



MedDream DICOM Viewer

Install MANUAL

(version 7.5.1)

© 2020, Softneta UAB, Kaunas

All rights reserved in the event of granting of patents or registration as a utility patent.

All names of companies and products mentioned in this manual may be trademarks or registered trademarks. References to products of other manufacturers are for information purposes only. Such references are intended neither as an approval nor a recommendation of these products. Softneta UAB accepts no liability for the performance or use of such products.

Other brand names, software and hardware names used in this manual are subject to trademark or patent protection. The quoting of products is for informational purposes only and does not represent a trademark misuse.

This Install Manual is protected by copyright. Unless expressly authorized in writing, dissemination, duplication or other commercial exploitation of this documentation set or communication of its contents or parts of it is not permitted. In case of infringement, the violator may be liable to pay compensation for damages.

Specifications due to technical developments are subject to change. This Install Manual is not subject to the revision service. Please contact the manufacturer or authorized dealer to request the latest edition of Install Manual.

Table of Contents

1	Introduction	1
2	Minimal server side requirements	1
2.1	Minimal hardware requirements	1
2.2	Minimal memory requirements	2
2.3	Minimal software requirements	2
2.3.1	Supported operating systems	2
2.3.2	Supported PHP scripting interpreters	2
2.3.3	Supported Java runtime	2
3	Integration with PACS	2
3.1	Integration modes	2
3.1.1	Direct access mode on a different host	3
3.1.2	Saving measurements and Key Objects	3
3.1.3	Multiple PACSes in parallel	4
3.2	Direct access to PACS database mode	4
3.2.1	PacsOne	4
3.2.2	DCM4CHEE	7
3.2.3	Conquest	11
3.3	Integration over Web or other APIs	12
3.3.1	Orthanc	12
3.4	DICOM mode	14
3.4.1	DICOM mode notes	14
3.4.2	MedDream configuration for DICOM mode	14
4	Image Access from hospital information system (HIS)	16
5	Deployment	16
5.1	Configuration	17
5.1.1	Essential configuration and the first run	17
5.1.2	System.json	18
5.1.3	Reference for remaining configuration parameters	21
5.1.4	Built-in authentication and authorization	27
5.1.5	Predefined login credentials	31
5.1.6	Java memory limits	31
5.2	Running as a service	31
5.2.1	Windows	32
5.2.2	Linux (System-V init)	32
5.2.3	Linux (systemd)	33
5.2.4	Linux (upstart)	33
5.3	Verification checklist	34
6	Additional software	35
6.1	3D service	35
6.1.1	3D server configuration	35
6.1.2	Network settings (ports and SSL)	35
6.1.3	Quality / Performance	36
6.2	Browser plugin	37
7	Security considerations	37
7.1	Search engines	37
7.2	DCM4CHEE 2.x	38
7.3	Embedding into IFRAME etc	38
7.4	php.ini	38
7.5	Browser's cache	41

7.6	Firewalls	42
8	Localization	42
9	Rebranding	42
10	Troubleshooting	45
10.1	Log files of the Java-based core	45
10.2	Browser download path selection	45
10.2.1	Google Chrome	45
10.2.2	Mozilla Firefox	46
10.2.3	Microsoft Edge	46
10.2.4	Safari	46
10.2.5	Internet Explorer 11	46
10.3	Symptom: on Linux the loading pauses just after logging in, possibly with wrong webpage colors	47

1. Introduction

MedDream DICOM Viewer is a HTML based package for PACS server which is designed to aid professionals in every day's decision making process, connecting all the medical data into a unified and fast performing network. MedDream ensures a fast and reliable way to search, present and analyze the medical data (images and video files) on various devices: computers, smart phones, tablets and so forth.

MedDream covers: radiology, cardiology, oncology, gastroenterology and many other fields of medical application. It seamlessly integrates with various medical imaging devices, such as: ultrasound (US), magnetic resonance (MRI), positron emission tomography (PET), computed tomography (CT), endoscopy (ES), mammography (MG), digital radiography (DR), computed radiography (CR) ophthalmology, and so forth.

Core MedDream DICOM Viewer uses are:

- Replacement of hard copies, e.g. film archives, paper documents, etc.
- Remote access. MedDream provides a possibility to be mobile and work from any place in the world where the Internet is accessible. More than one person can access and view medical records at one time. Such functionality speeds up the collaboration among the professionals. So that a doctor in the hospital and a doctor that is in the different location may view the medical data and discuss about it simultaneously. The patient's medical history, various studies and images are found much faster comparing to the conventional paper-based methods.
- MedDream can be used as a standalone WEB Viewer or integrated into MedDream PACS, PacsOne PACS, dcm4chee Archive, Conquest, Orthanc PACS systems. Moreover, MedDream can be adapted to client's PACS system and easily integrated into RIS/HIS workflow.
- MedDream has multiple functions such as search of studies, viewing, analyzing, saving, exporting, forwarding images and videos, etc.

Note: In 7.5.1, the Reporting function and some aspects of HIS integration are not ported to Java yet. Unfortunately the PHP backend, where this would still work, is not available any more.

2. Minimal server side requirements

2.1. Minimal hardware requirements

Parameter	Requirement
Processor	2.33GHz or higher x64-compatible (2 CPUs)
Memory	8+ GB
Hard drive	30 GB (RAID 1, RAID 5, RAID 10)
Network Interface	100 Mbit/s

2.2. Minimal memory requirements

Minimal memory requirements for the best performance of the software:

- 8 GB of RAM if you plan to open more than 800 images (CT & MRI, PET-CT).
- 12 GB of RAM for more than 1500 images (multi-slice CT & PET-CT).
- 16 GB of RAM for more than 3000 images (cardiac or functional imaging).

2.3. Minimal software requirements

Note: Starting from 7.5, MedDream is effectively Java-only and contains an embedded web server – **Apache is no more needed.**

2.3.1. Supported operating systems

MedDream supports the following operating systems:

- Windows Server 2008 (32 bit and 64 bit) and newer
- Windows 7 (32 and 64 bit) and newer
- Linux (32 bit and 64 bit)

2.3.2. Supported PHP scripting interpreters

Since 7.5.1 MedDream does not need PHP by itself. However PacsOne does, and MedDream provides a file `applet.php` for integration into its web interface.

This module requires the cURL extension and is regularly tested under PHP 5.4 . . . 7.1 (newer ones might also work).

2.3.3. Supported Java runtime

Only Java 8 is supported and was tested.

- We recommend [OpenJDK 8](#). The entire JDK is not needed, a JRE is sufficient. Builds for Windows are harder *but still possible* to obtain.
- Java 8 from Oracle is the traditional choice but less affordable as of now.

3. Integration with PACS

3.1. Integration modes

MedDream can access studies from PACS using:

- direct access to PACS database
- Web-based and other APIs
- DICOM 3.0 native interface (Query/Retrieve)

- direct file system access where a PACS is not necessary. (However for users' convenience some third-party user interface will still need to pass file/directory names to MedDream.)

Commercial integration solutions are also possible on request. In that case documentation with confidential information will be available as separate versions of this Manual.

For best performance, it is recommended to use direct access to PACS database whenever available.

3.1.1. Direct access mode on a different host

Warning: In the Direct access to PACS database mode, MedDream must either:

- be installed on the same host as PACS, or
- have access to studies' files, and likely path remapping needs to be configured.

Some databases contain paths to DICOM files stored on the PACS host (not on some common network storage, etc) and it is not always possible to create identical mount points or network drive letters on the MedDream host.

For this case most PACS plugins support a setting named *mappedStorageLocation* (or similarly) that specifies substrings in the path to be replaced with different substrings.

An example with PacsOne plugin: `...].mappedStorageLocation=/volume1/DICOMNL\=O:\|/volume2/DICOMNL\=P:\`. Here `/volume1/DICOMNL\` is replaced with `O:\` under which the network resource shared by a Linux system is mounted on a Windows system; in the same fashion `/volume2/DICOMNL\` is replaced with `P:\`. For best results, please take a look at Java logs for original paths.

Due to limitations of Windows, a service might fail to access a network drive mapped in an interactive session (even under the same user, even with the "Enable to interact with desktop" turned on). In this case, avoiding a drive letter should give better results – just remap PACS-local directories to CIFS paths that would otherwise be attached to a drive letter (`...].mappedStorageLocation=/volume1/DICOMNL\=\\server\share\DICOMNL/`).

3.1.2. Saving measurements and Key Objects

Since 7.1, to save Key Objects and Presentation States (annotations), the following parameters must be added to the configuration of every PACS integration plugin (except the "DICOM" plugin):

- Example: `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].storeScpIp=127.0.0.1`
IP of the Storage Server.
- Example: `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].storeScpPort=104`
Storage Server Port.
- Example: `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].storeScpAet=PACSONE`
Storage Server AE Title.

The local AE Title is configured by `com.softneta.meddream.dcmsnd.bind` as before.

3.1.3. Multiple PACSes in parallel

With most plugins multiple PACSes can be defined simultaneously, then used in the Search window to open studies (also called “Multi-PACS setup”).

This, however, is currently not supported in case of legacy HIS integration *without token validation*. Multiple instances of “QR” plugin (DICOM mode) are also not fully supported.

3.2. Direct access to PACS database mode

3.2.1. PacsOne

In case of PacsOne Server (<http://pacsone.net/>), MedDream implements direct database access mode.

A similar configuration called “Standard DB integration” uses the same plugin and a minimalistic database structure unrelated to the real PacsOne Server; the database is to be filled by custom solution implemented by the customer. Please contact info@softneta.com for example scripts etc.

3.2.1.1. PacsOne notes

applet.php shipped with MedDream is regularly tested with PHP versions from 5.4 to 7.1, though newer ones might also work. It requires the php_curl PHP module.

Warning: PacsOne and mD Java Core process must run as the same user because newer versions of PacsOne create subdirectories with permissions too strict for different users. Please ensure that on Linux operating systems PacsOne and mD Core services use the same user or belong to the same group.

Warning: PacsOne must store the received DICOM files in the “DicomPart10” format. The other format, “Native”, is not fully supported by MedDream (and you might have problems with other DICOM-related software). This setting is chosen during installation and later can be verified as follows:

- Windows: in the registry, REG_SZ StorageFormat under HKEY_LOCAL_MACHINE\SOFTWARE\RainbowFish Software\PacsOne\\${AeTitle};
- Linux: the setting StorageFormat in file(s) *.ini near PacsOne.exe.

PacsOne doesn’t have an index on series.modality. If searches with a particular modality are unacceptably slow compared to the “All” choice, then you’ll need to use the following MySQL command:

```
ALTER TABLE series ADD INDEX (modality);
```

Until 6.0, the HIS integration by Patient ID was using a certain kind of fuzzy matching that includes coerced values of Patient ID. For example, /?patient=12345 will also list studies with Patient ID “12345[some_original_value]”. Since 6.0 this is turned off by default. If you still need the legacy behavior, then configure the “PacsOne” plugin with `strictSearchIsEnabled=false`.

Since MySQL 5.7, the ONLY_FULL_GROUP_BY mode is on by default. Consequently, MedDream’s Search function uses a compatible and much slower query by default. If performance is paramount, we advise to disable ONLY_FULL_GROUP_BY and configure the “PacsOne” plugin with `useModalityAggregation=false`.

3.2.1.2. MedDream configuration for PacsOne

1. Perform steps in the *Essential configuration and the first run* chapter.
2. If you intend to reuse PacsOne user management, then configure this kind of authentication in `application.properties` file:

```
spring.profiles.include=auth-pacsone
authorization.defaultLoginPermissions=SEARCH,PATIENT_HISTORY,UPLOAD_DICOM_
↔LIBRARY,3D_RENDERING
#authorization.users[0].userName=user1
#authorization.users[0].role=DOCUMENT_VIEW
authentication.database.databaseName=DB_NAME
authentication.database.jdbcUrl=jdbc:mysql://DB_HOST:DB_PORT/DB_NAME
```

(for example, `jdbc:mysql://127.0.0.1:3306/${authentication.database.databaseName}` – we encourage placeholders to minimize human errors).

The `defaultLoginPermissions` setting globally covers permissions not available in PacsOne user management. Also please remember that PacsOne’s “Export” privilege is mapped to both `EXPORT_ISO` and `EXPORT_ARCH`. The `users[]` setting can apply permissions to individual users.

A different authentication method can still be configured according to *Built-in authentication and authorization*.

3. Edit `application.properties` file and update the options related to PacsOne plugin. The documentation below is for plugin version 2.0.1.

- Example: `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].type=PacsOne`

Use this specific value of `type` when connecting to PacsOne.

- Example: `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].id=PacsOneRouter`

Identifies the plugin/configuration pair in the search window drop-down menu. You can connect to multiple PacsOne instances by using different values of `id` and remaining options.

- Example: `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].searchApiEnabled=true`

(optional) Specifies if this plugin/configuration pair returns a study list for the Search window and provides study metadata. Default is `true`.

- Example: `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].imageApiEnabled=true`

(optional) Specifies if this plugin/configuration pair retrieves image data. Default is `true`.

- Example: `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].url=jdbc:mysql://127.0.0.1:3306/PACS_DB_NAME`

JDBC connection string. Please note that Oracle is not supported.

