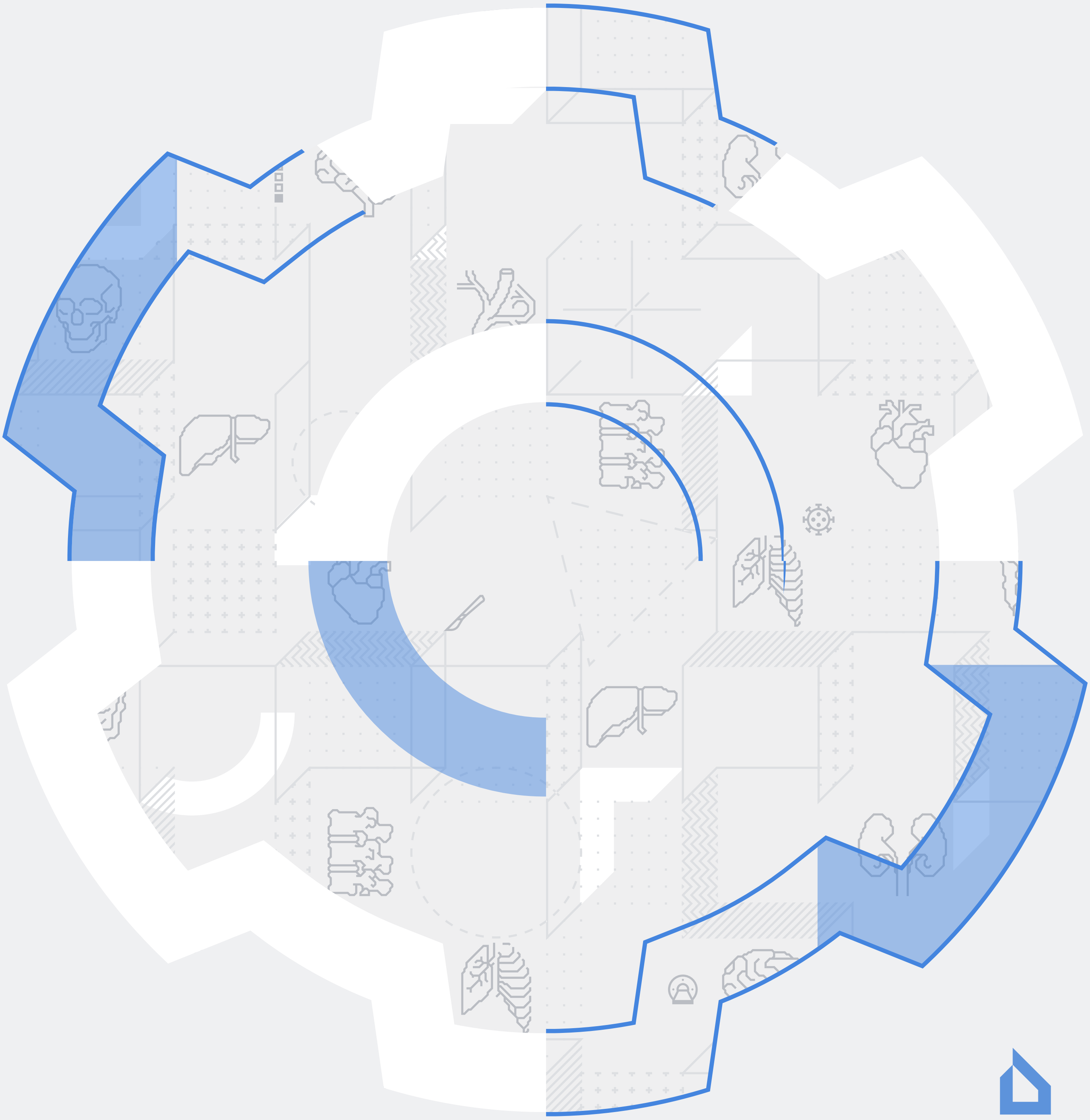
INOBITEC

software for healthcare

Inobitec Web DICOM Viewer version 2.10

ADMIN'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 «Inobitec Web DICOM Viewer» 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.

Contents

About this Manual

The Admin's manual contains information on the system requirements and the structure of «Inobitec Web DICOM Viewer» package, as well as on its installation, deletion, launch, licensing, customization and integration with PACS servers.

The functions of the program, the role of the interface components and the tools are described in detail in the User's manual.

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 Web DICOM Viewer» 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);
- your operating system version from which a client connects to the server (you can get this information from your system administrator);
- product version.

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

Chapter 1

About the Product

The «Inobitec Web DICOM Viewer» is a client-server software. A web browser can be used as a client. Since all resource-intensive operations are performed on the server, the system requirements on which the client is installed are rather low. The «Inobitec Web DICOM Viewer» is intended for use in an infrastructure that uses one or more powerful servers and workstations whose resources are sufficient for the full functioning of modern web browsers.

64-bit versions are available for all the operating systems supported.

The «Inobitec Web DICOM Viewer» 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 Web DICOM Viewer are not removed and changed after uninstalling.

Only specialists should use the «Inobitec Web DICOM Viewer» to make diagnoses.

To avoid personal data disclosure, secure channels should be used for data transfer via the network.

The Web DICOM Viewer functionality, installing, uninstalling, licensing are fully described in this User Manual on the website **inobitec.com**. License Agreement is available from the link **inobitec.com/eng/about/webviewerLic/**.

1.1 Destination

The «Inobitec Web DICOM Viewer» software product is intended for viewing, analyzing and printing medical data obtained from various DICOM equipment (modality). It is deployed on a server that can be accessed from client devices. The «Inobitec Web DICOM Viewer» software package can also be integrated with PACS servers.

The «Inobitec Web DICOM Viewer» is supplied as either a unified or a distributed assembly. The main features of the unified and distributed assemblies are outlined below.

1.2 Unified Assembly of the Web DICOM Viewer

The unified assembly is intended for use in scenarios with low load and a small number of users. As a database, either SQLite or PostgreSQL can be used. For the unified assembly of the Web DICOM Viewer, a trial period of 14 days is available with no functionality restrictions (see Section 3.3.1).

1.3 Distributed Assembly of the Web DICOM Viewer

The distributed assembly is designed for use in scenarios with high load and a large number of users. In this case, the resources of a single physical server may no longer be sufficient to handle the request flow. It is recommended to use PostgreSQL as the database.

The distributed assembly of the «Inobitec Web DICOM Viewer» program features a distributed architecture and consists of three nodes:

1. **Control Node** — This is the main node with which the user interacts. Only one copy of the control node is deployed. It provides static data (html-pages) to the user, ensures authorization and authentication of the user, and is used as a gateway when performing operations with the research repository and rendering servers.

2. **Storage Node** responsible for the storage of DICOM research. It requires a database (PostgreSQL or other DBMS) and hard disk space to store user research.

3. **Render Node** provides data visualization. The minimum system requirements for the server on which this node is deployed are indicated in the Section **System Requirements**.

Each of these nodes performs a specific function. Deployment of nodes can occur both on one server, and on different.

The software complex may comprise multiple storage nodes and render nodes. Nodes can be added as needed and as the load increases. To enable the use of resources from multiple physical machines simultaneously, the nodes must be deployed on separate physical machines (or on virtual machines located on different physical machines).

The distribution of loads between rendering nodes is based on the number of active sessions. When a new session is created, it is assigned a rendering node from the available nodes with the fewest assigned sessions. When operations are performed within the current session, all rendering requests will be sent to this selected node.

The distribution of loads between storage nodes is achieved by assigning a storage node to each user. The node is assigned by the administrator when the user is created. All of the user's storage data are located on this node. The information about the user's personal PACS servers and their SCU is also stored on this node. All the operations with PACS servers during this user's sessions are performed using this node. For sessions with an unknown user (e.g., opening a study via a link from a global PACS server), the storage node is selected in compliance with the rendering node selection logic — the node with the fewest sessions is chosen.

1.4 System Requirements

Minimum System Requirements for Server:

Operating system:

- Windows version not lower than Windows 7 x64;
- Ubuntu 20 x64;

DBMS: PostgreSQL 9.6 and greater (optional, depends on the selected DBMS);
processor: Intel Core i3-2100 or similar:

- clock frequency of 3,1 GHz;
- number of processor cores 2;
- maximum number of threads 4;

RAM: 16 GB;

If the server is deployed in a virtual machine, it is recommended to allocate static RAM, not dynamic RAM.

video card: GeForce GT 710 or similar:

- clock frequency of 954 MHz;
- the amount of video memory 2 GB;

free space on the disk: 2 GB (without space for the storage);
network card.

Recommended System Requirements for Server:

Operating system:

- Windows version not lower than Windows 7 x64;
- Ubuntu 20 x64;

DBMS: PostgreSQL 9.6 and greater (optional, depends on the selected DBMS);
processor: Intel Core i7-6700K or similar:

- clock frequency of 4,0 GHz;
- number of processor cores 4;
- maximum number of threads 8;

RAM: 32 GB;
If the server is deployed in a virtual machine, it is recommended to allocate static RAM, not dynamic RAM.
video card: GeForce GTX 1080 or similar;

- clock frequency of 1,6 GHz;
- the amount of video memory 8 GB;

free space on the disk: 2 GB (without space for the storage);
network card.

Minimum System Requirements for Client:

processor:

- clock frequency of 1,5 GHz;
- number of processor cores 1;

RAM: 2 GB;
video card: without hardware acceleration support;
network card;
display;
keyboard: standard;
mouse: two-button with a scroll wheel;
Internet browser.

Chapter 2

Installing, Uninstalling and Launching the Program

2.1 Installation of the Unified Assembly of the Program on Windows OS

For the unified assembly of the Web DICOM Viewer, SQLite or PostgreSQL can be used as the DBMS.

If SQLite is used, no prior installation of the DBMS is required.

If PostgreSQL is to be used as the DBMS, ensure that PostgreSQL is installed on the PC before installing the Web DICOM Viewer. The Web DICOM Viewer software package utilizes PostgreSQL version 9.6 or higher as the DBMS for its operation.

2.1.1 Preparation for Installation

1. Install the *Runtime* redistributable component library for Microsoft Visual C++ (abbreviated as MSVC) 2019 on the PC using the respective *vc_redist.x64.exe* package.

2. If PostgreSQL is used as the DBMS, install PostgreSQL on the PC and assign a login and password to the DBMS administrator.

3. Ensure that the path to the **bin** folder of the PostgreSQL DBMS is added to the **PATH** system environment variable.

2.1.2 Installation of the Unified Assembly of the Program with SQLite DBMS

1. Extract the distribution files from the archive into a separate directory.

2. Edit the *control.json* and *storage.json* files modifying the node ports and other parameters (optional). The parameter values in the configuration files can be left unchanged.

3. Edit the path to the storage folder and SQLite database in the *renderserverconfig.json* file (optional). The parameter can be applied by default.

4. Run the *RenderServer.exe* executable file to install the program.

The procedures of registration and launch of the server as a service are described in Section 2.1.4.

2.1.3 Installation of the Unified Assembly of the Program with PostgreSQL DBMS

Before installing the Web DICOM Viewer, make sure that the PostgreSQL DBMS and the required libraries are installed on the server (see Section 2.1.1).

1. Extract the distribution files from the archive into a separate directory.

2. Edit the *control.json* and *storage.json* files modifying the node ports and other parameters (optional). The parameter values in the configuration files can be left unchanged.

3. Edit the *renderserverconfig-postgresql.json* file specifying the values for the following database parameters:

   - **driver** — database driver name (default value: *QPSQL*);
   - **name** — database name (default value: *webviewer*);
   - **host** — database server address (default value: *localhost*);
   - **port** — database server port (default value: *5432*);
   - **user** — database user name (default value: *webviewer*);
   - **password** — database user password (default value: *webviewer*).

4. Run the *RenderServer.exe* executable file from the command line with the following parameters:

   RenderServer.exe -c renderserverconfig-postgresql.json --create-db-user --create-database --master-db-user <master_user_name> --master-db-password <master_db_password>,

   where

   > *<master_user_name>* — is the name of a database user with administrator rights to create new users and databases (default: *postgres*);
   >
   > *<master_db_password>* — is the password of the database user.
   >
   > If the database user specified in step 3 already exists, the *--create-db-user* flag is not required.

5. Run the *RenderServer.exe* executable file with the following command-line parameter *-c renderserverconfig-postgresql.json*. Alternatively, simply change the name of the file from *renderserverconfig-postgresql.json* to *renderserverconfig.json* beforehand, in which case specifying it as a command-line parameter is not necessary.

The procedures of registration and launch of the server as a service are described in Section 2.1.4.

2.1.4 Registration and Launch of the Server as a Service

1. Launch the command prompt as an administrator. Specify the path to the directory containing the unzipped distribution files by running the following in the command prompt:

   set INSTALL_DIR=<path to the installation directory>
   set OPTIONS=%OPTIONS% --no-log-to-console

2. Register the unified assembly as a service by running the following in the command prompt:

   sc create "Inobitec Web Viewer Server" binPath= "%INSTALL_DIR%\RenderServer.exe %OPTIONS% -c %INSTALL_DIR%\renderserverconfig.json --log %INSTALL_DIR% \renderserver.log"

The service name and the paths to the configuration files and log files can be modified by the user.

The created service is launched in the standard manner.

2.2 Installation of the Distributed Assembly of the Program on Windows OS

For the distributed assembly of the Web DICOM Viewer, it is recommended to use PostgreSQL as the DBMS.

2.2.1 Preparation for Installation

1. Install the *Runtime* redistributable component library for Microsoft Visual C++ (abbreviated as MSVC) 2019 on the PC using the respective *vc_redist.x64.exe* package.

2. If PostgreSQL is used as the DBMS, install PostgreSQL on the PC and assign a login and password to the DBMS administrator.

3. Ensure that the path to the **bin** folder of the PostgreSQL DBMS is added to the **PATH** system environment variable.

2.2.2 Installation and Launch of the Control Node

1. Extract the distribution files from the archive into a separate directory.

2. Edit the *control.json* file modifying the node port and other parameters (optional). The parameter values in the configuration file can be left unchanged.

3. Edit the *controlnodeconfig-postgresql.json* file specifying the values for the following database parameters:

   - **driver** — database driver name (default value: *QPSQL*);
   - **name** — node database name (default value: *control*);
   - **host** — database server address (default value: *localhost*);

- **port** — database server port (default value: *5432*);
- **user** — database user name (default value: *control*);
- **password** — database user password (default value: *control*).

4. To create a database for the control node of the Web DICOM Viewer, run the *ControlNode.exe* executable file from the command line with the following parameters:

   ControlNode.exe -c controlnodeconfig-postgresql.json --create-db-user --create-database --master-db-user <master_user_name> --master-db-password <master_db_password>,

   where

   <master_user_name> — is the name of a database user with administrator rights to create new users and databases (default: *postgres*);

   <master_db_password> — is the password of the database user.

   If the database user specified in step 3 already exists, the *--create-db-user* flag is not required.

5. To launch the control node, run the executable file *ControlNode.exe* with the command-line parameter *-c controlnodeconfig-postgresql.json*.

   ControlNode.exe -c controlnodeconfig-postgresql.json

   Alternatively, simply rename the file *controlnodeconfig-postgresql.json* to *controlnode-config.json* beforehand, in which case specifying it as a command-line parameter is not necessary.

2.2.3 Installation and Launch of the Storage Node

1. Extract the distribution files from the archive into a separate directory.

2. Edit the *storage.json* file modifying the node port and other parameters (optional). The parameter values in the configuration file can be left unchanged.

3. Enter the address of the control node (ControlNode) in the **control** parameter of the *storage.json* file.

4. Edit the *storagenodeconfig-postgresql.json* file specifying the values for the following database parameters:

   - **storage** — path to the storage directory (default value: *~/InobitecWebViewerStorage.postgres*);
   - **driver** — database driver name (default value: *QPSQL*);
   - **name** — node database name (default value: *storage*);
   - **host** — database server address (default value: *localhost*);
   - **port** — database server port (default value: *5432*);
   - **user** — database user name (default value: *storage*);
   - **password** — database user password (default value: *storage*).

