

The Worklist Server Module

User Guide

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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 the 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:

The dialog box titled "Sante PACS Server PG" contains the following configuration options:

- HL7 Port:** 3001
- IP Address:** 192.168.1.6
- Sending Application:** Santesoft
- Sending Facility:** Santesoft
- Send Acknowledgement
- In incoming queries use the Client AE Title when the tag 0040,0001 is empty
- Default Charset:** Unicode (UTF-8)

HL7 Port

The IP port for the 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 a proof that the client received the message. With this option enabled, the program sends this acknowledgement to the server.

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^O01|201903150904097|P|2.3.1|
PID||7007|7007||NAME||19731215|M||ADDRESS||6944600091|2107778888|||8833925|||GR||
PV1||I|15076600732|||^EOPYY^A|||15076600732|||54847|||201903150852|||
ORC|NW|54847||IP||^20190315085226||201903150852|||201903150852|||
OBR|1|54847||21100^CT|R||20190315095000|20190315100000|||CT|||CTAWP73120||201903150852|||
```

```
MSH|^~\&|application|application|REC_APP|REC_FAC|201912291543||ORM^O01||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 to do this mapping with the following dialog box:

Database To HL7 Field Mapping

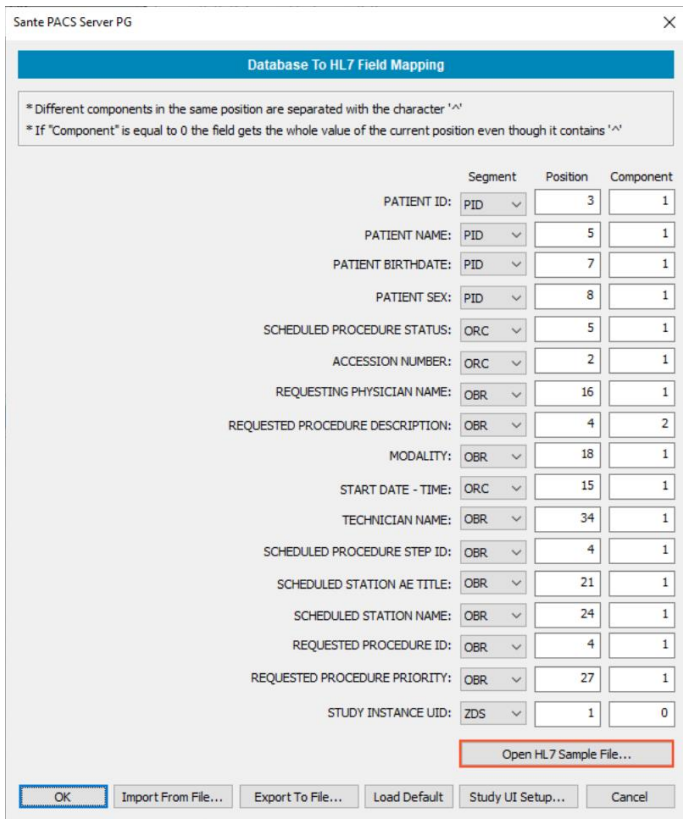
* Different components in the same position are separated with the character '^'

* If "Component" is equal to 0 the field gets the whole value of the current position even though it contains '^'