Note: SSL requirements can be disabled adding the following arguments:

- **verifyServerCertificate=false** Disables Server certificate verification.
 - **useSSL=false** Disables SSL usage.
 - **requireSSL=false** Disables the SSL requirement.
-

The plugin also supports PostgreSQL (`jdbc:postgresql://127.0.0.1:5432/DB_NAME`) for the “Standard DB integration” cases.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].username=UserName`

Username for connecting to the database.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].password=UserPassword`

Password for connecting to the database.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].mappedStorageLocation=D:/DICOM=Y:\DICOM1|E:/DICOM=Y:\DICOM2`

(optional) Defines replacement paths for MedDream installed on a different host than the PACS and accessing images through mapped network drives.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].useModalityAggregation=true`

(optional) Defines if modalities will be aggregated in database query results. Aggregation ensures that all modalities are visible in the Modality column but this could cause performance degradation. If set to false, then SQL mode must *not* contain 'ONLY FULL GROUP BY'. More information about SQL mode can be found at: <https://dev.mysql.com/doc/refman/8.0/en/sql-mode.html>.

false is incompatible with PostgreSQL ("Standard DB integration") and will result in errors.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].strictSearchIsEnabled=`

(optional) true enables exact matching by Patient ID everywhere, including the Search window. false enables fuzzy matching everywhere, including HIS integration by Patient ID. null or unset is the default: exact matching for Patient History and HIS integration, fuzzy matching for Search window.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].defaultStartDate=20181107`

(optional) Default "from" date in YYYYMMDD format when empty in the user interface.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].defaultEndDate=20181108`

(optional) Default "to" date in YYYYMMDD format when empty in the user interface.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].encoding=ISO-8859-1`

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].encodingTo=ISO-8859-8`

(optional) Specify encoding of database strings when it's not UTF-8.

- `encoding=ISO-8859-1, encodingTo=:`
 - * search query is converted from UTF-8 to ISO-8859-1
 - * search results are converted from ISO-8859-1 to UTF-8
- `encoding=ISO-8859-1, encodingTo=ISO-8859-8:`
 - * search results are converted from ISO-8859-1 to ISO-8859-8
 - * search query is converted from ISO-8859-8 to ISO-8859-1
- `encoding=, encodingTo=ISO-8859-8:`
 - * search results are converted from UTF-8 to ISO-8859-8
 - * search query is converted from ISO-8859-8 to UTF-8

`encoding` and `encodingTo` are empty: UTF-8 is assumed everywhere (the outcome might still be influenced by JVM system encoding).

- Restart Core for changes to take effect, and navigate to `http://127.0.0.1/`. Use login credentials that are valid for chosen method (PacsOne users in case of `spring.profiles.include=auth-pacsone`, etc).

3.2.1.3. Integration into PacsOne web interface

After you successfully log into MedDream and are able to access studies on PacsOne, the system can additionally be configured to open MedDream from PacsOne web interface. The “Show” button will appear on patient, study, series and image levels, however MedDream 7.5 supports the study level only.

- Make a backup of PacsOne’s `php/applet.php`.
- Copy and Replace MedDream’s `sys/php/applet.php` over the PacsOne version of the file.
- Start MedDream token validator from a separate console window: `java -jar token-service.jar`. Wait until the message “Application ... started” appears.
- In the PacsOne web interface, find some studies, tick at least one checkbox and click the “Show” button.

For later convenience the token validator should run as a service. MedDream installation package provides files `token-service.debian`, `token-service.redhat` and `token-service.xml`, while `meddream-jar-wrapper.*` needs manual copying to `token-service-jar-wrapper` (or `MedDream.exe` – to `token-service.exe`). Please follow the [Running as a service](#) chapter and do not forget to use the corresponding file names.

3.2.2. DCM4CHEE

For DCM4CHEE (<https://www.dcm4che.org/>) MedDream implements the direct database access mode.

3.2.2.1. DCM4CHEE notes

Warning: For DCM4CHEE 5, the 5.6 is our main testing platform. Some newer versions are tested occasionally. Support for 4.x was not ported from PHP due to very limited demand.

3.2.2.2. MedDream configuration for DCM4CHEE 5.x

- Perform steps in the [Essential configuration and the first run](#) chapter.
- Choose and configure a universal authentication method according to [Built-in authentication and authorization](#).
- Edit `application.properties` file and update the options related to DCM4CHEE 5.x plugin. The documentation below is for plugin version 2.0.1.

- Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].type=Dcm4chee5`

Use this specific value of `type` when connecting to DCM4CHEE 5.

- Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].id=MainArchive`

Identifies the plugin/configuration pair in the search window drop-down menu. You can connect to multiple DCM4CHEE instances by using different values of `id` and remaining options.

- Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].searchApiEnabled=true`

(optional) Specifies if this plugin/configuration pair returns a study list for the Search window and provides study metadata. Default is `true`.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].imageApiEnabled=true`

(optional) Specifies if this plugin/configuration pair retrieves image data. Default is `true`.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].url=jdbc:mysql://127.0.0.1:3306/PACS_DB_NAME`
- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].url=jdbc:postgresql://127.0.0.1:5432/PACS_DB_NAME`

JDBC connection string. Supported DBMSes are MySQL and PostgreSQL.

In case of connection problems it might be necessary to add some more parameters to this string: `useJDBCCompliantTimezoneShift=true` for a time zone shift, `serverTimezone=UTC` for a specific timezone, `useSSL=false` to disable SSL, etc. (The first parameter-value pair is preceded by "?", the remaining pairs – by "&".) See <https://dev.mysql.com/doc/connector-j/5.1/en/connector-j-reference-configuration-properties.html> for MySQL, or <https://jdbc.postgresql.org/documentation/head/connect.html> for PostgreSQL.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].username=UserName`

Username used to connect to the database.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].password=UserPassword`

Password used to connect to the database.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].dialect=MySQL`

Set database dialect. Supported values are `MySQL` and `PostgreSQL`. (To some extent duplicates the `url` parameter, this is by design.)

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].encoding=ISO-8859-1`
- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].encodingTo=ISO-8859-8`

(optional) Specify encoding of database strings when it's not UTF-8.

- `encoding=ISO-8859-1, encodingTo=:`
 - * search query is converted from UTF-8 to ISO-8859-1
 - * search results are converted from ISO-8859-1 to UTF-8
- `encoding=ISO-8859-1, encodingTo=ISO-8859-8:`
 - * search results are converted from ISO-8859-1 to ISO-8859-8
 - * search query is converted from ISO-8859-8 to ISO-8859-1
- `encoding=, encodingTo=ISO-8859-8:`
 - * search results are converted from UTF-8 to ISO-8859-8
 - * search query is converted from ISO-8859-8 to UTF-8

`encoding` and `encodingTo` are empty: UTF-8 is assumed everywhere (the outcome might still be influenced by JVM system encoding).

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].aggregateDataByDatabase=true`

Attempt to collect distinct series-level values of *Modality* and *Source AET* for every study in the search results.

`false` might improve performance in case of MySQL with corresponding configuration, however then only a single modality or AET from some series will be visible.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].storage=fs1=c:\\mnt\\NAS1;fs2=c:\\mnt\\NAS2`

Filesystem root directories, as configured in the LDAP tree via entries named “dcmStorageID”. The plugin doesn’t read this configuration from LDAP at the moment.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].pacsVersion=5.7`

Two-component DCM4CHEE version number that defines what database fields are available. Namely, *Number of Frames* was added in 5.7 and this version is expected by default; if your PACS is older, you’ll need to adjust this parameter to avoid SQL errors.

4. Restart Core for changes to take effect, and navigate to `http://127.0.0.1/`. Use login credentials that are valid for chosen method.

3.2.2.3. MedDream configuration for DCM4CHEE 2.x

1. Perform steps in the *Essential configuration and the first run* chapter.
2. Choose and configure a universal authentication method according to *Built-in authentication and authorization*.
3. If you intend to (partially) reuse DCM4CHEE user management, then configure this kind of authentication in `application.properties` file:

```
spring.profiles.include=auth-dcm4chee
authentication.database.username=APP_USER
authentication.database.password=APP_PASS
authentication.database.jdbcUrl=jdbc:mysql://DB_HOST:DB_PORT/DB_NAME
authorization.defaultLoginPermissions=EXPORT_ARCH,EXPORT_ISO,FORWARD,VIEW_
↪PRIVATE,DOCUMENT_VIEW,3D_RENDERING
authorization.remapRoles.Doctor=SEARCH
authorization.remapRoles.WebAdmin=ADMIN
authorization.users[0].userName=user
authorization.users[0].role=UPLOAD_DICOM_LIBRARY
```

`.jdbcUrl` supports not only MySQL but also PostgreSQL (`jdbc:postgresql://DB_HOST:DB_PORT/DB_NAME`) and MS SQL Server (`jdbc:sqlserver://DB_HOST:DB_PORT;database=DB_NAME`). `.username` and `.password` are credentials of an application user for reading the database tables; you can use the same credentials for the plugin below.

`.defaultLoginPermissions` lists common permissions. In this example, the DCM4CHEE’s predefined “Doctor” role additionally gets SEARCH, and the predefined user “user” gets UPLOAD_DICOM_LIBRARY. Because “user” belongs to “Doctor” by default, it now has UPLOAD_DICOM_LIBRARY, SEARCH and everything from defaultLoginPermissions. Similarly, the predefined user “admin” who has “WebAdmin” and “Doctor” roles in DCM4CHEE, now has ADMIN, SEARCH, etc (except UPLOAD_DICOM_LIBRARY).

The full list of permissions can be found in *Built-in authentication and authorization*. That chapter also describes a few universal authentication methods.

4. Edit `application.properties` file and update the options related to DCM4CHEE 2.x plugin. The documentation below is for plugin version 2.0.1.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].type=Dcm4chee2`

Use this specific value of `type` when connecting to DCM4CHEE 2.x.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].id=RouterPacs`

Identifies the plugin/configuration pair in the search window drop-down menu. You can connect to multiple DCM4CHEE instances by using different values of `id` and remaining options.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].searchApiEnabled=true`

(optional) Specifies if this plugin/configuration pair returns a study list for the Search window and provides study metadata. Default is `true`.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].imageApiEnabled=true`

(optional) Specifies if this plugin/configuration pair retrieves image data. Default is `true`.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].url=jdbc:mysql://127.0.0.1:3306/PACS_DB_NAME`

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].url=jdbc:postgresql://127.0.0.1:5432/PACS_DB_NAME`

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].url=jdbc:sqlserver://127.0.0.1:1433;database=PACS_DB_NAME`

JDBC connection string. Supported DBMSes are MySQL, PostgreSQL and Microsoft SQL Server.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].username=UserName`

Username used to connect to the database.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].password=UserPassword`

Password used to connect to the database.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].defaultStoragePath=C:/DCM4CHEE_INSTALL_DIR/server/default`

Base directory for relative paths. By default all paths are relative to a certain location below the installation directory (see the example), unless one sets up an absolute filesystem prefix via `addRWFileSystem()` in JMX Console.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].charset=latin1`

(optional) Defines the character set used in the database. If not empty, conversion from this character set to UTF-8 is attempted; otherwise the data is passed as is (default). `utf8` might work in case of double encoding.

Note: The PACS GUI (`/dcm4chee-web`, `/dcm4chee-web3`, etc) is able to correctly display data even if the database server was configured incorrectly before sending the images and therefore parts of the database accessed by the plugin now contain garbled text or question marks. *DCM4CHEE has a certain workaround against this situation; there is no equivalent of it in the plugin.*

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].enableStatistics=false`

(optional) `true` enables query statistics such as query time and so on. You might also want to set `logging.level.org.hibernate.stat=DEBUG` in `application.properties` to get more details.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].idleConnectionTestPeriod=900`

(optional) Try lowering the value (in seconds) if the plugin doesn't reconnect automatically after the DBMS server is restarted (or the server closes the connection for being idle too long). A too low value will impact performance, though.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].mappedStorageLocations=D:/DICOM=Y:\\DICOM1|E:/DICOM=Y:\\DICOM2`

(optional) Defines replacement paths for MedDream installed on a different host than the PACS and accessing images through mapped network drives.

We recommend to configure `defaultStoragePath` with a ready to use value, instead of using a PACS-local value and adding a separate replacement rule here. Of course the corresponding folder must be shared on the PACS, too.

5. Restart Core for changes to take effect, and navigate to `http://127.0.0.1/`. Use login credentials that are valid for chosen method.

3.2.3. Conquest

For Conquest (<https://ingenium.home.xs4all.nl/dicom.html>) MedDream implements the direct database access mode.

3.2.3.1. Conquest notes

MedDream does not support the "V2 (allows NKL compression)" image format. All images that were received by Conquest with this setting on, including those of the example patient "HEAD EXP2", will be unusable.