5. To create the database for the storage node of the Web DICOM Viewer, run the *StorageNode.exe* executable file from the command line with the following parameters:

   ```
   StorageNode.exe -c storagenodeconfig-postgresql.json --create-db-user --create-database
   --master-db-user <master_user_name> --master-db-password <master_db_password>,
   ```

   where

   > *<master_user_name>* — is the name of a database user with administrator rights to create new users and databases (default: *postgres*);
   >
   > *<master_db_password>* — is the password of the database user.
   >
   > If the database user specified in step 4 already exists, the *--create-db-user* flag is not required.

6. To launch the storage node, run the *StorageNode.exe* executable file with the following command-line parameter *-c storagenodeconfig-postgresql.json*.

   ```
   StorageNode.exe -c storagenodeconfig-postgresql.json
   ```

   Alternatively, simply change the name of the file from *storagenodeconfig-postgresql.json* to *storagenodeconfig.json* beforehand, in which case specifying it as a command-line parameter is not necessary.

2.2.4 Installation and Launch of the Rendering Node

1. Extract the distribution files from the archive into a separate directory.

2. Run the *rendernode.exe* executable file.

2.2.5 Registration and Launch of the Server as a Service

1. Launch the command prompt as an administrator. Specify the path to the directory containing the unzipped distribution files by running the following in the command prompt:

   ```
   set INSTALL_DIR=<path to the installation directory>
   set OPTIONS=%OPTIONS% --no-log-to-console
   ```

2. Register the nodes as services by running the following in the command prompt:

for the ControlNode:

```
sc create ”Inobitec Web Viewer Control Node” binPath= ”%INSTALL_DIR%\ControlNode.exe
%OPTIONS% -c %INSTALL_DIR%\controlnodeconfig.json --log %INSTALL_DIR%\controlnode.log”
```

for the StorageNode:

```
sc create ”Inobitec Web Viewer Storage Node” binPath= ”%INSTALL_DIR%\StorageNode.exe
%OPTIONS% -c %INSTALL_DIR%\storagenodeconfig.json --log %INSTALL_DIR%\storagenode.log”
```

for the RenderNode:

```
sc create ”Inobitec Web Viewer Render Node” binPath= ”%INSTALL_DIR%\rendernode.exe
%OPTIONS% --log %INSTALL_DIR%\rendernode.log”
```

The created services are launched in the standard manner.

2.3 Uninstalling the Program on Windows OS

To uninstall the Web DICOM Viewer, delete the directory containing the program. If the server is running as a service, stopping and removing the service is performed using the standard tools of the operating system.

2.4 Installation of the Unified Assembly of the Program on Linux OS

This section outlines the procedure for installing the Web DICOM Viewer without registering it as a service. The installation of the Web DICOM Viewer as a service is described in Section 2.6.

For the unified assembly of the Web DICOM Viewer SQLite or PostgreSQL can be used as the DBMS.

When SQLite is used, no prior installation of the DBMS is required.

If PostgreSQL is to be used as the DBMS, ensure that PostgreSQL is installed on the PC before installing the Web DICOM Viewer.

The Web DICOM Viewer software package utilizes PostgreSQL version 9.6 or higher as the DBMS for its operation.

2.4.1 Dependencies installation

You must to install the following packages:

- **postgresql** (only if PostgreSQL is used as the DBMS)
- **libqt5sql5-psql** (only if PostgreSQL is used as the DBMS)
- **qt5-default**
- **openssl**

To install the packages on Ubuntu, proceed as follows:

sudo apt install postgresql qt5-default openssl libqt5sql5-psql

2.4.2 Installation of the Unified Assembly of the Program with SQLite DBMS

1. Extract the distribution files from the archive into a separate directory.
2. Edit the *control.json* and *storage.json* files modifying the node ports and other parameters (optional). The parameter values in the configuration files can be left unchanged.
3. Edit the path to the storage folder and SQLite database in the *renderserverconfig.json* file (optional). The parameter can be applied by default.
4. Run the *./RenderServer* executable file to install the program.

2.4.3 Installation of the Unified Assembly of the Program with PostgreSQL DBMS

Before installing the Web DICOM Viewer, make sure that the PostgreSQL DBMS and the required libraries are installed on the server (see Section 2.4.1).

1. Extract the distribution files from the archive into a separate directory.
2. Edit the *control.json* and *storage.json* files modifying the node ports and other parameters (optional). The parameter values in the configuration files can be left unchanged.
3. Edit the *renderserverconfig-postgresql.json* file specifying the values for the following database parameters:
   - **driver** — database driver name (default value: *QPSQL*);
   - **name** — database name (default value: *webviewer*);
   - **host** — database server address (default value: *localhost*);
   - **port** — database server port (default value: *5432*);
   - **user** — database user name (default value: *webviewer*);
   - **password** — database user password (default value: *webviewer*).
4. Run the *./RenderServer* executable file from the command line with the following parameters:

   ./RenderServer -c renderserverconfig-postgresql.json --create-db-user --create-database --master-db-user <master_user_name> --master-db-password <master_db_password>,

   where

   > *<master_user_name>* — is the name of a database user with administrator rights to create new users and databases (default: *postgres*);
   >
   > *<master_db_password>* — is the password of the database user.
   >
   > If the database user specified in step 3 already exists, the *--create-db-user* flag is not required.
5. Run the *./RenderServer* executable file with the following command-line parameter *-c renderserverconfig-postgresql.json*. Alternatively, simply change the name of the file from *renderserverconfig-postgresql.json* to *renderserverconfig.json* beforehand, in which case specifying it as a command-line parameter is not necessary.

2.5 Installation of the Distributed Assembly of the Program on Linux OS

This section outlines the procedure for installing the Web DICOM Viewer without registering it as a service. The installation of the Web DICOM Viewer as a service is described in Section 2.6.

For the distributed assembly of the Web DICOM Viewer, it is recommended to use PostgreSQL as the DBMS.

2.5.1 Preparation for the Distributed Assembly Installation

Install the following packages on the respective PCs:

- **postgresql** (for the ControlNode and StorageNode nodes)
- **libqt5sql5-psql** (for the ControlNode and StorageNode nodes)
- **qt5-default** (for all nodes)
- **openssl** (for the ControlNode node)

Before deploying the ControlNode node on the respective PC, install the packages (example for Ubuntu OS):

sudo apt install postgresql qt5-default openssl libqt5sql5-psql

2.5.2 Installation and Launch of the Control Node

1. Extract the distribution files from the archive into a separate directory.

2. Edit the *control.json* file modifying the node port and other parameters (optional). The parameter values in the configuration file can be left unchanged.

3. Edit the *controlnodeconfig-postgresql.json* file specifying the values for the following database parameters:

   - **driver** — database driver name (default value: *QPSQL*);
   - **name** — node database name (default value: *control*);
   - **host** — database server address (default value: *localhost*);
   - **port** — database server port (default value: *5432*);
   - **user** — database user name (default value: *control*);
   - **password** — database user password (default value: *control*).

4. To create a database for the control node of the Web DICOM Viewer, run the *./ControlNode* executable file from the command line with the following parameters:

   ./ControlNode -c controlnodeconfig-postgresql.json --create-db-user --create-database --master-db-user <master_user_name> --master-db-password <master_db_password>,

   where

   <master_user_name> — is the name of a database user with administrator rights to create new users and databases (default: *postgres*);

   <master_db_password> — is the password of the database user.

   If the database user specified in step 3 already exists, the *--create-db-user* flag is not required.

5. To launch the control node, run the executable file *./ControlNode* with the command-line parameter *-c controlnodeconfig-postgresql.json*.

   ./ControlNode -c controlnodeconfig-postgresql.json

   Alternatively, simply rename the file *controlnodeconfig-postgresql.json* to *controlnodeconfig.json* beforehand, in which case specifying it as a command-line parameter is not necessary.

2.5.3 Installation and Launch of the Storage Node

1. Extract the distribution files from the archive into a separate directory.
2. Edit the *storage.json* file modifying the node port and other parameters (optional). The parameter values in the configuration file can be left unchanged.
3. Enter the address of the control node (ControlNode) in the **control** parameter of the *storage.json* file.
4. Edit the *storagenodeconfig-postgresql.json* file specifying the values for the following database parameters:
   - **storage** — path to the storage directory (default value: *~/InobitecWebViewerStorage.postgres*);
   - **driver** — database driver name (default value: *QPSQL*);
   - **name** — node database name (default value: *storage*);
   - **host** — database server address (default value: *localhost*);
   - **port** — database server port (default value: *5432*);
   - **user** — database user name (default value: *storage*);
   - **password** — database user password (default value: *storage*).
5. To create the database for the storage node of the Web DICOM Viewer, run the *./StorageNode* executable file from the command line with the following parameters:

   ./StorageNode -c storagenodeconfig-postgresql.json --create-db-user --create-database --master-db-user <master_user_name> --master-db-password <master_db_password>,

   where

   <master_user_name> — is the name of a database user with administrator rights to create new users and databases (default: *postgres*);

   <master_db_password> — is the password of the database user.

   If the database user specified in step 4 already exists, the *--create-db-user* flag is not required.
6. To launch the storage node, run the *./StorageNode* executable file with the following command-line parameter *-c storagenodeconfig-postgresql.json*.

   ./StorageNode -c storagenodeconfig-postgresql.json

   Alternatively, simply change the name of the file from *storagenodeconfig-postgresql.json* to *storagenodeconfig.json* beforehand, in which case specifying it as a command-line parameter is not necessary.

2.5.4 Installation and Launch of the Rendering Node

1. Extract the distribution files from the archive into a separate directory.

2. Run the *./rendernode* executable file.

2.6 Installation of the Web DICOM Viewer as a Service on Linux OS

This section outlines the procedure for installing the Web DICOM Viewer as a service. The procedure of installation of the Web DICOM Viewer without registering it as a service is described in Sections 2.4 and 2.5.

2.6.1 Script for Installing and Launching the Web DICOM Viewer Components

The Web DICOM Viewer distribution for Linux OS comprises a *ServiceInstall.sh* shell script. This script allows the user to install the Web DICOM Viewer server as a service.

Attention! The «ServiceInstall.sh» script must be executed by a user with superuser privileges.

The script is launched from within the unpacked archive.

Launch Arguments

The *ServiceInstall.sh* script requires one mandatory parameter *PROGRAM*, which specifies what needs to be installed. The parameter can take the following values:

RenderServer — install the unified assembly as a service;

Control — install the control node (ControlNode) as a service;

Storage — install the storage node (StorageNode) as a service;

Render — install the rendering node (RenderNode) as a service.

In addition to the mandatory parameter, the *ServiceInstall.sh* script can take the following optional values of the argument::

-h, **--help** — display information about the script and launching arguments;

--postgresql — use the configuration file for working with PostgreSQL as the DBMS when launching the program;

--sqlite — use the configuration file for working with SQLite as the DBMS when launching the program;

-b, **--backup** — backup the current configuration files if they exist in the installation paths and replace them with new configuration files from the distribution;

-f, **--force** — perform all the necessary actions without confirmation.

As an option, an *INSTALL_DIR* environment variable specifying the specifying the path for installing executable files and libraries can be passed to the *ServiceInstall.sh* script. By default, the path is */opt/<PROGRAMNAME>*.
For example, the default installation path for ControlNode is: */opt/ControlNode*.

Configuration files, the *service* file for *systemd*, and log files are located in standard Linux paths regardless of the value of the *INSTALL_DIR* variable.

Script Operation Peculiarities

1. During execution, the *ServiceInstall.sh* script prompts questions expecting a **yes** or **no** response. The line awaiting the user's response has the **[y/N]** format. To confirm the operation, enter the **y** character and press **Enter**; to decline, enter the **n** character and press **Enter**. Alternatively you can simply press **Enter** to decline the operation. The uppercase letter in the response prompt stands for the default action. In our example, pressing the **Enter** key will cancel the operation.

2. During the installation process, a the *WebViewer* system group and a *<PROGRAMNAME>* user are added to the operating system. This user is a part of the *WebViewer* group. The user's home directory located in */var/lib/<PROGRAMNAME>* serves as the working directory for the service. It enables the use of the «∼» symbol to specify the path to the DBMS or storage. For example, the path to the directory (the value of the *storage* parameter in the configuration file) can be specified in two ways:

   ∼/InobitecWebViewerStorage.sqlite or

   /var/lib/StorageNode/InobitecWebViewerStorage.sqlite

3. After installation, depending on the argument eceived, the service uses one of the following configuration files:

   --postgresql: configuration file
   /etc/<PROGRAMNAME>/<prefix>-postgresql.json,
   where *prefix* takes a value depending on the program being installed: *controlnodeconfig*, *renderserverconfig* or *storagenodeconfig*;

   --sqlite: configuration file
   /etc/<PROGRAMNAME>/<prefix>-sqlite.json,
   where *prefix* takes a value depending on the program being installed: *controlnodeconfig*, *renderserverconfig* or *storagenodeconfig*

4. The installation script does not check the parameters have been passed multiple times. The selection of the *--sqlite* or *--postgresql* parameter occurs in sequence. The priority is given like this:

   - if the *--postgresql* parameter is specified, the configuration file for the PostgreSQL DBMS is selected;
   - if the *--sqlite* parameter is specified, the configuration file for the SQLite DBMS is selected;
   - if no parameter is specified, the configuration file for the PostgreSQL DBMS is selected by default.

5. The script copies configuration files to the installation directories. If a configuration file already exists in the installation directory, the new configuration file will be copied to the installation directory with the suffix *.new*. This behavior can be overridden by passing the *-b* or *--backup* parameter to the installation script. With this parameter, the current configuration file will be renamed to *<configname>.back*, and the new configuration file will be copied in its place.

6. Before installing the program in a different directory, remove the currently installed program. Then run the installation script with the *INSTALL_DIR* environment variable. The information on the program uninstallation is provided below.

Script for Uninstalling the Installed Program

After installation, the *ServiceInstall.sh* script creates a file for uninstalling the installed program. The uninstallation script is named *<PROGRAMNAME>Uninstall*, for example, *ControlNodeUninstall*. It is located in the directory where the executable files are installed, such as */opt/ControlNode/bin/ControlNodeUninstall*. To uninstall the installed program, run this script in the name of a user with superuser privileges.

The script does not delete the user, the group, the path to the configuration files, or the path to the log file.

2.6.2 Installing the Unified Build as a Service

To install the unified build as a service, follow these steps:

1. Prepare for installation as described in Section 2.4.1.

2. Extract the distribution files from the archive into a separate directory.

3. If PostgreSQL is used as the DBMS, create a database (see steps 3-4 in Section 2.4.3).

4. Depending on the DBMS used, execute the installation command:

   sudo ./ServiceInstall.sh RenderServer --postgresql — for PostgreSQL DBMS;

   sudo ./ServiceInstall.sh RenderServer --sqlite — for SQLite DBMS.

5. Edit the configuration file for the unified build. The file path is:
   /etc/RenderServer/. The configuration file parameters are listed in sections 2.4.2 and 2.4.3.

6. In the *control.json* file, specify the path to the **html** directory.

7. Start the service by executing the following:
   sudo systemctl start RenderServer

8. To check the service status, run the following command:
   sudo systemctl status RenderServer

9. To enable the service to start automatically when the OS is booted, execute the following:
   sudo systemctl enable RenderServer

To remove the service, execute the following command:
sudo /opt/RenderServer/bin/RenderServerUninstall

2.6.3 Installing the Distributed Build as a Service

Prepare for installation as described in Section 2.5.1.

