INOBITEC
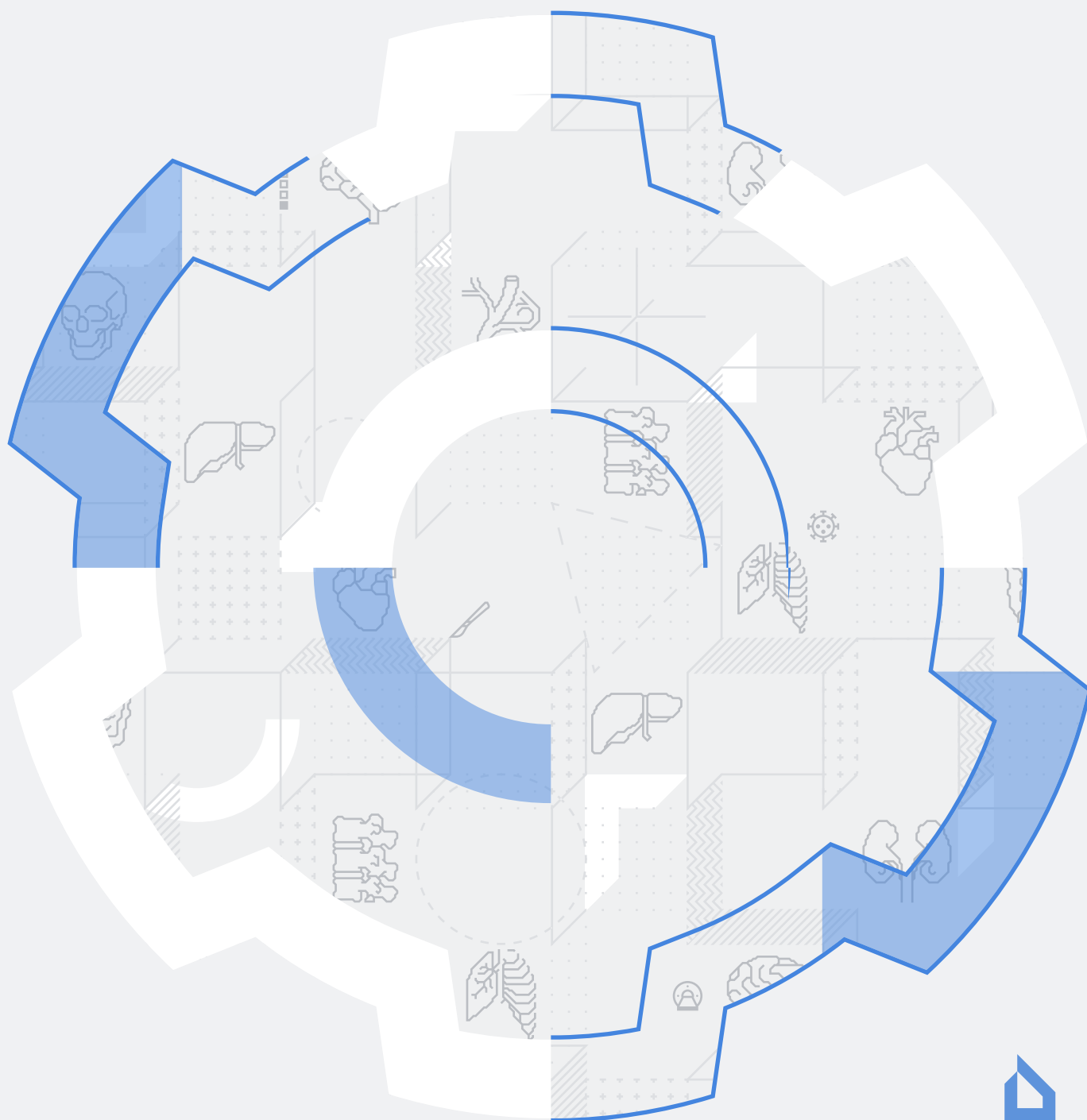
Inobitec Web DICOM Viewer version 2.8

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. The 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 DICOM 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

he «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 (mobile devices and/or workstations). «Inobitec Web DICOM Viewer» software package can also be integrated with DICOM servers.

1.2   Structure of the Web DICOM Viewer

«Inobitec Web DICOM Viewer» consists of the six microservices:

1. **Control Node** — This is the main node with which the user interacts. It provides static data (html-pages) to the user, provides authorization and authentication of the user, and is 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) and hard disk space to store user research. Depending on the configured configuration, Storage Node can provide both independent research storage and use Inobitec DICOM Pacs for this.

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

4. **User Node** provides storage of user settings. Only a database (PostgreSQL) is needed for its operation.

5. **DICOM PACS Adapter** provides interoperability with external systems that support the DICOM network protocol. Through the microservice, you can search for studies, series and images, download files from and to DICOM servers. More in the section **Integration with the DICOM Server**.

6. **DicomWrapper Node** provides an opportunity to convert files of popular formats (jpeg, png, bmp, pdf, mpeg2 etc.) into DICOM files.

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

1.3   System Requirements

Minimum System Requirements for Server:

Operating system:

• Windows version not lower than Windows 7 x64;

• Ubuntu 20 x64;

DBMS: PostgreSQL 9.6;
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: 200 MB (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;
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: 200 MB (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: resolution 1024x768;
keyboard: standard;
mouse: two-button with a scroll wheel;
Internet browser.

Chapter 2

Installing, Uninstalling and Launching the Program

2.1 Installation DBMS PostgreSQL

PostgreSQL DBMS is a database management system developed for various operating systems.

The Web DICOM Viewer software package is used for PostgreSQL DBMS version 9.6 or superior. Before installing the Web DICOM Viewer, make sure that PostgreSQL DBMS has been installed on the server.

2.2 Installing and Uninstalling the Program on Linux

2.2.1 Preparation for the Installation

Dependencies installation

You must to install the following packages:

- **qt5-default**

- **openssl**

- **dcmtk**

- **libopenjp2-7**

- **libqt5sql5-psql**

- **webp**

- **libturbojpeg**

- **minizip**

- **libavformat58**

To install the packages on Ubuntu, proceed as follows:

*sudo apt install qt5-default openssl dcmtk libopenjp2-7 libqt5sql5-psql webp \
libturbojpeg minizip libavformat58*

PostgreSQL DBMS Setting

After installation, set PostgreSQL DBMS. Open the terminal and launch the psql console utility for **postgres** users:

sudo -u postgres psql postgres

Provide a password to the **postgres** user:

ALTER USER postgres PASSWORD '<password>';

2.2.2 Installation of one server with automatic deployment scripts

1. In the directory of the source files set the following parameters in the *scripts/init.sh* file:

    - **POSTGRES_USER**: login for PostgreSQL DBMS (must be **postgres**);
    - **POSTGRES_PASS**: password for PostgreSQL (the password provided to the **postgres** user in **PostgreSQL DBMS Settings**);

        The parameters listed below may be applied by default.