3.2.3.2. MedDream configuration for Conquest

1. Perform steps in the *Essential configuration and the first run* chapter.
2. Choose and configure a universal authentication method according to *Built-in authentication and authorization*.
3. Edit `application.properties` file and update the options related to Conquest plugin. The documentation below is for plugin version 1.0.0.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].type=Conquest`

Use this specific value of `type` when connecting to Conquest.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].id=ResearchPacs`

Identifies the plugin/configuration pair in the search window drop-down menu. You can connect to multiple Conquest instances by using different values of `id` and remaining options.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].searchApiEnabled=true`

(optional) Specifies if this plugin/configuration pair returns a study list for the Search window and provides study metadata. Default is `true`.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].imageApiEnabled=true`

(optional) Specifies if this plugin/configuration pair retrieves image data. Default is `true`.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].url=jdbc:mysql://127.0.0.1:3306/PACS_DB_NAME`
- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].url=jdbc:postgresql://127.0.0.1:5432/PACS_DB_NAME`
- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].url=jdbc:sqlserver://127.0.0.1:1433;database=PACS_DB_NAME`

JDBC connection string. Supported DBMSes are MySQL, PostgreSQL, Microsoft SQL Server, dBASE 3.

MS SQL server isn't directly supported by Conquest. This is a special case when Conquest uses an ODBC source backed by the SQL Server, and MedDream connects to the server directly.

Please contact support@softneta.com if you would like to use dBASE 3 integration.

In case of connection problems it might be necessary to add some more parameters to this string: `useJDBCCompliantTimezoneShift=true` for a time zone shift, `serverTimezone=UTC` for a specific timezone, `useSSL=false` to disable SSL, etc. (The first parameter-value pair is preceded by "?", the remaining pairs – by "&".) See <https://dev.mysql.com/doc/connector-j/5.1/en/connector-j-reference-configuration-properties.html> for MySQL, or <https://jdbc.postgresql.org/documentation/head/connect.html> for PostgreSQL, or <https://docs.microsoft.com/en-us/sql/connect/jdbc/setting-the-connection-properties?viewFallbackFrom=sql-server-previousversions> for Microsoft SQL Server.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].username=UserName`

Username used to connect to the database.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].password=UserPassword`

Password used to connect to the database.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].pathToDicomIni=E:\\Conquest\\dicom.ini`

Full path to the Conquest configuration file dicom.ini. MedDream will read `MAGDeviceXXX=`. . . lines from it.

In case when MedDream is on a different host, it is recommended to copy dicom.ini to a file on MedDream host, leave only `MAGDeviceXXX` lines and update them with shared paths that are accessible on MedDream host. For example, `MAGDevice1=E:\\DICOM` might change to `MAGDevice1=\\conquest-srv\\dicomstorage1`.

4. Restart Core for changes to take effect, and navigate to `http://127.0.0.1/`. Use login credentials that are valid for chosen method.

3.3. Integration over Web or other APIs

3.3.1. Orthanc

For Orthanc (<https://www.orthanc-server.com/>) MedDream uses its custom Web API.

Direct database access wasn't implemented as it would likely offer little performance gain due to database schema complexity. You might try the DICOM mode as an alternative.

3.3.1.1. Orthanc notes

The API is not used for authentication because tested versions of Orthanc offer only global credentials (for a single user). These credentials must still be entered in plugin configuration, though.

3.3.1.2. MedDream configuration for Orthanc

1. Perform steps in the *Essential configuration and the first run* chapter.
2. Choose and configure a universal authentication method according to *Built-in authentication and authorization*.
3. Edit `application.properties` file and update the options related to Orthanc plugin. The documentation below is for plugin version 2.0.1.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].type=Orthanc`

Use this specific value of `type` when connecting to Orthanc.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].id=Telemedicine`

Identifies the plugin/configuration pair in the search window drop-down menu. You can connect to multiple Orthanc instances by using different values of `id` and remaining options.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].searchApiEnabled=true`

(optional) Specifies if this plugin/configuration pair returns a study list for the Search window and provides study metadata. Default is `true`.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].imageApiEnabled=true`

(optional) Specifies if this plugin/configuration pair retrieves image data. Default is `true`.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].baseUrl=http://127.0.0.1:8042`

Base URL that points to the root of Orthanc Web API. (Endpoints `/tools/find`, `/instances` etc will be appended automatically.)

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].username=UserLogin`

Username for Basic Authentication.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].password=UserPassword`

Password for Basic Authentication.

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].dicomCacheDirectory=C:\\DICOM`

(optional) A directory for caching images. Without this setting a file is downloaded anew every time and it's not possible to examine the contents for troubleshooting.

Multiple instances of this plugin should have different directories in order to not mix up different versions of the file with the same Study/Series/SOP Instance UIDs.

As of MedDream 7.5.1, this directory is not cleaned automatically and you need to configure a separate entry under `com.softneta.tempCleaner.tempItems[]` (see *Temporary files cleaner*).

- **Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].strictSearchIsEnabled=true`

(optional) `true` enables exact matching by Patient ID in the Search window.

- Restart Core for changes to take effect, and navigate to `http://127.0.0.1/`. Use login credentials that are valid for chosen method.

3.4. DICOM mode

MedDream is able to communicate over DICOM 3.0 native interface with any PACS that supports Query/Retrieve.

3.4.1. DICOM mode notes

The Query/Retrieve SCU identifies itself as “MEDDREAM” by default. (Do not forget to configure the PACS to accept connections from this AET.) This can be changed by the `localAET` setting of the plugin. Binding to a particular port is usually not required, and the current Java implementation doesn't support that.

The plugin also contains its own Store SCU that is used to send annotations and Key Object Selection documents back to the PACS. (With other plugins, a common DICOM SCU in Java Core is used, see [Saving measurements and Key Objects](#).) As a result,

- its Calling AE Title is also configured by the `localAET` plugin setting, instead of `com.softneta.meddream.dcmsnd.bind`;
- the plugin-level settings `storeScpIp`, `storeScpPort` and `storeScpAet` (for the common DICOM SCU) are not needed – the plugin uses the same `remoteHost`, `remotePort` and `remoteAET` as for Query/Retrieve.

The local Store SCP is implemented not in the plugin but in Java Core. It **must** bind to a port (we recommend 11116) and listens on all available addresses. The mandatory settings are:

- `com.softneta.dicomStoreService.localAETitle`,
- `com.softneta.dicomStoreService.port`,
- `com.softneta.dicomStoreService.acceptAETitles` – known Calling AE Titles,
- `com.softneta.dicomStoreService.saveURIDirectory` – base directory for received files.

3.4.2. MedDream configuration for DICOM mode

- Perform steps in the [Essential configuration and the first run](#) chapter.
- Choose and configure some universal authentication method according to [Built-in authentication and authorization](#).
- Edit `application.properties` file and update the options related to Query/Retrieve plugin. The documentation below is for plugin version 2.1.1.

- Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].type=QR`

Use this specific value of `type` when connecting to a PACS over the DICOM 3.0 protocol.

- Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].id=AnonStudies`

Identifies the plugin/configuration pair in the search window drop-down menu. Multiple instances of this plugin, however, are not recommended at the moment.

- Example:** `com.softneta.meddream.pacs.configurations[PLUGIN_INDEX_NUMBER].searchApiEnabled=true`

(optional) Specifies if this plugin/configuration pair returns a study list for the Search window and provides study metadata. Default is `true`.

- **Example:** `com.softneta.meddream.pacs.configurations [PLUGIN_INDEX_NUMBER].imageApiEnabled=true`

(optional) Specifies if this plugin/configuration pair retrieves image data. Default is `true`.

- **Example:** `com.softneta.meddream.pacs.configurations [PLUGIN_INDEX_NUMBER].remoteAET=PACSONE`

The AE Title of the remote machine.

- **Example:** `com.softneta.meddream.pacs.configurations [PLUGIN_INDEX_NUMBER].remoteHost=127.0.0.1`

IP address or hostname of the remote machine.

- **Example:** `com.softneta.meddream.pacs.configurations [PLUGIN_INDEX_NUMBER].remotePort=104`

Port number of the remote machine.

- **Example:** `com.softneta.meddream.pacs.configurations [PLUGIN_INDEX_NUMBER].localAET=MEDDREAM`

The AE Title of the DICOM C-FIND/C-MOVE/C-STORE clients implemented in this plugin.

- **Example:** `com.softneta.meddream.pacs.configurations [PLUGIN_INDEX_NUMBER].cacheDir=C:\\DICOM\\PACSONE\\`

A directory with images that are received by *local C-STORE SCP* in background. *The trailing slash/backslash is mandatory.*

Do not forget to include a trailing subdirectory equal to `remoteAET`, as the local SCP adds one automatically to the configured base directory.

Warning: Due to a bug, 7.5.1 also requires to set `com.softneta.meddream.tempDir` to the same value as this `cacheDir` setting.

- **Example:** `com.softneta.meddream.pacs.configurations [PLUGIN_INDEX_NUMBER].timeout=90000`

DICOM file receive timeout in milliseconds (starting from the C-MOVE request).

- **Example:** `com.softneta.meddream.pacs.configurations [PLUGIN_INDEX_NUMBER].retryDelay=1000`

DICOM file existence check period in milliseconds.

- **Example:** `com.softneta.meddream.pacs.configurations [PLUGIN_INDEX_NUMBER].strictSearchIsEnabled=true`

`true` enables exact matching by Patient ID in the Search window.

- **Example:** `com.softneta.meddream.pacs.configurations [PLUGIN_INDEX_NUMBER].multipleModalitySupport=true`

`false` will yield an error message when the user selects multiple modalities. Use this if the PACS does not support multiple modalities and search results confuse the users.

- **Example:** `com.softneta.meddream.pacs.configurations [PLUGIN_INDEX_NUMBER].defaultStartDate=20181107`

(optional) Default “from” date in `YYYYMMDD` format when empty in the user interface. This is for some PACSes that require the Study Date search key in every C-FIND request.

- **Example:** `com.softneta.meddream.pacs.configurations [PLUGIN_INDEX_NUMBER].defaultEndDate=20181108`

(optional) Default “to” date in *YYYYMMDD* format when empty in the user interface. This is for some PACSes that require the Study Date search key in every C-FIND request.

- Restart Core for changes to take effect, and navigate to `http://127.0.0.1/`. Use login credentials that are valid for configured method.

4. Image Access from hospital information system (HIS)

In MedDream 7.5.1, the legacy “unsafe” integration (an object identifier in the URL is sufficient to display it) supports *only the “study” parameter*

```
http://localhost/?study=1.2.392.200036.9107.500.110113,1.2.840.114350.2.171.2.798268.2.567817820.1
```

(multiple values can be separated with commas).

These parameters, in turn, are supported by almost all PACS plugins. Rare exceptions are listed under a particular PACS integration in *Integration with PACS* chapter.

Additional limitations:

- only HTTP GET method;
- multiple PACS plugins are not allowed (particularly due to unsupported parameter “storage” in the URL).

To enable this integration mode, add `auth-his` to the `spring.profiles.include` parameter, list all enabled URL parameters in `authentication.his.valid-his-params`, maximum number of their values in `authentication.his.maxObjects` and list permissions in `authentication.his.defaultHisPermissions`. For example,

```
spring.profiles.include=auth-pacsone,auth-his
authentication.his.valid-his-params=study
authentication.his.maxObjects=2
authorization.defaultHisPermissions=EXPORT_ARCH,DOCUMENT_VIEW
```

However it is recommended to **use the new token-based integration mode** instead:

- a token validator service (its reference implementation is bundled with MedDream for integration into PacsOne web interface) accepts object identifiers and returns a generated token;
- MedDream HIS integration links include only a single parameter called “token”;
- when MedDream loads, it obtains object identifiers (study, accession number, ...) from the token service.

For more information, including specification of the token service, see a separate document “MedDream DICOM Viewer integration MANUAL” (contact info@softneta.com if needed).

5. Deployment

This chapter is dedicated to PACS-independent part of the deployment. Normally you should start reading at support for a specific PACS under *Integration with PACS*, as those parts refer to this chapter anyway.

In case of Linux, this chapter assumes that the user has root permissions and appropriate part of MedDream installation archive was extracted into `/opt/meddream` (the file `/opt/meddream/MedDream-*.jar` exists).

5.1. Configuration

5.1.1. Essential configuration and the first run

The main configuration file is `application.properties` in the directory of `MedDream-*.jar`. After any changes it is required to restart the Java application.

During an upgrade it's recommended to use `application.SAMPLE.properties` (shipped with MedDream) as a template and update it based on contents of your old configuration file. This will prevent misunderstandings like parameters renamed or removed between versions.

1. Revise the following most important configuration parameters:

1. Application TCP/IP port

```
server.port = APPLICATION_PORT
```

Allows to choose a different port if the default one is occupied. Example: `server.port=80`.

2. Path to MedDream temporary files

```
com.softneta.meddream.tempDir = PATH_TO_MEDDREAM_TEMP_FILES
```

Allows to specify the path to location where MedDream temp files are stored. Example: `./temp`, `/tmp/meddream`, `E:\mdtmp`.

Note: Since 7.0 some cached files might need paths longer than 260 characters which are not allowed under Windows. The only solution is to have `com.softneta.meddream.tempDir` as short as possible.

Note: When specifying a path with a different Windows drive letter, always use the doubled backslashes. For example, `E:/mdtmp` and `file:/E:/mdtmp` will not work.

3. Under Linux, FFmpeg installation is required to create video thumbnails and convert some less-supported formats.

```
com.softneta.thumbnails.ffMpegExecutable = PATH_TO_FFmpeg
```

The default value is a simple name of the executable, `ffmpeg`. In most cases it is enough under Linux.

