

Sante PACS Server

The Worklist Server Module

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Overview

The built-in Worklist server module can receive via HL7 communication messages the patients' demographics and scheduling information of exams that are stored in a HIS/RIS system (Hospital Information System / Radiology Information System) and transfer them to any modality/medical scanner via DICOM communication protocols (C-FIND). The program offers an automated, error-free and reliable information transferring way from HL7 nodes (HIS/RIS) to DICOM nodes (medical scanners) without any human reaction.

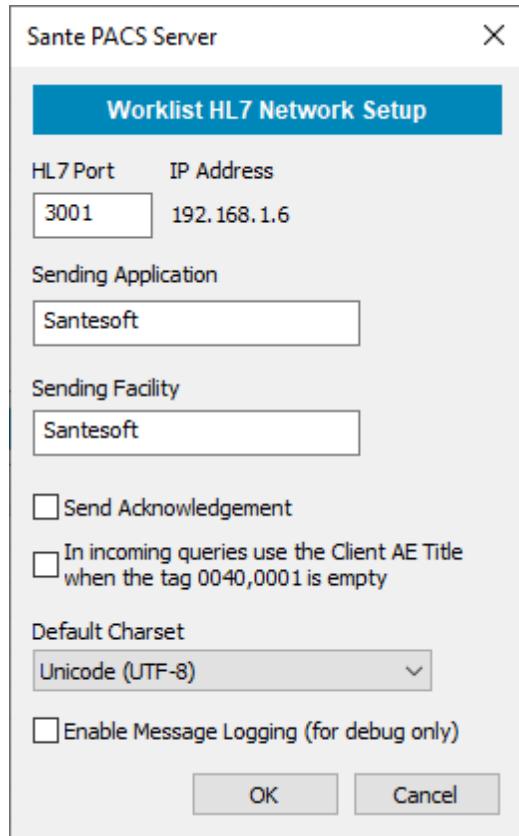
The features of Worklist server module

- Supports unlimited number of patients/exams (it depends only on hard disk size)
- Supports unlimited number of connections with HL7 nodes
- Supports unlimited number of connections with DICOM nodes
- It can query other DICOM Worklist nodes
- Mapping of HL7 message fields to program's database fields to cover several HL7 message formats
- Supports all charsets (Latin, Chinese, Japanese, Korean, Cyrillic, Arabic, Greek, Turkish, etc.)
- Supports DICOM network services (C-FIND SCU/SCP, C-ECHO SCU/SCP)
- Compatible with all modalities (CT, MR, NM, US, XA, MG, CR etc.).

Configuration

Network Configuration

Before the first use of the Worklist, the user must configure it. The program can receive HL7 messages about the scheduled procedures from HIS/RIS programs and for that purpose must have an IP port for communication with other HL7 nodes. For the configuration the user must use the menu command “**Network ➔ Worklist Server Setup**”. This command displays the following dialog box:



HL7 Port

The IP port for communication with other HL7 nodes like HIS/RIS software. If the number of the HL7 port is equal to 0 the program does not open the HL7 port and the program cannot receive HL7 messages. The port number 0 can be used if the user wants the Worklist server module to be disabled.

IP Address

This address is received automatically from Windows OS. The user can change this value only from the TCP/IP configuration of Windows.

Sending Application / Sending Facility

The program can send HL7 messages to other HL7 clients. The program will use these values in the corresponding fields MSH.3 and MSH.4 of the HL7 messages.

Send Acknowledgement

Some HL7 servers require to receive an acknowledgement as proof that the client received the message. With this option enabled, the program sends this acknowledgement to the server.

Enable Message Logging (for debug only)

By default, the C-FIND requests from medical scanners to worklist are not logged in the log database of the program and they are not displayed in the SCP report lists. That is because many medical scanners send periodically C-FIND requests in a very small time-frame (usually every 15 sec) and this way the log database becomes huge. The user must enable the C-FIND message logging of the worklist for debug reasons only and turn them off again after debugging.

Default Charset

If the HL7 message does not contain any information about the used charset, the program uses the value of this box.