    - **POSTGRES_HOST**: the IP address or the name of the PC on which the DBMS has been installed;
    - **POSTGRES_PORT**: the DBMS port;
    - **DEST_DIR**: the directory for Web DICOM Viewer installation;
    - **LOG_PATH**: the folder for keeping the log;
    - **STORAGE_PATH**: the folder for the local DICOM files storage;
    - **CONTROL_POSTGRES_USER**: the login used by the Control Node microservice for access to the DBMS. The login is created automatically;
    - **CONTROL_POSTGRES_PASS**: the password for the user specified in CONTROL_POSTGRES_USER;
    - **CONTROL_PORT**: the port used by the Control Node microservice;
    - **STORAGE_POSTGRES_USER**: the login used by the Storage Node microservice for access to the DBMS. The login in the DBMS is created automatically;
    - **STORAGE_POSTGRES_PASS**: the password for the user specified in STORAGE_POSTGRES_USER;
    - **STORAGE_PORT**: the Storage Node microservice port;

- **RENDER_PORT**: the Render Node microservice port;

- **USERNODE_POSTGRES_USER**: the login used by the User Node microservice for access to the DBMS. The login in the DBMS is created automatically;

- **USERNODE_POSTGRES_PASS**: the password for the user specified in USERNODE_POSTGRES_USER;

- **WRAPPER_PORT**: the DicomWrapper Node microservice port;

- **USERNODE_PORT**: the User Node microservice port.

Attention! When specifying a path containing spaces, the entire path is required enclose in double quotes or use a backslash «\» character before a space.

2. Run the *scripts/deploy_webviewer.sh* script as sudo.

sudo ./scripts/deploy_webviewer.sh

After successful installation, a message is displayed: «Installing WebViewer completed».

Checking the Status of Microservices

The microservices status may be checked via **«systemctl»**. For details, see Section 3.1.

2.2.3   Uninstalling the Program on Linux

To uninstall Web DICOM Viewer run the *scripts/uninstall.sh* script as sudo.

sudo ./scripts/uninstal.sh

While the program is being uninstalled, the following message will pop up:
Please note that uninstall cannon be aborted.
1. Uninstall Inobitec WEB Viewer Server and delete all its databases.
2. Uninstall Inobitec WEB Viewer Server but keep databases.
3. Exit without uninstall.
Choose your option [1.2.3]?

When the message appears, enter the number of the action to be performed and press **Enter**.

2.3   Installing and Uninstalling the Program on Windows

2.3.1   Preparation for the Installation

1. Install PostgreSQL on your PC and provide a login and a password to the DBMS administrator.

2. Make sure that the path to the **bin** folder, PostgreSQL DBMS, has been added to the **path** system environment variables.

2.3.2 Installation on One Server with Automatic Deployment Scripts

1. In the directory of the source files set the following parameters in the *scripts/init.bat* file:

   - **POSTGRES_USER**: login for PostgreSQL DBMS (must be **postgres**);
   - **POSTGRES_PASS**: password for PostgreSQL (the password provided to the **postgres** user in **PostgreSQL DBMS Settings**);

     The parameters listed below may be applied by default.

   - **POSTGRES_HOST**: the IP address or the name of the PC on which the DBMS has been installed;
   - **POSTGRES_PORT**: the DBMS port;
   - **DEST_DIR**: the directory for Web DICOM Viewer installation;
   - **LOG_PATH**: the folder for keeping the log;
   - **STORAGE_PATH**: the folder for the local DICOM files storage;
   - **CONTROL_POSTGRES_USER**: the login used by the Control Node microservice for access to the DBMS. The login is created automatically;
   - **CONTROL_POSTGRES_PASS**: the password for the user specified in CONTROL_POSTGRES_USER;
   - **CONTROL_PORT**: the port used by the Control Node microservice;
   - **STORAGE_POSTGRES_USER**: the login used by the Storage Node microservice for access to the DBMS. The login in the DBMS is created automatically;
   - **STORAGE_POSTGRES_PASS**: the password for the user specified in STORAGE_POSTGRES_USER;
   - **STORAGE_PORT**: the Storage Node microservice port;
   - **RENDER_PORT**: the Render Node microservice port;
   - **USERNODE_POSTGRES_USER**: the login used by the User Node microservice for access to the DBMS. The login in the DBMS is created automatically;
   - **USERNODE_POSTGRES_PASS**: the password for the user specified in USERNODE_POSTGRES_USER;
   - **WRAPPER_PORT**: the DicomWrapper Node microservice port;
   - **USERNODE_PORT**: the User Node microservice port;
   - **POSTGRES_SERVICE_NAME**: PostgreSQL service name. The name of the service may differ depending on the DBMS version. E.g., for PostgreSQL 14, the service name will be *postgresql-x64-14*.

2. Run the *scripts/deploy_webviewer.bat* script as administrator. After successful installation, a message is displayed: "Installing WebViewer completed".

3. Set the dependence of the launch of microservices on the DBMS. Example for the DBMS service **postgresql-x64-12**. To check the version of the **postgresql** service installed on your PC, open the **Services** tab in the Task Manager.

In the console as administrator, run the commands:

sc config ControlNode depend=postgresql-x64-12
sc config StorageNode depend=postgresql-x64-12
sc config UserNode depend=postgresql-x64-12

This sequence of actions provides an opportunity to avoid the situations when Web DICOM Viewer is launched before PostgreSQL server and stops operation as the database is unavailable.

4. Reboot the computer.

For correct operation of the software system, the **Control Node** microservice must have continuous access to the Internet.

2.3.3   Uninstalling the Program on Windows

To uninstall Web DICOM Viewer run the *scripts/uninstall.bat* script as administrator.

While the program is being uninstalled, the following message will pop up:
Please note that uninstall cannon be aborted.
1. Uninstall Inobitec WEB Viewer Server and delete all its databases.
2. Uninstall Inobitec WEB Viewer Server but keep databases.
3. Exit without uninstall.
Choose your option [1.2.3]?

When the message appears, enter the number of the action to be performed and press **Enter**.

