KEREVAL HEALTHLAB - Project IHE EUROPE

User Guide

Order Manager – V4.x

IHE Integrating the Healthcare Enterprise

■ KEREVAL Approval

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■ **Table of content**

1 Introduction

The Order Manager emulates the actors Order Placer, Order Filler and Automation Manager for various integration profiles defining work flows. This simulator is also able to produce DICOM worklists and to respond to SCU queries thanks to the use of the DCMTK toolkit. The aim of this application is, in a first hand, to help modality developers with querying worklists without asking the support of Order Placer and/or Order Filler systems for producing the relative order. In another hand, the OrderManager will help developers of Order Placer, Order Filler and Automation Manager with testing the sending and receiving of HL7 messages required by the transactions they have to support in the context of a work flow integration profiles. The application is able to act in the following integration profiles:

- Radiology domain
  - Scheduled Workflow (SWF)
  - Scheduled Workflow b (SWF.b)
  - Mammography Workflow (MAWF)
  - Import Reconciliation Workflow (IRWF)
- Eye care domain
  - Advanced eye care workflow (A-EYECARE)
  - Basic eye care workflow (B-EYECARE)
- Laboratory domain
  - Laboratory Testing Workflow (LTW)
  - Laboratory Analytical Workflow (LAW)

See below the exhaustive list of actors and transactions emulated by the application.

Domain	Role played by the simulator	Transactions	Availability
Radiology/Cardiology	Order Filler	RAD-3 and RAD-2	1.0-RC1
-	Order Placer	RAD-2 and RAD-3	1.0-RC1
Radiology	Order Filler	RAD-48	not yet available
-	Order Placer	RAD-48	not yet available
-	Order Filler	RAD-5	1.0-RC1
-	Image Manager/Report Manager	RAD-4 and RAD-13	2.1-GA
-	Order Filler	RAD-4 and RAD-13	2.1-GA

-	Order Filler	RAD-1 and RAD-12	3.1-GA
-	Order Placer	RAD-1 and RAD-12	3.1-GA
-	Image Manager/Report Manager	RAD-12	3.1-GA
-	Acquisition Modality	RAD-5	3.2-GA
Laboratory (LTW)	Order Filler	LAB-1 and LAB-2	2.0-RC2
-	Order Placer	LAB-1 to LAB-5	2.0-RC2
-	Automation Manager	LAB-4 and LAB-5	2.0-RC6
-	Order Result Tracker	LAB-3	2.0-RC6
Laboratory (LAW)	Analyzer	LAB-27, LAB-28 and LAB-29	2.0-RC6
-	Analyzer Manager	LAB-27, LAB-28 and LAB-29	2.0-RC6
Anatomic Pathology	Order Placer	PAT-1 and PAT-2	not yet available
-	Order Filler	PAT-1 and PAT-2	not yet available
-	Order Filler	PAT-5	not yet available
Eye care	Order Placer	RAD-2 and RAD-3	3.0-GA
-	Order Filler	RAD-2 and RAD-3	3.0-GA
-	Order Placer	RAD-48	not yet available
-	Order Filler	RAD-48	not yet available
-	Order Filler	EYECARE-1	3.0-GA
-	Image Manager/Report Manager	RAD-4 and RAD-13	3.0-GA
-	Order Filler	RAD-1 and RAD-12	3.1-GA
-	Order Placer	RAD-1 and RAD-12	3.1-GA
-	Image Manager/Report Manager	RAD-12	3.1-GA

2   How to get started

2.1   Login

First of all, note that, like the other applications from Gazelle testing platform, Order Manager is linked to our CAS service. That means that, if you have an account created in Gazelle, you can use it, if you do not have one, you can create one now by filling the form http://gazelle.ihe.net/EU-CAT/users/user/register.seam . The login link ("cas login") is located in the top right corner of the page.

The OrderManager application is dedicated to the test of several actors and transactions in different domains.

Being logged in the application will give you access to some additional features. As an example, each time you create a new object in the application (patient, order, worklist ...), if you are logged in, you will be set as its "creator", which will enables you to easily retrieve your items. If the system you are testing has to receive messages from the OrderManager, the system you have selected will be stored into your preferences and the application will offer you this one in first position, the next time you launch a test.

2.2   Registration of Systems Under Test acting as HL7 responders

Most of the transactions offered by the Order Manager are based on HL7v2.x standard. If your system acts as an HL7 responder in one of the transactions offered by the simulator, for example your system is an Order Placer and supports RAD-3 transaction, you will have to enter its configuration in the application.

In order to proceed, go to "System Configurations" and hit the "Create a Configuration" button. You can also copy ⬚ or Edit ✎ an existing configuration (one of yours !).

In both cases, the simulator needs to know:

- ■   A name for your configuration (displayed in the drop-down list menus)
- ■   The actor played by your system under test
- ■   The receiving facility/application
- ■   The IP address
- ■   The port the system is listening on
- ■   The charset expected by your SUT

If you are logged in when creating the configuration, you will be set as the owner of the configuration. If you do not want other testers to send messages to your SUT you can uncheck the box "Do you want this configuration to be public?" and you will be the only one to be able to select your system in the drop-down list and to edit it (if logged in !).

Before sending messages to your system under test, ensure that your firewall options give to OrderManager the access to your system.

2.3   Starting a test

The menu part located at the top of the application offers access to the three IHE domains in which the Order Manager can be involved for testing. Each domain menu is divided into sub menu, each of them

standing for an actor of the domain. The other entries are dedicated to the application configuration and browsing.

SUT configurations is the starting point for users who test an HL7 responder, this menu is a link to the page of system configurations

HL7 messages leads to the page gathering all the HL7 messages sent and received by the simulator.

Below are some tips to easily access the right page of the tool depending on what you want to do.

