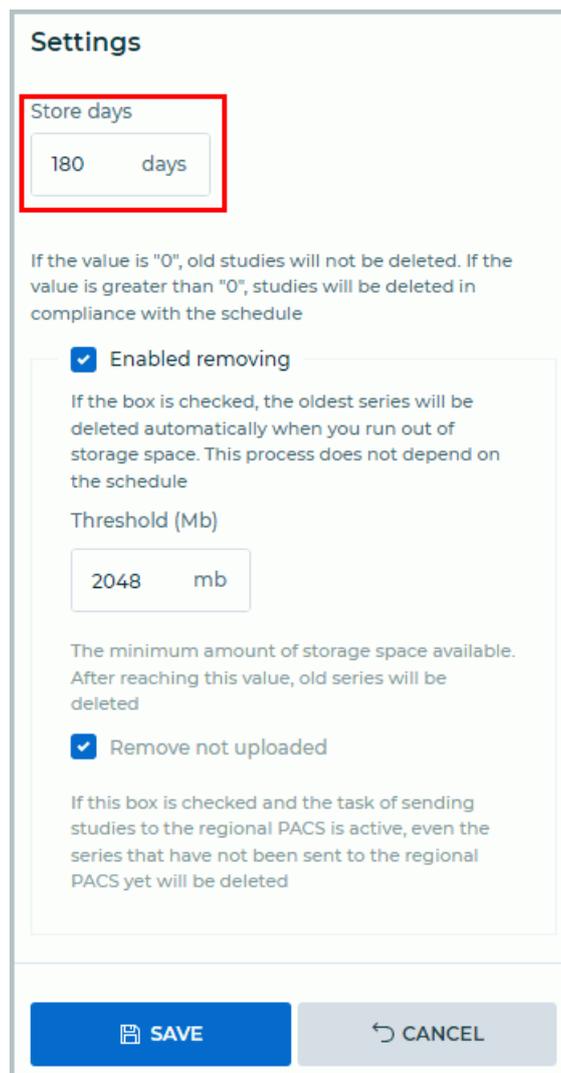
If the DICOM Server works as a client, the series will not be deleted until they are sent to the regional DICOM server. (for details see Section 1.6.1).

To enable automatic study disposal after a specified storage period:

1. Open the **Tasks** page and go to the **Deletion** tab.

2. Create a schedule for deleting data tasks (see Section 1.6).

   Attention! When you add a data deletion schedule, you do not activate the deletion function. To activate this function, set the storage period in the «Store days» field. To deactivate the deletion function, enter zero in the «Store days» field.

3. Enter the storage period (a whole number of days greater than zero) in the **Store days** field (is highlighted in the Fig. 1.25 in red). If you enter zero (the default value), the data will not be disposed of.

4. To save the changes, click the **SAVE** button under the settings section, to cancel, click **CANCEL**.

*Figure 1.25: The **Deletion** tab settings panel*

If you change the value provided in the **Store days** field from 0 to any other number, a warning message (Fig. 1.26) will pop up when you click the **SAVE** button.
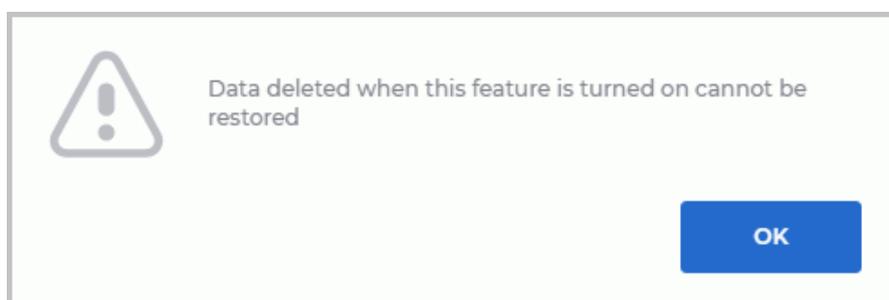

Figure 1.26: A warning message notifying the user that the deleted data cannot be restored

If the same series complies with the requirements for compression and for deletion, it will be deleted.

1.6.5 Automatic series deletion if running out of storage space

The function is unavailable in trial mode

This functionality allows you to free up space by deleting old series in those storage folders in which free space ends.