Control Node

To install the control node as a service:

1. Extract the distribution files from the archive into a separate directory.
2. If PostgreSQL is used as the DBMS, create a database (see steps 3-4 in Section 2.5.2).
3. Depending on the DBMS used, execute the installation command:

   sudo ./ServiceInstall.sh Control --postgresql — for PostgreSQL DBMS;

   sudo ./ServiceInstall.sh Control --sqlite — for SQLite DBMS.
4. Edit the control node configuration file. The parameters of the control node configuration file are provided in Section 2.5.2.
   File path: */etc/ControlNode*.
5. In the *control.json* file, specify the path to the **html** directory.
6. Start the service by executing the following:
   sudo systemctl start ControlNode
7. To check the service status, run the following command:
   sudo systemctl status ControlNode
8. To enable automatic startup of the service when the OS is booted, execute the following:
   sudo systemctl enable ControlNode

To remove the service, execute the following command:
sudo /opt/ControlNode/bin/ControlNodeUninstall

Storage Node

To install the storage node as a service:

1. Extract the distribution files from the archive into a separate directory.
2. If PostgreSQL is used as the DBMS, create a database (see steps 4-5 in Section 2.5.3).
3. Depending on the DBMS used, execute the installation command:

   sudo ./ServiceInstall.sh Storage --postgresql — for PostgreSQL DBMS;

   sudo ./ServiceInstall.sh Storage --sqlite — for SQLite DBMS.
4. Edit the storage node configuration file. The parameters of the storage node configuration file are provided in Section 2.5.3.
   File path: */etc/StorageNode*.

5. Start the service by executing the following:
   sudo systemctl start StorageNode

6. To check the service status, run the following command:
   sudo systemctl status StorageNode

7. To enable automatic startup of the service when the OS is booted, execute the following:
   sudo systemctl enable StorageNode

To remove the service, execute the following command:
sudo /opt/StorageNode/bin/StorageNodeUninstall

Render Node

To install the rendering node as a service:

1. Extract the distribution files from the archive into a separate directory.

2. Execute the installation command: *sudo ./ServiceInstall.sh Render*

3. Start the service by executing the following:
   sudo systemctl start RenderNode

4. To check the service status, run the following command:
   sudo systemctl status RenderNode

5. To enable automatic startup of the service when the OS is booted, execute the following:
   sudo systemctl enable RenderNode

To remove the service, execute the following command:
sudo /opt/RenderNode/bin/RenderNodeUninstall

2.7 Peculiarities of Running the Program

The peculiarities of running the program on Windows and Linux operating systems when the current working directory is not the installation directory are described below.

2.7.1 Peculiarities of Running the Program on Windows and Linux Operating Systems

If the current working directory is not the installation directory, then for the control node and storage nodes, you need to specify the configuration file for launching. If no such file is specified, then the default value is used as the configuration file name. There is a special value for each executable file. If the specified path to the configuration file is relative (which also applies to the default path), launching the program from an arbitrary directory will, in most cases, cause problems with opening the configuration file. And since the presence of a configuration file is mandatory for the specified executables, this will lead to a launch error. Therefore, in such cases, the path to the configuration file must always be explicitly specified (using the *-c* or *--config* flag) and must be either absolute or correct for the current working directory.

The unified build and all types of nodes write a log file. For each executable file, the default log file name is specific, but it is always assigned with consideration to the current directory. The current directory may be inaccessible or not intended for writing. Therefore, in most cases, it is better to specify the path to the log file each time (using the *-l* or *--log* flag).

2.7.2 Peculiarities of Running the Program on Linux

The unified build and the storage node use additional libraries that are included in the installation archive and located in the *lib* directory of the installation directory. In the specified executable files, a path has been added for finding libraries and executables during the program runtime *rpath=./lib*. When the program is launched from the installation directory, library loaders use rpath to locate the required additional libraries. However, when the program is launched from other directories, there will be problem with finding these libraries.

You can launch the unified build when the working directory is not the installation directory in several ways:

1. To enable launching the program from an arbitrary directory, the path to the directory with the specified libraries must be added to the *LD_LIBRARY_PATH* environment variable, or else the specified libraries must be copied to one of the directories included in the standard library search path.

2. Configuration files for the *ld* utility can be used for the same purpose. For this variant create a file in the */etc/ld.so.conf.d/* directory with the *.conf* extension. In this file, specify the installation directory. Then execute the following: *sudo ldconfig*. Below you can see examples of such commands.

   ```
   INSTALL_DIR="<install path>"
   echo "$INSTALL_DIR" > /etc/ld.so.conf.d/web-viewer-server.conf
   sudo ldconfig
   ```

3. Upon request, the *launcher.sh* script can be provided. It will automatically assign the required value to the *LD_LIBRARY_PATH* variable and then launch the executable file.

2.8 Uninstalling the Program on Linux OS

To uninstall the Web DICOM Viewer, delete the directory containing the program. If the server is running as a service, stopping and removing the service is performed using the standard tools of the operating system.

If the Web DICOM Viewer was installed using a script, run the program uninstallation script (see Section 2.6.1).

2.9 Command Line Parameters

General parameters for all executable files:

-?, **-h**, **--help**: display the list of command-line parameters and terminate execution. The **-?** parameter is only applicable for Windows OS;

-v, **--version**: display the version of the executable file and terminate execution;

-l, **--log <file name>**: specifies the path for the log file;

--log-level <level>: sets the logging level. <level> can take the following values: **error**, **warning**, **info**, **debug**;

--no-log-to-console: disables duplication of log messages to the console;

--no-log-flush: do not flush the log file after each message;

--high-precision-log-time-labels: ensures microsecond precision for the timestamps of messages in the log file.

Parameters shared by the unified build, control node, and storage nodes:

-c, **--config <file name>**: specifies the path to the configuration file.

Parameters for database maintenance operations for the unified build, control node, and storage nodes:

--drop-database: delete the database of the node or unified build, the name of which is specified in the configuration file, or delete the database file if SQLite is used;

--create-db-user: create a database user for the node or unified build, whose name and password are specified in the configuration file (not applicable to SQLite). The name and the password of a user with administrative privileges must be specified using the **--master-db-user** and **--master-db-password** keys;

--create-database: create a database for the node or unified build. The name of the database (for SQLite the path to the database file) is specified in the configuration file. Grant all the privileges for the created database to the database user whose name is specified in the configuration file. The name and the password of a user with administrative privileges must be specified using the **--master-db-user** and **--master-db-password** keys (except for SQLite). It may also be necessary to specify the database for administrative connection using the **--master-db-name** key (e.g., DSN in the case of ODBC);

--master-db-user <name>: the name of the user with administrative privileges for performing operations on behalf of such a user;

--master-db-password <password>: the password of the user with administrative privileges;

--master-db-name <name>: the name of the database for operations with administrative privileges, if required.

Parameters for the rendering node and unified build:

--device <index>: the number of the rendering device for 3D/MPR reconstructions from the list of devices provided to the log file or to the console when the rendering node or unified build is launched. By default, the rendering device with the highest performance is selected;

--port <port>: the tcp port for http listener;

--render-bandwidth <cps>: the limit on the maximum bandwidth for rendering requests per one render context in bytes per second. The value is unlimited by default;

--max-thread-pool-threads <count>: the number of threads used for parallelizing rendering operations. The default value is 4;

--no-image-cache: do not cache images in case of reopening in other contexts;

--no-volume-cache: do not cache 3D/MPR reconstructions in case of reopening in other contexts;

--no-cache: do not cache images or 3D/MPR reconstructions in case of reopening in other contexts.

Chapter 3

Administrator Web Console

3.1 Access to the Administrator Web Console

Administrator Web Console is available by the
http://<ip address>:<port>/admin,
where **port** is the port with the Control Node (for the distributed assembly) or the RenderServer port (for the unified assembly).. By default, it is port 8090.

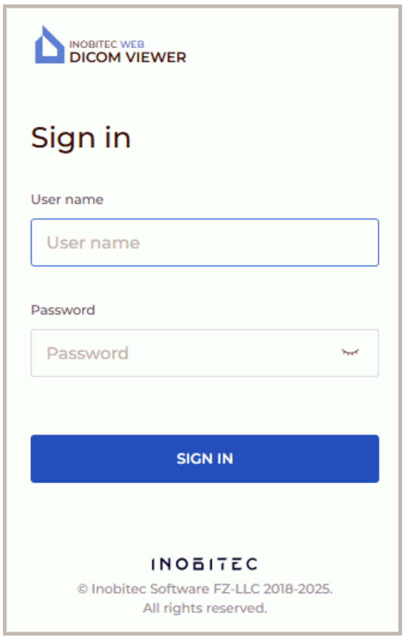


Figure 3.1: Logging into the administrator web console

In the pop-up box (Fig. 3.1) print the user name (login) and password, and then click the **SIGN IN** button. The entered password is hidden and displayed as dots. To make the password visible in the input field, click on the icon representing a closed eye.
The following credentials are used by default:

User name: admin
Password: admin

Main menu of the administrator web console of the Web DICOM Viewer is swown in Fig. 3.2.

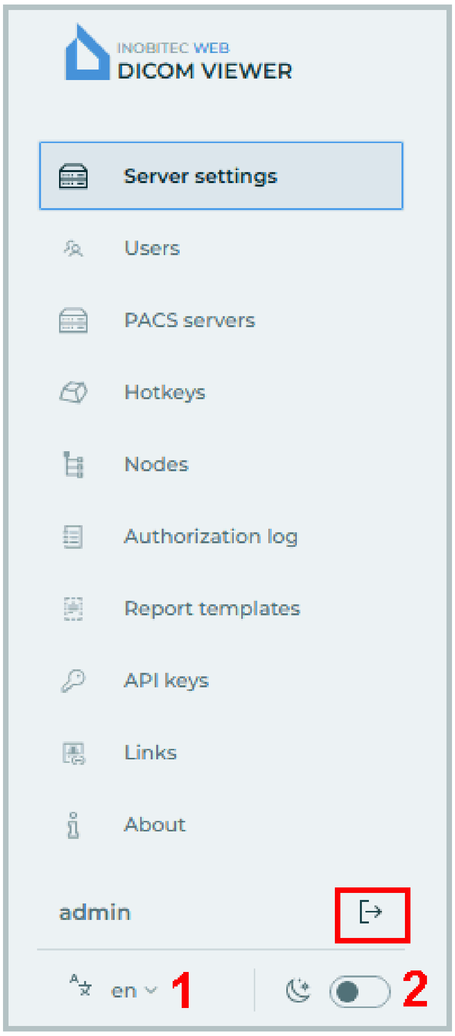


Figure 3.2: Main menu of the administrator web console

To change the interface language, click the language selection button in the lower left corner (marked with number «1» in Fig. 3.2). To change the page background click the switch marked with number «2» in Fig. 3.2.

To log out from the administrator web console, click the **Sign out** button on the main menu (see the red box in Fig. 3.2).

The administrator can set the default interface language for all the users. To do this, follow these steps:

1. Navigate to the directory where the Web DICOM Viewersoftware package is installed. Go to the **html** directory.

2. In the **.config.json** configuration file, change the value of the *language* parameter. If the parameter is missing in the configuration file, it needs to be added. The admissible

values are:

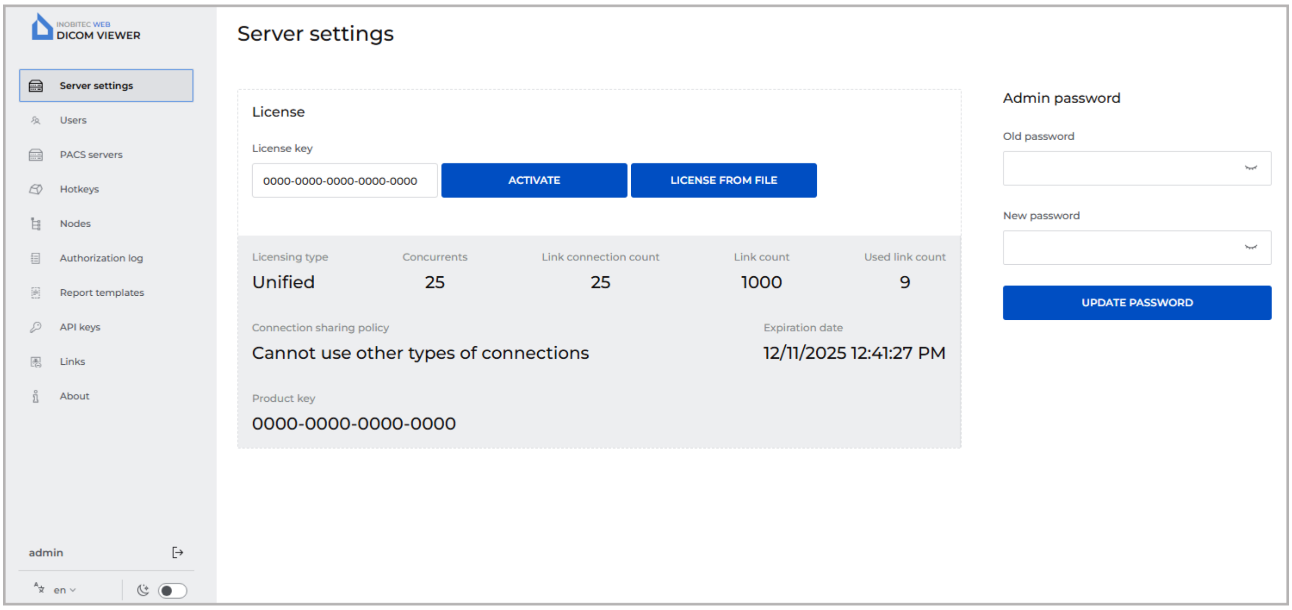
- **en** — sets English as the interface language for all users;
- **pt** — sets Portuguese (Brazilian) as the interface language for all users.

3. Save the edited configuration file.

The user can change the interface language set by the administrator by default.

3.2 Server settings

On the **Server settings** page (Fig. 3.3) activates the license and changes the administrator password.



Server settings

License

License key: 0000-0000-0000-0000-0000

Licensing type	Concurrents	Link connection count	Link count	Used link count
Unified	25	25	1000	9

Connection sharing policy: Cannot use other types of connections

Expiration date: 12/11/2025 12:41:27 PM

Product key: 0000-0000-0000-0000

Admin password

Old password

New password

Figure 3.3: **Server settings** *page*

3.3 Licensing. License activation

On the **Server settings** page (Fig. 3.3) activates the license.

3.3.1 Trial Period

The trial period allows the user to explore the capabilities of the Web DICOM Viewer by using it without any functional limitations for 14 days. A trial license can only be activated by the user if it has not been previously issued for the Web DICOM Viewer with the current product code. The product code is displayed on the **Server settings** page (see Section 3.3.2).

Ttrial period limitations:

- only the unified server edition using the **SQLite** DBMS is available;

- the duration of a working session is limited to 1 hour.

To activate a trial license, click the **ACTIVATE TRIAL LICENSE** button on the **Server settings** page. After successful activation of the trial license, the **Server settings** page will display the license type and the trial period expiration date.

Attention! Activation of a trial license is not available if the Web DICOM Viewer is launched in a virtual environment.

After 14 days, you will no longer be able to use the Web DICOM Viewer, and to continue working, you will have to purchase a license.

To purchase a license, contact the sales department at the email address
market@inobitec.com.

3.3.2 License activation

On the **Server settings** page, the product key is displayed in the **Product key** field and the license key is to be provided.

You can activate the license in two ways:

1. **With a license key**. Enter the license key in the **License key** field and click the **ACTIVATE** button.

2. **With a license from file**. Click the **License from file** button. In the dialog box that opens, select the license file. **Attention! With this activation method, not all server modes may be available.** For more information, please contact technical support at **support@inobitec.com**.

In the **Licensing type** field, you see the information about the current server mode. It depends on the license key type:

- if the user has activated a trial license, the **Licensing type** field displays **Trial** (see Section 3.3.1);

- if the server license key is for a personal user license, in the **Licensing type** field you will see the words **Personal** (see Section 3.3.3);

- if the server license key is for a concurrent license, in the **Licensing type** field you will see the words **Concurrent**. In the **Concurrents** field, you see the maximum number of users who can work with the system simultaneously. The total number of the system users may be greater than the number of concurrent connections (see Section 3.3.4);

- if the server license key combines the capabilities of a personal and a concurrent licens with additional features, the **Licensing type** field displays **Unified** (see Section 3.3.5).

3.3.3 Personal User Licenses

A personal user license is registered in the user's account on the **Users** page (see Section 3.5.2).