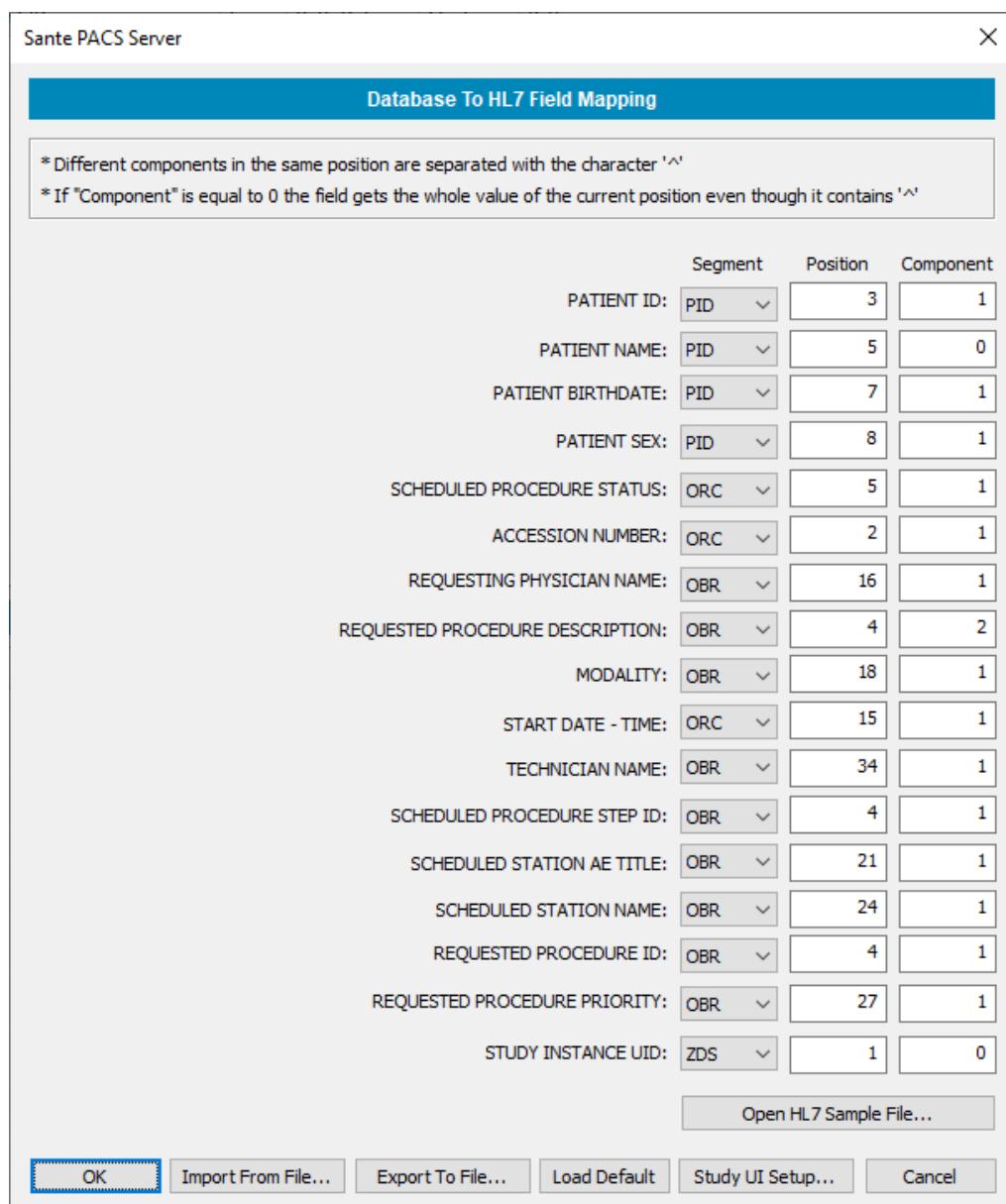
Mapping HL7 message fields to Database fields

Not all the HL7 applications use the same fields of an HL7 message to store the same piece of information. In the example below the two messages use different position of the OBR segment to store the modality:

```
MSH|^~\&|EUROMEDICA|EUROMEDICA|SYNGO.PLAZA|SYNGO.PLAZA|20190315090409||ORM^001|20190315090409
7|P|2.3.1|
PID||7007|7007||NAME||19731215|M|||ADDRESS||6944600091|2107778888||||8833925|||||GR|||
PV1||I|15076600732|||||^EOPYY^A||||15076600732||||54847|||||||||||||2019031508
52|||||
ORC|NW|54847||IP||^20190315085226|201903150852|||||201903150852|||||
OBR|1|54847||21100^CT|R|20190315095000|20190315100000|||||||CT|||||CTAWP73120|||20190315
0852||||

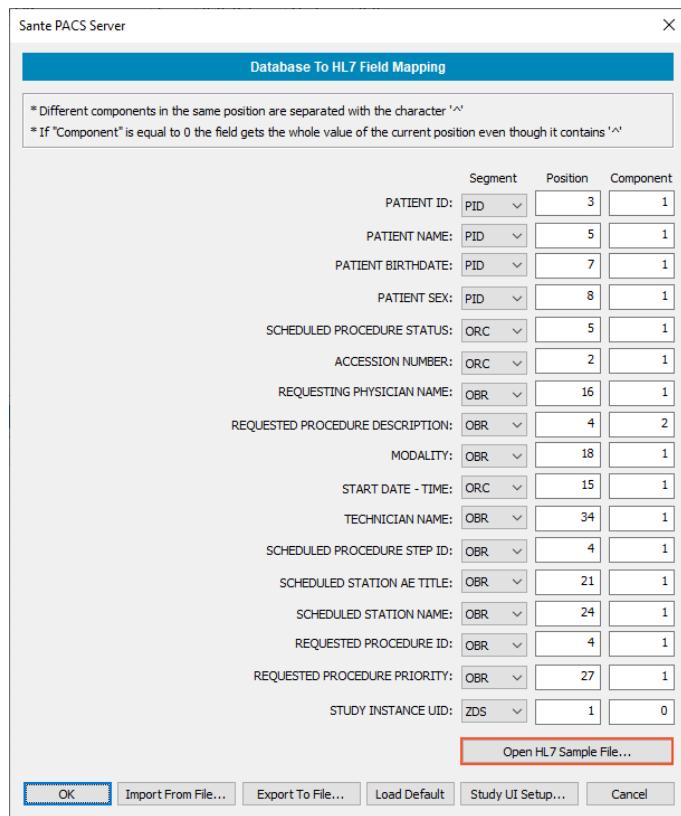
MSH|^~\&|application|application|REC_APP|REC_FAC|201912291543||ORM^001||P|2.3.1|||||
PID||1|1|Patient^Name||19591206|M|||||||||||||
PV1|||||||||||||||||||||||||
ORC|NW|||||||||||||
OBR|||2005-9999|1234^BRAIN||200512301613529400|||||||CT|||||||||
```