It might be enough under Windows, too, if you have a recent FFmpeg installation and the directory is included in `PATH` environment variable. Otherwise update this parameter with a full path to the bundled `${com.softneta.meddream.configRoot}/sys/ffmpeg/ffmpeg.exe`; you might need to use a literal path without placeholders.

4. Remaining values

During the first start these can usually remain unchanged. See [Reference for remaining configuration parameters](#).

2. Add native libraries bundled with MedDream for a more comprehensive support of compressed DICOM transfer syntaxes:

- open `libs.zip` and choose the folder suitable for your operating system. For example, `win-i686`;
- extract file(s) from that folder to a new folder of your choice. For example, `C:\MedDreamPACS-Premium\services\lib`;
- from now on you'll need to specify the path to this folder in the command that starts Java: `-Djava.library.path=PATH_TO_FOLDER`.

3. Start the Java application manually with a console command “java -jar”, for example, `java -jar MedDream-7.5.1.jar`.

After adding the native libraries mentioned above, the command changes accordingly. For example, `java -cp MedDream-7.5.1.jar -Djava.library.path=C:\MedDreamPACS-Premium\services\lib org.springframework.boot.loader.PropertiesLauncher`.

At this point it should just start up without errors, and the message “Application ... started” will eventually appear.

The login form at http://localhost:APPLICATION_PORT/ is disabled by default (results in a “not found” message) unless *Built-in authentication and authorization* is configured. As the optimal method might be PACS-dependent, you can configure it a bit later, together with the plugin for a particular PACS.

5.1.1.1. Additional steps for Linux

1. FFmpeg is required in order to display thumbnails of MPEG2 DICOM files and non-BD-compatible MPEG4 videos (Transfer Syntax UID 1.2.840.10008.1.2.4.102). If your distribution does not provide ffmpeg, avconv package may be used. In that case a symlink to avconv binary is required:

```
ln -s /usr/bin/avconv /usr/bin/ffmpeg
```

2. To display non-BD-compatible MPEG4 videos (Transfer Syntax UID 1.2.840.10008.1.2.4.102), latest version of FFmpeg might be required.
3. If Java application will run under a non-root user, then adjust file system permissions:

```
chown LIMITED_USER:LIMITED_GROUP -R /opt/meddream
find /opt/meddream -type d -exec chmod 775 {} \;
find /opt/meddream -type f -exec chmod 664 {} \;
```

Running Java application as root is OK for initial tests, however in production environment it should run under some limited user instead, ideally the one who can access all DICOM files in read only mode. A compromise would be to run the JVM under the same user as the PACS process.

This step makes sure that a process running under a limited user can access its files, especially the ones created earlier under name of root. In the simplest case you can examine the log file after starting the process under a different user, as even the log file will likely be non-writeable.

5.1.2. System.json

The file `system.json` (`sys/settings/system.json` by default) is automatically created if missing when the Java application starts. Several key features require this file to be updated; the application must be restarted afterwards.

An example of the entire file is shown below. When updating, take care to preserve the syntax (quotes, commas, brackets, etc); a text editor with JSON syntax checking is recommended.

```
{
  "disableMultiFrameVideoAutoLoad": false,
  "threeDimensionServiceIntegration": {
    "port": "8089",
    "protocol": "https:",
    "serverIP": "127.0.0.1",
    "pathPrefix": "D:\\DICOM",
    "pathPrefixReplaceTo": "Z:\\DICOM"
  },
  "features": {
    "patientHistory": true,

```

(continues on next page)

(continued from previous page)

```

"keyObjectAndPresentationStateQuickSave": true,
"keyObjects": true,
"presentationState": true,
"searchSettings": true,
"viewerSettings": true,
"reportSettings": true,
"hangingProtocolsSettings": true,
"export": true,
"archive": true,
"search": false
},
"blackListedSopClasses": [
  "1.2.840.10008.5.1.4.1.1.66",
  "1.2.840.10008.5.1.4.1.1.4.2"
],
"forwardPacs" : [
  {
    "storeScpIp": "127.0.0.1",
    "storeScpPort": 104,
    "storeScpAet": "PACS",
    "description": "An example destination for Forward"
  }
],
"languages" : ["lt","en","ru"],
"dicomLibraryConfiguration": {
  "dicomLibrarySender": "someone@mail.com",
  "dicomLibrarySubject": "My special study"
},
"asynchronousStudyLoading": false,
"formatIntegrationLinkInViewer": false
}

```

- disableMultiFrameVideoAutoLoad: false
 - (reserved) Disables multiframe and video autoloading. Used for automated testing purposes, do not change this setting.
- patientHistory: true
 - The viewer window will load patient history.
- keyObjects: true
 - The viewer window will load key objects.
- keyObjectAndPresentationStateQuickSave: true
 - The viewer window will display the Key Object And Presentation State Quick Save button.
- presentationState: true
 - The viewer window will load presentation state objects.
- searchSettings: true
 - Enable search settings page in the settings window.
- viewerSettings: true
 - Enable viewer settings page in the settings window.
- reportSettings: true
 - Enable report settings page in the settings window.
- hangingProtocolsSettings: true
 - Enable hanging protocol settings page in the settings window.

- **export: true**

Globally enable the Export/ISO (Burn) function. If disabled, it won't be available even to users who have the EXPORT privilege.
- **archive: true**

Globally enable the Export/Archive (Save Active ...) function. If disabled, it won't be available even to users who have the ARCHIVE privilege.
- **search: false**

Globally disable or enable the Search window. If disabled, the window will be replaced with an error message even for users who have the SEARCH privilege.

The window is disabled by default as currently it implements no per-user filters and allows access to every patient on the PACS. You need to explicitly use `true` here to enable the interactive search.

If MedDream will open only via HIS integration, `true` is still recommended as an *initial* choice, as interactive login usually provides a faster way to verify whether images can be displayed. In this case do not forget to switch to `false` after testing.
- **blackListedSopClasses: ["1.2.840.10008.5.1.4.1.1.66"]**

Thumbnails of images with these SOP Classes will not be shown in the viewer.

This list is appended to a hardcoded list of non-image objects from DICOM Standard. (By the way, the above ... 1.1.66 SOP Class is already there.) Main purpose of this setting is to hide any Private SOP Classes not known in advance.
- **storeScplp: "127.0.0.1"**

Destination IP address for the Forward function.
- **storeScpPort: 4242**

Destination TCP port for the Forward function.
- **storeScpAet: "PACS"**

Destination AE Title for the Forward function.
- **description: "An example destination for Forward"**

Human-readable description of a destination device for the Forward function.
- **languages: ["it","en","ru"]**

List of localization languages that will be offered (in this order) in MedDream user interface. The first entry becomes the default on user's computer when MedDream is opened there for the first time.
- **dicomLibrarySender: "someone@mail.com"**

The Share function requires a non-empty value. (If empty, 7.5+ displays the same "license does not allow updates" message even if the license is OK.)
- **asynchronousStudyLoading: false**

(experimental) When a single plugin of type QueryRetrieve is used, you can change this to `true` and enable a faster mode based on websockets.
- **formatIntegrationLinkInViewer: false**

(experimental) After the viewer opens, adjust the URL so that it becomes a HIS integration link suitable for copying. Only the "study" parameter and a single PACS plugin are supported.

5.1.3. Reference for remaining configuration parameters

The parameters listed below can be left alone in most situations. The rarest of them aren't included in application.SAMPLE.properties for the sake of its simplicity.

1. MedDream root directory

```
com.softneta.meddream.configRoot = PATH_TO_MEDDREAM_DIRECTORY
```

Examples:

```
com.softneta.meddream.configRoot = ../meddream
com.softneta.meddream.configRoot = /opt/meddream
com.softneta.meddream.configRoot = file:/C:/MedDreamPACS/
MedDream
```

2. Session duration in seconds

```
server.session.timeout = 60
```

Some PACS plugins are slower and might take several minutes to load even the structure of a large study (afterwards empty thumbnail placeholders are displayed). In these situations the timeout should be increased.

Please remember that due to larger timeouts, client connections will persist longer in case of inactivity or incorrectly closed MedDream window (using the "X" icon on the corner instead of "Logoff"). With a license that limits the number of concurrent connections, this might exhaust the free connections more often.

3. Session cookie name

```
server.session.cookie.name = MEDDREAMSESSID
```

The default value, JSESSIONID, might be also used by HIS or different software on the same domain; in these situations MedDream unpredictably loses its session.

4. IFRAME embedding permissions

This is the default and allows embedding MedDream only on the server that hosts it:

```
security.frameOptionsPolicy = SAMEORIGIN
```

(Results in headers X-Frame-Options: sameorigin, Content-Security-Policy: frame-ancestors 'self'.)

This disables both headers altogether, therefore MedDream can be opened in an IFRAME without any restrictions:

```
security.frameOptionsPolicy = NONE
```

This disallows IFRAME embedding completely:

```
security.frameOptionsPolicy = DENY
```

(Results in headers X-Frame-Options: deny, Content-Security-Policy: frame-ancestors 'none'. Please note that **DICOM PDFs won't open any more**, as MedDream uses an internal IFRAME for the system-default PDF viewer.)

This allows embedding on servers listed in the second parameter:

```
security.frameOptionsPolicy = ALLOW-FROM
security.frameOptionsWhitelist = 93.184.216.34,example.com
```

(Results in headers X-Frame-Options: allow-from <list>, Content-Security-Policy: frame-ancestors 'self' <list> with <list> populated from the second parameter.)

5. “Secure” flag of the session cookie

```
server.session.cookie.secure = true
```

After configuring `true`, MedDream must be accessed over HTTPS or else the browser won't send session cookies back to the server after a successful login. Recommended in HTTPS-only installations.

6. “SameSite” flag of the session cookie

```
server.servlet.session.cookie.sameSite = strict
```

The default value is the string “unset”, which means the flag is not added to the cookie. Other possible values:

- `none` – no restrictions on the cookie, however the “Secure” flag is still mandatory;
- `lax` and `strict` will further prevent embedding MedDream in an IFRAME, and might cause problems with viewing DICOM PDFs.

7. Local AE Title for saving annotations and key objects

```
com.softneta.meddream.dcmsnd.bind = MEDDREAM
```

Created DICOM objects will be sent to the PACS over DICOM C-STORE. This Local AET identifies MedDream as a sender. For testing purposes one might use any AET already accepted by the PACS.

Not used in case of the “QR” plugin because the plugin has a separate parameter for Local AET.

8. Credentials for /manage endpoint

```
security.user.name = LOGIN_NAME  
security.user.password = LOGIN_PASSWORD
```

This endpoint can be used to examine MedDream logs etc over HTTP, therefore it presents a security risk. Use a strong password, and do not leave it configured longer than necessary. (An empty username or password makes the login impossible.)

9. Log level

The log level can be adjusted for every class or a particular part of class hierarchy. The example below provides separate parameters (not alternatives of a single parameter).

```
logging.level.ROOT = ERROR  
logging.level.com.softneta = INFO  
logging.level.com.softneta.meddream.dicomStoreServer = DEBUG
```

10. Log file name without extension

```
logging.file = meddream
```

Commenting this line out will disable logging to file. The console, if visible, will still receive the messages.

Do not include the extension; it is added automatically together with additional suffixes.

To change the location of the file, please change `logging.path` instead.

11. Specify a certain directory for log files

```
logging.path = /var/log
```

12. Limit size of old log files

```
logging.file.max-size = 10MB
```

The log file is automatically rotated (renamed to *.log.1, *.log.2, ...) when its size reaches this value.

13. Limit number of old log files

```
logging.file.max-history = 10
```

During log rotation, the oldest ones are removed unless this parameter is set to 0.

14. Base directory for caching thumbnails, pixel data, DICOM attributes and study structure objects

```
com.softneta.preparation.cacheDir = ./temp/cache
```

15. Directory where converted videos and conversion process logs are stored

```
com.softneta.video.convertedDir = ./temp/converted-videos
```

16. Directory to store temporary anonymized images before uploading to DICOM Library

```
com.softneta.dicom.library.upload.tempDir = ./temp/upload-to-dicom-library
```

17. Settings for Export to ISO/Burn

```
com.softneta.export.tempDir = ${com.softneta.meddream.tempDir}
com.softneta.export.tmpCleanAfterSec = 86400
com.softneta.export.additionalSoftwarePath=
#com.softneta.export.isoSizes[0].id = MiniCD
#com.softneta.export.isoSizes[0].name = Mini CD (210 MB)
#com.softneta.export.isoSizes[0].size = 220200960
com.softneta.export.appendIsoSizes = false
```

Every `tmpCleanAfterSec` seconds after application start, MedDream attempts to remove outdated (older than `tmpCleanAfterSec`) export jobs and their temporary files under `tempDir`. During normal operation, this data is removed after the Export window closes, provided that there are no related background downloads.

If `additionalSoftwarePath` is specified, it shall be the path to a directory with files of a DICOMDIR viewer (`autorun.inf` and others). They will be automatically included in each disc of exported studies.

The `isoSizes[]` array can be used to specify custom media sizes. `id` is a simple alphanumeric identifier (Latin letters, no spaces). `size` is in bytes.

When `appendIsoSizes` is true, custom media sizes are appended to the default list of CD (681574400), DVD (5046586572), DL-DVD (9126805504). Otherwise the default list is lost and, if some of its entries are still needed, they need to be added to `isoSizes[]` manually.