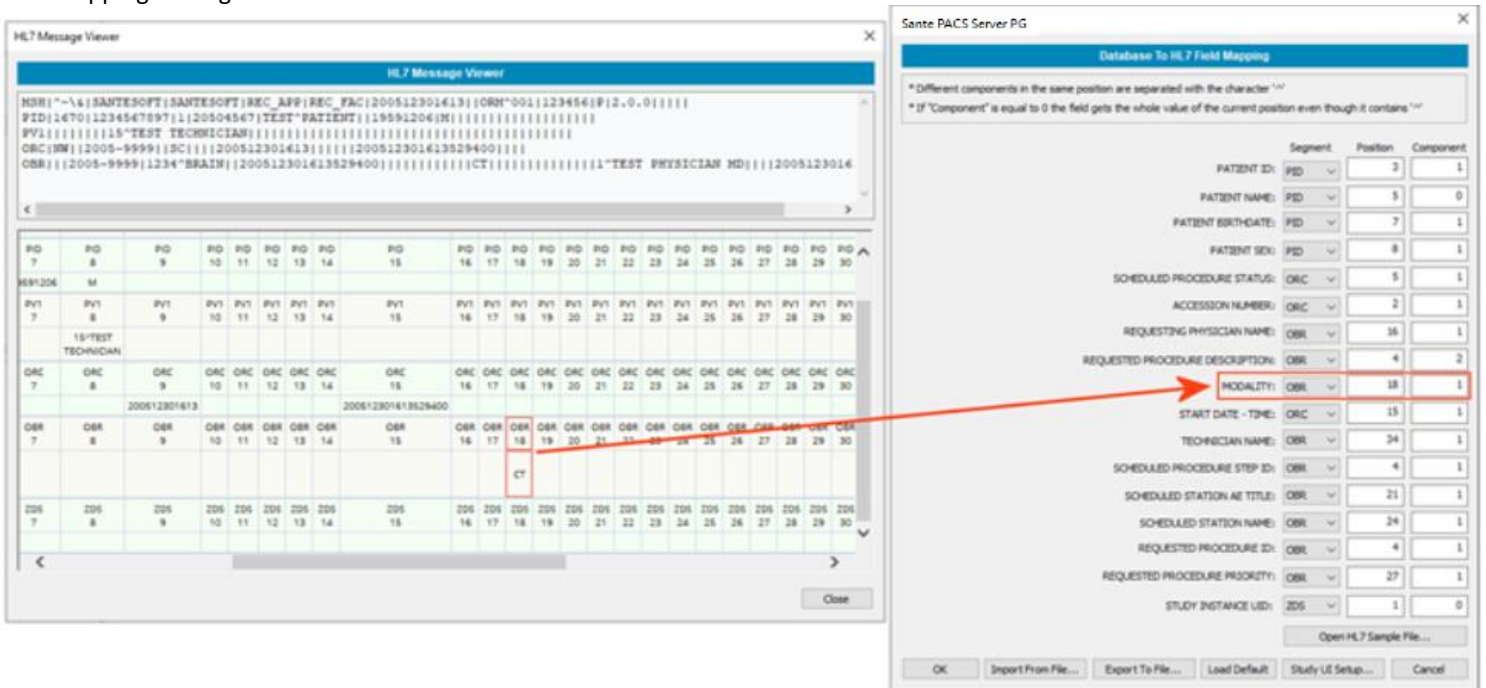
	Segment	Position	Component
PATIENT ID:	PID	3	1
PATIENT NAME:	PID	5	0
PATIENT BIRTHDATE:	PID	7	1
PATIENT SEX:	PID	8	1
SCHEDULED PROCEDURE STATUS:	ORC	5	1
ACCESSION NUMBER:	ORC	2	1
REQUESTING PHYSICIAN NAME:	OBR	16	1
REQUESTED PROCEDURE DESCRIPTION:	OBR	4	2
MODALITY:	OBR	18	1
START DATE - TIME:	ORC	15	1
TECHNICIAN NAME:	OBR	34	1
SCHEDULED PROCEDURE STEP ID:	OBR	4	1
SCHEDULED STATION AE TITLE:	OBR	21	1
SCHEDULED STATION NAME:	OBR	24	1
REQUESTED PROCEDURE ID:	OBR	4	1
REQUESTED PROCEDURE PRIORITY:	OBR	27	1
STUDY INSTANCE UID:	ZDS	1	0

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 "A", the value of the "Component" must be equal to 1. If a HL7 field contains the character "A", 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 to 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

Lets the user to load from the disk drive a previously saved mapping.

Study UI Setup button

Some medical scanners does 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 screenshot shows a dialog box titled "Sante PACS Server PG" with a close button (X) in the top right corner. The dialog has a blue header bar with the text "Automatic Study UI Creation". Below the header, there is a section labeled "Study UI Root" with a text input field containing the value "1.2.300.0.7230010.3.1.3". Below this, there are two radio button options: "Create Study UI for all AE Titles" (which is selected) and "Create Study UI for AE Titles on the list". Below the radio buttons, there is a section labeled "AE Title for automatic Study UI creation" with a text input field and an "Insert AE Title" button. At the bottom, there is a section labeled "List of AE Titles for automatic Study UI creation" with a large empty list box, an "Edit AE Title..." button, and a "Delete AE Title" button. At the very bottom of the dialog are "OK" and "Cancel" buttons.