2.4 Send and receive queries for AWOS

If you want to test your Analyzer Manager, select *Laboratory/Analyzer/[LAB-27]Query Analyzer Manager for AWOS* to send messages (defined by LAB-27 transaction) to your system under test

If you want to test your Analyzer, select *Laboratory/Analyzer Manager/Configuration* : this page shows the configuration of the Analyzer Manager actor to which your Analyzer can send messages in the context of a LAB-27 transaction.

2.5 Create, cancel, replace ... an order

If you want to test your Order Filler, select the *Radiology/Order placer* submenu. This sub menu will offer you 2 choices

1. *[RAD-2] Create/Cancel order*: use this page to send the messages specified by the Placer Order Management transaction (RAD-2) to your Order Filler

2. *Configuration* : this page shows the configuration of the Order Placer to which your Order Filler can send messages in the context of a RAD-3 transaction.

If you want to test your Order Placer, select the *Radiology/Order filler* submenu. This sub menu will offer you 2 choices

1. *[RAD-3] Create/Update/Cancel order*: use this page to send the messages specified by the Filler Order Management transaction (RAD-3) to your Order Placer

2. *Configuration* : this page shows the configuration of the Order Filler to which your Order Placer can send messages in the context of a RAD-3 transaction.

If you want to test your **Laboratory Order Placer,** select the *Laboratory/Order Filler* submenu. This sub menu will offer 3 sets of transactions, only two of them are of your interest:

1. *[LAB-1/LAB-2] Notify Order Placer of orders*: use this page to send messages (from LAB-1 and LAB-2 transactions) to your system under test

2. *Configuration*: this page shows the configuration of the Order Filler to which your Order Placer can send messages in the context of a LAB-1 transaction.

2.6 Create a worklist and query the SCP

The part of the simulator acting as an Order Filler is also able to create DICOM worklists, the latter can be queried by your modalities in the context of RAD-5 transaction for instance. A kind of proxy is running and listening to your C-FIND queries, the ones are forwarded to the DICOM Basic Worklist Management SCP (wlmscpfs) from the DICOM toolkit developed by OFFIS, DCMTK. Before being forwarded, the messages are stored in database and the received responses are also stored before being forwarded to your system. In this way you can look at the exchange messages and we plan to add a validation

service. The log file produces by the SCP is split and stored in the database of the tool, in that way you can consult more details about the DICOM association performed with our tool.

3   Codes used in this tool

(1) The mapping between ordering codes in the following table and the procedure codes in Radiology is based on the file available at http://gazelle.ihe.net/examples/Bern2012-orderHierarchy.xml

(2) This table contains the list of codes used by the Order Manager tool; all codes are stored in the Repository part of the SVS Simulator and can be retrieved from a REST service.

Value set OID	Value set name	Usage (HL7)	Usage (DICOM)
1.3.6.1.4.1.21367.101.104	Patient Class - HL7 Table 0004	PV1-2	
1.3.6.1.4.1.21367.101.110	Physician ID - HL7 Table 0001	PV1-8 ORC-10, ORC-11, ORC-12 OBR-16, OBR-28, OBR-34 OBX-16	(0032,1032) (0008,0090) (0040,2008) (0040, 0006)
1.3.6.1.4.1.21367.101.116	Priority	ORC-7-6 (RAD/CARD) OBR-27-6 (RAD/CARD) TQ1-9 (LAB)	
1.3.6.1.4.1.21367.101.117	Entering Organization - HL7 Table IHE005	ORC-17 OBX-23	(0040,2009)
1.3.6.1.4.1.21367.101.118	Ordering Codes - Universal Service ID (RAD)	OBR-4	
1.3.6.1.4.1.21367.101.119	Danger Code - HL7 table IHE007	OBR-12	(0038,0500)
1.3.6.1.4.1.21367.101.120	Transportation mode code - HL7 Table 0124	OBR-30	
1.3.6.1.4.1.21367.101.121	Transport arranged - HL7 Table 0224	OBR-41	(0040,1004)
1.3.6.1.4.1.12559.11.4.2.15	Ordering Codes - Universal Service ID (LAB)	OBR-4	
2.16.840.1.114222.4.11.3020	Specimen Source/Specimen type	OBR-15 SPM-4	
1.3.6.1.4.1.21367.101.9	Acquisition Modality Codes	OBR-24 (radiology)	(0008,0060)

2.16.840.1.113883.12.488	Specimen Collection Method - HL7 Table 0488	SPM-7	
1.3.6.1.4.1.12559.11.4.2.14	Specimen Role - HL7 Table 0369	SPM-11	
2.16.840.1.113883.12.489	Risk Code - HL7 Table 0489	SPM-16	
1.3.6.1.4.1.12559.11.4.2.16	Diagnostic Section Service ID (subset for LAB)	OBR-24	
2.16.840.1.113883.12.125	Value type - HL7 Table 0125	OBX-2	
2.16.840.1.113883.12.78	Abnormal flags - HL7 Table 0078	OBX-8	
2.16.840.1.113883.12.85	Observation result status code interpretation - HL7 Table 0125	OBX-11	
1.3.6.1.4.1.12559.11.4.2.19	Source of comment (defined in LAB TF)	NTE-2 (not used yet)	
1.3.6.1.4.1.12559.11.4.2.20	Comment Type (defined in LAB TF)	NTE-4 (not used yet)	
to be defined	access check	OBX-13	
1.3.6.1.4.1.12559.11.4.2.21	Observation identifier (related to order)	OBX-3 (in OBX segment related to an OBR segment)	
1.3.6.1.4.1.12559.11.4.2.22	Observation identifier (related to specimen)	OBX-3 (in OBX segment related to a SPM segment)	
1.3.6.1.4.1.12559.11.4.2.23	Result status (sub set of HL7 Table 0123)	OBR-25	
1.3.6.1.4.1.12559.11.4.2.24	order status (sub set of HL7 Table 0038)	ORC-5	
1.3.6.1.4.1.21367.101.108	Bed	PV1-3-3	(0038,0300)
1.3.6.1.4.1.21367.101.109	Facility	PV1-3-4	(0038,0300)
1.3.6.1.4.1.21367.101.107	Room	PV1-3-2	(0038,0300)
1.3.6.1.4.1.21367.101.106	Point of care	PV1-3-1	(0038,0300)