Chapter 3

Performance Check

3.1 Checking the Status of Microservices

3.1.1 Checking the status of microservices on Linux

Check the status of the microservices through **systemctl**, by performing:

```
sudo systemctl status control-node.service
sudo systemctl status storage-node.service
sudo systemctl status user-node.service
sudo systemctl status render-node.service
sudo systemctl status dicomwrapper-node.service
```

3.1.2 Check the status of the microservices in Windows

You can check the status of the microservices in two ways:

1. In the window **Services**.

2. By running the query on the command-line interface:
   sc query <microservice name>.

3.2 Management of microservices operation

3.2.1 Management of microservices in Linux

To stop microservices through **systemctl**, execute the following:

```
sudo systemctl stop control-node.service
sudo systemctl stop storage-node.service
sudo systemctl stop user-node.service
sudo systemctl stop render-node.service
```

sudo systemctl stop dicomwrapper-node.service

To start microservices through **systemctl**, execute the following:

sudo systemctl start storage-node.service
sudo systemctl start render-node.service
sudo systemctl start user-node.service
sudo systemctl start control-node.service
sudo systemctl start dicomwrapper-node.service

3.2.2   Management of microservices in Windows

You can manage of the microservices in two ways:

1. In the window **Services**.

2. Using command-line interface commands.

To stop microservices run at the command prompt as an administrator:
sc stop <microservice name>.
To start microservices run at the command prompt as an administrator:
sc start <microservice name>.

3.3   Viewing Microservices Logs

3.3.1   Viewing Microservices Logs in Linux

There are two ways to view microservice logs:

1. Open **controlnode.log**, **rendernode.log**
   and **storagenode.log** files. The paths to the folders with the log files are provided in the
   configuration files, e.g. "/var/log/web-viewer/".

2. With the help of standard Linux distribution software, withc **systemd** through **journalctl**:

   journalctl -u storage-node.service
   journalctl -u render-node.service
   journalctl -u user-node.service
   journalctl -u control-node.service
   journalctl -u dicomwrapper-node.service

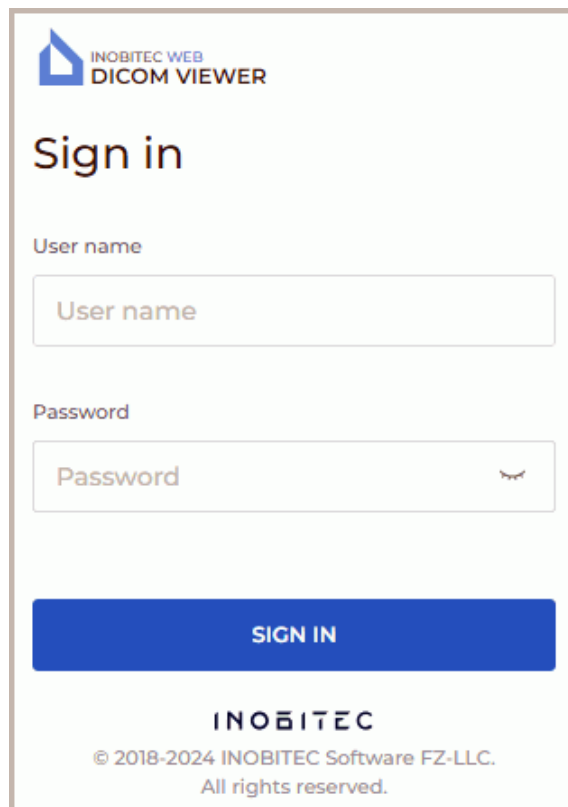### 3.3.2   Viewing Microservices Logs in Windows

To view the log files open the folder **logs**. The paths to the folders with the log files are
provided in the configuration files, e.g. *"C:\Program Files\Inobitec\WebViewer\Logs"*.

Chapter 4

Administrator Web Console

4.1 Access to the Administrator Web Console

Administrator Web Console is available by the
http://<ip address>:<port>/admin/index.html,
where **port** is the port with the Control Node. By default, it is port 8090.

Figure 4.1: Logging into the administrator web console

In the pop-up box (Fig. 4.1) print the user name (login) and password, and then click the

SIGN IN button.

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. 4.2.

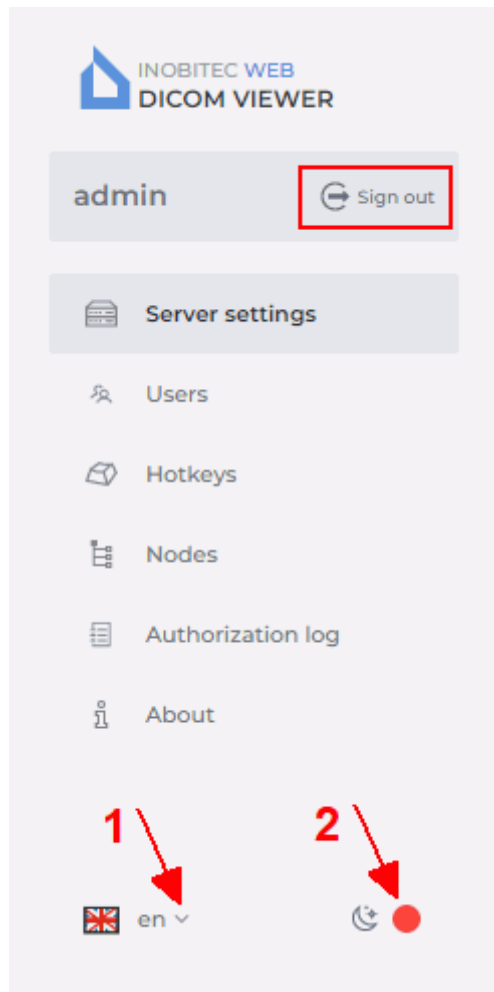*Figure 4.2: Main menu of the administrator web console*

To change the interface language, click the language selection button in the lower left corner (marked with number «1» in Fig. 4.2). To change the page background click the switch marked with number «2» in Fig. 4.2. To log out from the administrator web console, click the **Sign out** button on the main menu (see the red box in Fig. 4.2).