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 lets the user to 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 user interface of the Santesoft - Sante PACS Server PG. It is divided into three main sections:

- Search Database (Left Panel):** Contains search filters for 'Study date from' (Today, Yesterday, Last 7 days), 'Study date to', and 'Search All'/'Search Dates' buttons. Below this is the 'Search Criteria (Optional)' section with input fields for Patient Name, Patient ID, Accession Number, and Date of birth, along with a 'Clear Fields' button. At the bottom is the 'Modality' dropdown menu set to 'All'.
- Worklist Database (Middle Panel):** A table with the following columns: #, 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. The first row contains the following data: 1, TEST, 15650160026, 1978/04/05, M, 333, , LOW DOSE MAMMOGRAPHY B..., MG, 2019/06/18, 19:12, IP, FUSION2279-2, 5355.
- Search Results (Right Panel):** A vertical toolbar with icons for 'View Record', 'Edit Record', 'Duplicate Record', 'Send Record To HL7 Node', 'Export Record', 'Copy Record To Clipboard', and 'Delete Record'. Below this is the 'Worklist Data' section with icons for '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 bottom of the window shows a taskbar with icons for 'Database', 'Network', 'Worklist', and 'Activity'.

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 to 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
✕

View 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

Edit Record



This command lets the user to 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
✕

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

Duplicate Record

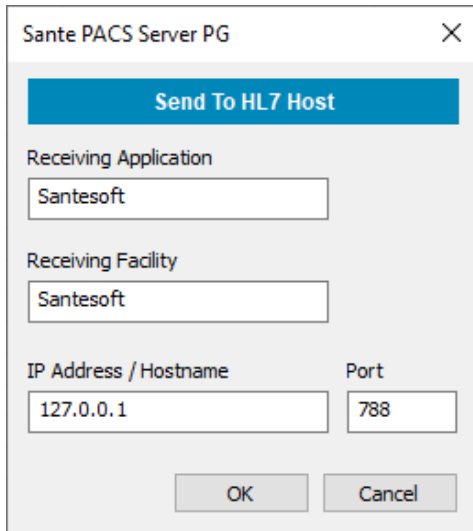


This command lets the user to create a second instance of a record and it is useful when the user wish to create a new record that has many common fields with another record. The command is enabled when one record at least has been selected in the list of the records of the database. Otherwise the command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

Send Record



This command lets the user to 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.



Sante PACS Server PG

Send To HL7 Host

Receiving Application
Santesoft

Receiving Facility
Santesoft

IP Address / Hostname Port
127.0.0.1 788

OK Cancel

Export Record



This command lets the user to 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 to 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 to delete one or more database entries that are not useful any more. 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 use 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