18. Possibility to disable anonymization in the Share To DICOM Library function (VET license only)

```
com.softneta.dicom.library.upload.anonymized = false
```

For non-VET license this parameter is ignored and remains set to `true`.

19. Possibility to disable the study count request for Patient History window

```
com.softneta.meddream.patientStudyCountEnabled = false
```

This is not needed under normal circumstances (value should remain `true`).

20. Bind address of the HTTP server

```
server.address = 192.168.200.100
```

This parameter can be used to expose MedDream on a single IP address that belongs to the machine. The default value is 0.0.0.0, meaning “all IP addresses”.

21. Enable/disable compression of HTTP responses

```
server.compression.enabled = true
server.compression.mime-types = application/octet-stream
```

If the first parameter is set to true, then the second one lists comma-separated MIME types to which the compression will be applied.

22. Rename robots.txt

```
com.softneta.settings.robotsFileName = robots.txt
```

MedDream is shipped with an example file `sys/settings/robots.txt`. If you are experimenting with multiple files, it might be more convenient to point to a different one instead of rewriting contents of the same file.

23. “Send to DICOM Library”: upload chunk size

```
com.softneta.dicom.library.upload.partSize = 100000
```

The default is 1 MB. If the Internet connection to DICOM Library is slow, then smaller values might yield faster recovery from connection drops.

24. “Send to DICOM Library”: number of retries and related pause

```
com.softneta.dicom.library.upload.repeatTimes = 5
com.softneta.dicom.library.upload.repeatAfterSeconds = 5
```

If the upload process fails, then the related job pauses for `repeatAfterSeconds` seconds and retries up to `repeatTimes` times.

25. “Send to DICOM Library”: thread pool management

```
com.softneta.dicom.library.upload.job.corePoolSize = 10
com.softneta.dicom.library.upload.job.maxPoolSize = 100
com.softneta.dicom.library.upload.job.keepIdleForSeconds = 30
```

See <https://docs.oracle.com/javase/8/docs/api/java/util/concurrent/ThreadPoolExecutor.html>. Initially, `corePoolSize` threads are ready for work; up to `maxPoolSize` threads can be created on demand and they will be terminated after `keepIdleForSeconds` seconds of inactivity.

26. Local Storage SCP: AE Title

```
com.softneta.dicomStoreService.localAETitle = MEDDREAM
```

PACSeS need to know this value, the corresponding IP and port for sending images to MedDream.

27. Local Storage SCP: TCP port

```
com.softneta.dicomStoreService.port = 11116
```

The SCP binds to all IP addresses that belong to the machine, and listens on this port.

28. Local Storage SCP: base directory for received DICOM files

```
com.softneta.dicomStoreService.saveURIDirectory = file:///c:/StoreSCP
```

If left unconfigured or empty, the SCP will not start.

For better compatibility with the temporary files cleaner, empty value is recommended here instead of commenting the entire setting out.

Under this directory the SCP creates received files: CALLING_AET/ STUDY_INSTANCE_UID /SERIES_INSTANCE_UID/ SOP_INSTANCE_UID.dcm. The path must be absolute and in the file: format. Avoid long saveURIDirectory under Windows, because together with UID values from the files the path might become longer than supported by Windows.

29. Local Storage SCP: accepted Calling AE Titles

```
com.softneta.dicomStoreService.acceptAETitles = DCMSND,SENDTOPACS
```

A comma-separated list of accepted titles. It is not possible to accept “any” title.

If left unconfigured or empty, the SCP will not start.

30. Local Storage SCP: number of simultaneous connections

```
com.softneta.dicomStoreService.multiThreadCount = 5
```

Connections beyond this number will be ignored instead of rejecting associations.

31. Default value of (0008,0005) Specific Character Set when this attribute is missing in the DICOM file

```
com.softneta.dicomParser.defaultCharset =
```

Empty value, commented out line and US-ASCII are equivalent.

32. Force using defaultCharset above even if (0008,0005) is present in the DICOM file

```
com.softneta.dicomParser.defaultCharsetOverride = false
```

true will ignore any declarations in DICOM files. This might be adequate in a (small) clinic where all modalities specify wrong Specific Character Set.

33. MedCAD: path to backend plugins directory

```
com.softneta.meddream.medcad.pluginsDir = ./medcadPlugins
```

The value in this example is the default.

34. MedCAD: path to frontend plugins directory

```
com.softneta.meddream.medcad.frontendPluginsDir = ./md5/plugins
```

The value in this example is the default, and currently it's hardcoded in the frontend.

35. Background DICOM preparation (EXPERIMENTAL): thread management

```
com.softneta.preparation.coreThreadCount = 1
com.softneta.preparation.maxThreadCount = 40
com.softneta.preparation.workQueueSize = 2000
com.softneta.preparation.threadTimeoutSeconds = 120
com.softneta.preparation.multiFrameThreadCount = 5
```

See <https://docs.oracle.com/javase/8/docs/api/java/util/concurrent/ThreadPoolExecutor.html>. Initially, coreThreadCount threads are ready for work and up to maxThreadCount threads can be created on demand.

Threads are terminated after threadTimeoutSeconds even if busy. You might need more time if some files are very large.

For every multiframe file, up to `multiFrameThreadCount` threads will be created for processing frames of the same file in parallel.

36. Temporary files cleaner

The cleaner starts 30 seconds after the application start, and executes every `cleanRateSec`. Files are removed by their modification date.

You can configure multiple locations with a distinct file name pattern and maximum age. The setting `matchAnyDepth=false` disallows searching for a match in every subdirectory and beyond, thus helps to avoid needless scanning of underlying large directory trees.

The default configuration, which is duplicated below, lists known locations with possible leftover temporary files (MedDream removes most of them ASAP during normal operation).

```
com.softneta.tempCleaner.cleanRateSec=1800

com.softneta.tempCleaner.tempItems[0].directory = ${com.softneta.meddream.
↳tempDir}/archive
com.softneta.tempCleaner.tempItems[0].pattern = *
com.softneta.tempCleaner.tempItems[0].olderThanSec = 7200

com.softneta.tempCleaner.tempItems[1].directory = ${com.softneta.meddream.
↳tempDir}
com.softneta.tempCleaner.tempItems[1].pattern = *_export
com.softneta.tempCleaner.tempItems[1].olderThanSec = 21600
com.softneta.tempCleaner.tempItems[1].matchAnyDepth = false

com.softneta.tempCleaner.tempItems[2].directory = ${com.softneta.meddream.
↳tempDir}
com.softneta.tempCleaner.tempItems[2].pattern = forward_*.dcm
com.softneta.tempCleaner.tempItems[2].olderThanSec = 7200
com.softneta.tempCleaner.tempItems[2].matchAnyDepth = false

com.softneta.tempCleaner.tempItems[3].directory = ${com.softneta.meddream.
↳tempDir}/3d
com.softneta.tempCleaner.tempItems[3].pattern = *
com.softneta.tempCleaner.tempItems[3].olderThanSec = 7200

com.softneta.tempCleaner.tempItems[4].directory = ${com.softneta.video.
↳convertedDir}
com.softneta.tempCleaner.tempItems[4].pattern = *
com.softneta.tempCleaner.tempItems[4].olderThanSec = 3600

com.softneta.tempCleaner.tempItems[5].directory = ${com.softneta.preparation.
↳cacheDir}
com.softneta.tempCleaner.tempItems[5].pattern = *
com.softneta.tempCleaner.tempItems[5].olderThanSec = 604800

com.softneta.tempCleaner.tempItems[6].directory = ${com.softneta.dicom.
↳library.upload.tempDir}
com.softneta.tempCleaner.tempItems[6].pattern = *
com.softneta.tempCleaner.tempItems[6].olderThanSec = 86400

#com.softneta.tempCleaner.tempItems[7].directory = ${com.softneta.
↳dicomStoreService.saveURIDirectory}
#com.softneta.tempCleaner.tempItems[7].pattern = *
#com.softneta.tempCleaner.tempItems[7].olderThanSec = 86400
```

Take caution with the last entry (related to `saveURIDirectory`). If you uncomment it and the related `com.softneta.dicomStoreService.saveURIDirectory` setting is commented out, then the cleaner receives a literal string `${com.softneta...` and might misbehave. When not using the local DICOM receiver, you should either comment out (or remove) this entire cleaner entry, or set `saveURIDirectory` to an empty string (it is ignored both by receiver and

cleaner).

If you use some PACS plugins that download DICOM files instead of directly accessing them on PACS file system (like “QR”), then their cache directories might need to be added here, too.

37. Lifetime of cached thumbnails, pixel data, DICOM attributes and study structure objects

```
com.softneta.ehcache.timeToIdleSeconds = 86400
com.softneta.ehcache.cacheCleanRate = 1800000
```

Every `cacheCleanRate` *milliseconds*, entries older than `timeToIdleSeconds` will be removed (please note different units).

Warning: As of 7.5.1, the cache does not have a persistent index. If the application is restarted, any cached files become invisible to it; they won't be used any more, and won't be cleaned automatically. The *Temporary files cleaner* above provides a workaround.

5.1.4. Built-in authentication and authorization

MedDream supports a few universal authentication/authorization methods. They can be used when instructions for a particular PACS integration do not offer a dedicated (more proper) method.

Most methods are designed for the interactive login. As a result, the login form can be opened only when a particular method is chosen (for example, `spring.profiles.include = auth-pacsone`).

For authorization you can choose from the following list of permissions:

- ADMIN – Settings and Register,
- SEARCH – the Search window,
- PATIENT_HISTORY – Patient History,
- UPLOAD_DICOM_LIBRARY – Share (Send To DICOM Library window),
- EXPORT_ISO – the Export function related to “Download” and “Burn”,
- EXPORT_ARCH – the Export function related to “Save”,
- FORWARD – the Forward function,
- 3D_RENDERING – Oblique MPR,
- ANONYMOUS_VIEW – on-the-fly anonymization of visible patient data (not the exported data),
- DOCUMENT_VIEW – ability to view Structured Report and PDF documents.

Warning: Due to a bug, the `VIEW_PRIVATE` permission is almost always needed in `authorization.defaultLoginPermissions`, or else the Search window will nag with the message “Limited view access”. However this permission is meaningful only when using the `auth-pacsone` method and affects only plugins of type “PacsOne”.

In a similar fashion, `DOCUMENT_VIEW` must be present for pre-7.5.1 functionality. Currently MedDream does not support permissions of “deny” type (existing ones are of “grant” type), therefore it is not possible to grant `DOCUMENT_VIEW` for all users and afterwards deny for a few ones.

5.1.4.1. In-memory storage

Provides both authentication (username/password) and authorization (permissions). All this data must be entered into `application.properties`, in plain text form.

The `spring.profiles.include` setting must include `auth-inmemory`.

Elements of `authentication.inmemory.users[]` describe the credentials. Elements of `authorization.users[]` link to credentials and list the permissions. `authorization.defaultLoginPermissions` lists permissions common to everyone.

Example with two users:

```
spring.profiles.include = auth-inmemory
authentication.inmemory.users[0].userName = user1
authentication.inmemory.users[0].password = pass1
authentication.inmemory.users[1].userName = user2
authentication.inmemory.users[1].password = pass2
authorization.users[0].userName = user1
authorization.users[0].role = ADMIN,SEARCH,DOCUMENT_VIEW
authorization.users[1].userName = user2
authorization.users[1].role = SEARCH,ANONYMOUS_VIEW
authorization.defaultLoginPermissions = VIEW_PRIVATE,PATIENT_HISTORY,UPLOAD_DICOM_LIBRARY
```

5.1.4.2. Embedded database storage

Keeps credentials and permissions in a built-in H2 database. Passwords are salted and hashed.

There is no GUI so far, management involves running SQL commands in the H2 Console.

After fresh installation of MedDream, enable this profile and H2 Console

```
spring.profiles.include = auth-meddream
spring.h2.console.enabled = true
spring.h2.console.settings.web-allow-others = true
authorization.defaultLoginPermissions = VIEW_PRIVATE
```

then do the following:

1. Try to log in. Make sure the login failed with “Access Denied” error and the log contains messages “Query returned no results for user ...”, “User ... not found”.

This first attempt will be unsuccessful as the database doesn’t contain any accounts. However the file `sys/databases/authdb.mv.db` with all relevant tables will be automatically created for blank user and password values.

If the logged error is different (for example, you’ve got a `ClassCastException` instead), then clear all cookies **and saved passwords** and try again.

2. Try opening `:SERVER_PORT/h2-console` in the browser. It will request HTTP credentials defined by `security.user.name` and `security.user.password`, then display the H2 Console login form. Make sure the JDBC URL form field contains `jdbc:h2:file:MEDDREAM_ROOT_DIR/sys/database/authdb` and both “User Name” and “Password” are empty. Then press the “Connect” button.
3. After the H2 Console opens, make sure the database contains the tables “USERS” and “PERMISSIONS”, then use the following SQL expressions to create new users:

```
INSERT INTO users VALUES ('LOGIN_NAME', 'ENCODED_PASSWORD', 1);
INSERT INTO permissions VALUES ('LOGIN_NAME', 'PRIVILEGE_NAME');
```

ENCODED_PASSWORD consists of a prefix (like `{bcrypt}`) that identifies the algorithm, and the encoded value. For the `bcrypt` algorithm (recommended) you can use online services like <https://www.javainuse.com/onlineBcrypt> (do not forget to add the prefix afterwards).