The license key activated for a certain user creates one personalized connection providing for continuous access to the system. The user with a personal license has constant access to the system.

3.3.4 Concurrent licenses

A concurrent license is a license limiting the number of users who can work in the system simultaneously.

The Web DICOM Viewer server automatically provides an unoccupied connection to the user when he/she logs in. The connection provided belongs to the shared unoccupied connection pool. The shared connection pool is a list of unoccupied concurrent connections. The connection stays active during the work session, which ends after the user logs out.

When a user opens a study from a link it uses a competitive user connection.

Attention! If there are not enough concurrent connections, the user will be able to work in the system only after another user log out and an unoccupied connection appears.

3.3.5 Unified User Licenses

A unified license combines the capabilities of a personal and a concurrent license with a range of additional features.

After activating a unified license key, the **Server settings** page (Fig. 3.3) displays information on the current server mode.

In the **Concurrents** field, you see the maximum number of users who can work with the system simultaneously. The total number of the system users may exceed the number of concurrent connections.

In the **Link connection count** field you see the maximum number of connections for opening a study simultaneously via a link.

In the **Link count** field, the number of links that can be signed by the server is shown. The links signed by the server can be opened by an unlimited number of users simultaneously (regardless of the number of concurrent link connections specified in the **Link connection count** field).

The number of server-signed links is displayed in the **Used link count** field. The number of links that can still be signed by the server is determined as the difference between the total number of links and the number of used links.

In the **Connection sharing policy** field, the policy for sharing concurrent user connections and opening studies via links is described:

- **Cannot use other types of connections**: no sharing of concurrent user connections and opening studies via links;
- **Connections by link can use users connections**: connections for opening studies via links can use concurrent user connections;
- **Users connections can use connections by link**: concurrent user connections can use connections for opening studies via links.

In the **Expiration date** field, the date and time of the license expiration are displayed.

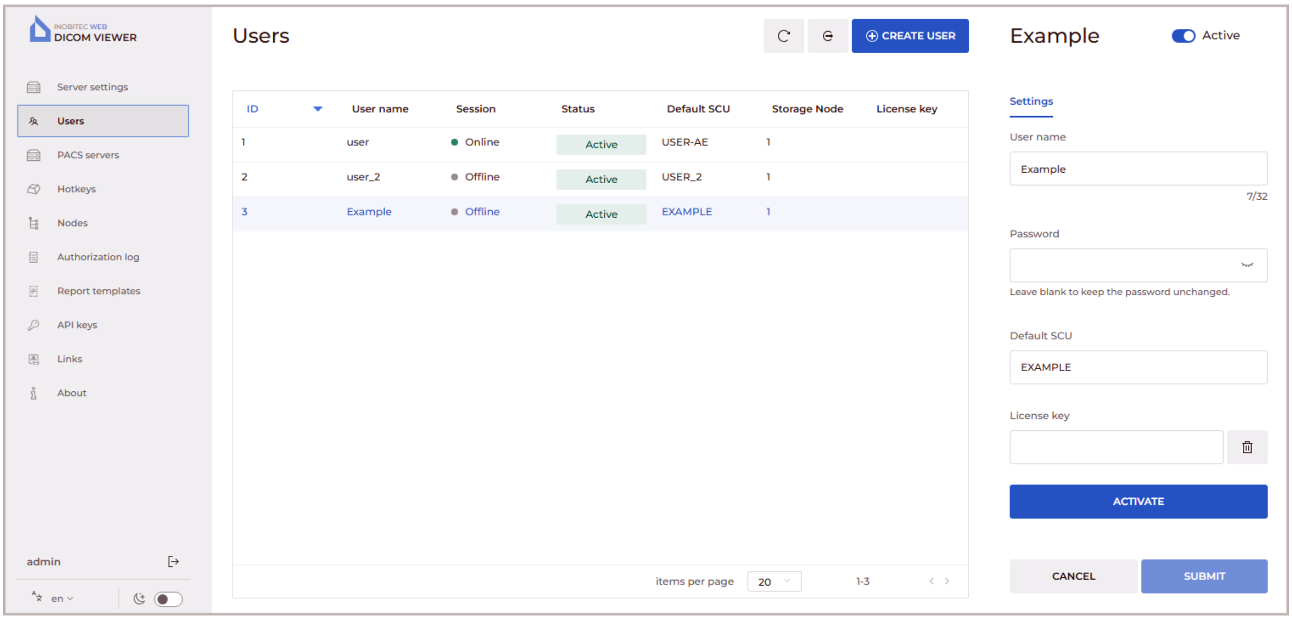
3.4 Changing the administrator password

On the **Server settings** page (Fig. 3.3) you can change the administrator password.

To change the Web DICOM Viewer administrator password, enter the current password in the **Old password** field and the new password in the **New Password** field. A null value is inadmissible! Passwords are hidden when entered. To display the password, press the icon in the shape of an eye. To save the new administrator password click the **UPDATE PASSWORD** button.

3.5 User settings

On the **Users** page (Fig. 3.4) you can manage users.



Users

ID	User name	Session	Status	Default SCU	Storage Node	License key
1	user	● Online	Active	USER-AE	1	
2	user_2	● Offline	Active	USER_2	1	
3	Example	● Offline	Active	EXAMPLE	1	

items per page 20 1-3

Example

User name: Example 7/32

Password:

Leave blank to keep the password unchanged.

Default SCU: EXAMPLE

License key:

Figure 3.4: ***Users*** *page*

The table shows the users parameters.

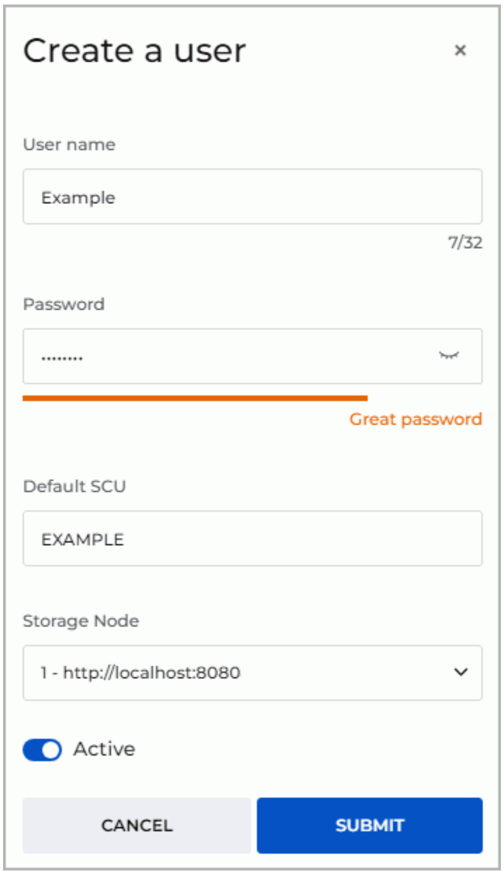
For details on the parameters display options, see Section 3.14.1. The users may be sorted by the values provided in one of the columns (see Section 3.14.2).

At the bottom of the page, you see the range of users for the current page and the total number of users. To go to the next page of the list, click the ❯ button; to go to the previous page — click the ❮ button. To go to the last page of the list, click the ❯| button, to return to the first page — click the |❮ button.

On the **items per page** drop-down list, select the number of users to be displayed on a page.

3.5.1 Creating New Users

To add a new user, click the **CREATE USER** button on the **Users** page.



Create a user

User name

Example

7/32

Password

....

Great password

Default SCU

EXAMPLE

Storage Node

1 - http://localhost:8080

Active

Figure 3.5: Create a user dialog box

Type the user's parameters in the **Create a user** dialog box (Fig. 3.5) paying attention to the following requirements:

- The first character in the **User name** must be a letter. The name may include digits, letters of the Latin alphabet, as well as underscores. The **User name** must be up to 32 characters. No punctuation marks, spaces, quotation marks or special characters are to be used.
- The user's **Password**. The length of the password is not limited. When the password is entered, its strength is indicated. To display the password, press the icon in the shape of an eye;
- The **Default SCU** can contain digits, letters of the Latin alphabet hyphens, and underscores. The SCU length must not exceed 16 characters. Punctuation marks, quotation marks, special characters, and spaces are not allowed;
- from the **Storage Node** dropdown list, select the address of the active Storage Node where the user's DICOM studies will be stored (see Section 3.8). This option is only available for the distributed assembly of the program.

.

To enable/disable access, move the **Active** switch. The user is active by default. Click **SUBMIT** to create a new user or **CANCEL** to cancel.

3.5.2 Managing Users in the Personal User Licensing Mode

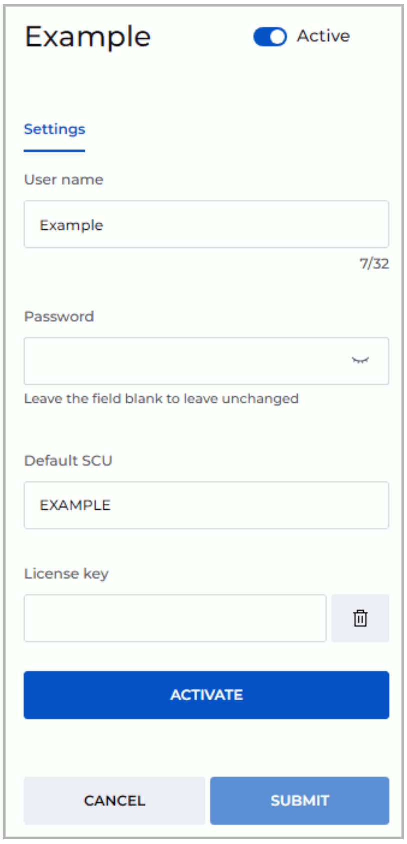
Select a user in the list on the **Users** page. On the right-hand side of the window, the user's credentials are displayed in the **Settings** area. To edit the user's parameters, type the new data in the respective fields (Fig. 3.6).

The requirements for creating the **User name**, the **Password** and **Default SCU** are provided in Section 3.5.1.

Enter the user's personal license key in the **License key** field and click the **ACTIVATE** button.

To enable/disable access, move the **Active** switch.

Attention! After changing the username, studies stored in the storage and on the user's personal PACS servers become inaccessible for opening via previously created links.



Example

User name: Example
7/32

Password:
Leave the field blank to leave unchanged

Default SCU: EXAMPLE

License key:

Figure 3.6: Editing the user's settings

When a personal license key is activated for a certain user, one personalized connection is created providing for continuous access to the system.

To delete the user's license key, click the 🗑 **Remove** button.

Attention! If a license key has been deleted, it cannot be used in future.

Click **SUBMIT** to apply the settings or **CANCEL** to cancel.

3.5.3 Managing Users in the Concurrent Licensing Mode

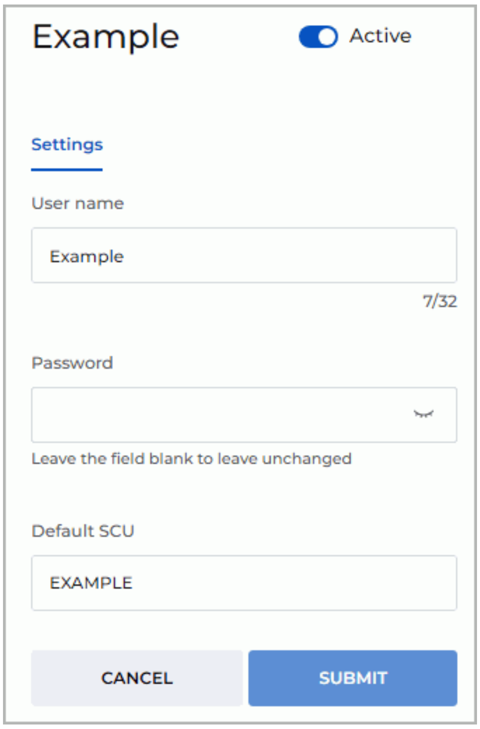
Select a user in the list on the **Users** page. On the right-hand side of the window, the user's credentials are displayed in the **Settings** area. To edit the user's parameters, type the new data in the respective fields (Fig. 3.7).

The requirements for creating the **User name**, the **Password** and **Default SCU** are provided in Section 3.5.1.

Click **SUBMIT** to apply the settings or **CANCEL** to cancel.

To enable/disable access, click the **Active** switch.

Attention! After changing the username, studies stored in the storage and on the user's personal PACS servers become inaccessible for opening via previously created links.



Example

Active

Settings

User name

Example

7/32

Password

Leave the field blank to leave unchanged

Default SCU

EXAMPLE

Figure 3.7: Editing the user's settings

The total number of the system users may be greater than the number of concurrent connections. If all the concurrent connections are busy, a message will pop up when the user tries to enter the system.

3.5.4 Managing Users in the Unified Licensing Mode

User management in the **Unified** licensing mode is performed similarly to user management in the personal licensing mode and is described in Section 3.5.2.

Attention! After the username is changed, the studies stored in the user's storage and on the user's personal PACS servers cannot be opened via previously created links.

3.5.5 User sessions

On the **Users** page you can manage user sessions (Fig. 3.4).

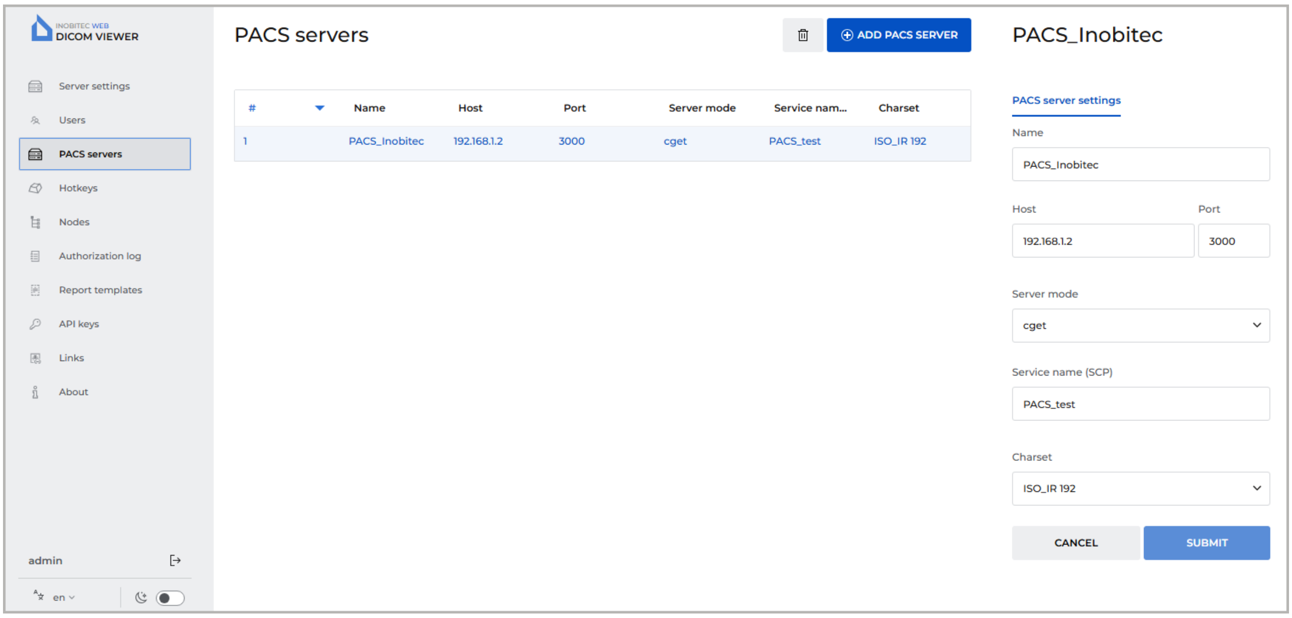
To stop the session, click the ⇥ **Close the user session** button.

To update the session list, click the ↻ **Update user list** button.

3.6 Configuring the Connection to PACS Servers

On the **PACS servers** page, you can configure common connections to PACS servers and applications with which data exchange via the DICOM protocol becomes possible. Common connections to PACS servers are available to all the Web DICOM Viewer users.