4 Sharing of data with Test Management and PatientManager Gazelle applications

Order Filler and Order Placer actors needs to be aware of the patient's demographics and encounters. In the radiology and cardiology domains, this functionnality is assumed by the ADT actor with the RAD-1 and RAD-12 transactions. In other domains, the use of PAM (Patient Admission Management) integration profile is recommended and often required. In order to populate the Order Manager with consistent data, we have chosen to put in place a mechanism for sharing patient and encounter data between several applications from the Gazelle testing platform. In case you just need a patient and an encounter but you did not use PAM Simulator or Test Management applications to create it, you can randomly generate one.

4.1 Random generation of patient and encounter

For the needs of the OrderManager, a REST web service has been implemented in PAMSimulator application which enables the other applications to get random data for a patient and/or an encounter. As a consequence, if you want to create an order for a new patient or for a new encounter (you already have the patient created in OrderManager) you only have to select the country in the application (or the existing patient), the PAM Simulator will return you a patient and a related encounter or only an encounter.

The example below is taken from the page which enables a user to send a new order to his/her Order Filler.

1. Hit the button entitled "plusCreate new patient and encounter" if none of the offered encounters nor patients meet your needs.

2. You will then have to choose the country of your patient. Here we have chosen India.

3. Finally, the patient and the encounter have been created
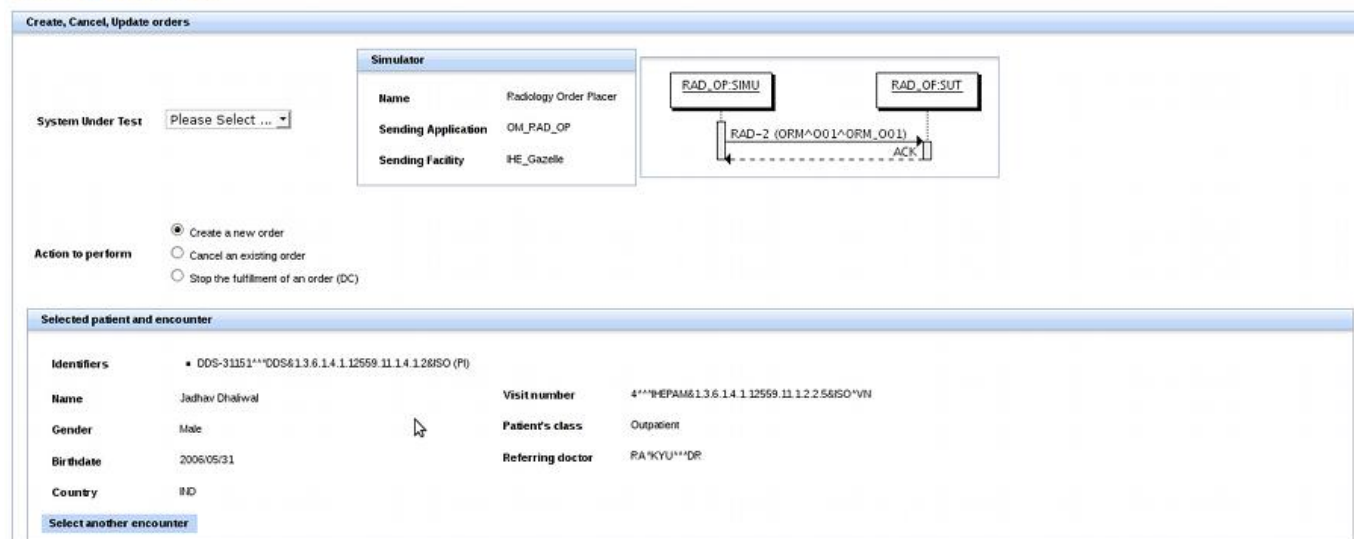
If you want to use a patient already registered in the application, use the "plusCreate a new encounter for an existing patient" button, you will be asked to pick up one of the existing patient and an encounter will be automatically, randomly generated.

4.2   Import patient from PAM Simulator and Test Management

Both PAM Simulator and Test Management application enable the user to create patients according various criteria. In some tests, you will want to reuse the same patient without losting your time copying each piece of information one by one. In order to save your time during the connectathon or during your testing periods, we have added a feature in those application. You will only have to select the patient you need, hit a button, choose the patient identifier to use for creating the order or the worklist and send the request to the OrderManager.

In PAMSimulator, the button is available for each patient in the All Patients page. In Test Management, go to Connectathon --> Patient Generation and Sharing --> tab "Existing patients".

The screenshots below are taken from Test Management.

1. Select the patient to import in Order Manager. Here we have chosen the first one, Yanira Gregg by hitting the "Create a worklist for this patient" button; the last button of the row, on the right.

2. A pop-up shows up and ask you from which assigning authority you want to use the patient identifier. Select the proper assigning authority and hit the green button.

3. I will then arrive in OrderManager, the patient demographics are filled and an encounter has been created randomly. You then need to tell the application if you want to create an order or a worklist for this patient. If you want to create an order, specified which actor will have to send it (Order Placer or Order Filler). If you choose to create a worklist, specified the integration profile for which you are performing the test. Finally, hit the "create" button.

Note that, if you choose to create a worklist, the order will be filled with random values.