Example: `INSERT INTO users VALUES ('admin', '{bcrypt}$2a$10$DqbOQDCzx.inz.anVIYUoOiw.331UiOn.PIhLWZVlIKARQEJNsJzC', 1).`

The third column can either be 1 or 0. Zero means a disabled account (login not possible).

`PRIVILEGE_NAME` can be ADMIN, FORWARD, EXPORT_ISO, etc. Use multiple “INSERT INTO permissions” statements when adding more than one privilege.

- As shown in the example, you can use `authorization.defaultLoginPermissions` to assign permissions that are needed for every user account.

Note: Do not forget Step 1, because then

- Step 2 will also create `authdb.mv.db` but without the relevant tables (unless you modify the JDBC URL in a particular cumbersome way). This state is unsuitable for continuing with Step 3;
- you can accidentally specify a non-blank username or password during Step 2, and not get any warning or error; however afterwards Core will be unable to access the database.

Provided that credentials were empty, you can retry Step 1 later which will populate the tables. Stopping Core and removing `authdb.mv.db` might also help.

5.1.4.3. LDAP storage

Verifies credentials against an LDAP server (use third-party tools to manage credentials and groups). Mapping between user’s LDAP groups and MedDream permissions is configured in `application.properties`. The latter can also append permissions to individual users.

The `spring.profiles.include` setting must include `auth-openldap` or `auth-activedirectory`.

The main setting is `authentication.ldap.url`: hostname, port and base DN. Other settings depend on the profile (server type).

Example for OpenLDAP:

```
spring.profiles.include = auth-openldap
authentication.ldap.url = ldap://MY-SERVER:389/ou=DEPT-NAME,dc=COMPANY-NAME
authorization.defaultLoginPermissions = SEARCH,EXPORT_ARCH,EXPORT_ISO,PATIENT_HISTORY,
↔UPLOAD_DICOM_LIBRARY,DOCUMENT_VIEW
authorization.remapRoles.DOCTORS-GROUP-NAME = 3D_RENDERING
authorization.remapRoles.ADMINS-GROUP-NAME = ADMIN
authorization.remapRoles.TECHNICIANS-GROUP-NAME = FORWARD
authorization.users[0].userName = USER-NAME-1
authorization.users[0].role = ADMIN
authorization.users[1].userName = USER-NAME-2
authorization.users[1].role = FORWARD
```

To authenticate, MedDream binds to DN `uid=LOGIN-NAME,ou=People,ou=DEPT-NAME,dc=COMPANY-NAME` (the part `uid=...,ou=People` is hardcoded) using `LOGIN-NAME` and password from the login form.

Then it collects groups to which this user belongs, by searching for group objects exactly in `ou=groups,ou=DEPT-NAME,dc=COMPANY-NAME` with a filter `(memberUid=LOGIN-NAME)`; both `ou=groups` and the filter are hardcoded.

Finally, `authorization.remapRoles.*` and `authorization.users[]` are consulted for corresponding MedDream permission sets: the group `DOCTORS-GROUP-NAME` receives `3D_RENDERING`, the user `USER-NAME-1` additionally receives `ADMIN`, etc.

Example for Active Directory:

```

spring.profiles.include = auth-activedirectory
authentication.ldap.url = ldap://MY-SERVER:389/ou=DEPT-NAME,dc=COMPANY-NAME
authentication.ldap.bindUserDn = cn=MEDDREAM-APP,ou=SERVICE,ou=DEPT-NAME,dc=COMPANY-NAME
authentication.ldap.bindUserPassword = MEDDREAM-APP-PASS
authentication.ldap.userSearchBase = ou=USERS
authentication.ldap.groupSearchBase = ou=USERS
authorization.defaultLoginPermissions = SEARCH,EXPORT_ARCH,EXPORT_ISO,PATIENT_HISTORY,
↳UPLOAD_DICOM_LIBRARY,DOCUMENT_VIEW
authorization.remapRoles.DOCTORS-GROUP-NAME = 3D_RENDERING
authorization.remapRoles.ADMINS-GROUP-NAME = ADMIN
authorization.remapRoles.TECHNICIANS-GROUP-NAME = FORWARD
authorization.users[0].userName = USER-NAME-1
authorization.users[0].role = ADMIN
authorization.users[1].userName = USER-NAME-2
authorization.users[1].role = FORWARD

```

To authenticate, MedDream binds to bindUserDn using bindUserPassword, searches for a user object at or below ou=USERS (empty userSearchBase is not allowed) with a hardcoded filter (sAMAccountName=LOGIN-NAME), then binds to the found DN using the password from the login form.

Then it extracts group names from this user object. Its attributes memberOf (hardcoded) are expected to contain group DNs which start with cn=GROUP-NAME, . . . Due to technical limitations, the user object found earlier is not reused – a second search is performed at or below groupSearchBase (should obviously be equal to userSearchBase) with the same hardcoded filter (sAMAccountName=LOGIN-NAME).

As with OpenLDAP, authorization.remapRoles.* provide permission sets for entire groups, while authorization.users[] can add more permissions to individual users.

5.1.4.4. Database connection

Generic authentication against a DBMS server (use third-party DBMS tools to manage credentials). Internal MedDream permissions are assigned to users in application.properties.

Example with two MySQL users:

```

spring.profiles.include = auth-db-connection
authentication.database.driverClassName = com.mysql.jdbc.Driver
authentication.database.jdbcUrl = jdbc:mysql://127.0.0.1:3306/pacs2
authorization.defaultLoginPermissions = VIEW_PRIVATE,EXPORT_ARCH
authorization.users[0].userName = user1
authorization.users[0].role = ADMIN,SEARCH,DOCUMENT_VIEW
authorization.users[1].userName = user2
authorization.users[1].role = SEARCH

```

authorization.defaultLoginPermissions lists permissions common to everyone.

Supported values for authentication.database.driverClassName:

- com.mysql.jdbc.Driver,
- org.postgresql.Driver,
- com.microsoft.sqlserver.jdbc.SQLServerDriver.

5.1.5. Predefined login credentials

In demo installations it is sometimes desirable to have the login form automatically filled with some working credentials.

For that it is necessary to patch `md5/index.html`. Find the final `</body></html>` and insert the following before it:

```
<script>
window.autoFillLogin = { username: ACCOUNT_USERNAME, password: ACCOUNT_PASSWORD }
</script>
```

For example,

```
... src="js/md.main.min.7.5.1-47d313eb039c.js"></script>
<script>
window.autoFillLogin = { username: 'demo', password: 'demo' }
</script>
</body> </html>
```

5.1.6. Java memory limits

Some example configurations included in MedDream installation archive specify 1 GB, which is sufficient for typical files.

In general, the application requires **an amount of memory no less than the size of the largest DICOM file**. Use this as a ballpark figure, and add a generous overhead for simultaneous connections. Furthermore, up to `com.softneta.preparation.maxThreadCount` files of the same study will be processed in the background simultaneously, so this should be taken into account, too, when your studies contain multiple moderately-sized files.

Experiments with a single connection show that a single 1.3 GB multiframe file opens rather slowly under a 2 GB memory limit and without problems under a 3 GB limit; consequently, 4 GB would be recommended in this case.

The memory limit is configured by the Java option `-XmxSIZE`, where `SIZE` can use suffixes “M”, “G”, etc (for example, `-Xmx1024M`).

- When you are starting the backend from the console (during *Essential configuration and the first run*, or for a quick experiment with a stopped service), then just add `-Xmx4G` etc as the first option. For example,

```
java -Xmx4G -jar MedDream-7.5.1.jar
java -Xmx4G -cp MedDream-7.5.1.jar -Djava.library.path=C:\
MedDreamPACS-Premium\services\lib org.springframework.boot.loader.
PropertiesLauncher
```

- When the service is already set up, then you need to adjust the application command line in the corresponding part of the installation. See the next chapter, *Running as a service*, for possible locations.

5.2. Running as a service

You should first make sure everything works when the Java Core is started manually. Afterwards a more standalone setup makes sense.

5.2.1. Windows

1. In the directory of the Java application, copy MedDream.NET2.exe or MedDream.NET4.exe (depends on installed .NET version) to MedDream.exe;
2. Open the Command Prompt;
3. Run the command `MedDream.exe install`;
4. Start the service from the Windows service manager.

Note: If you need a native library from “libs.zip” mentioned earlier, then update `<arguments>...</arguments>` in `MedDream.xml` accordingly.

Note: When configuring Token Service this way, copy the chosen `MedDream.*.exe` to `token-service.exe`. The accompanying file `token-service.xml` already exists and will likely not require any modifications.

5.2.2. Linux (System-V init)

If your architecture is not 64-bit but 32-bit, then rename `{INSTALL_DIRECTORY}/meddream-jar-wrapper.i386` to `meddream-jar-wrapper`.

If your system is RedHat-like (Fedora, RHEL, etc), then copy `{INSTALL_DIRECTORY}/meddream.redhat` to `{INSTALL_DIRECTORY}/meddream`. If it's Debian-like (Ubuntu, Debian itself, etc), then copy `{INSTALL_DIRECTORY}/meddream.debian` to `{INSTALL_DIRECTORY}/meddream`.

Execute the following commands:

```
sudo ln -s {INSTALL_DIRECTORY}/meddream /etc/init.d/meddream
sudo chmod +x {INSTALL_DIRECTORY}/meddream {INSTALL_DIRECTORY}/meddream-jar-wrapper
sudo service meddream start
sudo chkconfig meddream on
```

Note: The variable `BASEDIR` in the script is dynamically initialized with the directory of the script itself. This means that you must leave the script near the JAR file, and place only a softlink in `/etc/init.d`. The entire script can be copied to `/etc/init.d` only if you adjust `BASEDIR`, too.

As Debian-like systems don't have `chkconfig`, the last command can be replaced with `sudo update-rc.d meddream defaults`.

By changing the line `USER=root` in `{INSTALL_DIRECTORY}/meddream`, you can force a less privileged user that can still access DICOM files etc. However this will likely require updating the line `PIDF=/var/run/$PROG.pid`, too, as `/var/run` is usually a privileged location (a `chown`'ed subdirectory will suffice in that case).

The file `{INSTALL_DIRECTORY}/meddream` also contains the JRE command line, for example:

```
MD_JAR_COMMAND="java -Xmx1G -cp MedDream-7.5.1.jar -Djava.library.path=./lib org.
↳springframework.boot.loader.PropertiesLauncher"
```

Note: When configuring the Token Service this way, the file names and command parameters change as follows:

- `{INSTALL_DIRECTORY}/meddream.*` to `{INSTALL_DIRECTORY}/token-service.*`
- `{INSTALL_DIRECTORY}/meddream` to `{INSTALL_DIRECTORY}/token-service`
- `{INSTALL_DIRECTORY}/meddream-jar-wrapper` to `{INSTALL_DIRECTORY}/token-service-jar-wrapper`

- `sudo service meddream start` to `sudo service token-service start`
- ...

5.2.3. Linux (systemd)

Create the file `/etc/systemd/system/meddream.service` with the following text:

```
[Unit]
Description=MedDream Viewer
After=syslog.target

[Service]
WorkingDirectory=/opt/meddream
User=root
ExecStart=/usr/bin/java -Xmx1G -cp /opt/meddream/services/MedDream-7.5.1.jar -Djava.
↳library.path=/opt/meddream/services/lib org.springframework.boot.loader.
↳PropertiesLauncher
SuccessExitStatus=143

[Install]
WantedBy=multi-user.target
```

Note: Update `User=root` with the actual username under which the Java application will run.

Execute the following command for service autostart:

```
sudo systemctl enable meddream.service
```

Note: When configuring the Token Service this way, change as follows:

- `meddream.service` to `token-service.service`
- `MedDream-*.jar` to `token-service.jar`
- `MedDream Viewer` to `MedDream Token Service`
- `ExecStart=/usr/bin/java -Xmx1G -jar token-service.jar`

5.2.4. Linux (upstart)

Create a file `/home/{user name}/.config/upstart/meddream.conf` with the following text:

```
description "MedDream Viewer"
respawn
exec java -Xmx1G -cp {INSTALL_DIRECTORY}/MedDream-7.5.1.jar -Djava.library.path={INSTALL_
↳DIRECTORY}/lib org.springframework.boot.loader.PropertiesLauncher
```

Note: When configuring the Token Service this way, change as follows:

- `meddream.conf` to `token-service.conf`
- `MedDream Viewer` to `MedDream Token Service`
- `exec java -Xmx1G -jar token-service.jar`

5.3. Verification checklist

Suppose you already went through the *Essential configuration and the first run* chapter, configured the authentication method and PACS plugins, set up Java applications as services, adjusted system.json and even read the *Reference for remaining configuration parameters* superficially.

It's time for a final check-up.

- For installations with an interactive login and Search window:
 - The login form does not produce an error message and is successfully replaced by the Search window. An administrative login (with the ADMIN privilege) also succeeds and gives access to the Settings window.

In 7.5.1, there is no sense to have an interactive login if the Search window is disabled (the text “404” on dark background, due to features.search=false in system.json).