4.2 Server settings

On the **Server settings** page (Fig. 4.3) activates the license and changes the administrator password.
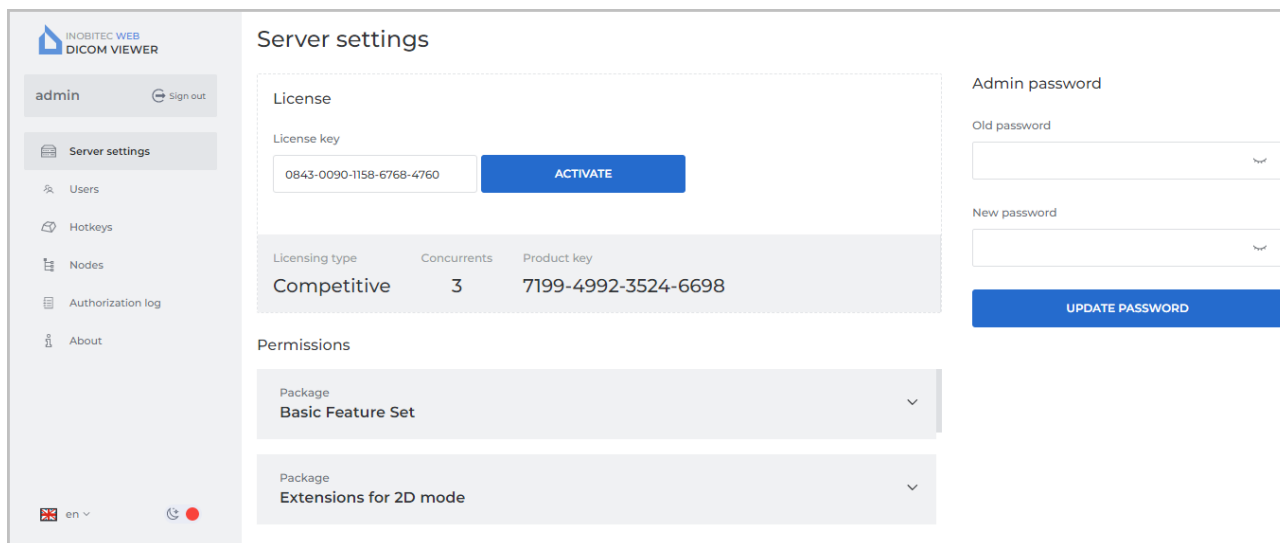

Figure 4.3: «Server settings» page

4.2.1 Changing the administrator password

On the **Server settings** page (Fig. 4.3) 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.

4.3 Licensing. License activation

On the **Server settings** page (Fig. 4.3) activates the license.

4.3.1 License key activation

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

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

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

If the server license key is for a personal user license, in the **Licensing type** field you will see the words **Personal user license**.

If the server license key is for a concurrent license, in the **Licensing type** field you will see the words **Competitive**. 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. Below you can see the list of the functions available.

In the **Permissions** field is displayed list of packages with user-accessible features.

4.3.2   Personal User Licenses

A personal user license is registered in the user's account on the **Users** page (see Section 4.4.2).

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.

4.3.3   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.

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.

4.4   User settings

On the **Users** page (Fig. 4.4) you can manage users.

Figure 4.4: «Users» page

The table shows the users parameters. To see the data on the user's activity, mouse over the cell of the **Status** column. The following data will be shown in a pop-up tip:

- **The user is online**. The user's work session is active;

- the date and the time of the user's last work session if the user is offline;

- **The user has never signed in**. The user has never used his/her account.

For details on the parameters display options, see Section 4.10.1. The users may be sorted by the values provided in one of the columns (see Section 4.10.2).

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.

4.4.1 Creating New Users

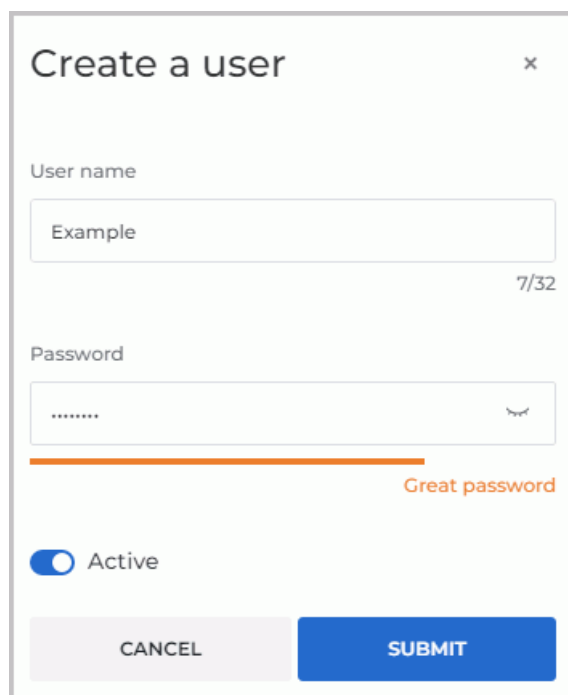To add a new user, click the **CREATE USER** button on the **Users** page.

Figure 4.5: Create a user dialog box

Type the user's name and password in the **Create a user** dialog box (Fig. 4.5) 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
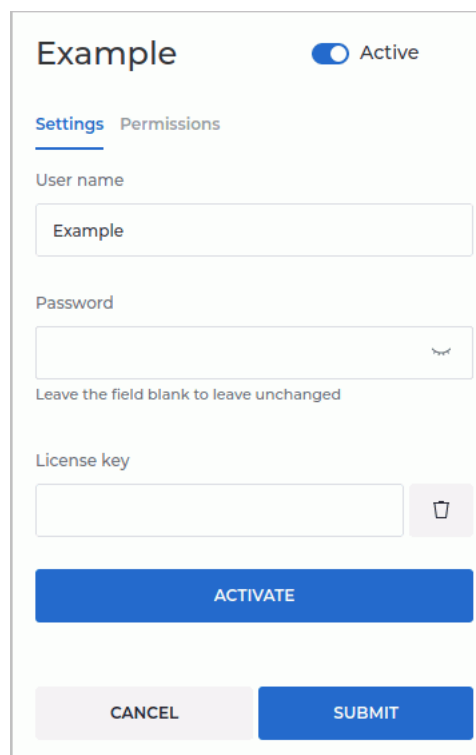
characters. No punctuation marks, spaces, quotation marks or special characters are to be used.

- 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.

.

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.

4.4.2 Managing Users in the Personal User Licensing Mode

Select a user on the left-hand side of the **Users** page. On the right-hand side of the window, you will see the user's credentials. To edit or change the user's name and password, click on the **Settings** tab and type the new data in the respective fields (Fig. 4.6).

Figure 4.6: Editing the user's settings

The recommendations concerning the **User name** and the **Password** are provided in Section 4.4.1.

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

Enter the user's personal license key in the **License key** field and click the **ACTIVATE** button. In the **Permissions** tab you will see the list of functions available to the user.

The functions available to the user depend on the personal license key.

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

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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.

4.4.3 Managing Users in the Competitive Licensing Mode

Select a user on the left-hand side of the **Users** page. On the right-hand side of the window, you will see the user's credentials. To edit or change the user's name and password, click on the **Settings** tab and type the new data in the respective fields (Fig. 4.6).

The recommendations concerning the **User name** and the **Password** are provided in Section 4.4.1.

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

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

The functions available to the user depend on the personal license key.

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.

4.5 User sessions

On the **Users** page you can manage user sessions (Fig. 4.4).

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

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

4.6 Hotkeys

On the **Hotkeys** page you can set the default hotkeys (Fig. 4.7).