**Data deleted when this feature is turned on cannot be restored**

Attention! Automatic data deletion does not depend on the schedule. To enable/disable automatic data deletion when running out of storage space, check/uncheck the Enabled removing box.

To enable automatic study disposal if running out of storage space:

1. Open the **Tasks** page and go to the **Deletion** tab.

2. To enable automatic deletion of series from the storage, check the **Enabled removing** box.

3. In the **Threshold (Mb)** field, provide the amount of space available in the storage folder (in Mb). After reaching this limit, series will be collected for deletion. The default value is 2048.

4. If you have provided for automatic forwarding of series to the regional DICOM server and checked the **Remove not uploaded** box, series will be deleted even if they have not been sent to the regional DICOM server

To save the changes, click the **SAVE** button under the settings section, to cancel, click **CANCEL**.

If you check the **Enabled removing** box, a warning message (Fig. 1.27) will pop up notifying you that the deleted data cannot be restored when you click the **SAVE** button.
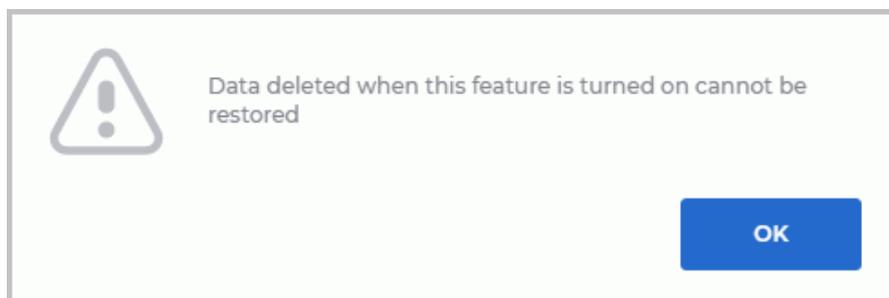
Figure 1.27: A warning message notifying the user that the deleted data cannot be restored

DICOM Server can send emails in case of problems with storage availability, reaching the limit of free space or file saving errors. For details see Section 1.10.1.

1.7 Log Viewing

To view the system log, select the **Log** page (Fig. 1.28). The contents of the latest log file for A1 appender will be shown. **Attention: If there isn't such an appender, no data will be displayed**. The entries are sorted by the time of their creation; the latest entries are shown at the top. To scroll through the log, move the bar on the right-hand side of the window, scroll the wheel or use the arrow keys.
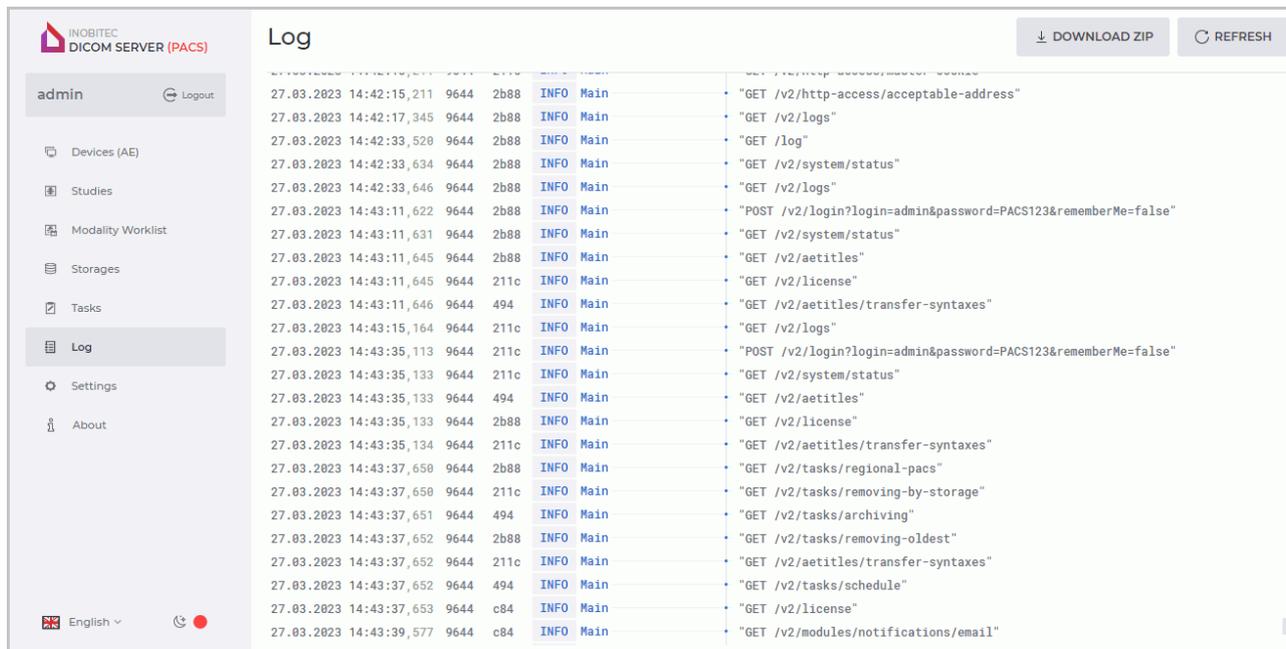