The first message uses the **ORB.18** field to store the modality while the second one uses the field **ORB.21**. For that reason, the user must map the fields of the HL7 message that generates a specific HL7 server to the database fields of Sante Worklist Server. The menu command “**Network → Worklist Database To HL7 Field Mapping**” lets the user do this mapping with the following dialog box:

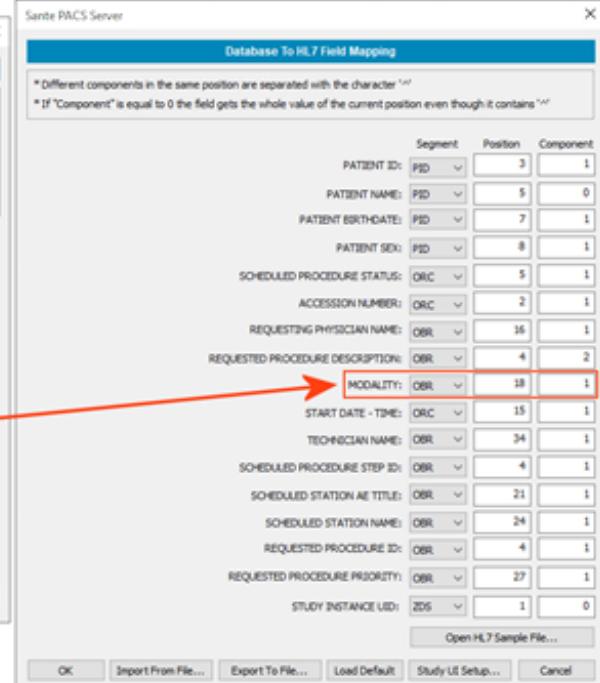
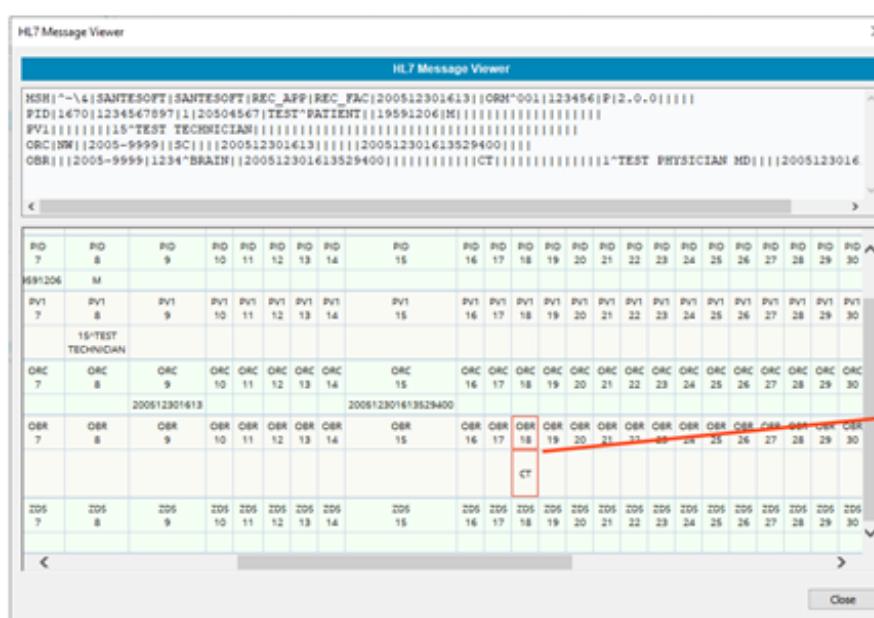


Getting help on HL7 to Database field mapping

With the “Open HL7 Sample File” button, the program allows the user to open an HL7 message “side-by-side” with the “Database To HL7 Field Mapping” dialog box.



The user can view the position of a field in the HL7 message and put the correct value on corresponding field of the "Database To HL7 Field Mapping" dialog box.



Segment Position Component fields

If a HL7 field does not contain the character “^”, the value of the “Component” must be equal to 1. If a HL7 field contains the character “^”, e.g. “1234^BRAIN”, for the first part of the value (1234) the “Component” must be equal to 1 and for the second part of the value (BRAIN) the “Component” must be equal to 2. If the value of “Component” is equal to 0, the program uses the whole value (1234^BRAIN), without splitting it into its parts.