The table shows the settings for tools and the respective hot keys. For details on customizing parameters display options, see Section 4.10.1. The tools may be sorted in the table by the values shown in one of the columns (see Section 4.10.2).
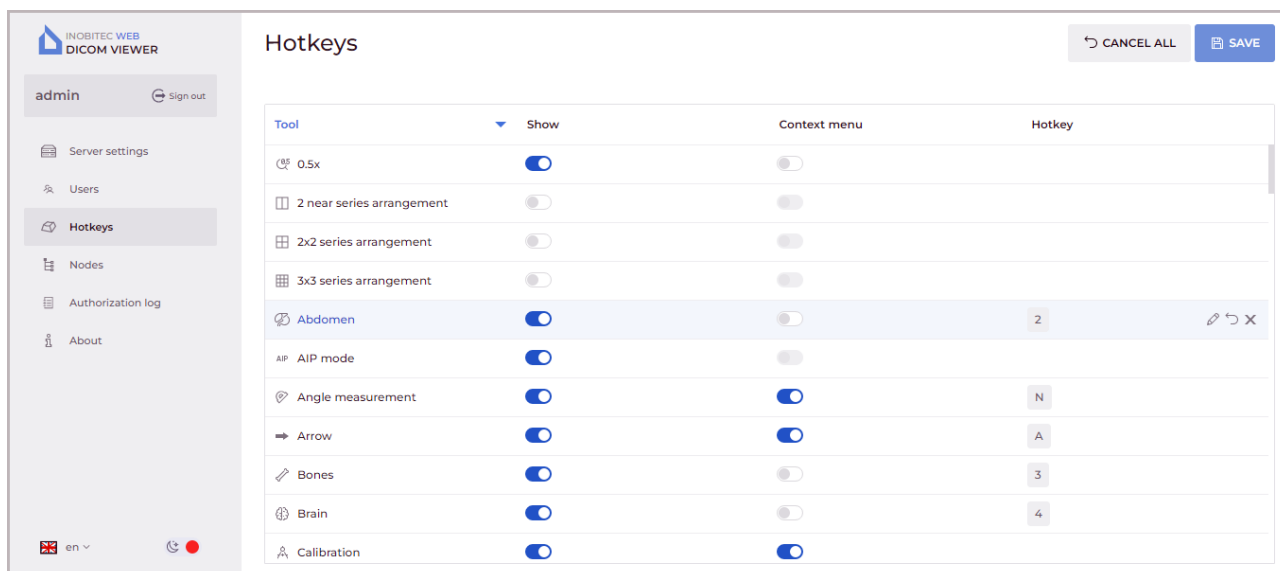
Figure 4.7: «Hotkeys» page

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 **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, 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 cancel an assigned hot key, click the **Cancel change** button.

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

Click **SAVE** to save the settings or **CANCEL ALL** to get back to the previous settings.

4.7 Nodes

On the **Nodes** page of Web DICOM Viewer displays information about the nodes which are stored in the Control Node (Fig. 4.8). The PACS adapter script automatically adds the necessary records to the configuration file and the Control Node microservice database.
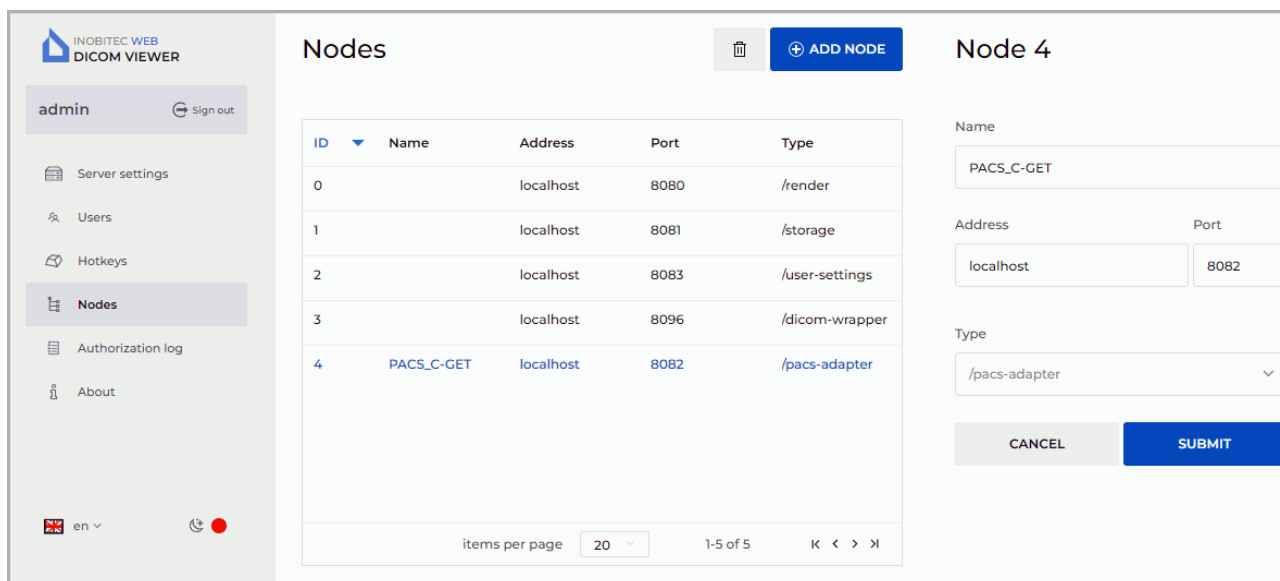
Figure 4.8: «Nodes» page

At the bottom of the page, you see the range of nodes for the current page and the total number of nodes. 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** dropdown list, select the number of nodes to be shown on a page.

The table for connected nodes shows the connection parameters. For details on customizing parameters display options, see Section 4.10.1. The nodes may be sorted in the table by the values shown in one of the columns (see Section 4.10.2).

To change the port, host name or IP address, run:

1. Edit the node configuration file.

2. Change the parameter values of the microservice on page **Nodes**.

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

4. Restart the service of the edited node.

5. Restart the **Control Node** microservice.

Figure 4.9: Creating a new node

To add a connection:

1. Click the **ADD NODE** button.

2. In the **Create a node** dialog box (Fig. 4.9) set:

   - the name of the node in the **Name** field;

   - the IP address for the node (without spaces) in the **Address** field;

   - the port value from 0 to 65535 in the **Port** field.

3. Select the node type from the dropdown list.

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

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

4.8 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 4.10.1. The events may be sorted in the table by the values shown in one of the columns (see Section 4.10.2).

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.