Figure 1.28: Log page

To update the window, click the ⟳ **REFRESH** button at the top of the window.

To download the archive with all the log files, click the **DOWNLOAD ZIP** button. The name of an archive is written as *logs.zip*.

To change the logging level, go to the **Settings** page and choose the level required from the **Logging level** dropdown list.

Use the following logging levels:

- **TRACE**: DICOM data dumps, method execution time, input parameters, and intermediate function performance results are recorded. DEBUG, INFO, WARN, ERROR, and FATAL level messages are also recorded;

- **DEBUG**: the details of the diagnostic data are recorded. Example: method invocation order during command processing. INFO, WARN, ERROR, and FATAL level messages are also recorded;

- **INFO** (by default): the main work stages are recorded. Examples: incoming connections, command processing results. WARN, ERROR, and FATAL level messages are also recorded;

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- **WARN** any abnormal program behavior that does not lead to malfunctioning is recorded. ERROR and FATAL level messages are also recorded;

- **ERROR**: the errors having impact on the program functioning but not resulting in termination are recorded. Examples: failure to establish a DBMS connection at start, denied access to resource files and other services. FATAL level messages are also recorded;

- **FATAL**: errors resulting in a failure to execute the program are recorded.

When the logging level is changed through the web console, restart the DICOM Server is not required.

1.8 Integration of the DICOM Server with other Services via the HTTP Protocol

To access to the DICOM Server via the HTTP protocol, use the REST API commands, which can be found from the link: **https://inobitec.com/eng/downloads/dicomserver/**. To integrate the DICOM Server into services via the HTTP protocol, go to the **Settings** tab. The following fields will be available in the **Access without authorization by login and password** settings box (Fig. 1.29):
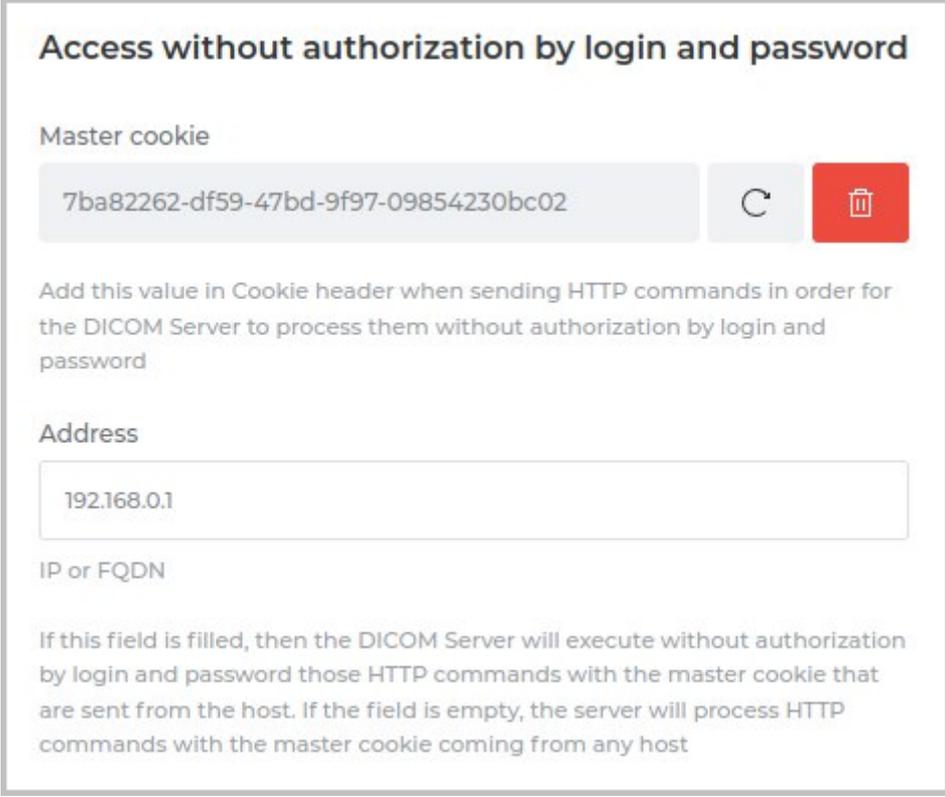
Figure 1.29: Setting up access to the DICOM Server via the HTTP Protocol