Export To File button

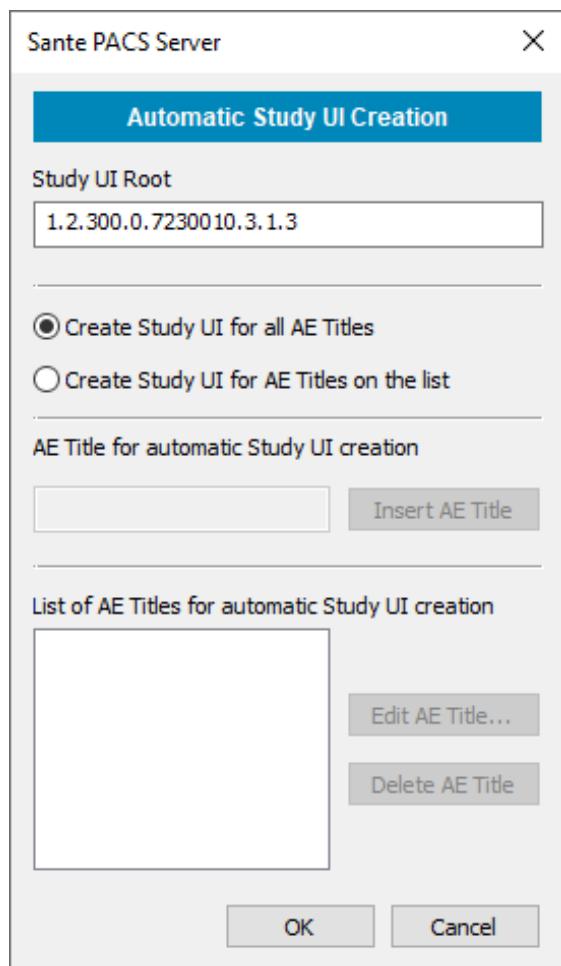
The user can save the mapping to a disk file for backup and for use in another installation of the program.

Import From File button

It lets the user load from the disk drive a previously saved mapping.

Study UI Setup button

Some medical scanners do not accept worklist responses if those responses do not contain Study UI value and this field in the response is blank. With this button, the program can create Study UIs automatically for those scanners:



The program will create Study UIs only if the received HL7 message from HIS/RIS software does not contain any value for this field, as well as the target scanner exists in the list of the above dialog box.

The User Interface

The window of the program is divided to 3 parts:

1. In the left part of the window there are the controls that let the user query the local database and view the records.
2. In the middle part of the window is the list that contains the records that the database engine returns after a query of the user of the program.
3. In the right of the window there are the controls for handling the results of a query.

The screenshot displays the SanteSoft - SANTE PACS SERVER application window, which is divided into three main vertical sections:

- Left Section (Search Database):** Contains controls for querying the database, including date ranges (Today, Yesterday, Last 7 days, Search Dates), search criteria (Patient Name, Patient ID, Accession Number, Date of birth), and a modality dropdown (All).
- Middle Section (Worklist Database):** A table showing the results of a query. The columns include: #, Patient Name, Patient ID, Birth Date, Sex, Accession Number, Requesting Physician, Requested Procedure, Modality, Start Date, Start Time, Status, Scheduled AE Title, Scheduled Station Name, and Requested Procedure ID. One row is visible, representing a test named "TEST".
- Right Section (Search Results):** A list of actions for managing the query results, such as View Record, Edit Record, Duplicate Record, Send Record To HL7 Node, Export Record, Copy Record To Clipboard, Delete Record, Create New Record, Import HL7 Data From File, Query Other DICOM Worklist, Database To HL7 Field Mapping, Compose And Send HL7 Message, and Compare HL7 Messages.

The Command Buttons

	View Record
	Edit Record
	Duplicate Record
	Send Record To HL7 Node
	Export Record
	Copy Record To Clipboard
	Delete Record
	Create New Record
	Import HL7 Message From File
	Query DICOM Worklist Node
	Database To HL7 Field Mapping
	Compose And Send HL7 Message
	Compare HL7 Messages

View Record



This command lets the user review a database entry. The command is enabled when one record at least has been selected in the list of the records of the database. Otherwise, the command is grayed out.

View Worklist Record

X

View Worklist Record	
Field	Value
PATIENT ID	12590260483
PATIENT NAME	[REDACTED]
PATIENT BIRTHDATE	24/02/1951
PATIENT SEX	F
ACCESSION NUMBER	108551
MEDICAL ALERTS	
ALLERGIES	
STUDY INSTANCE UID	
REQUESTING PHYSICIAN NAME	
REQUESTED PROCEDURE DESCRIPTION	ADMINISTRATION OF IODINATED CONTRAST MEDIA
MODALITY	CT
REQUESTED CONTRAST AGENT	
SCHEDULED STATION AE TITLE	CT111115
START DATE	
START TIME	
TECHNICIAN NAME	
SCHEDULED PROCEDURE STEP DESCRIPTION	
SCHEDULED PROCEDURE STEP ID	5555^ADMINISTRATION OF IODINATED CONTRAST MEDIA^BODY^0
SCHEDULED STATION NAME	CT111115
SCHEDULED PROCEDURE STEP LOCATION	
PRE MEDICATION	
SCHEDULED PROCEDURE STEP COMMENTS	
STATUS	IP
REQUESTED PROCEDURE ID	5555
REQUESTED TIMING	11/08/2020 16:25

OK

Edit Record



This command lets the user edit and modify a database entry. The fields that are pointed out with a star (*) are mandatory fields and they cannot be deleted. The command is enabled when one record at least has been selected in the list of the records of the database. Otherwise, the command is grayed out.