The table displays the parameters of PACS servers connected to the Web DICOM Viewer. For more details on setting up the display of the table parameters, see Section 3.14.1. The parameters can be sorted in the table by the values in one of the displayed columns (see Section 3.14.2).



#	Name	Host	Port	Server mode	Service nam...	Charset
1	PACS_Inobitec	192.168.1.2	3000	cget	PACS_test	ISO_IR 192

Name: PACS_Inobitec

Host: 192.168.1.2

Port: 3000

Server mode: cget

Service name (SCP): PACS_test

Charset: ISO_IR 192

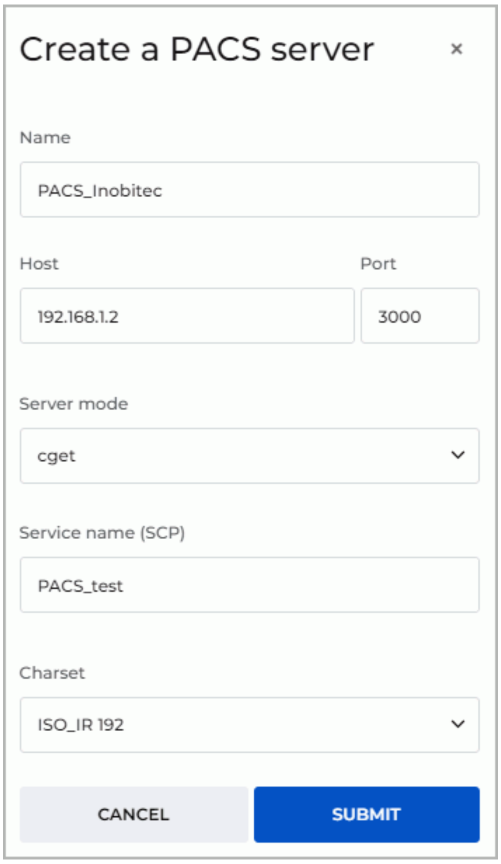
Figure 3.8: **PACS servers** *page*

To add a new connection to a PACS server, follow these steps:

1. Click the **ADD PACS SERVER** button.
2. In the **Create a PACS server** dialog box that pops up (Fig. 3.9), fill in the following fields:
   - in the **Name** field, type the name of the PACS server;
   - in the **Host** field, type the IP address of the PACS server without spaces;
   - in the **Port** field, enter the port value in the range from 0 to 65535;

- on the **Server mode** dropdown list, select the desired mode;
- in the **Service name (SCP)** field, type the name of the server where the PACS server is installed;
- on the **Charset** dropdown list, select the encoding supported by the PACS server.

3. Click the **SUBMIT** button to save the information and close the window, or **CANCEL** to cancel.



Create a PACS server

Name: PACS_Inobitec

Host: 192.168.1.2

Port: 3000

Server mode: cget

Service name (SCP): PACS_test

Charset: ISO_IR 192

Figure 3.9: Creating a new PACS server

To modify the connection parameters of any PACS server, perform the following:

1. Select the PACS server from the list and edit its parameters in the **PACS server settings** area located on the right-hand side of the page (Fig. 3.8).
2. Click the **SUBMIT** button to apply the changes, or **CANCEL** to cancel.

Attention! After the PACS server name is changed, the studies stored on that PACS server annot be opened via previously created links.

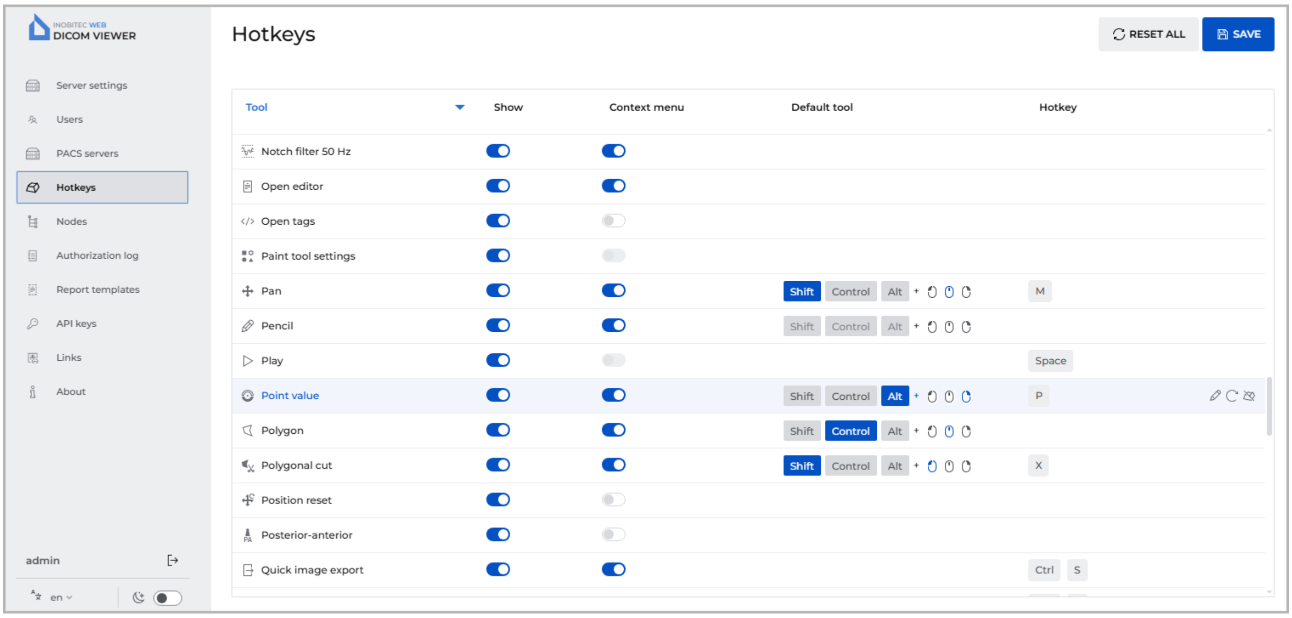
To delete a connection to a selected PACS server, click the **Delete the PACS server** button 🗑. In the confirmation dialog box click **YES** to delete or **CANCEL** to cancel.

The administrator can edit or delete only common connections available to all users. The functions of editing and deleting personal connections to PACS servers are only available for the users who created those connections.

3.7 Hotkeys

On the **Hotkeys** page you can set the default hotkeys (Fig. 3.10).

The table shows the settings for tools and the respective hot keys. For details on customizing parameters display options, see Section 3.14.1. The tools may be sorted in the table by the values shown in one of the columns (see Section 3.14.2).



Hotkeys

Tool	Show	Context menu	Default tool	Hotkey
Notch filter 50 Hz	●	●		
Open editor	●	●		
Open tags	●	○		
Paint tool settings	●	○		
Pan	●	●	[✓ Shift] Control Alt +	M
Pencil	●	●	Shift Control Alt +	
Play	●	○		Space
Point value	●	●	Shift Control [✓ Alt] +	P
Polygon	●	●	Shift [✓ Control] Alt +	
Polygonal cut	●	●	[✓ Shift] Control Alt +	X
Position reset	●	○		
Posterior-anterior	●	○		
Quick image export	●	●		Ctrl S

Figure 3.10: **Hotkeys** *page*

If you want a tool or action to be displayed on the toolbar, put the **Show** switch in the right position. If you want to hide the tool, choose the left position of the switch. If you want a tool to be shown on the context menu, put the switch in the **Context menu** column in the right position. If you don't want the tool to be shown, choose the left position of the switch.

In the **Default tool** column, a combination of modifier keys (**Shift**, **Ctrl**, **Alt**) and mouse buttons is assigned to activate the tool when the is combination is pressed. To change or assign a default key combination to a selected tool, follow these steps:

- click on one of the mouse button thumbnails to activate the selected tool with the left, middle, or right mouse button;
- select a modifier key.

The combination of a mouse button and a modifier key must be unique for each tool. If the selected mouse button and modifier key are already used for another tool, they are highlighted in red and a duplicate warning up. The **SAVE** button is deactivated. Assigning a modifier key is not mandatory.

In the **Hotkey** column, you can see the hot keys assigned to the respective tools or actions. To change or assign a hot key for a selected tool or action, put the mouse cursor on the desired line, click the **Update hotkey** ✎ button and enter the name of the key in the respective field. If the key is already being used for another action, a warning will pop up.

To restore the default key combination assigned to a tool or action, click the **Reset hotkey** button.

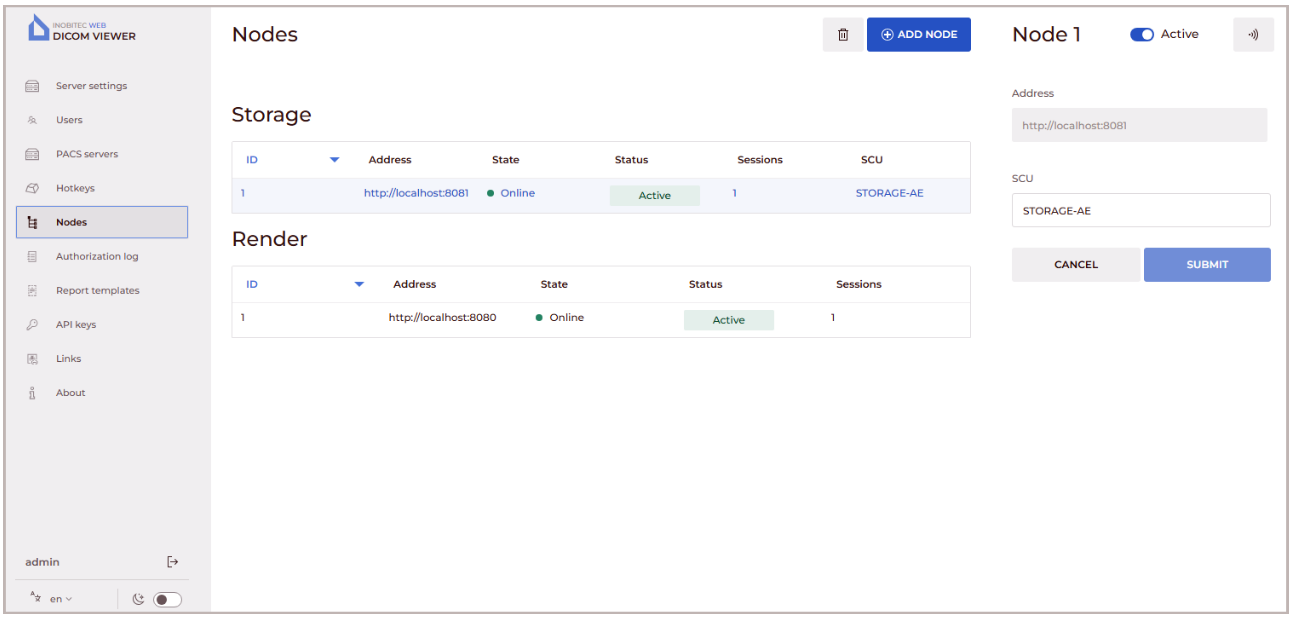
To delete a hot key assigned to a tool, click the **Delete hotkey** button.

Click **SAVE** to save the settings. To restore the default tool display settings and hot keys, click the **RESET ALL** button. In the dialog box that appears, click **YES** to delete or **CANCEL** to cancel.

3.8 Nodes

Attention! The Nodes page is only available for the distributed assembly of the program.

On the **Nodes** page information on the Web DICOM Viewer nodes which are stored in the Control Node database is provided (Fig. 3.11).



Nodes

Storage

ID	Address	State	Status	Sessions	SCU
1	http://localhost:8081	● Online	Active	1	STORAGE-AE

Render

ID	Address	State	Status	Sessions
1	http://localhost:8080	● Online	Active	1

Node 1

Address: http://localhost:8081

SCU: STORAGE-AE

Figure 3.11: ***Nodes** page*

The table for connected nodes shows the following connection parameters:

- the node number in the **ID** column;
- the node address in URL format in the **Address** column;
- the node availability in the **State** column;
- the node activity in the **Status** column;
- the number of active sessions with the node in the **Sessions** column;

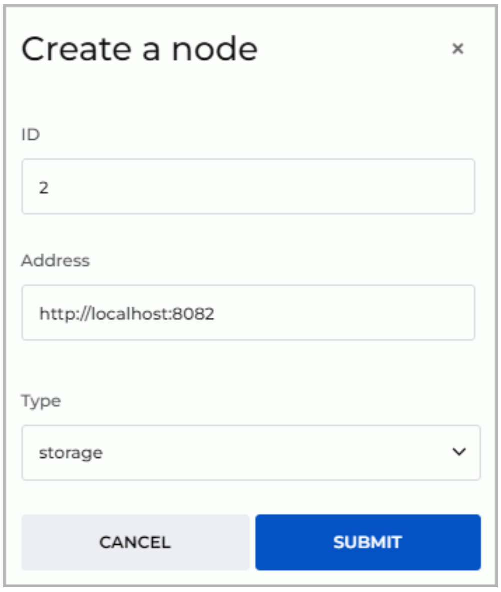
- the SCU value for the Storage Node, which is required for opening via a link from a PACS server, in the **SCU** column.

For details on customizing parameters display options, see Section 3.14.1. The nodes may be sorted in the table by the values shown in one of the columns (see Section 3.14.2).

To change the port, IP address or SCU for some node, proceed as follows:

1. If required, edit the configuration file and/or the node service startup parameters.
2. Restart the service of the edited node.
3. In the administrator's web console, go to the **Nodes** page. Select the node whose parameters have been modified. On the right-hand side of the **Nodes** page, edit the parameter values, specifying the current ones. The status of the node may be changed if the selected node is available.
4. Click the **SUBMIT** button, to apply the changes or **CANCEL** to cancel.

To change the status of the selected node (active/inactive), adjust the **Active/Inactive** toggle switch. To check the availability of the selected node, click the **Ping the node** button •)))
.



Create a node

ID

2

Address

http://localhost:8082

Type

storage

Figure 3.12: Creating a new node

To add a connection:

1. Click the **ADD NODE** button.
2. In the **Create a node** dialog box (Fig. 3.12) set:
   - the node number in the **ID** field. By default, the next consecutive number is entered in the field;

- in the **Address** field the IP address and the port in the following format: *http://<IP-address>:<port>*;
- the node type by selecting from the **Type** dropdown list.

3. Click **SUBMIT**, to apply changes or **CANCEL** to cancel.

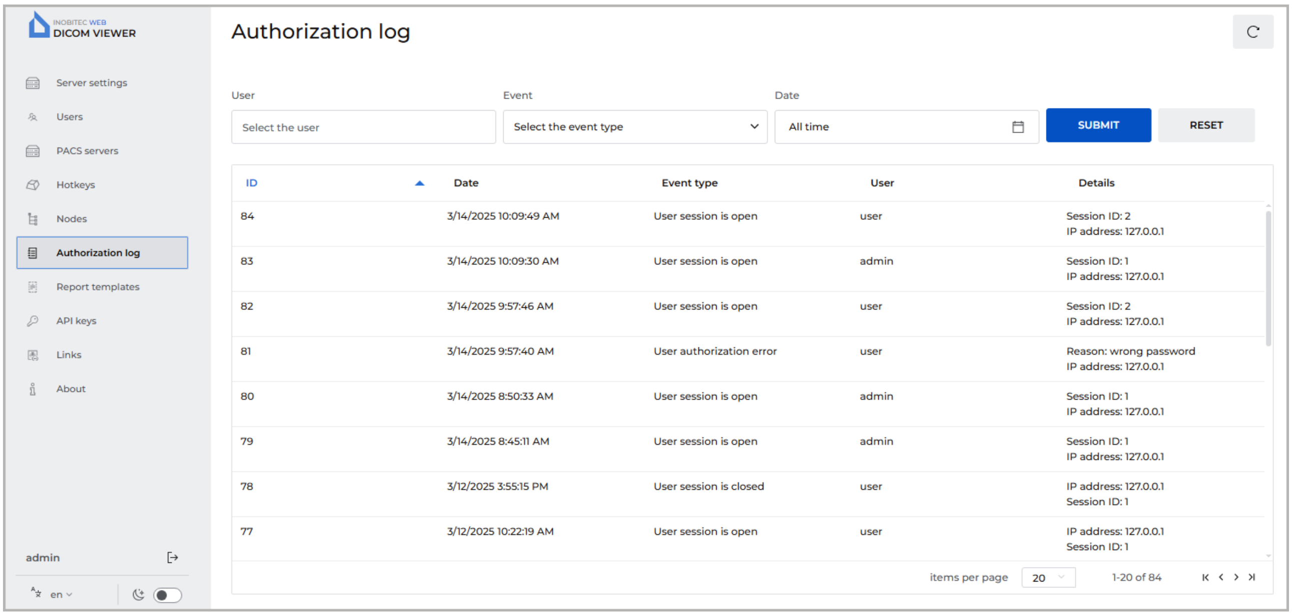
To remove the connection, click the **Delete the node** 🗑 button.