- A read-only field with the **Master-cookie** value. The Master-cookie value is generated in the DICOM Server web console. Master-cookie value is entered in the services settings. When sending requests to the DICOM Server, the Master cookie value must be added to the HTTP request cookie header.
To generate a new Master-cookie value, click the ↻ **Generate** button. To delete the Master-cookie value, click the ⏸ **Delete** button;

- To restrict access to the DICOM Server enter the IP address or the FQDN of the host from which master cookie requests are to be accepted in the **Address** field. If the **Address** field is already filled, then without user name and password verification the DICOM Server will only execute those HTTP commands with the master cookie that were sent from this host. If the **Address** field is empty, the server will process HTTP commands with the master cookie received from any host.

1.9   Web services to access the DICOM Server

To set up the DICOM Server accessibility via the WADO protocol, go to the **Settings** tab. The following fields will be available in the **Web-services** settings box (Fig. 1.30):
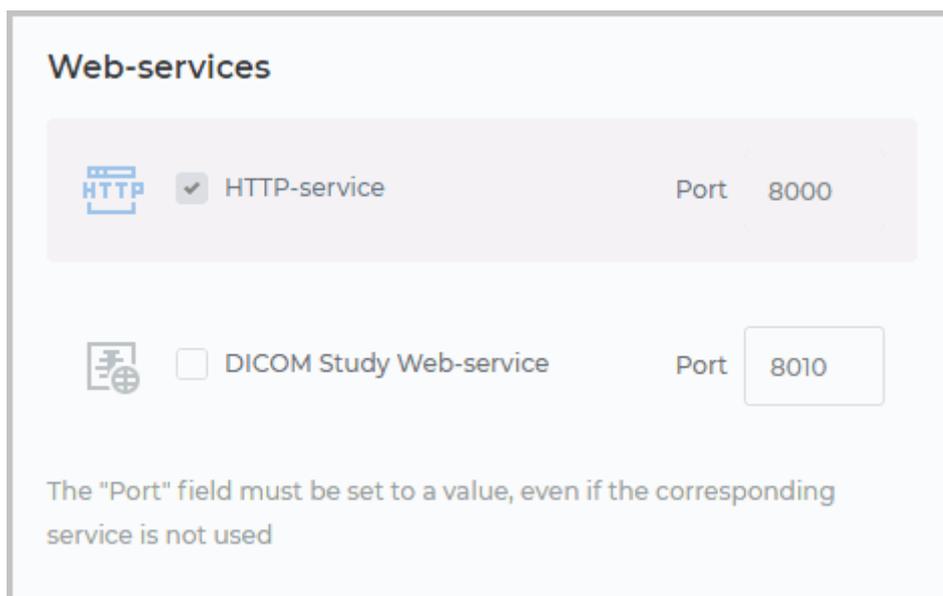
Figure 1.30: The **Web Services** settings box

- A read-only **HTTP-service** field for HTTP requests. The service is required for correct administrator web console operation. If the service has been deactivated, the web console cannot be accessed.
The port value that was set when the DICOM Server was installed is shown in the **Port** field. The default value is 8000;

- The **DICOM Study Web-service** field where you can change the port value and activate the service. The DICOM Study Web Service provides an opportunity to download studies from a server (WADO-RS), search for studies at a server (QIDO-RS), and upload studies

to a server (STOW-RS). The service is disabled by default. To enable the service, tick the respective box.