Edit Worklist Record

Edit Worklist Record	
Field	Value
PATIENT ID (*)	12590260483
PATIENT NAME (*)	██████████
PATIENT BIRTHDATE	24/02/1951
PATIENT SEX	F
ACCESSION NUMBER	108551
MEDICAL ALERTS	
ALLERGIES	
STUDY INSTANCE UID	
REQUESTING PHYSICIAN NAME	
REQUESTED PROCEDURE DESCRIPTION	ADMINISTRATION OF IODINATED CONTRAST MEDIA
MODALITY	CT
REQUESTED CONTRAST AGENT	
SCHEDULED STATION AE TITLE	CT111115
START DATE	
START TIME	
TECHNICIAN NAME	
SCHEDULED PROCEDURE STEP DESCRIPTION	
SCHEDULED PROCEDURE STEP ID	5555^ADMINISTRATION OF IODINATED CONTRAST MEDIA^BODY^0
SCHEDULED STATION NAME	CT111115
SCHEDULED PROCEDURE STEP LOCATION	
PRE MEDICATION	
SCHEDULED PROCEDURE STEP COMMENTS	
STATUS	IP
REQUESTED PROCEDURE ID (*)	5555
REQUESTED TIMING	11/08/2020 16:25

(*) = required field

OK Cancel

Duplicate Record

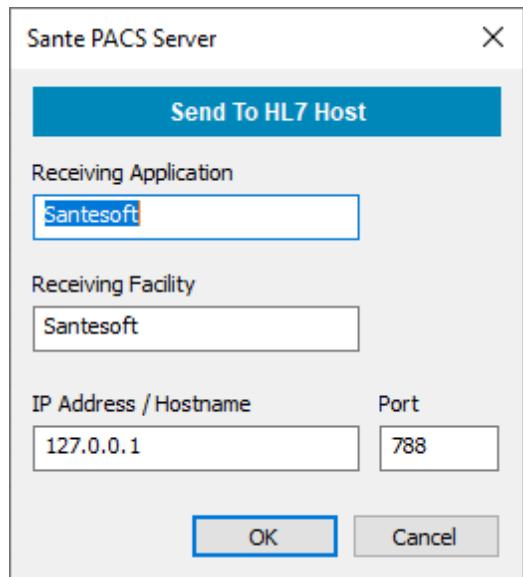


This command lets the user create a second instance of a record and it is useful when the user wishes to create a new record that has many common fields with another record. The command is enabled when one record at least has been selected in the list of the records of the database. Otherwise, the command is grayed out.

Send Record



This command lets the user send to a specific HL7 node a database entry, in the form of an HL7 message. The command is enabled when one record at least has been selected in the list of the records of the database. Otherwise, the command is grayed out.



Export Record



This command lets the user save in a disk file a database entry in the form of HL7 message. The command is enabled when one record at least has been selected in the list of the records of the database. Otherwise, the command is grayed out.

Copy Record To Clipboard



This command lets the user copy to clipboard a database entry in the form of HL7 message. The command is enabled when one record at least has been selected in the list of the records of the database. Otherwise, the command is grayed out.

Delete Record



This command lets the user delete one or more database entries that are not useful anymore. The command is enabled when one record at least has been selected in the list of the records of the database. Otherwise, the command is grayed out.

Create New Record



Although the HL7 data are usually created by HIS/RIS software and they are sent to Worklist server via an HL7 message, the program offers to user the ability to create new worklist records from scratch. The fields that are pointed out with a star (*) are mandatory fields.

Create New Worklist Record

X

Create New Worklist Record

Field	Value
PATIENT ID (*)	
PATIENT NAME (*)	
PATIENT BIRTHDATE	
PATIENT SEX	
ACCESSION NUMBER	
MEDICAL ALERTS	
ALLERGIES	
STUDY INSTANCE UID	
REQUESTING PHYSICIAN NAME	
REQUESTED PROCEDURE DESCRIPTION	
MODALITY	
REQUESTED CONTRAST AGENT	
SCHEDULED STATION AE TITLE	
START DATE	
START TIME	
TECHNICIAN NAME	
SCHEDULED PROCEDURE STEP DESCRIPTION	
SCHEDULED PROCEDURE STEP ID	
SCHEDULED STATION NAME	
SCHEDULED PROCEDURE STEP LOCATION	
PRE MEDICATION	
SCHEDULED PROCEDURE STEP COMMENTS	
STATUS	
REQUESTED PROCEDURE ID (*)	
REQUESTED TIMING	