Even if the integration doesn't offer a working search functionality, you might still decide to keep the window enabled, at least for a short time – for convenient access to the Settings window via an administrative login.
 - The Search window shows studies from every configured PACS plugin (except FileSystem).
 - * Results can be restricted by date interval, Patient ID, etc. Keep in mind, however, that some plugins do not support returning some fields at all, and some plugins do not support filtering by some returned fields.
 - * If the plugin supports filtering by user identity (for example, Edge), then results are different depending on who is logged in. Consult configuration of the PACS and MedDream for a suitable identity.
 - If Export or Forward are enabled (both globally and by current user's permissions), then the operation can be started from Search window and succeeds.
- For all installations:
 - Opening a study succeeds: thumbnails are displayed instead of exclamation marks, the chosen image opens as well.

Choose the studies wisely and cover at least different modalities.

 - * Attempt to open MPEG2/MPEG4 video studies if any exist.
 - * For example, if the PACS stores all images from a particular Source AE, or some historic images, at a totally different location, then you might not notice a faulty “mappedStorageLocation” plugin setting until those images are accessed.

When opening from the Search window, repeat the attempt for every PACS plugin that returned some search results.
 - From an open study, all functionality allowed by 1) configuration, 2) license and 3) current user's permissions, is accessible and succeeds:
 - * Export,
 - * Forward,
 - * Share to DICOM Library,
 - * Oblique MPR,
 - * display of PDFs and SRs,
 - * the expected set of measurements is available.

Repeat with less-privileged users if any exist.
 - The Core service (and the token validation service, if used) starts successfully after rebooting the entire machine.

- If rebranding is used, then the About window etc. looks as expected.
- For HIS integration installations:
 - In case of “unsafe” integration, check if every enabled URL parameter (“study” etc) results in opening of the right study.
 - In case of token-based integration, also check whether MedDream correctly handles all integration options implemented in your HIS: expected set of object identifiers (“study”, “accnum”, etc – no less and no more), token-specified patient history, object restrictions (like by Patient ID), one-time tokens, limited-lifetime tokens. This will obviously involve different tokens and experiments at the HIS side.
 - If MedDream is supposed to open in an IFRAME at your webpage, then also attempt to open it from the dedicated network and using the dedicated server hostname.

A few first days after going online can involve multiple restarts of the Core service. In 7.5.1, each restart can leave a lot of unused temporary files that will be removed some time later. The cleanest way to verify this removal is to lower every “olderThanSec” setting (for example, to 1 second) temporarily and confirm that all accumulated files disappear. Nevertheless monitoring of the disk space is still advised.

6. Additional software

MedDream can be used in tandem with several external pieces of software that are listed below.

To get the required software, please contact support@softneta.com.

6.1. 3D service

6.1.1. 3D server configuration

The XStream HDVR WebSDK runs with default system configuration (non-SSL through port **8088**) with the most common quality and performance settings. Default behavior is described below and is changed by modifying the file `foviasever/config/configuration.xml`. The server must be restarted for any changes to take effect. The system configuration and default settings are described below:

```
<nodePort>8088</nodePort>
<useSSL>0</useSSL>
<jpegInteractive>50</jpegInteractive>
<jpegFinal>95</jpegFinal>
```

6.1.2. Network settings (ports and SSL)

`nodePort` and `useSSL` above specify the network protocol and port to be used. Separate port configuration settings are used for SSL and non-SSL, although only one can be used at one time.

The port can be changed to any valid unused port, such as 9123. After restarting your server, validate that the test app “helloFovia” still works correctly after the corresponding reconfiguration (`<FoviaServerIPAddress>. . . :9123/version. . .`).

To enable SSL, set `useSSL` to 1 and restart your server. You can test the HTTPS protocol on the URL `https://localhost:8088/version` which uses the supplied test certificate. In a production environment, replace the supplied demo files `server.crt` and `server.key` in the directory `foviasever/ssl` with your company’s official certificate.

6.1.3. Quality / Performance

Default values for quality and performance are explained below. Care must be taken when changing these settings since they affect all users on the system. There are two types of quality / performance metrics in the system: those that relate to network, and those that relate to the actual rendering (and ray casting).

The network quality and performance trade off affects how much bandwidth is required for transferring images over the network, and specifically the amount of JPEG compression for interactive and final quality images. This is largely independent of rendering quality that is described below.

There are two levels of JPEG compression: `jpegInteractive` is set to 50/100 and `jpegFinal` is set to 95/100. Typically during mouse interactions, many frames of quality `jpegInteractive` are generated (such as during the `render()` call during a `mousemove` operation). These are quick rendering operations with more aggressively compressed JPEG images. On `mouseup`, a `renderFinal()` operation is triggered and results in a frame of quality `jpegFinal`. The rendering engine will take longer to generate higher quality images, and JPEGs with less aggressive compression will be used for these.

The server version and configuration settings are displayed at <http://localhost:8088/version>.

The 3D service creates a 3D representation of the study. In order to use the 3D service the MedDream license must have the "3D" module and the following files have to be edited.

6.1.3.1. system.json

In this file, update the parameters below `threeDimensionServiceIntegration`:

```
{
  "threeDimensionServiceIntegration": [{
    "serverIP": "127.0.0.1",
    "port": "8088",
    "protocol": "http:",
    "pathPrefix": null,
    "pathPrefixReplaceTo": null
  }]
}
```

- `serverIP`

Address of the server where the 3D service is installed. Default value: "127.0.0.1".

- `port`

The set port of the 3D service. Default value: "8088".

- `protocol`

The transfer protocol used by the server. Possible values: **http**, **https**.

- `pathPrefix`

Used if the 3D server is on a different machine than the PACS and the latter keeps DICOM files locally. Sets the base path of the DICOM file storage folders (like `D:\DICOM`). Default value: `null`.

- `pathPrefixReplaceTo`

A local equivalent of `pathPrefix`. At least this contains the path on the 3D server machine where DICOM file storage shared on the PACS machine is mounted (like `Z:\DICOM`). Default value: `null`.

6.1.3.2. Apache configuration file (httpd.conf)

If outside connections to the 3D service are not allowed, then the Apache configuration needs the following lines:

```
<IfModule proxy_module>
  <IfModule proxy_http_module>
    RewriteEngine On
    RewriteCond %{REQUEST_URI} ^/socket.io [NC]
    RewriteCond %{QUERY_STRING} transport=websocket [NC]
    RewriteRule /(.*) ws://{3D_SERVICE_IP}:{3D_SERVICE_PORT}/$1 [P,L]
    ProxyPass /socket.io http://{3D_SERVICE_IP}:{3D_SERVICE_PORT}/socket.io
    ProxyPassReverse /socket.io http://{3D_SERVICE_IP}:{3D_SERVICE_PORT}/socket.io
  </IfModule>
</IfModule>
```

Note: When SSL is used, change `ws` to `wss` and `http` to `https`.

6.2. Browser plugin

A plugin for the Chrome browser that expands a newly opened tab across several monitors. The URL is scanned for a entered keyword and if a match is found, a new window is created and expanded across the selected monitors. The plugin can be added using the Chrome extension tab.

To obtain the plugin, please contact support@softneta.com.

7. Security considerations

RATIONALE: It is an old dilemma of using “security through obscurity”. As a matter of fact, most MedDream installations tend to have a few security holes due to non-paranoid Web administrators. The very publication of this knowledge makes every old/unmaintained MedDream installation an easy target. But, we must draw a line one day so that at least new installations are secure.

7.1. Search engines

MedDream is shipped with the following `sys/settings/robots.txt`:

```
User-agent: *
Disallow: /

User-agent: AdsBot-Google
Disallow: /
```

This should prevent finding Internet-exposed MedDream login forms by searching for “MedDream” or “Softneta” (as most customers don’t use rebranding). Afterwards an attacker could check for known issues or misconfigurations.

If you still would like to index your installation, or allow indexing for a particular search engine only, then `sys/settings/robots.txt` can be modified accordingly (see <http://www.robotstxt.org/robotstxt.html>) or even renamed/removed. The backend treats the file as a static anonymous resource and simply returns contents of the file if it is found.

7.2. DCM4CHEE 2.x

Official installation instructions offer some defaults that sometimes are left unchanged.

The default database name for 2.x is “pacsdb”. You also might be tempted to call it “dcm4chee”. For a knowledgeable attacker, both provide a clear suggestion which PACS is there and what to try next.

After a mindless installation there also will be some default user accounts:

- a database user “pacs” with password “pacs”. Perfectly suitable for MedDream;
- an internal user “admin” with password “admin” – suitable for MedDream and DCM4CHEE’s web interface;
- an internal user “user” with password “user” – suitable for MedDream and DCM4CHEE’s web interface.

Any of these accounts can be used to access sensitive patient data. We suggest to change passwords for all three, as soon as possible after the installation. The first one is used by DCM4CHEE to connect to the database, therefore you will also need to update the file server/default/deploy/pacs-*-ds.xml (name depends on database used).

7.3. Embedding into IFRAME etc

Availability to embed MedDream into FRAME, IFRAME or OBJECT containers allows untrusted websites to use MedDream in fraudulent manner (“clickjacking”). Since v6.2.1 this is restricted by default: only the server that hosts MedDream is allowed to wrap it with an additional container.

It is possible to adjust IFRAME permissions in the application.properties file. Valid values for `frameOptionsPolicy`: NONE, DENY, SAMEORIGIN, ALLOW-FROM. When NONE is used, then the X-Frame-Options and Content-Security-Policy headers are not sent; when ALLOW-FROM is used, then valid host must be set in parameter `security.frameOptionsWhitelist`. Address entries are separated using spaces.

```
security.frameOptionsPolicy=POLICY_VALUE
security.frameOptionsWhitelist=IP_ADDRESS or HOST_ADDRESS
```

7.4. php.ini

Some PHP settings might make the installation less secure. This chapter lists most important recommendations and caveats.

Error handling

- `expose_php = Off`

The value “Off” hides the version of PHP from webserver response headers or error messages and therefore makes it more difficult to scan for known vulnerabilities of PHP itself.

- `error_reporting = E_ALL`

“E_ALL” is recommended for production. However during installation/troubleshooting of any server, including a production one, a more detailed choice like “E_ALL | E_STRICT” might be needed. One could have two versions of this line and comment the inactive one out.

- `display_errors = Off`
- `display_startup_errors = Off`

Use “Off” in production for both, or else error messages visible to the end user might reveal paths to files and other sensitive information.

- `track_errors = Off`

Can remain disabled as MedDream’s `applet.php` doesn’t use `$php_errormsg`.

- `html_errors = Off`
 “On” is not needed and, due to `display_errors=Off`, has no effect anyway.
- `log_errors = On`
- `error_log = /valid_path/PHP-logs/php_error.log`
 Logging to a file is preferred over *STDERR*. The latter means Apache’s `error_log` where PHP messages will be intermixed with Apache messages and therefore harder to read.
- `ignore_repeated_errors = Off`
 “On” is OK only as a temporary measure if there are lots of identical errors, they are filling up the log and nothing else can be done about that right now.

General settings

- `doc_root = /PacsOneInstall/php`
 In 7.5+, the only part of MedDream served over the Web is `applet.php` when copied to PacsOne’s “php” directory. In this configuration you can specify this directory or some parent part of the path.
- `open_basedir = /PacsOneInstall/php`
 Not relevant to MedDream any more.
 A non-empty setting provides more benefits (and influence) to other software, like PacsOne GUI, running on the same Apache server. Take caution and test all functionality.
- `include_path = ./path/PHP-pear/`
 Keep this list as short as possible. This setting is not related to `applet.php` of MedDream, but might be used by other software if hosted on the same server.
- `extension_dir = /path/PHP-extensions/`
 Use a full path. This parameter is not relevant to MedDream any more.
- `mime_magic.magicfile = /path/PHP-magic.mime`
 Use a full path. Not relevant to MedDream any more. When using MedDream with PacsOne on the same host, PacsOne might still benefit on correct value.
- `allow_url_fopen = Off`
 “On” is not required by MedDream 7.5+.
- `allow_url_include = Off`
- `allow_webdav_methods = Off`
 “Off” for both is safer and doesn’t interfere with any MedDream functionality.
- `variables_order = "GPCS"`
 A general recommendation, not relevant to MedDream any more.
- `session.gc_maxlifetime = 600`
 Not relevant to MedDream any more as sessions are now handled at Java side. Will influence behavior of PacsOne GUI, though.
 A smaller value will log the user off faster if the browser is closed, the computer is suspended or the Internet connection is cut. 10 minutes is a sane default and the legacy default is 1440 (24 minutes).

File uploads

- `file_uploads = Off`

MedDream 7.5+ does not contain PHP-based Reporting functionality so this setting doesn't apply.

"On" might be important for PacsOne, though, as its Study Notes and Upload Dicom Image functions work in a similar way.

- `upload_tmp_dir = /path/PHP-uploads/`

Use a full path. A separate directory might make cleaning leftover files easier.

- `upload_max_filesize = 10M`
- `post_max_size = 40M`

Files larger than `upload_max_filesize` will fail to upload. To account for overhead, ensure `post_max_size > 4*upload_max_filesize` and `memory_limit > 16*post_max_size`.