The DICOM Study Web Service port value is shown in the **Port** field. The default value is 8010. To change the port value, enter a value from 0 to 65535 in the **Port** field. If the value entered is invalid, the bounding box will turn red.

The new **Web-services** parameters will be applied after you relaunch the DICOM Server.

1.10   Settings

To view the settings of the DICOM Server go to the **Settings** page.

Some settings in the web console are read only. You can edit the settings in the configuration file.

- **Database connection settings**:

  – **Database address**;

  – **Database port**;

  – **Database name**;

  – **Maximum number of connections**;

  – **Database username**;

  – **Database driver**;

- **DICOM Server access**:

  – **Server AE Title**;

  – **Accepting connections from any device**;

  – **Activate AccessionNumber tag cropping to 16 characters before adding a survey record to the database**;

- **Store service settings**:

  – **Storage activation**;

  – **Storage port**;

  – **Secure storage activation**;

  – **Secure storage port**;

  – **Temp folder path**;

  – **Free disk space limit**;

- **Access without authorization by login and password** (for details see Section 1.8):

  – **Master-cookie**;

  – **IP or FQDN**;

- **MWL service settings**:

- **MWL service activation**;

- **MWL service port**;

- **Secure MWL service activation**;

- **Secure MWL service port**;

- **Notification settings emai** (for details see Section 1.10.1):

  - **SMTP server address**;

  - **Port**;

  - **Connection type**;

  - **User name**;

  - **User password**;

  - **Email address**;

  - **Save error notifications activation**;

  - **Storage notifications**;

  - **Activate storage space run out notifications**;

  - **Notification threshold (MB)**;

- **Web-services settings**:

  - **HTTP Service activation**;

  - **WADO Service activation**. he option disables unauthorized access to snapshots via HTTP. If the check box is unchecked, then viewing the series in the DICOM Server administrator web console will be impossible;

  - **HTTP port**;

- **Logging settings**:

  - **Changing the logging level**;

- **Certificates**:

  - **Root certificate (CA)**;

  - **Private SCP key**;

  - **Public SCP**;

  - **Private SCU key**;

  - **Public SCU**;

1.10.1 Email Notification

The DICOM Server may notify clients by email about problems with the storage availability, lack of storage space, and errors that occurred while trying to save files.

> **!** **If email notification was enabled in the earlier DICOM Server version, then notification must be enabled once again after the program is updated to Version 2.9**

To enable email notification, go to the **Settings** tab. The **Email notification settings** section (Fig. 1.31) contains the following fields:

Figure 1.31: Email notification settings section

- the **SMTP server address** field. Values may be entered in IPv4, IPv6, or URL (without specifying the protocol);

- the **Port** field for entering the service port. The field is empty by default;

- the **Connection type** drop-down list providing for **TCP** and **SSL** options. **TCP** is chosen by default;

- the **User** field where any characters may be entered. The field is empty by default;

- the **Password** field where any characters may be entered. The combination entered is hidden, asterisk characters are displayed instead. The field is empty by default;

- the **Email address** field where the user is to provide the address for notifications.

When values are entered in the settings fields, they are checked for conformity. If an invalid value is entered, the respective box turns red.

If at least one field is empty or the value is invalid, all the other components of this section (the send button, the checkboxes, and the field for entering the storage space threshold) are available read-only.

To enable notification about the errors that occurred when trying to save files on the server, check the **Activate save error notifications** box.

To enable notification about the storage unavailability, check the **Storage notifications** box.

To enable notification upon reaching the storage space threshold, check the **Activate storage space run out notifications** box. By default, the storage space threshold is 4096 MB. You may change the threshold value (in MB) after reaching which a notification will be sent.

To test the work of the service, send a message by clicking the ⊠ **Send a command** button. The results of the test will be shown in a pop-up message in the right-hand bottom corner.

If the value in the **Email address** field has been deleted, sending notifications is deactivated, even if the notification sending checkboxes are checked.

1.10.2   DICOM Server Certificates

After the DICOM Server has been installed, demo keys and certificates are shown in the Certificates settings window. It is not safe to use demo keys and certificates. Upload your own certificates and keys to the DICOM Server administration web console.