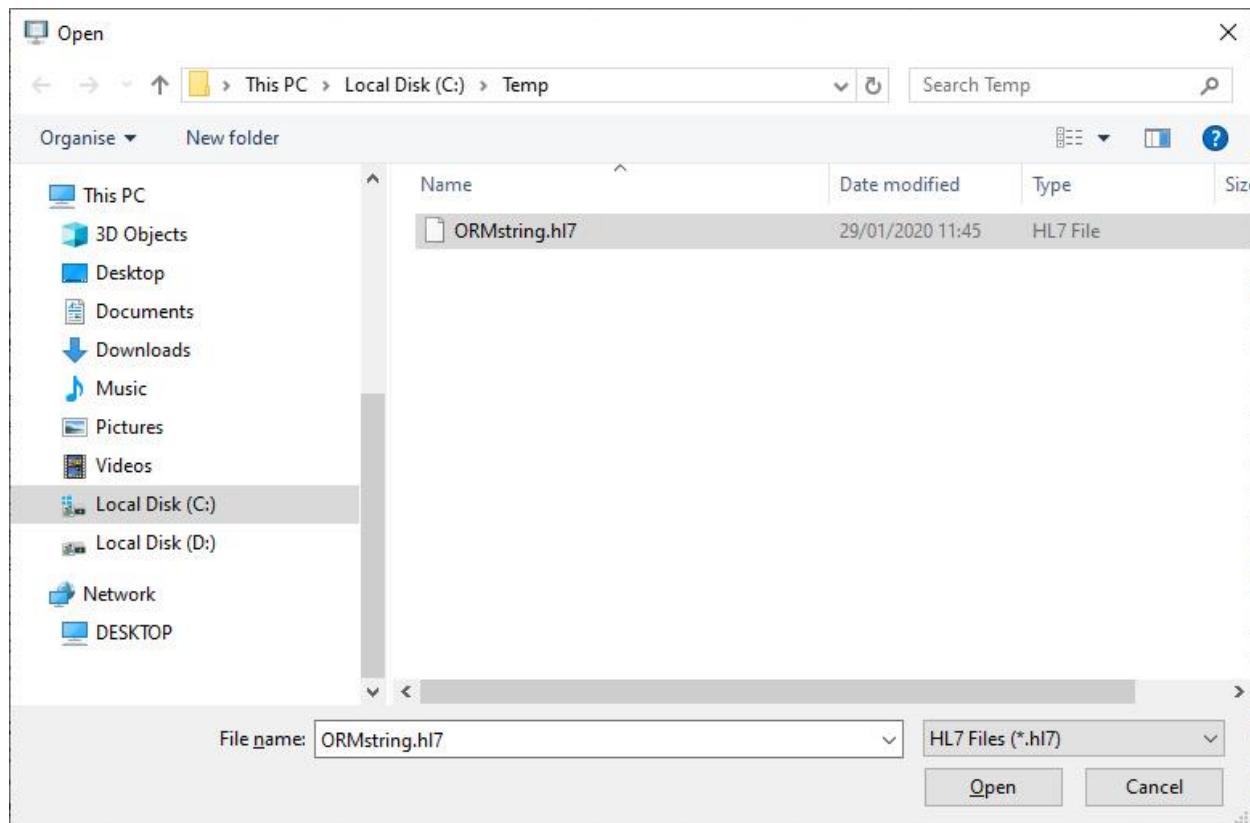
(*) = required field

OK Cancel

Import HL7 Message From File



This command lets the user insert into database an HL7 message that has been saved in a text file.



The file must be a text file that contains an HL7 formatted message like this example:

```
MSH|^~\&|EUROMEDICA|EUROMEDICA|SYNGO.PLAZA|SYNGO.PLAZA|20190315090409||ORM^O01|20190315090409
7|P|2.3.1|
PID||7007|7007||NAME||19731215|M||ADDRESS||6944600091|2107778888||||8833925|||||GR|||
PV1||I||15076600732|||||^EOPYY^A|||||15076600732||||54847||||||||||||||2019031508
52|||||||
ORC|NW|54847||IP||^^^20190315085226||201903150852|||||201903150852|||||
OBR|1|54847||21100^CT|R||20190315095000|20190315100000||||||CT|||||CTAWP73120|||20190315
0852|||||
```

Query DICOM Worklist Node



With this command, the program lets the user query other Worklist Servers of the network and import their records into the database of the program.

Sante PACS Server

Query DICOM Node

Worklist AE Title	IP Address / Hostname	Port
SANTESRVPG1	127.0.0.1	11122
Echo		

Search Database		Query Results							
Today	Study date from	#	Patient Name	Patient ID	Birth Date	Sex	Accession Number	Requesting Physician	Requested Pro
Yesterday	7/ 9/2021	1	[REDACTED]	700700	1973/12/15	M	54847	AJONIKH TOMI	LOW DOSE MA
Last 7 days	7/ 9/2021	2	[REDACTED]	156501600...	1976/04/05	M	333		LOW DOSE MA
Search All	Search Dates	3	[REDACTED]	156501600...	1976/04/05	M	333		AJONIKH TOMI
		4	[REDACTED]	700700	1973/12/15	M	54847		AJONIKH TOMI
		5	[REDACTED]	700700	1973/12/15	M	54847		AJONIKH TOMI
		6	[REDACTED]	700700	1973/12/15	M	54847		AJONIKH TOMI

Query Options

Patient Name: [Text Box]

Patient ID: [Text Box]

Accession Number: [Text Box]

Date of birth: 7/ 9/2021

Modality

Modality AE Title: [Text Box] Modality Type: [Text Box] All

Database To HL7 Field Mapping



Not all the HL7 applications use the same fields of an HL7 message to store the same piece of information. In the example below the two messages use different position of the OBR segment to store the modality:

```
MSH|^~\&|EUROMEDICA|EUROMEDICA|SYNGO.PLAZA|SYNGO.PLAZA|20190315090409||ORM^001|20190315090409
7|P|2.3.1|
PID||7007|7007||NAME||19731215|M|||ADDRESS||6944600091|2107778888||||8833925|||||GR|||
PV1||I|15076600732|||||^EOPYY^A||||15076600732||||54847||||||||||||||2019031508
52|||||||
ORC|NW|54847||IP||^^^20190315085226||201903150852|||||201903150852|||||
OBR|1|54847||21100^CT|R||20190315095000|20190315100000|||||||CT|||||CTAWP73120|||20190315
0852|||||
```

```
MSH|^~\&|application|application|REC_APP|REC_FAC|201912291543||ORM^001||P|2.3.1|||||||
PID|||1|1|Patient^Name||19591206|M|||||||||||||||
PV1|||||||||||||||||||||||||||||
ORC|NW|||||||||||||||||
OBR|||2005-9999|1234^BRAIN||200512301613529400|||||||||||CT|||||||||||||||
```