Figure 4.10: «Authorization log» page

The authorization log provides the following information:

- **User** — the name of the user who performed the action;

- **Sessions ID** — the unique identifier of the user session;

- **Event** — an event that has occurred in the system;

- **Date** — the date and time of the event;

- **IP address** — the IP address from which the system was entered.

The events to be recorded in the authorization log are:

- **Successful authentication**;

- **Successful logout**;

- **Failed authentication (invalid username)**;

- **Failed authentication (wrong password)**;

- **Successful password change**;

- **The number of connections exceeds the established limit of active sessions**;

- **Unsuccessful authentication (user inactive)**. The user is considered to be blocked if the **Active** switch has been unchecked for him/her;

- **Invalid access token**;

- **Unsuccessful attempt to change the password, the old password is incorrect**.

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

- **User**;

- **Event type**.

Click **SUBMIT** to search, or **RESET** to cancel. To update the events list, click the ⟳ **Update events list** button.
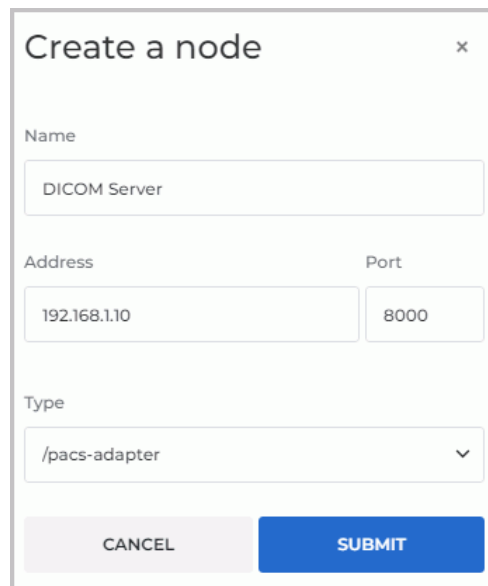
At the bottom of the log, you see the range of events for the current page and the total number of events. To go to the next page of the log, click the ＞ button; to go to the previous page — click the ＜ button. To go to the last page of the log, click the ＞| button, to return to the first page — click the |＜ button.

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

4.9 Version of Web DICOM Viewer

To find out the Web DICOM Viewer version, click the **About** page (Fig. 4.11).

Figure 4.11: «About» page

The page displays the following information about the program:

- Web DICOM Viewer version;

- Link to the website of the software developer;

- Email address of INOBITEC Software FZ-LLC Marketing and Sales Department;

- Email address of INOBITEC Software FZ-LLC Tectnical Support.

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4.10   Tables

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

4.10.1   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. 4.12 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.

Figure 4.12: «Table settings» dialog box

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

4.10.2   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.

4.10.3   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 4.10.1.

Chapter 5

Integration with the DICOM Server

5.1   General principle of connecting the DICOM server

The Web DICOM Viewer software system can be integrated with DICOM servers. A special service, DICOM PACS Adapter, is used for this purpose. It adapts the DICOM Server interface to the Web DICOM Viewer interface. One DICOM Server is paired with only one PACS Adapter. If there are several DICOM Servers in the system, the same number of PACS Adapters must be provided. The connection settings for the DICOM Server are provided in configuration XML files (see the **Configuration Files** section). PACS adapters can be added to the system with the help of scripts or manually.

5.2   Adding PACS Adapters on Linux

5.2.1   Adding PACS Adapters with the Help of Automatic Deployment Scripts

1. Set the following parameters in the *scripts/init_pacs.sh*:

   - **USER_FRIENDLY_NAME**: the DICOM server name displayed for the user;
   - **PACS_ADAPTER_PORT**: the port for data transfer between the PACS Adapter and the Control Node microservice;
   - **CONNECTION_MODE**: the method of DICOM files transfer (C-GET or C-MOVE);
   - **RECEIVE_PORT**: the port for data transfer from the DICOM Server to the PACS Adapter;
   - **PACS_SCP**: the DICOM Server AE Title;
   - **PACS_IP_ADDRESS**: the DICOM Server IP address;
   - **PACS_PORT**: the port for data transfer from the PACS Adapter to the DICOM Server;
   - **PACS_CHARSET**: the character encoding standard.

   To obtain files by C-MOVE method, the DicomPacsAdapter port must be registered at the DICOM Server.

2. In the name of the root, execute the script *scripts/append_pacs.sh*.

   sudo ./scripts/append_pacs.sh

   After successful installation, the following message is displayed: "Installing DICOM Pacs Adapter completed".

Adding PACS adapters manually

1. Create a configuration file for the new PACS adapter node. In **dicompacsadaptercon-fig.xml** configuration file (see the **Configuration Files** section), specify the parameters of the DICOM PACS Adapter connection to the DICOM Server.

2. Create a service file from the executable file by analogy with the creation of services for other microservices.

3. Enter the administrative console (see the **Launching the Program** section). On the **Nodes** page, add a new node with the parameters provided in the configuration file.

5.2.2   Adding PACS Adapters on Windows

Adding PACS Adapters with the Help of Scripts

1. Set the following parameters in the *scripts/init_pacs.bat*:

   - **USER_FRIENDLY_NAME**: the DICOM server name displayed for the user;
   - **PACS_ADAPTER_PORT**: the port for data transfer between the PACS Adapter and the Control Node microservice;
   - **CONNECTION_MODE**: the method of DICOM files transfer (C-GET or C-MOVE);
   - **RECEIVE_PORT**: the port for data transfer from the DICOM Server to the PACS Adapter;
   - **PACS_SCP**: the DICOM Server AE Title;
   - **PACS_IP_ADDRESS**: the DICOM Server IP address;
   - **PACS_PORT**: the port for data transfer from the PACS Adapter to the DICOM Server;
   - **PACS_CHARSET**: the character encoding standard.

2. Run the *scripts/append_pacs.bat* script as administrator. After successful installation, the following message is displayed: "Installing DICOM Pacs Adapter completed".

3. Reboot the computer.

Chapter 6

Working via a Reverse Proxy

6.1 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 functionality allowing to work via reverse proxy server is implemented.

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 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 an example of the **Nginx** configuration file. The Web DICOM Viewer will be available at *http://<IP-address nginx>:8888/web-viewer*.

```
events {
  worker_connections 1024;
}

http {

  ##
  # Basic Settings
  ##

  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;

  server {
    listen 8888;  # Port for connecting to Web DICOM Viewer via nginx server
     server_name localhost;

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

    location /web-viewer/v2 {
          proxy_pass http://192.168.1.58:8090/v2; # Web DICOM Viewer address
    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;
        }
      }
}
```

Chapter 7

Advanced Settings

7.1 Changing the Interpolation Filter

You can change the image interpolation method in the **rendernodeconfig.xml** configuration file (see the **Configuration Files** section).