You can work with certificates only from the administration web console. Certificate files are automatically provided with the correct extensions. The names of such files are saved in the database.

To view or edit the server certificates, go to the **Settings** tab. In the **Certificates** settings window (see Fig. 1.32), you will find the read-only data concerning the certificates:

- Root certificate (CA);

- Public and private keys for acceptance of TLS-protected DICOM connections;

- Public and private keys for initiation of TLS-protected DICOM connections.

The DICOM Server uses the **Private SCP key** and the **Public SCP** certificate for inbound connections. It uses the **Private SCU key** and the **Public SCU** certificate for outbound connections. All the keys must be signed with the DICOM Server **Root certificate (CA)**.
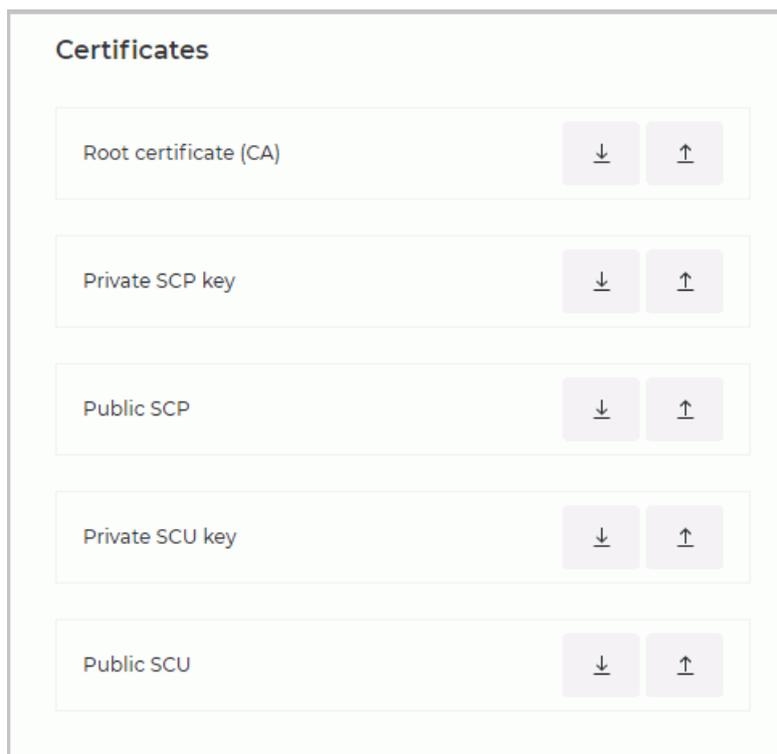
Figure 1.32: Certificates settings section

The ↓   **Download** and ↑   **Upload** buttons you see next to each field are used for downloading the current and uploading new certificate or key files. To download a certificate or key file, click the ↓   **Download** button will be inactive. To upload a certificate, click the ↑   **Upload** button. In the dialog box, choose the file and click **Open**.

Each time any changes referred to certificate or key files are introduced, you need to restart the server. The new settings will be applied after you have restarted the DICOM Server.

The names of the certificates and keys displayed in the **Certificates** box will not be changed when you replace a certificate or a key.

1.11   Tables

On the pages named **Devices (AE)**, **Studies**, **Modality Worklist**, and **Storages** the data are presented in tables. The user can customize the tables for better presentation of information.