The first message uses the **ORB.18** field to store the modality (CT) while the second one uses the field **ORB.21**. For that reason, the user must map the fields of the HL7 message that generates a specific HL7 server to the database fields of Sante Worklist Server. This can be done with use of command “**Database To HL7 Field Mapping**”. This command displays the following dialog box that lets the user do this mapping:



Export To File button

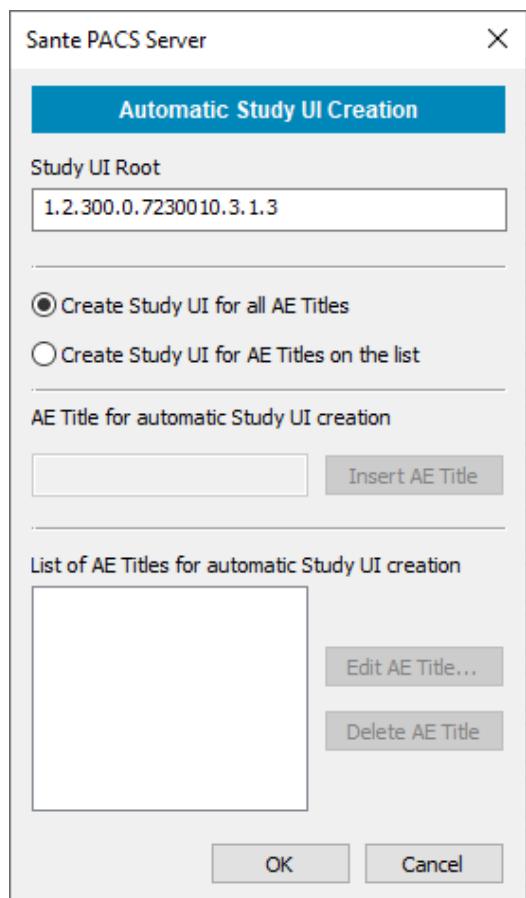
The user can save the mapping to a disk file for backup and for use in another installation of the program.

Import From File button

It lets the user load from the disk drive a previously saved mapping.

Study UI Setup button

Some medical scanners do not accept worklist responses if those responses do not contain Study UI value and this field in the response is blank. With this button, the program can create Study UIs automatically for those scanners:



The program will create Study UIs only if the received HL7 message from HIS/RIS software does not contain any value for this field, as well as the target scanner exists in the list of the above dialog box.

Compose And Send HL7 Message



This command lets the user compose or load an HL7 message from a file, edit it and send it to a specific HL7 node.

Sante PACS Server

Send HL7 Message

IP Address / Hostname	Port	Receiving Facility	Receiving Application
127.0.0.1	787	REC_APP	REC_APP

HL7 Message

```
MSH|^~&|EUROMEDICA1|EUROMEDICA2|SYNGO.PLAZA|SYNGO.PLAZA|20190315090409||ORM^O01|20190315
PID||700700|700700|||19731215|M||||BYRONAS^^16231|
PV1||I|15076600732^EOPYY^A||||15076600732^5|
ORC|NW|54847^EUROMEDICA||IP||^20190315085226||201903150852||||201903150852|||
OBR|1|54847^EUROMEDICA||21100^AJONIKH TOMOGRAFIA UVRAKOS^^0|R||20190315095000|201903151000
NTE|1|Notes|||
NTE|2|Remarks|||
```

< >

Send Load From File... Paste From Clipboard Close

Compare HL7 Messages



This command lets the user compare two HL7 messages. It is useful in cases where one message works fine with the current field mapping of the program and another does not, and the user wishes to find the differences between the two messages.

Sante PACS Server

HL7 Message Comparison

Select First File: C:\Temp\ORMstringParadeigmaDataDesign.hl7 Select Second File: C:\Temp\ORMstringParadeigmaSiemens.hl7

Position File	MSH 0	MSH 1	MSH 2	MSH 3	MSH 4	MSH 5	MSH 6	M
ORMstringParadeigmaDataDesign.hl7	MSH	~&	YGEIA AMPELOKIPON	YGEIA AMPELOKIPON	PACS	PACS	201906181514	
ORMstringParadeigmaSiemens.hl7	MSH	~&	EUROMEDICA1	EUROMEDICA2	SYNGO.PLAZA	SYNGO.PLAZA	20190315090409	
Position File	PID 0	PID 1	PID 2	PID 3	PID 4	PID 5	PID 6	P
ORMstringParadeigmaDataDesign.hl7	PID		15650160026	15650160026				1976
ORMstringParadeigmaSiemens.hl7	PID		700700	700700				1971
Position File	PV1 0	PV1 1	PV1 2	PV1 3	PV1 4	PV1 5	PV1 6	P
ORMstringParadeigmaDataDesign.hl7	PV1		O					
ORMstringParadeigmaSiemens.hl7	PV1		I	15076600732~				
Position File	ORC 0	ORC 1	ORC 2	ORC 3	ORC 4	ORC 5	ORC 6	O
ORMstringParadeigmaDataDesign.hl7	ORC	NW	333~YGEIA AMPELOKIPON			IP		~2019

< > Export to HTML file... Close

Integration with HIS/RIS software

The program lets the HIS/RIS programs open the studies of a patient to Sante DICOM Web Viewer for reviewing. The HIS/RIS software must query Sante PACS Server to get the tokens of the study and then must open Sante DICOM Web Viewer with these tokens as command line parameter.