To change the interpolation filter, proceed as follows:

1. Go to the catalogue with the Web DICOM Viewer software application.

2. In the **rendernodeconfig.xml** configuration file, change the image interpolation method by changing the method value in the following line:
   `<interpolationMethod>Lanczos5</interpolationMethod>`.
   The permitted values are:

   - Bilinear;
   - Bicubic;
   - Lanczos3;
   - Lanczos5.

   By default the Lanczos5 filter is active.

3. Save the edited **rendernodeconfig.xml** configuration file.

4. Restart the server with the Web DICOM Viewer installed.

   When filters are used (except for the Bilinear filter), distortions may occur. If you see any dubious artifacts, select the Bilinear filter.

Chapter 8

Web DICOM Viewer Update

In this chapter, you will find the information on how to update the Web DICOM Viewer to the current version from version 2.2 or superior.

Before starting the update procedure, the script creates a copy of the Web DICOM Viewer directory adding a time tag to the name. After updating, the directory may be deleted (on behalf of the superuser on Linux).

Configuration files for microservices are overwritten, while the old configuration files are saved with *.bak* extension. We recommend comparing the files after updating and, if required, copying certain values from the old files.

8.1   Updating the Program on Windows

Attention! While updating, all the Web DICOM Viewer microservices will be relaunched. Hence, all the active users' sessions will be interrupted.

1. Edit the *scripts/init.bat* file by providing the following parameters:

   - database connections (provide the login, password and database port);
   - port that will be used by the **DicomWrapper** node;
   - **DEST_DIR** directory where the Web DICOM Viewer is placed.

2. Run the *scripts/update_webviewer.bat* script as administrator. After successful update, a message is displayed: «Update completed!».

Attention! When working on a local area network, clear the cache of the browser used after the server is updated.

8.2   Updating the Program on Linux

Attention! While updating, all the Web DICOM Viewer microservices will be relaunched. Hence, all the active users' sessions will be interrupted.

1. Edit the *scripts/init.sh*, file by providing the following parameters:

- database connections (provide the login, password and database port);
- port that will be used by the **DicomWrapper** node;
- **DEST_DIR** directory where the Web DICOM Viewer is placed.

Attention! When specifying a path containing spaces, the entire path is required enclose in double quotes or use a backslash «\» character before a space.

2. Run the *scripts/update_webviewer.sh* script as sudo.

sudo ./scripts/update_webviewer.sh

After successful update, a message is displayed: «Update completed!».

Attention! When working on a local area network, clear the cache of the browser used after the server is updated.

8.3   Updating Older Versions of the Program

To update the Web DICOM Viewer to the current version, first update it to version 2.2.

Chapter 9

Web DICOM Viewer Integration with Third-Party Services

Starting with Version 2.8, «Inobitec Web DICOM Viewer» provides an opportunity to open studies via a link, e.g. to third-party services. In this chapter, the procedure of the program integration with third-party services is described.

To open a study from a link, the study must have been previously uploaded to the repository and a user session created.

9.1   Creating a User Session

1. To create a user session, send a */v2/session* request.
   Here is an example of the request:

   POST

   ```
   http://192.168.0.44:8090/v2/session?dummy=0.123
   ```

   In the request body, provide the *login* and *password* fields, e.g.:

   ```
   {
       "login": "test",
       "password": "test"
   }
   ```

   If the request is sent successfully, the *id* and *key* values are returned, which must be included in the parameters of subsequent requests. For example:

   ```
   {
       "id": 0,
       "key": "123"
   }
   ```

2. If you want the session to remain open, send a */v2/session/keep-alive* request every minute.
   Here is an example of the request:

   POST

   ```
   http://192.168.0.44:8090/v2/session/
   keep-alive?dummy=0.123&sessionId=0&sessionKey=123
   ```

   where *dummy* is any random number.

9.2   Uploading Studies to the Storage from the File System

1. Create a receiver session at the storage node.
   Here is an example of the request:

   POST

   ```
   http://127.0.0.1:8090/v2/storage/
   receiver?dummy=0.123&sessionId=1&sessionKey=123
   ```

   The id of the created session will be returned, which must be included in subsequent requests. For example:

   ```
   {
       "id": 10
   }
   ```

2. Send the files. Send a request for each file. For example:
   POST

   ```
   http://127.0.0.1:8090/v2/storage/receiver/
   10?dummy=0.123&sessionId=1&sessionKey=123
   ```

   Body: *binary data* — binary data for the file/part of the file.

   Headers:

   Content-Type: application/octet-stream

   It is recommended to break large files into several parts, e.g. 50 MB each. Each part must be sent with a separate request, and the following headers must be added:

   Content-Range: bytes 150000000-183834683/183834684

   File-Id: 0 — unique file id for the session

3. 3. Close the receiver session by sending a request, e.g.:
   DELETE

   ```
   http://127.0.0.1:8090/v2/storage/receiver/
   10?dummy=0.123&sessionId=1&sessionKey=123
   ```

9.3 Uploading Studies to the Storage from PACS

To upload studies from PACS, you need to set up the PACS adapter providing for interaction with external systems supporting the DICOM protocol. For details on setting up the PACS adapter, see Chapter 5.

1. Create a receiver session at the storage node.
   Here is an example of the request:
   POST

   ```
   http://127.0.0.1:8090/v2/storage/
   receiver?dummy=0.123&sessionId=1&sessionKey=123
   ```

   The id for the created session will be returned, which must be included in subsequent requests.

2. Create a sender session for sending studies to the PACS adapter.
   Here is an example of the request:
   POST

   ```
   http://127.0.0.1:8090/v2/pacs/3/scu/SOME_SCU/
   sender?dummy=0.123&sessionId=1&sessionKey=123
   ```

   where *3* is the id for the PACS node, SOME_SCU — *scu*.

   The id for the created session to be included in subsequent requests, as well as some additional information will be returned.

3. Inquire about the upload status.
   Here is an example of the request:
   GET

   ```
   http://127.0.0.1:8090/v2/pacs/3/scu/SOME_SCU/sender/
   5?dummy=0.123&sessionId=1&sessionKey=123
   ```

   The *«finished»* value must be returned in the *state* field.

4. Close the sender session for sending studies to the PACS adapter.
   Here is an example of the request:
   DELETE

   ```
   http://127.0.0.1:8090/v2/pacs/3/scu/SOME_SCU/sender/
   5?dummy=0.123&sessionId=1&sessionKey=123
   ```

5. Close the receiver session.
   Here is an example of the request:
   DELETE

   ```
   http://127.0.0.1:8090/v2/storage/receiver/
   12?dummy=0.123&sessionId=1&sessionKey=123
   ```

9.4   Opening Studies via a Link

A link refers to only one study series in one view mode. A page with the series is opened on condition that the link contains the mandatory parameters.