4.3 Import encounter from PAM Simulator

If you have created an encounter in the PAM Simulator application, you may want to use it to create an order or an encounter. In this case, choose the encounter you want to import into OrderManager; go to its permanent page and hit the button "Create a worklist or an order for the selected encounter". You will also be asked to select the patient's identifier; then you will reach the page described in point 3.

5   Order management

The OrderManager tool is able to manage orders from various domains:

- [Radiology, Eye Care, and Cardiology orders](#) (RAD-2 and RAD-3 transactions)
- [Laboratory orders](#) (LAB-1 and LAB-2 transactions)
- [Pathology orders](#) (PAT-1 and PAT-2 transactions)

5.1   Radiology, Eye Care, and Cardiology orders

The order management part for radiology/cardiology is divided into two parts: placer order and filler order. The placer order part gathers the actions related to the Placer Order Management transaction (RAD-2) whereas the filler order part is dedicated to the Filler Order Management transaction (RAD-3).

The orders can be created either by the Order Placer (RAD-2) or by the Order Filler (RAD-3). In both cases, each system attributes an order number to the just created order. In the RAD-3 transaction case, initiated by the Order Filler, the Order Placer has to notify the Order Filler of the number it has attributed to the order contain in the message sent by the Order Filler.

5.2   SWF.b

From version 4.0.0, the Order Manager tool supports the SWF.b profile. It will be able to handle and validate the OMG messages your SUT sent to it. You can also ask the tool to use HL7v2.5.1 instead of HL7v2.3.1 when configuring the message to send to your SUT, to do so, tick the "Send HL7v2.5.1 messages ?" checkbox.

5.3   Placer Order management (RAD-2)

The placer order management transaction is initiated by the Order Placer, the one sends a message of type ORM^O01^ORM_O01 to the Order Filler. Three actions can be performed, for each one, the order control code contained in the message (ORC-1) differs.

Your system plays the role of the Order Filler for this transaction, read the following lines:

You reach this page from menu *Radiology/Order Placer/[RAD-2] Create/Cancel orders*.

Create a new order (order control code = NW)

Firstly, select the configuration of your system under test; the simulator needs it to send the message. Then select "Create a new order" choice. The list of encounters stored in the simulator is displayed, you just have to select the one you want. If you are logged in, you can easily retrieve the encounters you have previously created by checking the "Display only my data" checkbox. The demographics of the patient related to the selected encounter and the details about the encounter are displayed. Below, you can see a panel entitled "The order". Here are the values required by the simulator to create the message. If you are boring with filling all the fields, you can fill only some (or none) of them and hit the "Randomly fill the order and send message". Random values will be taken from the SVS repository. If you feel courageous, fill the requried fields and hit "send message" button. Finally, the table gathering the message sent by the simulator and the one received from your system is displayed. You can used the [validation button](#) to check the conformance of the messages to the IHE specifications.

Hit the "Perform another test" button to continue testing.

Cancel an existing order (order control code = CA)

Select the action to perform as "Cancel an existing order". You will be provided with the list of orders holded by the Order Placer part of the simulator. Select the one you want to cancel, a pop-up shows up which ask you to confirm your choice. If you click "yes", the message is automatically sent to your Order Filler. If you click "no", the pop-up is closed and nothing else is done.

Stop the fullfilment of an "in progress" order (order control code = DC)

The order control code DC is sent when an order is already started. The action to perform are the same as the one for cancelling an order.

Your system plays the role of the Order Placer for this transaction, read the following lines:

Read carefully the configuration of our Order Filler. To do so, go to *Radiology/Order Filler/Configuration*. The Order Filler will store all the messages it receives and integrates them; that means that it will create/cancel/discontinue the sent order. Be carefull to always send the same placer/filler order number for a given order. The orders received from your simulator are stored in the database and you can browse them from menu *Radiology/Order Filler/Data Browser*. The name of the creator is "{sending application}_{sending facility}".

5.4 Filler Order management (RAD-3)

The placer order management transaction is initiated by the Order Filler, the one sends a message of type ORM^O01^ORM_O01 to the Order Placer. Three actions can be performed, for each one, the order control code contained in the message (ORC-1) differs.

Your system plays the role of the Order Placer for this transaction, read the following lines:

You reach this page from menu *Radiology/Order Filler/[RAD-3] Create/Update/Cancel orders*.

Create a new order (order control code = SN)

Firstly, select the configuration of your system under test; the simulator needs it to send the message. Then select "Create a new order" choice. The list of encounters stored in the simulator is displayed, you just have to select the one you want. If you are logged in, you can easily retrieve the encounters you have previously created by checking the "Display only my data" checkbox. The demographics of the patient related to the selected encounter and the details about the encounter are displayed. Below, you can see a panel entitled "The order". Here are the values required by the simulator to create the message. If you are boring with filling all the fields, you can fill only some (or none) of them and hit the "Randomly fill the order and send message". Random values will be taken from the SVS repository. If you feel courageous, fill the requried fields and hit "send message" button. Finally, the table gathering the message sent by the simulator and the one received from your system is displayed. You can used the validation button to check the correctness of the messages.

Hit the "Perform another test" button to continue testing.

Cancel an existing order (order control code = OC)

Select the action to perform as "Cancel an existing order". You will be provided with the list of orders holded by the Order Filler part of the simulator. Select the one you want to cancel, a pop-up shows up which ask you to confirm your choice. If you click "yes", the message is automatically sent to your Order Placer. If you click "no", the pop-up is closed and nothing else is done.

Update the status of an order (order control code = SC)

Select the action to perfrom as "Update order status". you will be provided with the lists of orders horded by the Order Filler part of the simulator. Select the order you want to update, a pop-up shows up which ask you to select the new status of the order. Click on the "Send update notification", the message will be automatically sent to your system under test.