3.9 Authorization log

On the **Authorization log** page, the data concerning the frequency and duration of the application use are collected. In the table provided, you can see the list of events in the system (authentication, password change etc.).

For details on customizing the list display options, see Section 3.14.1. The events may be sorted in the table by the values shown in one of the columns (see Section 3.14.2).

Besides, the authorization log helps to prevent unauthorized access, as the attempts to enter the system with an invalid user name or password are recorded.



Authorization log

User Select the user

Event Select the event type

Date All time

SUBMIT RESET

ID ▲	Date	Event type	User	Details
84	3/14/2025 10:09:49 AM	User session is open	user	Session ID: 2 IP address: 127.0.0.1
83	3/14/2025 10:09:30 AM	User session is open	admin	Session ID: 1 IP address: 127.0.0.1
82	3/14/2025 9:57:46 AM	User session is open	user	Session ID: 2 IP address: 127.0.0.1
81	3/14/2025 9:57:40 AM	User authorization error	user	Reason: wrong password IP address: 127.0.0.1
80	3/14/2025 8:50:33 AM	User session is open	admin	Session ID: 1 IP address: 127.0.0.1
79	3/14/2025 8:45:11 AM	User session is open	admin	Session ID: 1 IP address: 127.0.0.1
78	3/12/2025 3:55:15 PM	User session is closed	user	IP address: 127.0.0.1 Session ID: 1
77	3/12/2025 10:22:19 AM	User session is open	user	IP address: 127.0.0.1 Session ID: 1

items per page 20 1-20 of 84

Figure 3.13: **Authorization log** *page*

The authorization log provides the following information:

- **ID** — the unique identifier of the event;
- **Date** — the date and time of the event;
- **Event type** — events that are displayed in the authorization log:
  - **Admin authorization error**;
  - **User authorization error**;

  - **User session is open**;
  - **User session closed**;
  - **Session expired**;
  - **User data has been changed**;

- **User** — the name of the user who performed the action;
- **Details** — additional information about the event:
  - **IP address**;
  - **Old login** (old user login if user settings have been changed);
  - **New login** (new user login if user settings have been changed);
  - **New status** (new user's status);
  - **Old storage node ID**;
  - **New storage node ID**;
  - **Session ID** (the ID of the session during which the event occurred);
  - **Login** (the login used by the user in a failed login attempt);
  - **Password** (the user's password has been changed);
  - **Reason** (event description).

At the top of the authorization log, you see the event filtering panel. The search can be performed by the following parameters:

- **User**;
- **Event**;
- **Date**.

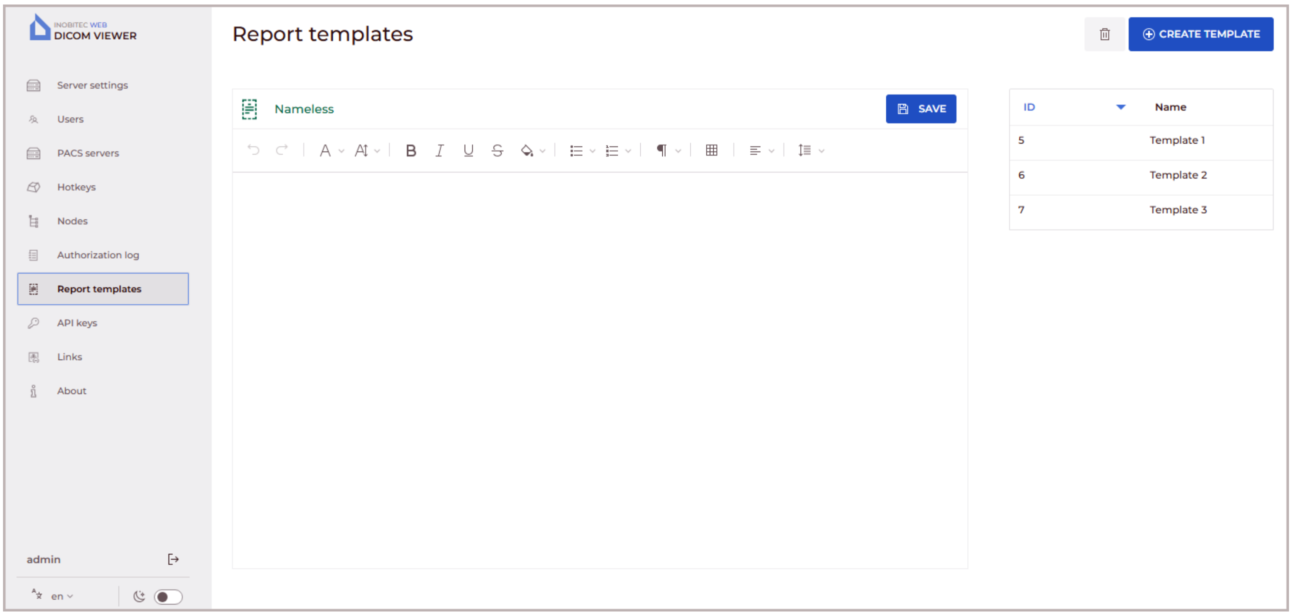
Click **SUBMIT** to search, or **RESET** to reset the specified event filtering parameters. To update the events list, click the ⟳ **Update events list** button.

At the bottom of the log, you see the range of events for the current page and the total number of events. To go to the next page of the log, click the > button; to go to the previous page — click the < button. To go to the last page of the log, click the >| button, to return to the first page — click the |< button.

On the **items per page** drop-down list, select the number of events to be displayed on the authorization log page. By default, 20 events per page are displayed.

3.10 Report Templates

On the **Report templates** page (Fig. 3.14), the administrator creates, edits, and deletes general report templates. General report templates are displayed on the template list for all program users. The functions of creation, editing, and deletion of general report templates are only available to the administrator.



ID	Name
5	Template 1
6	Template 2
7	Template 3

Figure 3.14: **Report templates** *page*

The page features the editor window and the list of general templates. The editor window and text editing tools are described in detail in Section **Editor Window** of the User Manual.

To create a new general report template, click the **CREATE TEMPLATE** button. By default, an empty template named **Nameless** is created. Change the template name and enter the information required. To save the report template, click the **SAVE** button. The saved template is added to the template list.

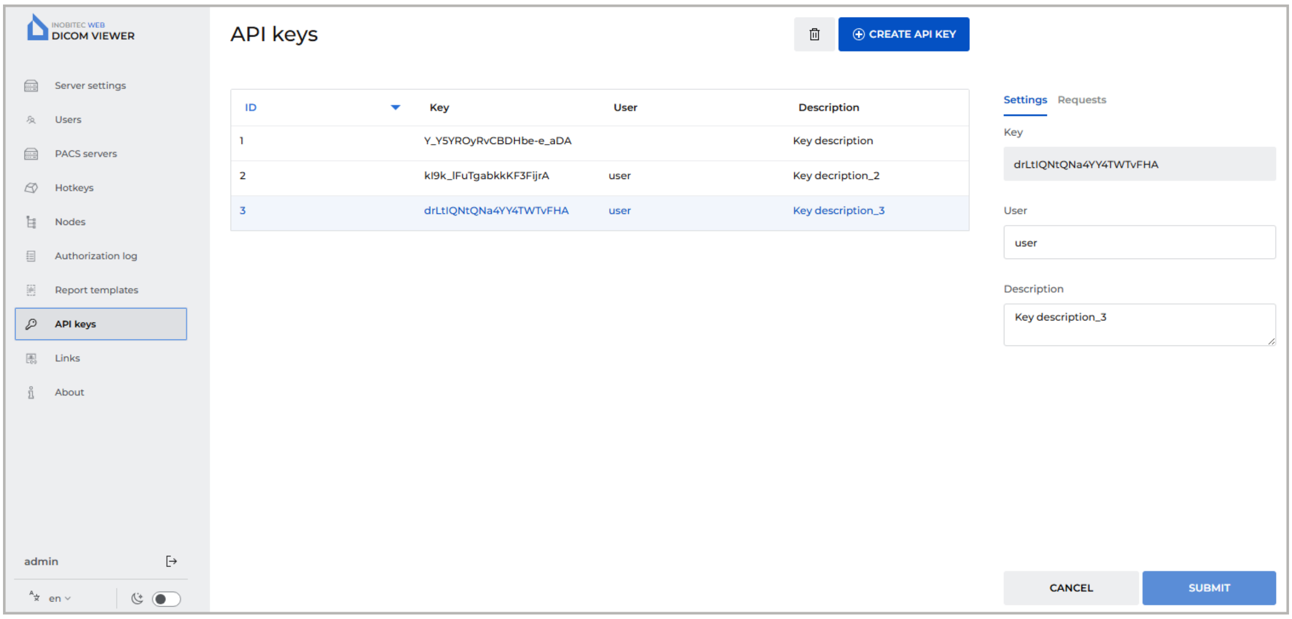
To open a previously created template for viewing and editing, select the desired template from the list. Edit the template's name and content. Save the edited report template by clicking the **SAVE** button.

To switch to another template, select it from the template list. If there are any unsaved changes in the current template, a dialog box with a warning will pop up when you attempt to switch. In the confirmation dialog, click **SWITCH** to switch to the other template, after which the unsaved data will be lost, or **CANCEL** to cancel the switch.

To delete a selected template from the list, click the **Delete template** button 🗑 . In the confirmation dialog that pops up, click **YES** to delete the report template or **CANCEL** to cancel.

3.11 API keys

A special authorization key is required for execution of API requests. On the **API keys** page (Fig. 3.15), the administrator manages access keys.



ID	Key	User	Description
1	Y_Y5YROyRvCBDHbe-e_aDA		Key description
2	kl9k_lFuTgabkkKF3FijrA	user	Key decription_2
3	drLtIQNtQNa4YY4TWTvFHA	user	Key description_3

Key: drLtIQNtQNa4YY4TWTvFHA

User: user

Description: Key description_3

Figure 3.15: API keys page

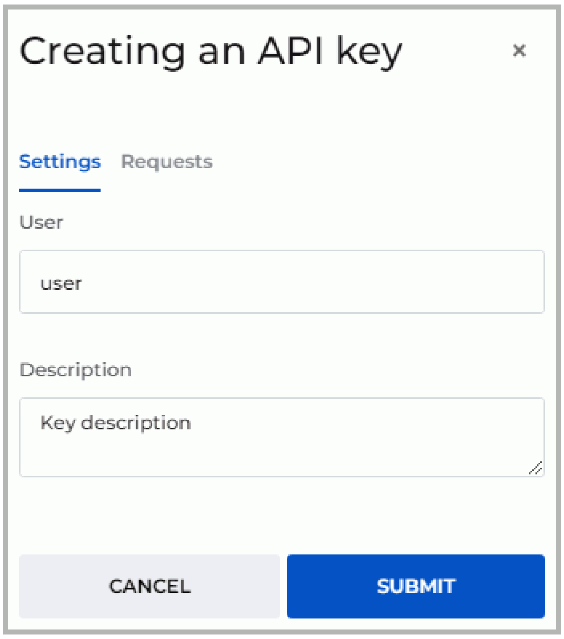
The table displays the following access key parameters:

- key number in the **ID** column;
- generated access key in the **Key** column;
- the user on whose behalf the requests are executed in the **User** column. If there is no username in the column, the request is executed on behalf of the administrator;
- key description in the **Description** column.

For more details on configuring the display of table parameters, see Section 3.14.1. The parameters can be sorted in the table by the values of one of the displayed columns (see Section 3.14.2).

To create a new API key, follow these steps:

1. Click the **CREATE API KEY** button.
2. In the **Creating an API key** dialog box (Fig. 3.16) that pops up, on the **Settings** tab, fill in the following fields:
    - in the **User** field, enter the username on whose behalf the requests will be executed. Entering a non-existent username is not allowed. To execute requests on behalf of the administrator, leave the **User** field empty;
    - in the **Description** field, add a description of the key if necessary.



Creating an API key

User

user

Description

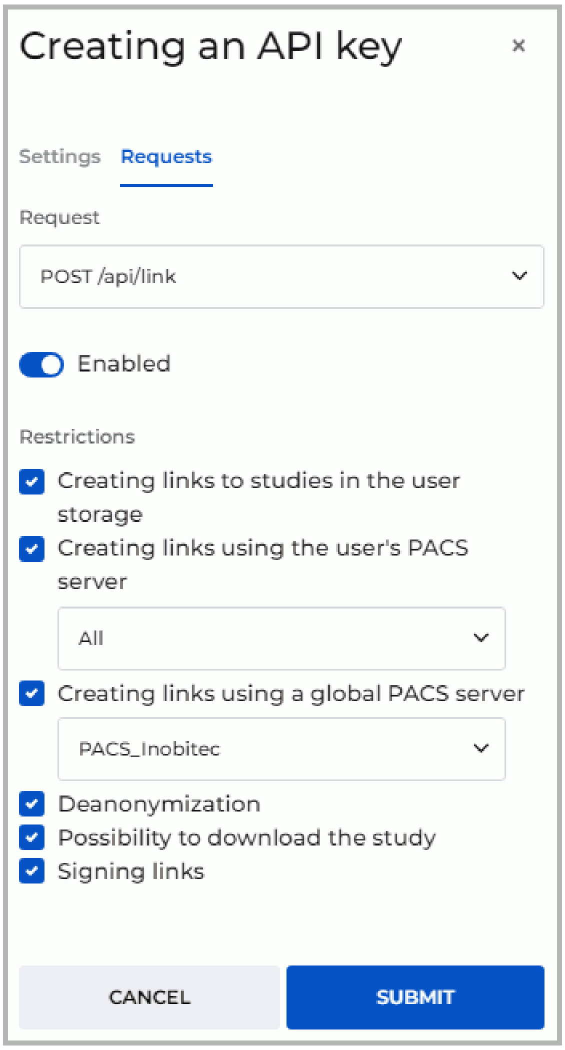
Key description

Figure 3.16: The **Settings** *tab of the* **Creating an API key** *dialog box*

3. In the **Creating an API key** dialog box (Fig. 3.17), on the **Requests** tab, do the following:

    - From the **Request** dropdown list, choose an available request. Currently, only the *POST/api/link* request is available;
    - Activate the request by toggling the **Enabled** switch. By default, the request is deactivated;
    - Set key restrictions for this request when creating links. To permit an action, check the respective box, to prohibit an action, uncheck it. By default, all the boxes are checked.
        - The **Creating links to studies in the user storage** option controls the restriction on creating links to studies located in the user's storage;
        - The **Creating links using the user's PACS server** option controls the restriction on creating links to studies located on the user's personal PACS server. From the dropdown list, select the required number of the user's personal PACS servers. After selecting the user's PACS servers, click on the empty space in the dialog box;
        - The **Creating links using a global PACS server** option controls the restriction on creating links to studies located on a global PACS server available to all users. From the dropdown list, select the required number of global PACS servers. After selecting the global PACS servers, click on the empty space in the dialog box;
        - The **Deanonymization** option determines whether a deanonymized study link will be returned to a user sending request;
        - The **Possibility to download the study** option determines whether a download link to a study will be returned to a user sending a request;
        - The **Signing links** option controls the restriction on signing links.