1.11.1   Customizing Parameters Display Options

To customize the parameters display options, right-click on the table header and choose the **Table settings** option in the right-click menu. A dialog box shown in Fig. 1.33 will pop up. Our example shows the settings for the table on the **Devices (AE)** page. The tables presented on the pages named **Studies**, **Modality Worklist**, and **Storages** can be customized by analogy.
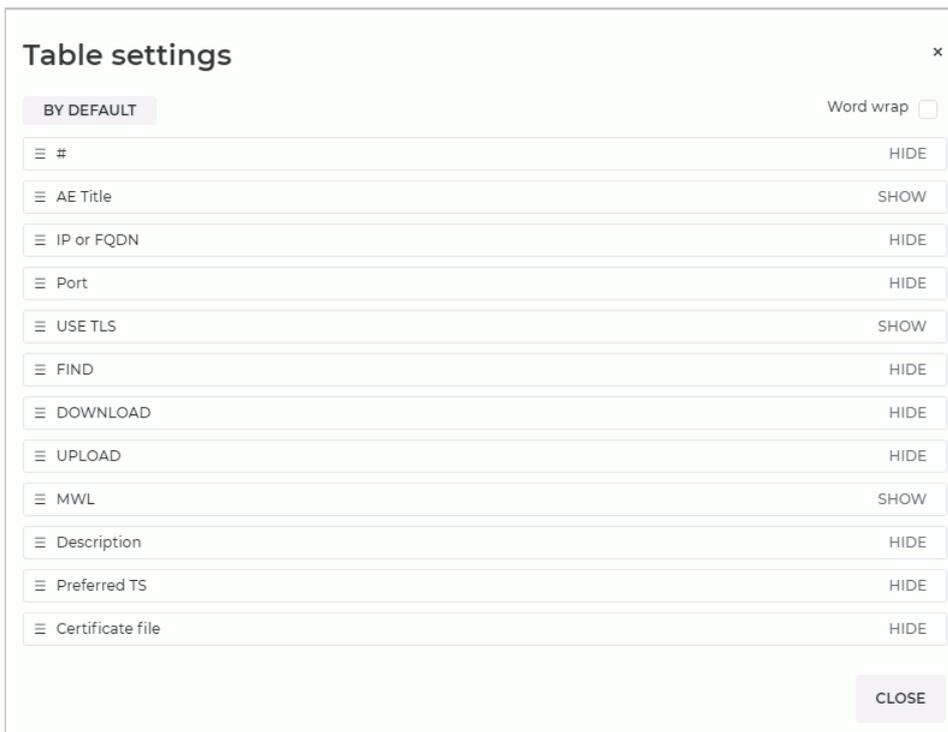
Figure 1.33: The **Table settings** *dialog box*

To change the order of parameters display in the table header, move the cell with the selected parameter. To display or hide a column with a table parameter, click the **HIDE** or **SHOW** button in the cell with this parameter. Check the **Word wrap** box to move the parameters within the line. To restore the default settings, click the **BY DEFAULT** button.

To escape from the table settings dialog box, click the **CLOSE** button.

1.11.2   Sorting by Values

If there are several lines in the table, you can sort the lines by the values displayed in one of the columns. To do that, click on the header of a column with the respective parameter. Next to the name of this column, you will see an arrowhead showing the sorting order (⌄ **down** — in descending order, ⌃   **up** — in ascending order). To change the sorting order, click on the column header once again. You cannot sort the lines by several parameters simultaneously.

Chapter 2

Licensing

2.1   General Information

A unique product code is generated for each DICOM Server. Then a license file containing the following information is created for each product code:

- end of support date;

- maximum number of clients connected (AETitle number).

You may need a product code to obtain technical support and to purchase a license. The product code can be obtained in two ways:

- In the **About** tab. The product code is shown on the right panel **About** tab (Fig. 2.1).

- At the command pronpt using the *-p* key. On the command prompt run:
  «program_path>\pacs_server -p.
  For more details, see Section Command Line Parameters.

The license key is the unique product identifier at the manufacturer's license server and, since version 2.0.0, is no longer a means of providing a license.

Each license has a support term. A DICOM Server can be updated to the new version created during the support term. To get a license for the updates issued after the expiration of the support term, you need to subscribe to updates, which is cheaper than buying a new license. The minimum support term for each license is one year.

If you have a license for an early DICOM Server version (earlier than 2.0.0) and it is still valid, then you need to get a free license file for 2.0.0 or a later version (issued during the support term). To do that, contact the help desk.

There are two licensing schemes available:

1. With a limited number of all client's connections (AETitle). The cost of the license depends on the number of connections.