Your system plays the role of the Order Filler for this transaction, read the following lines:

Read carefully the configuration of our Order Placer. To do so, go to *Radiology/Order Placer/Configuration*. The Order Placer will store all the messages it receives and integrates them; that means that it will create/cancel/update the sent order. Be carefull to always send the same placer/filler order number for a given order. The orders received from your simulator are stored in the database and you can browse them from menu *Radiology/Order Placer/Data Browser*. The name of the creator is "{sending application}_{sending facility}".

5.5   Laboratory orders

All the actors playing a role in the LTW and LAW integration profiles from the Laboratory domain are available under the Laboratory menu.

5.6   Order Placer

Under the *Laboratory/Order Placer* menu, you will find three sub menus:

- **[LAB-1/LAB-2] Notify Order Filler of orders**: this page is dedicated to the sending part of the Order Placer actor from LTW profile. You will be able to create/cancel an order and to send a message to your SUT acting as an Order Filler.

- **Configuration**: this page is dedicated to the receiving part of the Order Placer. You will find the IP address, port and receiving application/facility names of this part of the simulator.

- **Data Browser**: this entry points to the page where the patients and the orders/specimens owned by this part of the simulator are gathered.

5.7   Order Filler

Under the Order Filler menu, you will find five sub menus but only two of them deal with the management of orders :

- **[LAB-1/LAB-2] Notify order placer of orders**: this page is dedicated to the sending part of the Order Filler actor from the LTW profile. You will be able to create/cancel update the status of an order and send a message to your SUT acting as an Order Placer.

- **Configuration**: this page is dedicated to the receiving part of the Order Filler. You will find the IP address, port and receiving application/facility names of this part of the simulator.

5.8   Creation of a new order

Both Order Filler and Order Placer parts of this simulator work in the same way; only some little differences can be noticed due to differences between those two actors as described in the Technical Framework of Laboratory.

First of all, select your system under test from the drop-down list entitled "System Under Test".

Then select the action to perform: Create a new order

As defined in the Technical Framework, LAB-1 and LAB-2 transactions allows the Order Filler and Order Placer actors to exchange orders using different structures. In this part of the simulator, we enable you to test all of them. Differences between structures implies that the way to build an order in not the same depending on the message you want to send. As a consequence, before creating an order, you will have to tell the simulator which structure you want to use (see below).

Then select an encounter from the displayed list. Using "Create a new patient and encounter" you will be able to ask for the generation of a new patient with random demographic data, using "Create a new encounter for an existing patient" you will get a new encounter for a patient selected in the displayed list.

5.8.1   Laboratory order message (OML^O21^OML_O21)

This message structure is battery-centric. To build such an order, follow the steps below:

1. You are first asked to fill out the order properties (use the "Fill with random values" button for a random filling of the form).

2. Once you think the order is properly defined, click on "Create a specimen for order" button.

3. A new form appears, fill it out with specimen properties, in the same way as previously the "Fill with random values" button can help you for this task.

4. Click on "Add to current order" to add the specimen to the order you have previously created.

5. If you need more than one specimen, click on "Add a specimen to this order" button and repeat steps 3 to 5.

6. Once all the specimens are created, click on "Send message" button.

Note that you can remove a specimen from the list using the red "minus" sign located on each row of the table.

5.8.2   Laboratory order for multiple orders related to a single specimen (OML^O33^OML_O33)

This message structure is specimen-centric. To build such an order, follow the steps below:

1. You are first asked to fill out the specimen properties (use the "Fill with random values" button for a random filling of the form).

2. Once you think the specimen is properly defined, click on "Create an order for specimen" button.

3. A new form appears, fill it out with order properties, in the same way as previously the "Fill with random values" button can help you for this task.

4. Click on "Add to current specimen" button to add the order to the specimen you have previously created.

5. If you need more than one order, click on "Add an order to this specimen" button and repeat steps 3 to 5.

6. Once all the orders are created, click on "Send message" button.

Note that you can remove an order from the list using the red "minus" sign located on each row of the table.

5.8.3   Laboratory order for multiple orders related to a single container of a specimen (OML^O35^OML_O35)

This message structure is specimen-centric. For each specimen, a list of containers is given and for each container, a list of orders is specified. To build such an order, follow the steps below:

1. You are first asked to fill out the specimen properties (use the "Fill with random values" button for a random filling of the form).

2. Once you think the specimen is properly defined, click on "Create a container for specimen" button. The list of containers specified for the current specimen is displayed.

3. To add an order for a given specimen click on the "Add an order for this container" button.

4. Fill out the order properties and click on the "Add to current container" button. The order will be displayed within a table below the relative container.

5. Repeat steps 3 and 4 until you have created all the orders you want.

6. If you need to add another container to the specimen, click on "Add a container for specimen" button.

7. To add orders to this new container, repeat steps 3 and 4.

8. Finally, click on the "Send message" button.

Note that you can remove an order from a container using the red "minus" sign located on each row of the table. You can also remove a container from the specimen by clicking on the red "minus" sign located beside the container identifier.

5.9   Cancellation of an order

Both Order Filler and Order Placer actors can cancel existing orders. See below the instructions to send such a message to your SUT.

1. Select your system under test from the drop-down list entitled "System Under Test".

2. Then select the action to perform: Cancel an existing order

3. Select the structure of message to use

4. Select the order to cancel. A pop-up raises, click on "Yes" to send the cancellation message.

5.10   Update of an order

Only the Order Filler has the capabilities to update the status of an order. See below the instructions to send such a message to your Order Placer.

1. Select your system under test from the drop-down list entitled "System Under Test".

2. Then select the action to perform: Update order status.

3. Select the structure of message to use

4. Select the order to update. A pop-up raises, select the new status of the order and click on "Send update notification" button.