4. Click the **SUBMIT** button to create the API key or **CANCEL** to cancel.



Request: POST /api/link

Enabled

Restrictions

☑ Creating links to studies in the user storage

☑ Creating links using the user's PACS server: All

☑ Creating links using a global PACS server: PACS_Inobitec

☑ Deanonymization

☑ Possibility to download the study

☑ Signing links

Figure 3.17: The **Requests** *tab of the* **Creating an API key** *dialog box*

To modify the parameters of an API key, do the following:

1. Select an API key from the list and edit its parameters on the **Settings** and **Requests** tabs on the right-hand side of the **API keys** page (Fig. 3.15).

2. Click the **SUBMIT** button to save the changes or **CANCEL** to cancel.

You can copy the selected key to the clipboard in two ways:

- from the read-only **Key** field on the **Settings** tab: select the text in the **Key** field, right-click on the selected text to open the context menu, and select **Copy**, or press the **Ctrl+C** key combination on the keyboard;

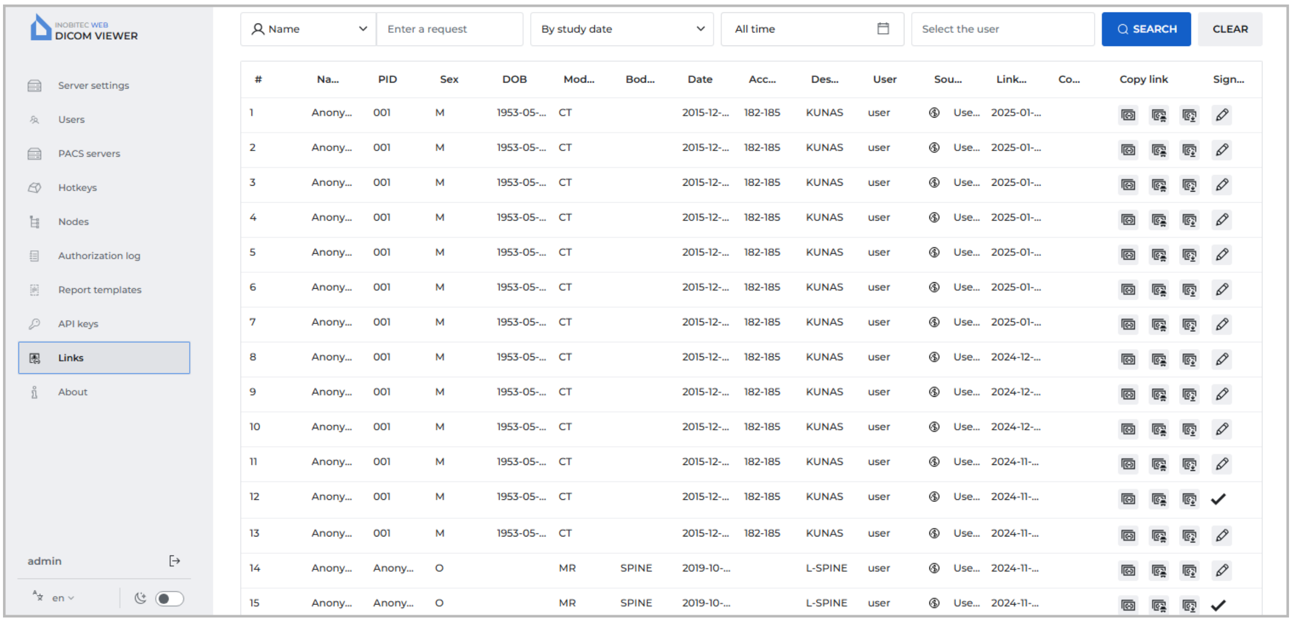
- from the **Key** column cell in the keys table: hover the mouse cursor over the value in the **Key** column, right-click, and select **Copy value** from the context menu.

To delete a selected API key from the list, click the **Delete API key** button 🗑. In the confirmation dialog box that pops up, click **YES** to delete or **CANCEL** to cancel.

3.12 Links Table

On the **Links** tab (Fig. 3.18), a list of links to studies created by users is displayed. The procedure of creation links in the user's interface is described in the **Creating Links to View Studies** chapter of the User Manual.

The procedure of creating links by entering study parameters in the browser address bar and via an API request is described in Sections 5.1.1 and 5.1.2 of this Manual.



#	Na...	PID	Sex	DOB	Mod...	Bod...	Date	Acc...	Des...	User	Sou...	Link...	Co...	Copy link	Sign...
1	Anony...	001	M	1953-05-...	CT		2015-12-...	182-185	KUNAS	user	Use...	2025-01-...			✎
2	Anony...	001	M	1953-05-...	CT		2015-12-...	182-185	KUNAS	user	Use...	2025-01-...			✎
3	Anony...	001	M	1953-05-...	CT		2015-12-...	182-185	KUNAS	user	Use...	2025-01-...			✎
4	Anony...	001	M	1953-05-...	CT		2015-12-...	182-185	KUNAS	user	Use...	2025-01-...			✎
5	Anony...	001	M	1953-05-...	CT		2015-12-...	182-185	KUNAS	user	Use...	2025-01-...			✎
6	Anony...	001	M	1953-05-...	CT		2015-12-...	182-185	KUNAS	user	Use...	2025-01-...			✎
7	Anony...	001	M	1953-05-...	CT		2015-12-...	182-185	KUNAS	user	Use...	2025-01-...			✎
8	Anony...	001	M	1953-05-...	CT		2015-12-...	182-185	KUNAS	user	Use...	2024-12-...			✎
9	Anony...	001	M	1953-05-...	CT		2015-12-...	182-185	KUNAS	user	Use...	2024-12-...			✎
10	Anony...	001	M	1953-05-...	CT		2015-12-...	182-185	KUNAS	user	Use...	2024-12-...			✎
11	Anony...	001	M	1953-05-...	CT		2015-12-...	182-185	KUNAS	user	Use...	2024-11-...			✎
12	Anony...	001	M	1953-05-...	CT		2015-12-...	182-185	KUNAS	user	Use...	2024-11-...			✓
13	Anony...	001	M	1953-05-...	CT		2015-12-...	182-185	KUNAS	user	Use...	2024-11-...			✎
14	Anony...	Anony...	O		MR	SPINE	2019-10-...		L-SPINE	user	Use...	2024-11-...			✎
15	Anony...	Anony...	O		MR	SPINE	2019-10-...		L-SPINE	user	Use...	2024-11-...			✓

Figure 3.18: Links

For each entry on the list, information is displayed about the study and the link created for it. Study parameters are shown in the following columns:

- **#**: sequential link number;
- **Name**;
- **PID** (Patient ID);
- **Sex**;
- **DOB** (date of birth);
- **Modality**;
- **Body part**;
- **Date** of the study;

- **Accession number**;
- **Description** of the study.

Information on the link is displayed in the following columns:

- **User** (username) who created the link;
- **Source** (storage) where the study is located. If the study is hosted on a PACS server, the PACS server name is displayed in the cell;
- **Link creation date**;
- **Comment** on the link.

The administrator can perform the following actions:

- **Copy link** to the clipboard;
- **Sign link**. If a license for signing links is not available, the **Sign link** column is not displayed in the table, and the function of signing links is unavailable.

To copy a link to a study, click the **Copy link to open the study** button in the selected line. The link is copied to the user's device clipboard.

To hide personal data when viewing a study via a link, click the **Copy link to open the anonymized study** button . The link is copied to the user's device clipboard. When the study is opened via this link, personal data is not displayed. You cannot view structured reports, protocols, tags, and PDF documents for anonymized studies.

To copy a link that allows the user to open and download a study, click the **Copy link to open and download the study** button . The link is copied to the user's device clipboard. When the study is opened via this link, the user gains the ability to download the study.

If a link was not signed when created, it can be signed on the **Links** page (for more details, see Sections **Creating a Link from the Study List** and **Creating a Link from the Viewing Tab** in the User Manual). To do this, click the **Sign link** button ✎ in the corresponding line.

The server address (URL) provided in the link is the value of the *serverUrl* parameter in the **.config.json** configuration file and can be modified by the administrator. By default, the parameter value is *http://localhost:8090*. The file is located in the **html** directory.

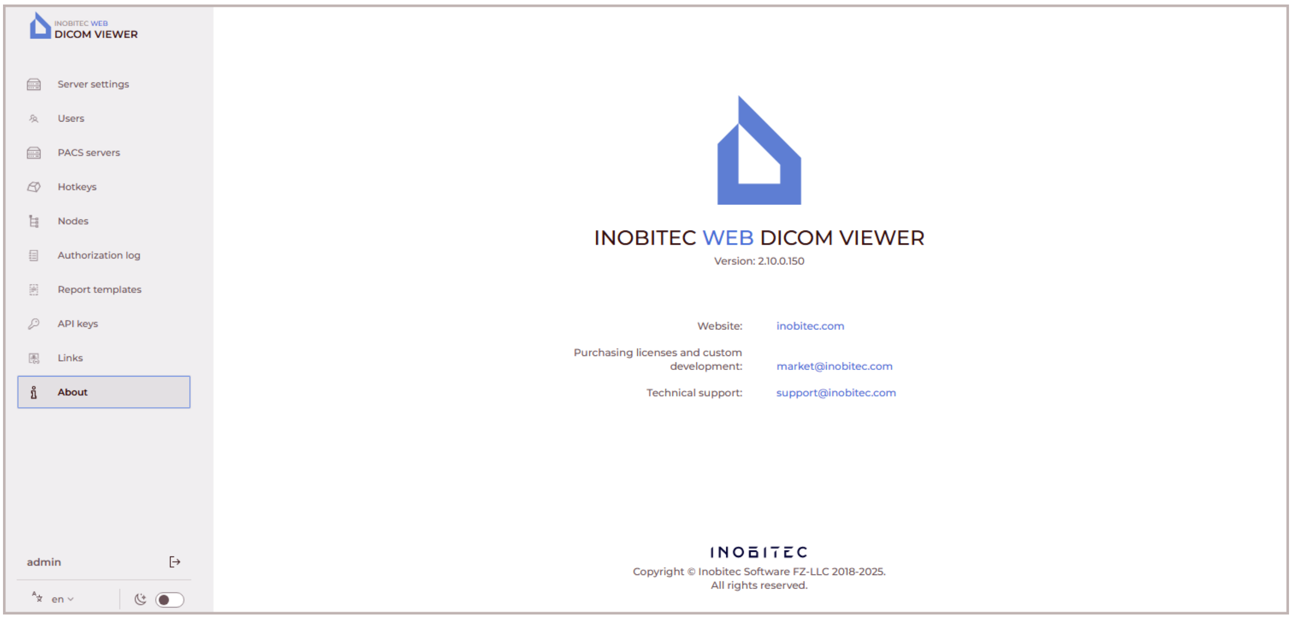
Searching for study links is performed on the search panel similar to searching for studies. Besides, it is possible to search by the link creation date and username.

At the bottom of the **Links** page, the number of links on the current page is displayed. To go to the next page of the list, click the › button; to go to the previous page, click the ‹ button.

From the **items per page** dropdown list, select the number of links to be displayed per page. The default value is 20 links per page.

3.13 Version of the Web DICOM Viewer

To find out the Web DICOM Viewer version, click the **About** page (Fig. 3.19).



INOBITEC WEB DICOM VIEWER

Version: 2.10.0.150

Website: inobitec.com

Purchasing licenses and custom development: market@inobitec.com

Technical support: support@inobitec.com

INOBITEC

Copyright © Inobitec Software FZ-LLC 2018-2025.
All rights reserved.

Figure 3.19: ***About*** *page*

The page displays the following information about the program:

- the Web DICOM Viewer version;
- Link to the website of the software developer;
- Email address of the Inobitec Software FZ-LLC Marketing and Sales Department;
- Email address of the Inobitec Software FZ-LLC Tectnical Support.

3.14 Tables

On the pages named **Users**, **PACS servers**, **Hotkeys**, **Nodes** the data are presented in tables. The user can customize the tables for better presentation of information.

3.14.1 Customizing Parameters Display Options

To customize the parameters display options, right-click on the table header or any row in the table and choose the **Table settings** option in the right-click menu. A dialog box shown in Fig. 3.20 will pop up. Our example shows the settings for the table on the **Users** page. The tables presented on the pages named **Hotkeys**, **Nodes**, **Authorization log** can be customized by analogy.

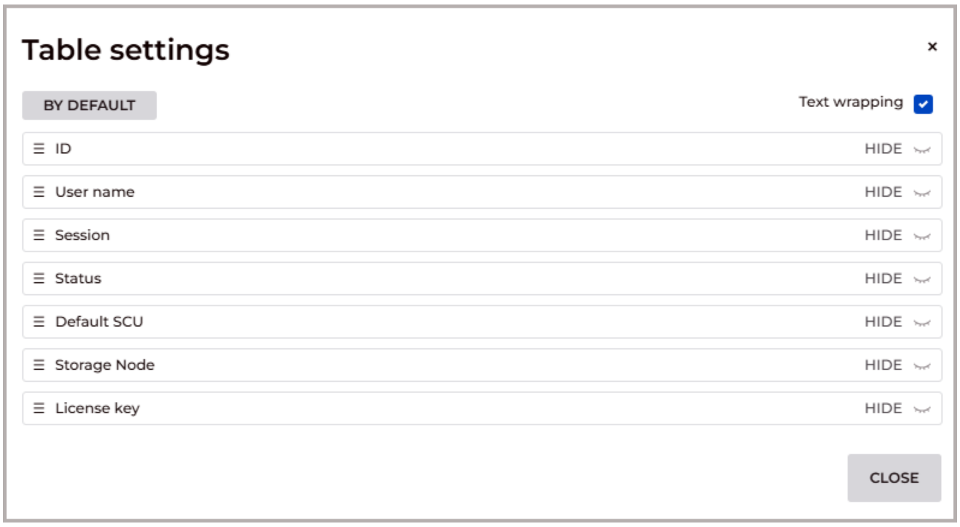


Table settings ×

BY DEFAULT

Text wrapping ☑

☰ ID	HIDE
☰ User name	HIDE
☰ Session	HIDE
☰ Status	HIDE
☰ Default SCU	HIDE
☰ Storage Node	HIDE
☰ License key	HIDE

CLOSE

Figure 3.20: **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 **Text wrapping** box to move the long value of 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.

3.14.2 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.

3.14.3 Table Context Menu

To open the context menu for the table, right-click on a table row. The following commands are available on the context menu:

- **Copy value**. The value from the selected cell is copied to the clipboard;
- **Copy row**. All the *JSON* or *CSV* values are copied from the selected row to the clipboard;
- **Cancel selection** Deselects the row and the current item. On the **Users** and **Nodes** pages, the edit form is closed for the user or the node;
- **Table settings**. For details of the table settings, see Section 3.14.1.

Chapter 4

Working via a Reverse Proxy

4.1 Configuring Nginx as a Reverse Proxy

In some situations, the user needs to provide access to multiple servers in the same domain, while not using the lower level domains. For example, the user may need to place the Web DICOM Viewer at *example.com/web-viewer* address.

To perform this task, they need to use **Nginx** HTTP server configured as a reverse proxy in front of the servers. A reverse proxy works only with the servers that have been associated with it and returns responses only from these servers.

In the Web DICOM Viewer, a functionality has been implemented that allows operation via a **Nginx** reverse proxy server using:

- http connection;
- https connection with encryption support;
- redirection from http to https.

You will find the details on configuring **Nginx** as a reverse proxy at: **https://docs.nginx.com/nginx/admin-guide/web-server/reverse-proxy/**. The availability of the resource and relevance of the information on this link is not guaranteed. In this case, we recommend finding information on configuring the **Nginx** reverse proxy server yourself.

It is necessary to host static the Web DICOM Viewer content on the **Nginx** HTTP server for the viewer to work correctly. Simply copy the contents of the *html* directory from the installation package of the Web DICOM Viewer to the directory where **Nginx** is installed. In the example of our configuration file, the *html* directory from the Web DICOM Viewer distribution package is copied to the */html/web-viewer/* directory of the **Nginx** HTTP server.