Retrieve the token of a study

The HIS/RIS software must send to **HL7 port** of Sante PACS Server a message that contains the Study Instance UID of the desired study. The message must start with the character 10H and it must finish with the character 0DH. Sante PACS Server will answer with a message that contains the token of the study. This message will start with the character 10H and it will finish with the character 0DH as well. The token of a study is permanent and it can be stored from HIS/RIS software for later use.

Examples

The HIS/RIS software sends the message that contains the Study Instance UID:

10H1.2.826.0.1.3748527.1.4.2.0.20181120.185921.3846420DH

and it receives from Sante PACS Server the answer that contains the token of the study:

10HJH89ZQBkySrgt9f38OYic5wyC8YVO41pLPNesa5shYnmsl1DOXVF9eNK5SVwlg60DH

Retrieve the token of the studies of a patient

The HIS/RIS software must send to **HL7 port** of Sante PACS Server a message that contains the Patient ID of the desired patient. The message must start with the character 10H and it must finish with the character 0DH. Sante PACS Server will answer with a message that contains a list with pairs of Study Instance UID and token of the studies of the patient. Every Study Instance UID and every token in the list ends with the character 0DH. This message will start with the character 10H and it will finish with the character 0DH as well. Because every token ends with the character 0DH, the message ends with **two 0DH characters**.

Examples

The HIS/RIS software sends the message that contains the Patient UID:

10HID200631zw6090DH

and it receives from Sante PACS Server the answer that contains the pairs UID/token of the studies:

10H1.2.840.113619.2.55.3.2831173124.78.1375418120.8120DH

H4sTZJQ7OqxsxO9M633kSm9ES8wUexIW5auoZqJuuot88Cu1QLklYe38fR4R42IR40DH

1.2.840.113619.2.55.3.2831173124.78.1375418120.8130DH

H0QHLkW2RpypVCTSrmP4xni2U0lgcEfogLK5bKaEV6Gg655ru1Kr76X770eIRhhL0DH

1.2.840.113619.2.55.3.2831173124.78.1375418120.8140DH

HKx1erewwPpyBhAygMTmKHBFlwCuqkT78r3fjiVUcM4gbB9XhsojgOA15Qj9MWM0DH0DH

Usage of a token for loading of the study in Sante DICOM Web Viewer

Sante DICOM Web Viewer accepts in the command line a parameter of the form:

sante://download?url=[server url]:[server port]&ssl=[yes|no]&token=[token of the study]

where:

server url: it can be an IP address like 127.0.0.1, 192.168.1.2, or a valid ICANN name like mycompany.com

server port: the port of the built-in web server of Sante PACS Server, the default port is 3000

ssl: this parameter can have one of two values, **yes** if the server supports ssl connections or **no** if it does not

token: the token of the study

Examples of usage of the token:

Direct call of Sante DICOM Web Viewer:

"C:\Program Files\Santesoft\Sante DICOM Web Viewer\Sante DICOM Web Viewer.exe"

"sante://download?url=127.0.0.1:3000&ssl=no&token=rXplcx6FHk9KlrZs18j1p77rGy881TAOmsjAyLwSW3gRauyKNGwrVvhagXaK69Gs"

"C:\Program Files\Santesoft\Sante DICOM Web Viewer\Sante DICOM Web Viewer.exe"

"sante://download?url=192.168.1.2:3000&ssl=no&token=rXplcx6FHk9KlrZs18j1p77rGy881TAOmsjAyLwSW3gRauyKNGwrVvhagXaK69Gs"

"C:\Program Files\Santesoft\Sante DICOM Web Viewer\Sante DICOM Web Viewer.exe"

"sante://download?url=mycompany.com:3000&ssl=yes&token=rXplcx6FHk9KlrZs18j1p77rGy881TAOmsjAyLwSW3gRauyKNGwrVvhagXaK69Gs"

As a link within a web page

```
<a href="sante://download?url=127.0.0.1:3000&ssl=no&token=rXplcx6FHk9KlrZs18j1p77rGy881TAOmsjAyLwSW3gRauyKNGwrVvhagXaK69Gs">Open this study</a>
```

```
<a href="sante://download?url=192.168.1.2:3000&ssl=no&token=rXplcx6FHk9KlrZs18j1p77rGy881TAOmsjAyLwSW3gRauyKNGwrVvhagXaK69Gs">Open this study</a>
```

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<a href="sante://download?url=mycompany.com:3000&ssl=yes&token=rXplcx6FHk9KlrZs18j1p77rGy881TAOmsjAyLwSW3gRauyKNGwrVvhagXaK69Gs">Open this study</a>
```