- `max_file_uploads = 1`

PacsOne always uploads a single attachment together with a Study Note so "1" is a safe choice.

Executable handling

- `enable_dl = Off`

Not relevant to MedDream any more, and "Off" is a safer choice.

- `disable_functions = system, shell_exec, passthru, phpinfo, show_source, highlight_file, fopen_with_path, dbmopen, dbase_open, putenv, exec, popen, proc_open, move_uploaded_file, mkdir, rmdir, chmod, rename, chdir, filepro, filepro_rowcount, filepro_retrieve, posix_mkfifo`

These functions are generally considered dangerous and `applet.php` of MedDream does not use them.

If MedDream runs together with PacsOne on the same host, then some functions listed above might interfere with proper functioning of PacsOne. Take caution and test the configuration.

Session handling

- `session.save_path = /path/PHP-session/`

Use an absolute path. This will ensure that both Apache-integrated and CLI versions of PHP keep session files in the same location.

- `session.name = mysessid`

You can rename the session cookie to something less obvious.

Not relevant to MedDream any more but other software on the same Apache server might benefit from this.

- `session.auto_start = Off`

Not relevant to MedDream any more, and "Off" is a safer choice.

- `session.use_trans_sid = 0`
- `session.use_cookies = 1`
- `session.use_only_cookies = 1`

Not relevant to MedDream any more, and "Off" is a safer choice. Take care with PacsOne, though.

- `session.cookie_domain = my.website.tld`

Not relevant to MedDream any more, and "Off" is a safer choice. Take care with PacsOne, though.

- `session.use_strict_mode = 1`

"1" or "On" is more secure. There is no effect on MedDream functionality in any case.

- `session.cookie_lifetime = 0`
Zero is the legacy value (the session exists while the browser is not closed) and end users are accustomed to it. This is more relevant to PacsOne than MedDream.
- `session.cookie_secure = 1`
Not relevant to MedDream any more. If Apache also hosts other software that is accessed only via HTTPS (plain HTTP is undesirable), then set this to “1”.
- `session.cookie_httponly = 1`
“1” is a general recommendation. Not relevant to MedDream any more, but might influence other software if hosted on the same server.
- `session.cache_expire = 30`
Not relevant to MedDream any more but might influence other software if hosted on the same server.
- `session.cookie_samesite = Strict # PHP 7.3+`
- `session.sid_length = 256 # PHP 7.1+`
- `session.sid_bits_per_character = 6 # PHP 7.2+`
- `session.hash_function = 1 # PHP 7.0-7.1`
- `session.hash_bits_per_character = 6 # PHP 7.0-7.1`
The above values are recommended and are understood by newer PHP versions.
- `session.referer_check = http://server/path`
Not relevant to MedDream any more but might influence other software if hosted on the same server. For PacsOne, you can set here a typical URL pointing to its GUI (directories only, without home.php etc).

Less obvious settings

- `memory_limit = 50M`
- `max_execution_time = 30`
Not relevant to MedDream any more. The setting provides more benefits (and influence) to other software running on the same Apache server.
- `report_memleaks = On`
“On” might help to detect memory leaks earlier. Not relevant to MedDream any more.

7.5. Browser’s cache

MedDream is designed with “zero footprint” concept in mind. From a security perspective this also means that no patient data is left on a client machine: after the end user logs out from MedDream, its cache does not contain any server responses with patient data.

Normally browsers obey the “do not cache” headers. [Firefox, however, has a bug](#) that allows to extract potentially sensitive data from browser’s memory cache after the user logs out and doesn’t close the entire browser application. On a shared computer, an attacker could later examine the memory cache and access data that isn’t available to him via MedDream and HIS.

Shared computers make protecting sensitive data a lot more difficult. If this is unavoidable, then we recommend at least to avoid Firefox or teach users to also close the entire browser (not just a particular tab or one of the windows) after logout.

7.6. Firewalls

Every server, especially the ones that handle medical data, should have a working firewall.

MedDream obviously needs permission to listen at port configured by `server.port` for a typical HTTP(s) traffic. When the QueryRetrieve plugin is used with websockets (`asynchronousStudyLoading=true` in `system.json`), they operate over the same port.

When using Oblique MPR, every client machine will directly access the corresponding backend (`threeDimensionServiceIntegration` in `system.json`). Do not forget to allow this, too.

Outgoing network accesses might need to be whitelisted in a corporate firewall:

- the Register function downloads a license file from `lic.softneta.com`;
- the About window verifies availability of a new version at `www.softneta.com`.

8. Localization

By default MedDream is available in English, Lithuanian and Russian; user documentation is only in English.

Warning: Softneta is not responsible for not verified translations made by licensed users. Please note that Medical Device certificates are not valid for not verified translations.

The default value of “languages” setting in `sys/settings/system.json` is just “en”. You can specify any available language or their combination. For example, `["en"]` can be changed to `["lt", "en", "ru"]`.

9. Rebranding

MedDream can be rebranded and use custom branding information (e.g., logo, product name, contact details).

Important things to consider:

- By default the software license does not allow rebranding of the About dialog. Please contact info@softneta.com for an updated license that is fully compatible with rebranding.
- The license can also define software as a module and, as a result, hide the following parts of the About dialog: “Manufactured by”, “Medical device class”, “ID of the notified body”, “FDA Cleared”, the FDA and CE labels.
- Rebranded software does not check for recent versions; the version displayed in About dialog is always considered up to date.

Configuration and related files must be located in the directory `sys/settings/rebranding/`.

The main configuration file is ‘`rebranding_configuration.json`’. It must contain a valid JSON object without comments and newlines. The file must be encoded in UTF-8.

When rebranding is enabled, most attributes must be specified in the file as they have no default values.

JSON object attributes:

- `isRebranded`

Possible values: true, false

Default value: false

This attribute allows to turn on/off rebranding without changing a lot of other attributes.

Example:

```
"isRebranded":true
```

• `productName`

Possible values: any text

Replaces the text “MedDream” in the bottom left corner of the login form, the “Product” part of the About dialog, the title of the browser tab.

Example:

```
"productName": "MyViewer"
```

• `productVersion`

Possible values: any text

Replaces the version in the bottom left corner of the login form, and the “Version:” part of the About dialog.

Example:

```
"productVersion": "1.1.1"
```

• `copyright`

Possible values: any text

Replaces the text “Copyright 2020 © Softneta” in the bottom left corner of the login form, and below search results.

Example:

```
"copyright": "Copyright 2017 © Softneta"
```

• `companyLogoFile`

Possible values: name (with extension) of an image file in the `./rebranding` subdirectory.

Image format: PNG, JPG

Replaces the company logo in the About dialog.

Size of the default image is 134 x 28. Images wider than 540 pixels do not always fit into the dialog. A too high image might move the buttons outside the screen so the dialog becomes unusable. Make sure to check your customization on various client systems (different display DPI, etc) from where MedDream will be opened.

Example:

```
"companyLogoFile": "companylogo.jpg"
```

(refers to file `sys/settings/rebranding/companylogo.jpg`)

• `productLogoFile`

Possible values: name (with extension) of an image file in the `./rebranding` subdirectory

Image format: PNG, JPG

Replaces the product logo in viewer’s top left corner and on the left above the login form.

Size of default image is 170 x 40. In the viewer the height can be up to 52 px, anything more is clipped; if the width exceeds 215 px, the rest will overlap with thumbnails. In the login form, however, images wider than 180 pixels overlap with the login logo file. When your picture is near these limits, it might need checking on various client systems to ensure consistent behavior.

Example:

```
"productLogoFile": "productlogo.jpg"
```

(refers to file `sys/settings/rebranding/productlogo.jpg`)

- `loginLogoFile`

Possible values: name (with extension) of an image file in the `./rebranding` subdirectory

Image format: PNG, JPG

Replaces the picture on the right above the login form.

Size of the default image is 90 x 35. Wider images will not resize the login form.

Example:

```
"loginLogoFile": "loginlogo.jpg"
```

(refers to file `sys/settings/rebranding/loginlogo.jpg`)

- `companyName`

Possible values: any text, single line.

Replaces the 1st line under “CONTACTS” in the About dialog.

- `streetAddr`

Possible values: any text, single line.

Replaces the 2nd line under “CONTACTS” in the About dialog.

- `postCode, city`

Possible values: any text, single line.

A combination of these (`postCode + , + city`) replace the 3rd line under “CONTACTS:” in the About dialog.

- `country`

Possible values: any text, single line.

Replaces the 4th line under “CONTACTS” in the About dialog.

- `email`

Possible values: any text, single line.

The 5th line under “CONTACTS” in the About dialog will display this text. A prefix “E-mail ” is always added to the displayed text. A prefix “mailto:” is always added to the underlying address.

If this line is clicked, MedDream opens the default email client that offers to compose an email to this recipient.

- `site` (optional)

Possible values: any text that begins with “http” (you can use “https”, too)

The 6th line under “CONTACTS” in the About dialog will display this text. The same text is always added as the underlying address.

If this line is clicked, MedDream opens a new browser tab and navigates to this address.

A missing attribute will simply display an empty line without side effects.

- `defaultTheme` (optional)

Possible values: `red` (default), `blue`, `green`

Example:

```
"defaultTheme": "blue"
```

A typical “all included” example of `rebranding_configuration.json`:

```
{
  "isRebranded":true,
  "productName":"MyViewer",
  "productVersion":"1.1.1",
  "copyright":"Copyright 2017 © Softneta",
  "companyLogoFile":"companylogo.jpg",
  "productLogoFile":"productlogo.jpg",
  "loginLogoFile":"loginlogo.jpg",
  "companyName":"company",
  "streetAddr":"address",
  "postCode":"postal code",
  "city":"city",
  "country":"country",
  "email":"test@test.com",
  "site":"http://www.web.com",
  "defaultTheme": "red"
}
```

Note: An override for the Web resource `/favicon.ico` is always expected under a name “favicon.ico” in the same directory, `sys/settings/rebranding/`. This file is used if it exists, `isRebranded` is set to true and the license allows rebranding.

10. Troubleshooting

10.1. Log files of the Java-based core

In the directory of the Java application, the file `mdjavacore.main.log` will be created.

To control the overall logging level, adjust the following line in `application.properties`:

```
logging.level.root=DEBUG
```

Alternatives to “DEBUG” are INFO, ERROR etc as per Log4j specification.

The existing setting `logging.level.com.softneta` refers only to internal MedDream logic and in some cases might be insufficient even at DEBUG level.

10.2. Browser download path selection

10.2.1. Google Chrome

You can choose a location on your computer where downloads should be saved by default or pick a specific destination for each download.

- On your computer, open Chrome.
- At the top right, click More and then **Settings**.
- At the bottom, click **Advanced**.
- Under the “Downloads” section, adjust your download settings:
- To change the default download location, click **Change** and select where you’d like your files to be saved.
- If you’d rather choose a specific location for each download, check the box next to “Ask where to save each file before downloading”.

If you didn't change your default download location, then Google Chrome downloads files to the following locations:

- **Windows 10, 8, 7 and Vista:** \Users\\Downloads
- **Mac:** /Users/<username>/Downloads
- **Linux:** /home/<username>/Downloads

10.2.2. Mozilla Firefox

Note: Changing the location of your downloads affects **all** downloaded files in this Web browser.

- Click the menu icon on the top right corner of the browser.
- Click **Preferences**.
- Click **General**.
- Click **Choose...** next to Save files to.

10.2.3. Microsoft Edge

- Open Microsoft Edge.
- Select **Settings and more** -> **Settings**.
- Under **Downloads**, select **Change**.
- In the dialog box, select a new location for your downloaded files.

10.2.4. Safari

To change the default download location of your Safari browser:

- Click on the "**Edit Menu**" -> **Preferences** -> **General tab**
- Locate the "**Save downloaded files to**" section, Click on "**Downloads**" > "**Other**"...
- Browse and indicate your new download location.

10.2.5. Internet Explorer 11

- click on the **gear icon** (top right corner of the window), and choose "**View Downloads**" from the menu
- click on the **Options** link in the bottom left corner
- click on the **Browse** button and pick another folder. Click **OK** once done.

10.3. Symptom: on Linux the loading pauses just after logging in, possibly with wrong webpage colors

On some Linux installations, the Java backend might pause for up to several minutes when a new concurrent connection is made. Immediately after the login, the user sees either an empty dark page with a progress bar spinning at the top, or an empty white page, or a white page with a black-and-white DEMO message.

The cause: the default configuration of OpenJDK suggests reading from `/dev/random` that can block due to exhausted entropy pool. Some systems are refilling the pool more slowly so this problem becomes more common.

Solution 1: add `-Djava.security.egd=file:/dev/./urandom` to the command that starts the Java backend. Refer to the [Running as a service](#) chapter for hints where this command might be located.

It is recommended to stop the service, then start the updated command manually and verify the effect. You might want to force entropy exhaustion so that the problem appears as soon as possible; use `dd if=/dev/random of=/dev/null bs=512 count=1` for that (on a different terminal as it will block, too).

Solution 2: the above might still not help with some OpenJDK builds, therefore you'll need to update system-wide configuration in the `java.security` file (traditionally it's `$JAVA_PATH/jre/lib/security/java.security`):

```
securerandom.source=file:/dev/./urandom
```