Here is an example of the link:

```
http://192.168.0.44:8090/?studyUid=1.2.3&seriesUid=1.2.3&sessionId=1
&sessionKey=1&mode=0
```

The table shows the parameters provided in the link. The mandatory parameters are marked with *.

studyUid*	The identifier of the study to be opened. A mandatory parameter.
seriesUid	The identifier of the series to be opened when the study is opened.
sessionId*	The identifier of the created user session. A mandatory parameter.
sessionKey*	The key for the created user session. A mandatory parameter.
mode	The mode in which the study is to be opened.

The **mode** parameter may take on the following values:

IMAGE	0
VOLUME	1
MPR	2
WAVEFORM	3
TAGS	4
PDF	5
VIDEO	6
SR	7
PDF_IMAGE	8

If the **mode** parameter is not provided, the series is opened in the default mode.

If the series cannot be opened in the mode provided, the following message will pop up: **This series is not available to open in the selected mode**.

If the provided series identifier (**seriesUid**) does not exist, the following message will pop up: **Series not found**. If the **seriesUid** parameter is not present, only the series panel opens.

If the study with the provided study identifier (**studyUid**) has not been found, the 404 error message will be displayed.

Annex A. Configuration Files

«controlnodeconfig.xml»

```xml
<?xml version="1.0" encoding="UTF-8"?>
<config>
  <port>8090</port> <!-- the port where the microservice was
activated -->
  <documents>html</documents> <!-- the catalogue with the web
interface files -->
  <defaultDocument>/index.html</defaultDocument> <!-- the web
interface boot file -->
  <logPath>logs</logPath> <!-- the catalogue for storing logs -->
  <lookupTablesFile>vt_config.xml</lookupTablesFile> <!-- the path
to the file with the description of the lookup tables used -->
  <sessionTimeout>600</sessionTimeout> <!-- the time after which
the session is interrupted automatically -->
  <database>
    <driver>QPSQL</driver> <!-- the database driver -->
    <name>control</name> <!-- the database name -->
    <host>localhost</host> <!-- the IP address of the server with
the database -->
    <user>postgres</user> <!-- the name of the database user -->
    <password>123456</password> <!-- the password for the
database -->
    <port>5432</port> <!-- the database port -->
    <options></options> <!-- additional connection parameters -->
  </database>
</config>
```

«storagenodeconfig.xml»

```xml
<?xml version="1.0" encoding="UTF-8"?>
<config>
  <id>1</id> <!-- the Storage Node number -->
  <port>8081</port> <!-- the port where the microservice was
activated -->
  <logPath>logs</logPath> <!-- the catalogue for storing logs -->
  <logLevel>Debug</logLevel> <!--level of logs output to the console, possible
  values in ascending order of importance: Trace, Debug, Info, Warning, Error -->
  <makeSeriesFragmentation>0</makeSeriesFragmentation> <!-- service
parameter -->
  <codec>UTF-8</codec> <!-- encoding -->
  <tempFolder>/var/WebViewer/StorageNode/tmp</tempFolder> <!-- temporary file
  storage directory -->
  <database>
    <driver>QPSQL</driver> <!-- the database driver -->
    <name>storage</name> <!-- the database name -->
    <host>localhost</host> <!-- the IP address of the server with
the database -->
    <user>postgres</user> <!-- the name of the database user -->
    <password>123456</password> <!-- the password for the
database -->
    <port>5432</port> <!-- the database port -->
    <options></options> <!-- additional connection parameters -->
  </database>
</config>
```

«rendernodeconfig.xml»

```xml
<?xml version="1.0" encoding="UTF-8"?>
<config>
  <id>1</id> <!-- the Render Node number -->
  <port>8080</port> <!-- the port where the microservice was
activated -->
  <logPath>logs</logPath> <!-- the catalogue for storing logs -->
  <logLevel>Debug</logLevel> <!--level of logs output to the console, possible
  values in ascending order of importance: Trace, Debug, Info, Warning, Error -->
  <logFile>rendernode-%1.log</logFile> <!-- log file format -->
  <lookupTablesFile>vt_config.xml</lookupTablesFile> <!-- the path
to the file with the description of the lookup tables used -->
  <fontPath>/opt/inobitec/web-viewer/font.ttf</fontPath> <!-- the
path to the font file -->
  <interpolationMethod>Lanczos5</interpolationMethod> <!-- the
image interpolation method (permitted values: Bilinear, Bicubic,
Lanczos3, Lanczos5) -->
</config>
```

«usernodeconfig.xml»

```xml
<?xml version="1.0" encoding="UTF-8"?>
<config>
  <port>8083</port> <!-- the port where the microservice was
activated -->
<logPath>logs</logPath> <!-- the catalogue for storing logs -->
  <database>
    <driver>postgres</driver> <!-- the database driver -->
    <name>user_node</name> <!-- the database name -->
    <host>127.0.0.1</host> <!-- the IP address of the server with
the database -->
    <user>postgres</user>  <!-- the name of the database user -->
    <password>123456</password> <!-- the password for the
database -->
    <port>5432</port> <!-- the database port -->
  </database>
</config>
```

«dicomwrapperconfig.xml»

```xml
<?xml version="1.0" encoding="UTF-8"?>
<config>
  <port>8096</port> <!-- the port where the microservice was
activated -->
  <logPath>logs</logPath> <!-- the catalogue for storing logs -->
  <logFile>dicomwrapper-%1.log</logFile> <!-- log file format -->
  <tempFolder>tmp</tempFolder> <!-- temporary storage -->
</config>
```

«dicompacsadapterconfig.xml»

```xml
<?xml version="1.0" encoding="UTF-8"?>
<config>
  <id>1</id>
  <port>8082</port>
  <logPath>logs</logPath>
  <pacs>
    <scp>PACS_Inobitec</scp> <!-- the PACS identifier for the DICOM
network -->
    <host>192.168.1.2</host> <!-- the IP address of the server
where the PACS was deployed -->
    <port>3000</port> <!-- the port where the PACS was deployed -->
    <charset>UTF-8</charset> <!-- the character set for finding
studies and series in the PACS -->

    <!-- Obtaining DICOM files -->
    <receive>
      <mode>C-MOVE</mode> <!-- the method used for files exchange
with the PACS. C-GET and C-MOVE are supported -->
```

```
        <port>11115</port> <!-- the DicomPacsAdapter port which is
used for obtaining files by C-MOVE method -->
      </receive>
    </pacs>
</config>
```

To obtain files by C-MOVE method, the DicomPacsAdapter port must be registered at the DICOM Server.

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

We wish you success in your work!