2. With an unlimited number of connections. The licensing terms and conditions are determined case by case.

2.2 DICOM Server Licensing

To complete the licensing procedure for 2.3.0 or later version open the **ABOUT** tab and click the **UPDATE LICENSE** button. In the dialog that opens click on the white space to choose the license file or drag and drop the license file from the file manager to the white space. Click the **SAVE** button to save license or **CANCEL** to cancel. If the license is installed successfully, its parameters are shown on the right panel (Fig. 2.1) and the licnese file will be renamed to «pacs.lic» and moved to the «conf» folder in the folder with the installed DICOM Server. Default path for Windows: *C:\PACSServer\conf\pacs.lic*.
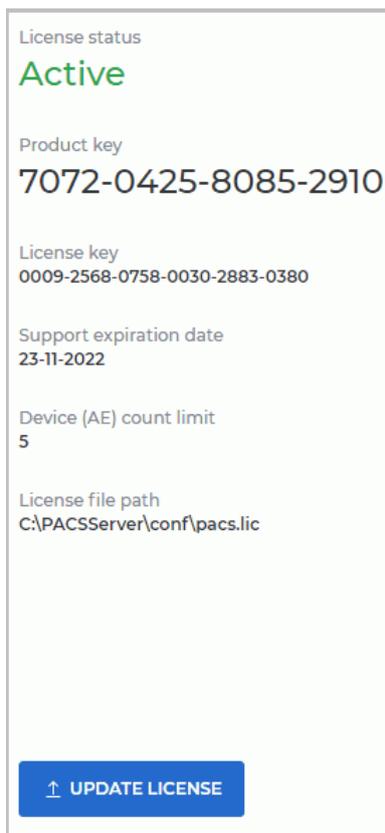

Figure 2.1: License parameters

If you don't have a license, the DICOM Server works in trial mode and its functions are limited (for details see Section **DICOM Server Functionality**). If the DICOM Server used to be licensed but then the license was deleted for some reason (e.g. the operating system was reinstalled), all the connections and studies that have already been added will still be available, though it will be impossible to establish new connections and add new studies in excess of the limit provided for the trial mode.

Chapter 3

DCM_IMPORT Utility

We use the dcm_import command-line utility for automated data uploading to the DICOM server. If the utility is started with no parameters, it works interactively.

The studies from the given folder are imported regardless of their nesting level. Thus, it is enough to provide the path to the top-level folder. All the files that have been found are interpreted as DICOM files.

The dcm_import utility uploads all the images from the chosen folder to the DICOM Server. By default, the DICOM Server does not overwrite the existing images when images with the same names are uploaded. To overwrite the existing images, choose the **true** value for the **overwrite_image** parameter in the «srv_settings.ini» configuration file.

Restart the DICOM Server to apply the changes.

If this line is missing from the configuration file, or if the **false** value has been chosen for the **overwrite_image** parameter, the images sharing their names with the existing images will be ignored.

When the program exits, reports with a list of files when reading which an error occurred and with a list of files when sending which an error occurred are generated.

The language is defined by the system locale of the operating system.

3.1   Using dcm_import in the Interactive Mode

To import data to the DICOM server interactively, proceed as follows:

1. Run the utility with no command line parameters.

2. Enter the IP address of the DICOM server. The default value is **127.0.0.1**. To keep the default value, do not make any entries. Press **Enter**.

3. Enter the port of the DICOM server. The default value is 3000. Press "Enter".

4. Enter the path to the folder with the studies to be imported to the DICOM server. The default value is: **the folder one level above the dcm_import utility executable file**. Press **Enter**.

5. Enter the AE Title of the DICOM server. The default value is: **PACS_Inobitec**. Press **Enter**.

The command line shows the process of files import and the errors occurring.

The import parameters can be passed via the command line when the dcm_import utility is run (see Section 3.2).

3.2   Using dcm_import with Command Line Parameters

To import data to the DICOM server, run the dcm_import utility with the following parameters:

[<program_path>]<dcm_import> [<host> <port> <path> <aetitlescp>]

<host> — DICOM server IP address for studies import;

<port> — DICOM server port for studies import;

<path> — path to the folder with the studies to be imported;

<aetitlescp> — AE Title of the DICOM server where the studies are to be imported.

Example:

D:\Inobitec\PACSServer\2.0.0\Dcm_import\dcm_import.exe 192.168.1.10 3000 D:\dicom_data PACS_Inobitec.

If the dcm_import utility is started with no parameters, it works interactively (see Section 3.1).

Thanks for selecting our product! The INOBITEC Software FZ-LLC team is constantly working to improve it. We will be grateful for any feedback, comments and suggestions how to enhance the product functionality, user-friendliness and visualization quality.

We wish you success in your work!