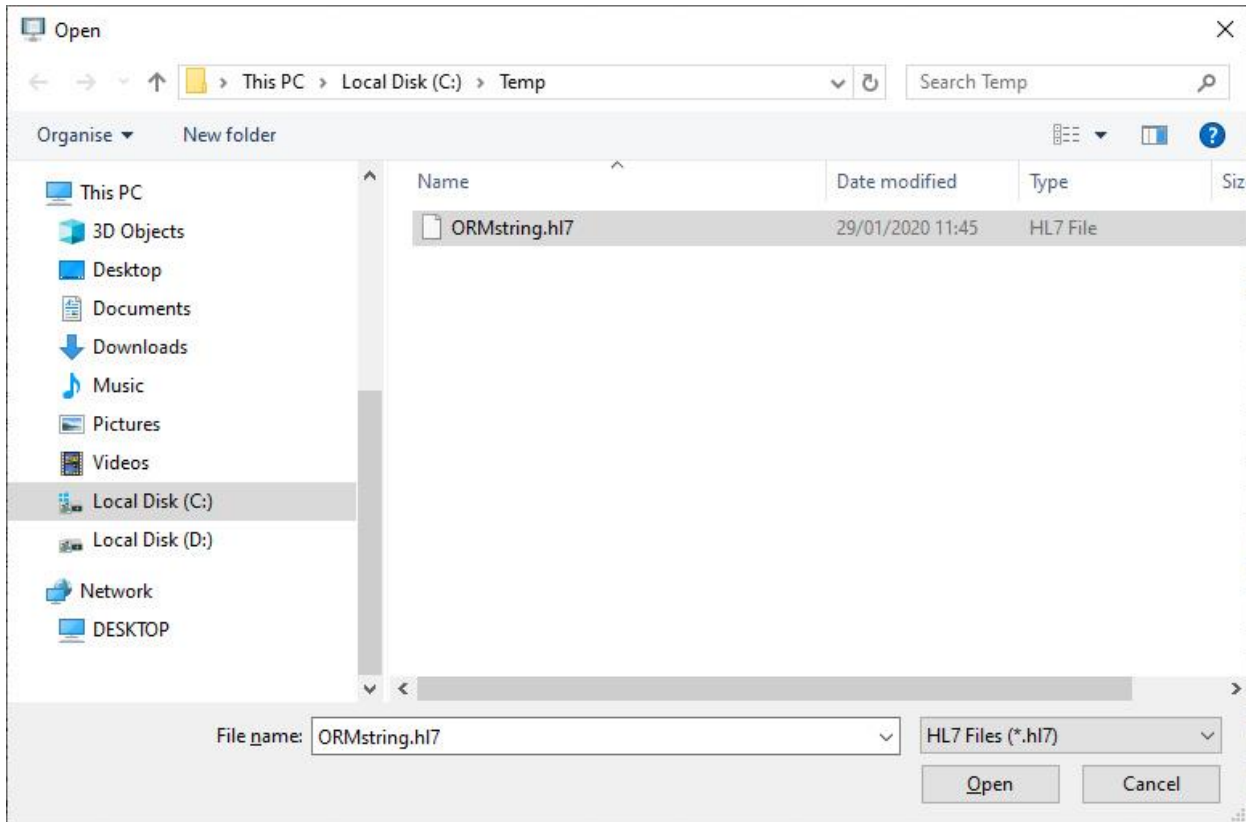
Field	Value
PATIENT ID (*)	
PATIENT NAME (*)	
PATIENT BIRTHDATE	
PATIENT SEX	
ACCESSION NUMBER	
MEDICAL ALERTS	
ALLERGIES	
STUDY INSTANCE UID	
REQUESTING PHYSICIAN NAME	
REQUESTED PROCEDURE DESCRIPTION	
MODALITY	
REQUESTED CONTRAST AGENT	
SCHEDULED STATION AE TITLE	
START DATE	
START TIME	
TECHNICIAN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