5.11   Sending messages to the simulator from your SUT

As mentionned above, the simulator is able to act as an Order Filler and an Order Placer (receiving role) for LAB-1 and LAB-2 transactions. The messages supported by the simulator are the same as the one it is able to send, all of three defined structures will be understood by the simulator. To browse the orders received by the simulator, go to the *Data Browser* menu linked to the actor you are using:

■   All orders (battery-centric) for the orders sent and received within OML^O21^OML_O21 messages

■   All orders (specimen-centric) for the orders received and sent within OML^O33^OML_O33 and OML^O35^OML_O35 messages. In that page, you will first see the specimen, and then, for each specimen, the list of orders.

5.12   Pathology orders

Not yet implemented

6   Procedure management

The Order Manager tool is able to act in transactions RAD-4 (procedure scheduled) and RAD-13 (procedure update) as both Order Filler and Image Manager (or Report Manager).

- *Radiology/Order Filler/[RAD-4/RAD-13] Scheduled/Update procedures*: Send procedures to your Image/Report Manager using our Order Filler

- *Radiology/Image Manager/Configuration* gives you the connection information to send messages to our Image Manager.

6.1   SWF.b

From version 4.0.0, the Order Manager tool supports the SWF.b profile. It will be able to handle and validate the OMG messages your SUT sent to it. You can also ask the tool to use HL7v2.5.1 instead of HL7v2.3.1 when configuring the message to send to your SUT, to do so, tick the "Send HL7v2.5.1 messages ?" checkbox.

6.2   Order Filler sends procedure notifications

The application offers you two ways of creating procedures:

- Schedule a procedure for an order already created within the Order Filler. This can be useful if you want to test a workflow and the Order Filler actor is missing and thus replaced by the tool

- Schedule a procedure for an order you create from scratch. This feature may be useful if you only need to test the behaviour of your Image Manager.

In those two cases, the procedure information are retrieved from an XML file which is used to map the ordering codes with the procedure informations. By now, we create only one requested procedure per order. If when reading those files you notice that an ordering code and/or procedure code your system supports is not available, please provide us with those informations and we will append them in our configuration files.

Ordering Codes (SVS file): http://gazelle.ihe.net/RetrieveValueSet?id=1.3.6.1.4.1.21367.101.118

Procedure mapping: http://gazelle.ihe.net/examples/Bern2012-orderHierarchy.xml

6.2.1   Procedure scheduled

The first time you use the application to send a procedure scheduled message to your Image Manager, you must register your system under test into the application, that means, providing the application with your connection informations: IP address, port, receiving application/facility. To do so, go to the SUT Configurations menu and click on the "Create a configuration..." button.

Then, go to *Radiology/Order Filler/[RAD-4/RAD-13] Procedure Scheduled/Update* and follow the instructions below.

1. Select your system under test in the drop-down list and verify the connection information. Also check on your system under test that no firewall rules prevent Gazelle servers from accessing your system.
2. Select "Procedure scheduled" as action to perform. The list of available orders should be displayed

3. You can restrain the search by using both the filters on columns and the research fields above the table. When you have found the order you want to use, click on the select link in the last column of the table.

4. The Requested Procedure is then created by the application and you only have to set the Scheduled Procedure step start date/time and eventually the modality type (if not specified in the mapping file)

5. Finally click on "Send message" and wait for the application to receive the acknowledgement from your system. As a last step, you can validate the conformance of the acknowledgement your system has sent against our HL7 message profile.

6.2.2 Procedure Update

According to the table gathering the required order control codes and order statuses (Table 4.13-1 in RAD TF volume 1), there are 4 actions that the Order Filler and the Image Manager must be able to support. Those actions are gathered in the "Action to perfom" list.

■ Procedure Update: cancel order request

■ Procedure Update: discontinue order request

■ Procedure Update: change order request

■ Procedure Update: order has been completed

For the two first ones, you only have to select a procedure and to hit the "Yes" button when the pop-up raises. For the two last ones, you will be asked to update the start date/time and then you can press the "Send message" button. Note that once a procedure is cancelled, discontinued or said as completed, it does not show up again in the list of available procedures.

6.3 Image Manager receives procedure notifications

The Image Manager actor acts as responder in the transactions RAD-4 and RAD-13. As a consequence, you will have to feed your system under test with the connection information of this part of the tool. As mentionned earlier in this page, you must be logged in to access those information.

Go to *Radiology/Image Manager/Configuration*

Once your system is configured to communicate with the tool, you can send it ORM^O01^ORM_O01 messages as defined for transactions RAD-4 and RAD-13. Note that, the Image Manager implemented in the Order Manager only plays a role of a message recipient. New procedure will be created, updated, cancelled... according to the message content but no other actions will be taken by this part of the tool.

If you want to see how the messages you have sent have been integrated by the tool, go to the section *Radiology/Image Manager/Browse Data.*

7 Work Order management (Laboratory domain)

The OrderManager tool is able to manage work orders; that means that it can act either as an Order Filler or an Automation Manager for the LAB-4 transaction defined in the Laboratory Technical Framework. As a consequence, both parts support OML^O21^OML_O21, OML^O33^OML_O33 and OML^O35^OML_O35 message structures.

7.1 Your SUT acts as an Order Filler

As an Order Filler, you may want to send messages to our Automation Manager. To do so, retrieve the configuration of the Automation Manager part of the simulator from menu *Laboratory/Automation Manager/Configuration*.

If you want to see the work orders received by the Automation Manager, go to *Laboratory/Automation Manager/Browse data* menu. The creator of the work orders contained in the messages you send is set to SendingApplication_SendingFacility.

7.2 Your SUT acts as an Automation Manager

There are two ways to send messages to your Automation Manager from the Order Manager tool. The first thing you have to do in both cases, is registering your system under test within the application. To do so, go to the "SUT Configurations" section of the tool, and click on the "Create a configuration..." button. Read the tutorial here for further explanation.