Below you will find are examples of the **Nginx** configuration files.

4.1.1 Configuring Nginx for HTTP with static content serving and traffic proxying

Starting from version 2.10, the Web DICOM Viewer supports the functions of opening via a link and *WebSocket* proxying. Detailed documentation on setting up a tunnel between the client and the proxied server is available at: **https://nginx.org/en/docs/http/websocket.html**.

Below you can see an example of a Nginx reverse proxy server configuration file for the HTTP protocol:

```
events {
    worker_connections 1024;
}

http {
    sendfile on;
    tcp_nopush on;
    tcp_nodelay on;
    keepalive_timeout 65;
    types_hash_max_size 2048;
    client_max_body_size 100m; # Maximum size of transferred files

    include /etc/nginx/mime.types;
    default_type application/octet-stream;

    map $http_upgrade $connection_upgrade {
        default upgrade;
        ''      close;
    }

    server {
        listen 8888; # http port

        server_name localhost; # server name

        # web-viewer access path, e.g. http://localhost:8888/web-viewer
        location /web-viewer {
            alias html/web-viewer; # path to static web-viewer content on nginx
            index index.html;
        }

        # Opening by links
        location /web-viewer/viewer/image {
            alias html/web-viewer/viewer;
            index index.html;
        }

        location /web-viewer/viewer/mpr {
            alias html/web-viewer/viewer;
            index index.html;
        }

        location /web-viewer/viewer/3d {
            alias html/web-viewer/viewer;
            index index.html;
        }

        # Proxying http requests
        # /web-viewer - web-viewer access path
        # http://192.168.0.44:8090 - server address
        location /web-viewer/v2 {
            proxy_pass http://192.168.0.44:8090/v2;
            proxy_http_version 1.1;
            proxy_set_header Connection "Keep-Alive";
            proxy_set_header Proxy-Connection "Keep-Alive";
            proxy_set_header Host $host;
            proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
            proxy_set_header X-Real-IP $remote_addr;
    proxy_cookie_path /v2 /web-viewer/v2;
            proxy_read_timeout 310s;
            proxy_buffering off;
            proxy_request_buffering off;
        }

        # WebSocket proxying
        # /web-viewer - web-viewer access path
        # http://192.168.0.44:8090 - server address
location /web-viewer/eventQueue {
            proxy_pass http://192.168.0.44:8090/eventQueue;
            proxy_http_version 1.1;
            proxy_set_header Upgrade $http_upgrade;
            proxy_set_header Connection $connection_upgrade;
        }
    }
}
```

4.1.2 Configuring Nginx for HTTP and HTTPS with static content serving and traffic proxying

Interaction with the server via HTTPS is required to support encryption in order to enhanced security. When setting up operation via HTTPS, the user must independently obtain a certificate. In Section 4.1.4 you can find an example of certificate generation.

In this example, *ssl* is enabled for port 8089, and the locations of files with the server certificate and the private key is specified. The HTTP connection is available at *http://localhost:8888/web-viewer*, while the HTTPS connection is available at *https://localhost:8889/web-viewer*. Static content for the Web DICOM Viewer is served by **Nginx**. Detailed documentation on configuring an HTTPS server is available at:
https://nginx.org/en/docs/http/configuring_https_servers.html.

```
events {
    worker_connections 1024;
}
```

```
http {
    sendfile on;
    tcp_nopush on;
    tcp_nodelay on;
    keepalive_timeout 65;
    types_hash_max_size 2048;
    client_max_body_size 100m; # Maximum size of transferred files

    include /etc/nginx/mime.types;
    default_type application/octet-stream;

    map $http_upgrade $connection_upgrade {
        default upgrade;
        ''      close;
    }

    server {
        listen 8888; # http port
listen 8889 ssl; # https port

        server_name localhost; # server name

ssl_certificate     ../ssl/certificate.crt; # certificate file location
        ssl_certificate_key ../ssl/privateKey.key; # location of the private key
        file

        # web-viewer access path, e.g. https://localhost:8889/web-viewer
        location /web-viewer {
            alias html/web-viewer; #          web-viewer   nginx
            index index.html;
        }

        # Opening by links
        location /web-viewer/viewer/image {
            alias html/web-viewer/viewer;
            index index.html;
        }

        location /web-viewer/viewer/mpr {
            alias html/web-viewer/viewer;
            index index.html;
        }

        location /web-viewer/viewer/3d {
            alias html/web-viewer/viewer;
            index index.html;
        }
# Proxying http requests
# /web-viewer - web-viewer access path
# http://192.168.0.44:8090 - server address
        location /web-viewer/v2 {
            proxy_pass http://192.168.0.44:8090/v2;
            proxy_http_version 1.1;
            proxy_set_header Connection "Keep-Alive";
            proxy_set_header Proxy-Connection "Keep-Alive";
            proxy_set_header Host $host;
            proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
            proxy_set_header X-Real-IP $remote_addr;
    proxy_cookie_path /v2 /web-viewer/v2;
            proxy_read_timeout 310s;
            proxy_buffering off;
            proxy_request_buffering off;
        }

        # WebSocket proxying
# /web-viewer - web-viewer access path
# http://192.168.0.44:8090 - server address
location /web-viewer/eventQueue {
            proxy_pass http://192.168.0.44:8090/eventQueue;
            proxy_http_version 1.1;
            proxy_set_header Upgrade $http_upgrade;
            proxy_set_header Connection $connection_upgrade;
        }
    }
}
```

4.1.3 Configuring Nginx for HTTP and HTTPS with proxying of all traffic

In this example, the HTTP connection is available at *http://localhost:8888*, and the HTTPS connection is available at *https://localhost:8889*. Static content for the Web DICOM Viewer is served by the Control Node.

```
events {
    worker_connections 1024;
}

http {
    sendfile on;
    tcp_nopush on;
    tcp_nodelay on;
    keepalive_timeout 65;
    types_hash_max_size 2048;
    client_max_body_size 100m; # Maximum size of transferred files

    include /etc/nginx/mime.types;
    default_type application/octet-stream;

    map $http_upgrade $connection_upgrade {
        default upgrade;
        ''      close;
    }

    server {
        listen 8888; # http port
listen 8889 ssl; # https port

        server_name localhost; # server name

ssl_certificate     ../ssl/certificate.crt; # certificate file location
        ssl_certificate_key ../ssl/privateKey.key; # location of the private key
        file

        # Proxying http requests
        # http://192.168.0.44:8090 - server address
        location / {
            proxy_pass http://192.168.0.44:8090;
            proxy_http_version 1.1;
            proxy_set_header Connection "Keep-Alive";
            proxy_set_header Proxy-Connection "Keep-Alive";
            proxy_set_header Host $host;
            proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
            proxy_set_header X-Real-IP $remote_addr;
            proxy_read_timeout 310s;
            proxy_buffering off;
            proxy_request_buffering off;
        }

    # WebSocket proxying
        # http://192.168.0.44:8090 - server address
location /eventQueue {
            proxy_pass http://192.168.0.44:8090/eventQueue;
            proxy_http_version 1.1;
            proxy_set_header Upgrade $http_upgrade;
            proxy_set_header Connection $connection_upgrade;
        }
    }
}
```

4.1.4 Example of Generating an SSL Certificate for Nginx

To enable TLS or SSL, it is necessary to create a pair comprising a public certificate and a private key. The private key is stored on the server and encrypts the data sent to clients, while the SSL certificate is available for all the users connecting connected to the server. This provides an opportunity to decrypt the content signed with the respective SSL key. Below you will find an example of generating files for a self-signed SSL certificate and private key.

To generate a self-signed SSL certificate, OpenSSL must be installed.

To create the certificate and private key files, run the following command in the command line:

openssl req -x509 -sha256 -nodes -days 365 -newkey rsa:2048 -keyout privateKey.key -out certificate.crt

where,

days — is the validity period of the certificate,

keyout — is the key file name/path,

out — is the certificate file name/path.

After entering the command, a series of dialogs will pop up, prompting you to enter the required information. Once the information is provided, the files will be generated. Examples of using the generated files can be found in sections 4.1.2 and 4.1.3.

Chapter 5

The Web DICOM Viewer Integration with Third-Party Services

5.1 Creating Links to Studies

In the Web DICOM Viewer, the an ability to create links for viewing studies has been provided. Links to studies can be created:

- in the Web DICOM Viewer user interface. Information about such links is saved as entries in the table on the **Links** page of the user web interface and in the Web DICOM Viewer database. Detailed information about creating links in the user interface is provided in Chapter 8 of the User Manual **Creating Links for Viewing Studies**;
- by entering study parameters in the browser address bar. Information about links created in this way is not saved in the Web DICOM Viewer database. By default, this method of creating links is disabled. Creating links to studies by providing parameters is described in Section 5.1.1;
- via an API request (for details, see Section 5.1.2).

5.1.1 Creating Links to Studies by Providing Parameters

The function of opening studies via links created by entering study parameters in the browser address bar is disabled by default. Information about such links is not stored in the Web DICOM Viewer database. In this section, we describe how to activate the function of opening studies via links created by providing parameters.

To enable the function of opening links created by providing parameters, perform the following steps:steps:

1. Go to the directory where the Web DICOM Viewer software package is installed.
2. In the **renderserverconfig.json** configuration file (for the unified assembly) or **controlnodeconfig.json** configuration file (for the distributed assembly), change the value of the

link_by_params_policy parameter value. If there isn't such a parameter in the configuration file, it must be added.
The admissible values are:

- **forbidden** — opening links with parameters is prohibited. This is the default value;
- **anonymized** — the studies opened via links with parameters are anonymized;
- **allowed** — the studies opened via links with parameters are not anonymized;
- **download** — the studies opened via links with parameters are not anonymized and can be downloaded as archives.

3. Save the edited configuration file.

4. Restart the Web DICOM Viewer (for the unified assembly of the program). For the distributed assembly, restart the **ControlNode** service.

A link with parameters has the following format:
http(s)://<server name>/viewer/<viewing method>?<parameters>,
where:

server name — is the IP address of the server and the port on which the node is activated;

viewing method — is the viewing mode in which the series is to be opened. The available values are:

image — opening the series in the **Image viewer** window;

mpr — opening the series in the **MPR reconstruction** window;

3d — opening the series in the **Volume reconstruction** window;

parameters — stands for the query parameters of the HTTP request. These include:

- the source where the study to be opened via the link is stored. The available values are:

  user=<user name> — the user's storage;

  pacsServer=<PACS server name> — a PACS server shared by all the users;

  user=<user name>&pacsServer=<PACS server name> — a user's personal PACS server;

- the unique identifier (UID). The available values are:

  studyUid=<StudyUID> — the UID identifier of the study containing the series to be opened via the link. This corresponds to the «StudyInstanceUID» DICOM tag ;

  accessionNumber=<AccessionNumber> — the Accession Number of the study. It can be specified as an identifier that is used to search for the study if the *studyUid* is not provided;

  seriesUid=<SeriesUID> — the UID identifier of the series to be opened (an optional parameter). This corresponds to the «SeriesInstanceUID» DICOM tag. If this parameter is not provided, the first series of the study is opened.

Below you can see some examples of links with parameters.

http://localhost:8090/viewer/image?user=<user>&studyUid=<StudyUID>&seriesUid=<SeriesUID>
When you follow this link, the series with the identifier **<seriesUid>** from the study with the identifier **<studyUid>**, which is located in the storage of the user **<user>**, is opened in the image viewer window.

http://localhost:8090/viewer/image?pacsServer=<PACS server name>&studyUid=<StudyUID>&seriesUid=<SeriesUID>
When you follow this link, the series with the identifier **<seriesUid>** from the study with the identifier **<studyUid>**, which is located on the PACS server **<PACS server name>**, is opened in the image viewer window.

5.1.2 Creating Links to Studies via API

When executing API requests, authorization in the Web DICOM Viewer is performed with API keys. API keys are created by the administrator on the **API Keys** page (see Section 3.11).

Link is created via the **POST/api/link** request. For authorization in the Web DICOM Viewer, you need to pass the API key in the request in one of the following ways:

- in the **apikey** query parameter;
- in the **X-Api-Key** header.

The request must include a *json* with the following fields:

1. **params** — object containing the link parameters:
    - **studyUid** — the UID identifier of the study containing the series to be opened via the link. This corresponds to the «StudyInstanceUID» DICOM tag;
    - **accessionNumber** — the Accession Number of the study. It is used to search for the study if the **studyUid** is not specified;
    - **seriesUid** — the UID identifier of the series to be opened via the link (an optional parameter). This corresponds to the «SeriesInstanceUID» DICOM tag. The parameter is considered if the **studyUid** is specified. If the series identifier is not provided, the server-selected series is opened;
    - **user** — username (login). This parameter is required if the study is opened from the user's storage or the user's personal PACS server;
    - **pacsServer** — PACS server name. This parameter is required if the **user** parameter is not provided. If the **user** parameter is specified, the **pacsServer** parameter can be used optionally.

    If the study is located in the user's storage, the **user** parameter must be provided; if it is on a global PACS server, the **pacsServer** parameter is required; if it is on the user's PACS server, both the **user** and the **pacsServer** parameters are needed.
2. **study** — an object containing the study parameters:

  - **uid** — identifier (optional parameter). If this parameter is specified while the **studyUid** or **accessionNumber** parameters are not provided in the **params** section, it is used as the **params.studyUid**. If the **studyUid** is specified in the **params** section, it must match the **uid** value;
  - **accessionNumber** — number of the order for conducting the study. If the **studyUid** or **accessionNumber** parameters are not provided in the **params** section, this value is used as the **params.accessionNumber**. If the **accessionNumber** is specified in the **params** section, the values must match;
  - **date** — date;
  - **modalities** — modality (this parameter can contain a list of values);
  - **description** — description;
  - **patient** — patient information:
    - **dob** — date of birth;
    - **id** — id;
    - **name** — name.

3. **regions** — body part (this parameter can contain a list of values);

4. **comment** — comment for the link, which is displayed in the links table (optional);

5. **sign** — flag indicating the need to sign the link.

Upon a successful response, a *json* is returned containing the following fields:

- **anonymized_link_query** — query parameters for the request to open the study in the anonymized form via a link;

- **download_link_query** — query parameters for the request to open the study via a link without anonymization, with the possibility to download;

- **link_query** — query parameters for the request to open the study via a link without anonymization;

- **signed** — information about the link signature.

Depending on the API key restrictions, some of these fields may be absent.

To form a link, you need to construct it from the server address, the opening mode, and the received parameters. The opening modes available are: **image**, **3d**, **mpr**.

The full link of the desired type is formed in compliance with the server response and has the following format:

http(s)://<server address>/viewer/<image, 3d, mpr>?<query parameters returned by the server>

Here is an example of such a link:
http://localhost:8090/viewer/image?link=eAhudwsNRPidigzHfR93Bw

Below, you can see an example of the body of a request for creating a link.

```
{
    "params": {
        "studyUid": "1.2.276.0.7230010.3.1.2.1070191241.29484.1728451815.990",
        "accessionNumber": "123456789",
        "seriesUid": "1.2.276.0.7230010.3.1.3.1070191241.29484.1728451817.1193",
        "user": "user",
        "pacsServer": "Pacs server name"
    },
    "study": {
        "uid": "1.2.276.0.7230010.3.1.2.1070191241.29484.1728451815.990",
        "accessionNumber": "123456789",
        "date": "2000-01-01",
        "description": "description",
        "modalities": ["CT"],
        "patient": {
            "dob": "1970-01-01",
            "id": "123",
            "name": "patient name"
        },
        "regions": ["HEART"],
    },
    "comment": "Example link",
    "sign": true
}
```

Below, you can see an example of the body of a response for creating a link.

```
{
    "anonymized_link_query": "link=123",
    "download_link_query": "link=123&deanonymization=456&download=789",
    "link_query": "link=123&deanonymization=456",
    "signed": true
}
```

Thanks for selecting our product! The Inobitec Software FZ-LLC 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!