Import HL7 Message From File



This command lets the user to 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|201903150904097|P|2.3.1|
PID||7007|7007||NAME||19731215|M||ADDRESS||6944600091|2107778888|||8833925|||GR||
PV1||I|15076600732|||^EOPYY^A|||15076600732|||54847|||201903150852|||
ORC|NW|54847||IP||^20190315085226|201903150852|||201903150852|||
OBR|1|54847||21100^CT|R||20190315095000|20190315100000|||CT|||CTAWP73120||201903150852|||
```

Query DICOM Worklist Node



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

Sante PACS Server PG
✕

Query DICOM Node

Worklist AE Title

IP Address / Hostname

Port

Search Database

Today

Yesterday

Last 7 days

Search All

Search Criteria (Optional)

Patient Name

Patient ID

Accession Number

Date of birth

Modality

Modality AE Title

Modality Type

Query Results

#	Patient Name	Patient ID	Birth Date	Sex	Accession Number	Requesting Physician	Requested
1	...	156501600...	1976/04/05	M	333		LOW DOSE
2	...	156501600...	1976/04/05	M	333		LOW DOSE
3	...	700700	1973/12/15	M	54847		AJONIKH T
4	...	700700	1973/12/15	M	54847		AJONIKH T
5	...	700700	1973/12/15	M	54847		AJONIKH T
6	...	1	1959/12/06	M			BRAIN
7	...	1	1959/12/06	M			BRAIN
8	...	156501600...	1976/04/05	M	333		LOW DOSE
9	...	1	1959/12/06	M			BRAIN
10	...	156501600...	1976/04/05	M	333		LOW DOSE
11	...	156501600...	1976/04/05	M	333		LOW DOSE
12	...	700700	1973/12/15	M	54847		AJONIKH T
13	...	700700	1973/12/15	M	54847		AJONIKH T
14	...	700700	1973/12/15	M	54847		AJONIKH T
15	...	1	1959/12/06	M			BRAIN
16	...	1	1959/12/06	M			BRAIN

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^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|||
```

```
MSH|^~\&|application|application|REC_APP|REC_FAC|201912291543||ORM^O01||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 to do this mapping:

Sante PACS Server PG ✕

Database To HL7 Field Mapping

* Different components in the same position are separated with the character '^'
 * If "Component" is equal to 0 the field gets the whole value of the current position even though it contains '^'

	Segment	Position	Component
PATIENT ID:	PID	3	1
PATIENT NAME:	PID	5	0
PATIENT BIRTHDATE:	PID	7	1
PATIENT SEX:	PID	8	1
SCHEDULED PROCEDURE STATUS:	ORC	5	1
ACCESSION NUMBER:	ORC	2	1
REQUESTING PHYSICIAN NAME:	OBR	16	1
REQUESTED PROCEDURE DESCRIPTION:	OBR	4	2
MODALITY:	OBR	18	1
START DATE - TIME:	ORC	15	1
TECHNICIAN NAME:	OBR	34	1
SCHEDULED PROCEDURE STEP ID:	OBR	4	1
SCHEDULED STATION AE TITLE:	OBR	21	1
SCHEDULED STATION NAME:	OBR	24	1
REQUESTED PROCEDURE ID:	OBR	4	1
REQUESTED PROCEDURE PRIORITY:	OBR	27	1
STUDY INSTANCE UID:	ZDS	1	0

Open HL7 Sample File...

OK
Import From File...
Export To File...
Load Default
Study UI Setup...
Cancel

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

Lets the user to load from the disk drive a previously saved mapping.

Study UI Setup button

Some medical scanners does 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 screenshot shows a dialog box titled "Sante PACS Server PG" with a close button (X) in the top right corner. The dialog has a blue header bar with the text "Automatic Study UI Creation". Below the header, there is a section labeled "Study UI Root" with a text input field containing the IP address "1.2.300.0.7230010.3.1.3". Below this, there are two radio button options: "Create Study UI for all AE Titles" (which is selected) and "Create Study UI for AE Titles on the list". Below the radio buttons, there is a section labeled "AE Title for automatic Study UI creation" with a text input field and an "Insert AE Title" button. At the bottom, there is a section labeled "List of AE Titles for automatic Study UI creation" with an empty list box, an "Edit AE Title..." button, and a "Delete AE Title" button. At the very bottom of the dialog are "OK" and "Cancel" buttons.

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 to compose or to load a HL7 message from a file, to edit it and send it to a specific HL7 node.

X

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||^BYRONAS^^16231|
PV1|I|15076600732^EOPYY^A|||||15076600732^
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 to compare two HL7 messages. It is useful in cases that one message works fine with the current field mapping of the program and another not, and the user wishes to find the differences between the two messages.

Sante PACS Server PG
✕

HL7 Message Comparison

Select First File

Select Second File

Position ----- File	MSH 0	MSH 1	MSH 2	MSH 3	MSH 4	MSH 5	MSH 6	MSH 7	MSH 8
sample.hl7	MSH	^~&	conquest	conquest	REC_APP	REC_FAC	200512301613		ORM^001
ORMstringParadeigmaDataDesign.hl7	MSH	^~&	YGEIA AMPELOKIPON	YGEIA AMPELOKIPON	PACS	PACS	201906181514		ORM^001
Position ----- File	PID 0	PID 1	PID 2	PID 3	PID 4	PID 5	PID 6	PID 7	PID 8
sample.hl7	PID	1670	1234567897	1	20504567			19591206	M
ORMstringParadeigmaDataDesign.hl7	PID		15650160026	15650160026				19760405	M
Position ----- File	PV1 0	PV1 1	PV1 2	PV1 3	PV1 4	PV1 5	PV1 6	PV1 7	PV1 8
sample.hl7	PV1								15^Marcel van Herk
ORMstringParadeigmaDataDesign.hl7	PV1		O						
Position ----- File	ORC 0	ORC 1	ORC 2	ORC 3	ORC 4	ORC 5	ORC 6	ORC 7	ORC 8
sample.hl7	ORC	NW		2005-9999		SC			

Export to HTML file...
Close