7.2.1 Creating a work order from scratch

Going to *Laboratory/Order Filler/[LAB-4] Notify Automation Manager of work orders*, you will reach the page which allows you to configure a new work order or to cancel a work order known by the Order Filler part of the tool.

As defined in the Laboratory Technical Framework, the Order Filler and the Automation Manager may use three different structures to share work orders. The Order Filler implemented in the tool is able to send all of them. Differences between structures imply that the way to build a work order in not the same depending on the message you want to send. As a consequence, before creating an order, you will have to tell the simulator which structure you want to use.

Then select an encounter from the displayed list. Using "Create a new patient and encounter" you will be able to ask for the generation of a new patient with random demographic data, using "Create a new encounter for an existing patient" you will get a new encounter for a patient selected in the displayed list.

7.3 Laboratory order message (OML^O21^OML_O21)

This message structure is battery-centric. To build such a message, follow the steps below:

1. You are first asked to fill out the work order properties (use the "Fill with random values" button for a random filling of the form).

2. Once you think the order is properly defined, click on "Create a specimen for order" button.

3. A new form appears, fill it out with the specimen properties, in the same way as previously the "Fill with random values" button can help you for this task.

4. Click on "Add to current order" to add the specimen to the work order you have previously created.

5. If you need more than one specimen, click on "Add a specimen to this order" button and repeat steps 3 to 5.

6. Once all the specimens are created, click on "Send message" button.

Note that you can remove a specimen from the list using the red "minus" sign located on each row of the table.

7.4 Laboratory order for multiple orders related to a single specimen (OML^O33^OML_O33)

This message structure is specimen-centric. To build such a message, follow the steps below:

1. You are first asked to fill out the specimen properties (use the "Fill with random values" button for a random filling of the form).

2. Once you think the specimen is properly defined, click on "Create an order for specimen" button.

3. A new form appears, fill it out with the work order properties, in the same way as previously the "Fill with random values" button can help you for this task.

4. Click on "Add to current specimen" button to add the work order to the specimen you have previously created.

5. If you need more than one work order, click on "Add an order to this specimen" button and repeat steps 3 to 5.

6. Once all the orders are created, click on "Send message" button.

Note that you can remove a work order from the list using the red "minus" sign located on each row of the table.

7.5 Laboratory order for multiple orders related to a single container of a specimen (OML^O35^OML_O35)

This message structure is specimen-centric. For each specimen, a list of containers is given and for each container, a list of work orders is specified. To build such a message, follow the steps below:

1. You are first asked to fill out the specimen properties (use the "Fill with random values" button for a random filling of the form).

2. Once you think the specimen is properly defined, click on "Create a container for specimen" button. The list of containers specified for the current specimen is displayed.

3. To add a work order for a given specimen click on the "Add an order for this container" button.

4. Fill out the work order properties and click on the "Add to current container" button. The work order will be displayed within a table below the relative container.

5. Repeat steps 3 and 4 until you have created all the work orders you want.

6. If you need to add another container to the specimen, click on "Add a container for specimen" button.

7. To add work orders to this new container, repeat steps 3 and 4.

8. Finally, click on the "Send message" button.

Note that you can remove a work order from a container using the red "minus" sign located on each row of the table. You can also remove a container from the specimen by clicking on the red "minus" sign located beside the container identifier.

7.6 Cancellation of an order

See below the instruction to send a cancellation notification to your Automation Manager.

1. Select your system under test from the drop-down list entitled "System Under Test".

2. Then select the action to perform: Cancel an existing order

3. Select the structure of message to use

4. Select the order to cancel. A pop-up raises, click on "Yes" to send the cancellation message.

7.7 Creating a work order from an existing laboratory order

In the context of a workflow, the work order is created by the Order Filler from a laboratory order previously received from an Order Placer or created within the Order Filler itself. The tool allows the user to create a work order using a laboratory order owned by the Order Filler part of the tool. The message structure used to send such a work order will be the same that the one used at receiving/sending time of the related laboratory order.

To select the laboratory order to use, go to the "*Laboratory/Order Filler/Browse data*" section and select one of "All orders (battery-centric)" or "All orders (specimen-centric)". Use the ⚙ button to select the laboratory order/specimen to use. A new page will be opened, the lists of related work orders/specimens/containers are displayed. You can remove the entities which must not appear in the message using the ▬ button. Do not forgot to select your system under test configuration in the drop-down list at the top of the page and click on the "Send message" button.

8   Analytical Work Order Step (Laboratory domain)

The OrderManager tool supports the LAW Profile of the Laboratory Domain. It means that the OrderManager tool is able to send and reveive query for AWOS (Analytical Work Order Step) (LAB-27 transaction) and to send and receive AWOS (LAB-28 transaction).

8.1   Your SUT acts as an Analyzer

As an Analyzer, you may want to send a query for AWOS to our Analyzer Manager (LAB-27) and receive AWOS from our Analyzer Manager (LAB-28).

8.2   Send queries for AWOS to the Analyzer Manager part of the simulator

As defined in the Laboratory Technical Framework Supplement for the Laboratory Analytical Workflow Domain (LAW), the Analyzer can query the Analyzer Manager for a WOS realated to a specimen. This is described in the LAB-27 transaction.

To do so, retrieve the configuration of the Analyzer Manager part of the simulator by going to *Laboratory/Analyzer Manager/Configuration*.

8.3   Receive an AWOS from the Analyzer Manager Simulator

As defined in the Laboratory Technical Framework Supplement for the Laboratory Analytical Workflow Domain (LAW), the Analyzer can receive a new AWOS or a cancelation on an existing AWOS, from the Analyzer Manager. This is described in the LAB-28 transaction.

Going to *Laboratory/Analyzer Manager/[LAB-28]Analytical Work Order Step Broadcast*, you will reach the page which enables you to configure a new work order or to cancel a work order known by the Analyzer Manager part of the tool.

First at all, select a System Under Test (SUT) configuration in the SUT configuration drop-down list.

For the "Action to perform", you have the choice between 2 different ways :

■ **"Create a new order"** : Used to create and send a new order to your SUT.

1. Select an encounter from the displayed list. Using "Create a new patient and encounter" you will be able to ask for the generation of a new patient with random demographic data, using "Create a new encounter for an existing patient" you will get a new encounter for a patient selected in the displayed list.

2. You are first asked to fill out the specimen properties (use the "Fill with random values" button for a random filling of the form).

3. Once you think the specimen is properly defined, click on "Create an order for specimen" button.

4. A new form appears, fill it out with the work order properties, in the same way as previously the "Fill with random values" button can help you for this task.

5. Click on "Add to current specimen" button to add the work order to the specimen you have previously created.

6. If you need more than one work order, click on "Add an order to this specimen" button and repeat steps 3 to 5.

7. (Note that you can remove a work order from the list using the red "minus" sign located on each row of the table.)

■ "Cancel an existing order"

1. Select the order to cancel. A pop-up raises, click on "Yes" to send the cancellation message.

8.4 Your SUT acts as an Analyzer Manager

As an Analyzer Manager, you may want to receive a query for AWOS from our Analyzer (LAB-27) and send an AWOS to our Analyzer (LAB-28).

8.5 Send queries for AWOS to the Analyzer Manager SUT

As defined in the Laboratory Technical Framework Supplement for the Laboratory Analytical Workflow Domain (LAW), the Analyzer can query the Analyzer Manager for a WOS related to a specimen. This is described in the LAB-27 transaction.

To do so, go to the *Laboratory/Analyzer/[LAB-27] Query Analyzer Manager for AWOS*.

First at all, select a System Under Test (SUT) configuration in the SUT configuration drop-down list.

Then, select the "Query Mode" and fill the required parameters values. (See the desciption of the LAB-27 transaction in the LAW Technical Framework Supplement for further details about the usage of the parameters).

Finally, hit the "Send Query" button. The Analyzer Simulator will send the query to the SUT.

8.6 Receive an AWOS from the Analyzer Manager SUT

As defined in the Laboratory Technical Framework Supplement for the Laboratory Analytical Workflow Domain (LAW), the Analyzer can receive a new AWOS or a cancelation on an existing AWOS, from the Analyzer Manager. This is described in the LAB-28 transaction.

To do so, retrieve the configuration of the Analyzer part of the simulator by going to *Laboratory/Analyzer/Configuration*.

If you want to see the awos received by the Analyzer, go to *Laboratory/Analyzer/Browse data*. The creator of the work orders contained in the message you send is set to SendingApplication_SendingFacility.

9   DICOM Worklist management

The Order Manager enables the user to create a DICOM worklist from an existing procedure (or order, in that case a procedure is created from the order and then a worklist can be generated from the scheduled procedure steps). This order can be one of the orders received from a system under test or created by the Order Filler functionality of the application. The user has also the possibility to create an new order if his/her purpose is only to test a modality.

9.1   Create a DICOM Worklist

Go to *Radiology/Order Filler/Create a DICOM worklist* or *Eye care/Order Filler/Create a DICOM worklist*

Basically, worklists are created from the scheduled procedure steps (not cancelled nor complete) which are owned by the Order Filler part of the tool. Nevertheless, you may want to create a worklist for an order for which no procedure exists yet or create a new order from scratch.

- **Use an existing order** : Click on the "Schedule an order" link. Select one of the orders displayed in the table. You can add some search criteria for restraining the search.

- **Create a new order for an existing encounter**: After reaching the page to schedule a new order, click on the "Create a new order for an existing encounter" link. The list of encounters known by the application will be displayed, pick one. Then, you are asked to fill the newly created order. Use the randomly fill order button if you do not want to select all values one by one; if some of them are set, only the empty attributes are valued.

Once the order is selected and filled, the procedure is created, set the start/date time of the procedure. Hit the "save requested procedure" button. Finally, for each step of the procedure, a button "Create a worklis for this step" is displayed, choose one and hit the button. You will be asked to fill out the Station AE Title, do so and hit the button "create the worklist", the worklist is created. Note that the procedure and protocol codes and descriptions are selected in behalf of the Universal Service Id attribute of the order. The matching is done thanks to the XML file available here.

The worklist is created and you can download the result of the generation. An XML file and the DICOM object are both available for download. Note that the worklist is first created in an XML form that match the DTD defined by OFFIS and then converting to a DICOM object using the xml2dcm tool from the DICOM toolkit DCMTK developed by OFFIS.

The configuration of the DICOM part of the Order Filler is available under *Radiology/Order Filler/Configuratio*n or *Eye care/Order Filler/Configuration*.

### 9.2   View all DICOM Worklist entries

Go to *Radiology/Order Filler/Data browser or Eye care/Order Filler/Data browser*

This page gathers all the worklists which are available in the SCP. For each worklist, you will retrieve the link to download the DICOM object and the associated XML file. In the same way, the configuration of the SCP to query is displayed again.

9.3   Worklist query messages

We have put in place a little proxy as a front-end of our SCP. Our SCP is played by the DICOM Basic worklist management SCP (wlmscpfs) developed by OFFIS and available in the DCMTK toolkit. The given port is one of those the OrderManager is listening on. When you send your DICOM query to the given configuration, the OrderManager stores the data set part of the message in its database after

some processing (extracts some informations stored beside the request) and forwards it to the DICOM SCP. When the SCP sends you the response, it is first received by the OrderManager which saves it and then forwards the response to your system. See below the sequence diagram for a better understanding of the workflow.
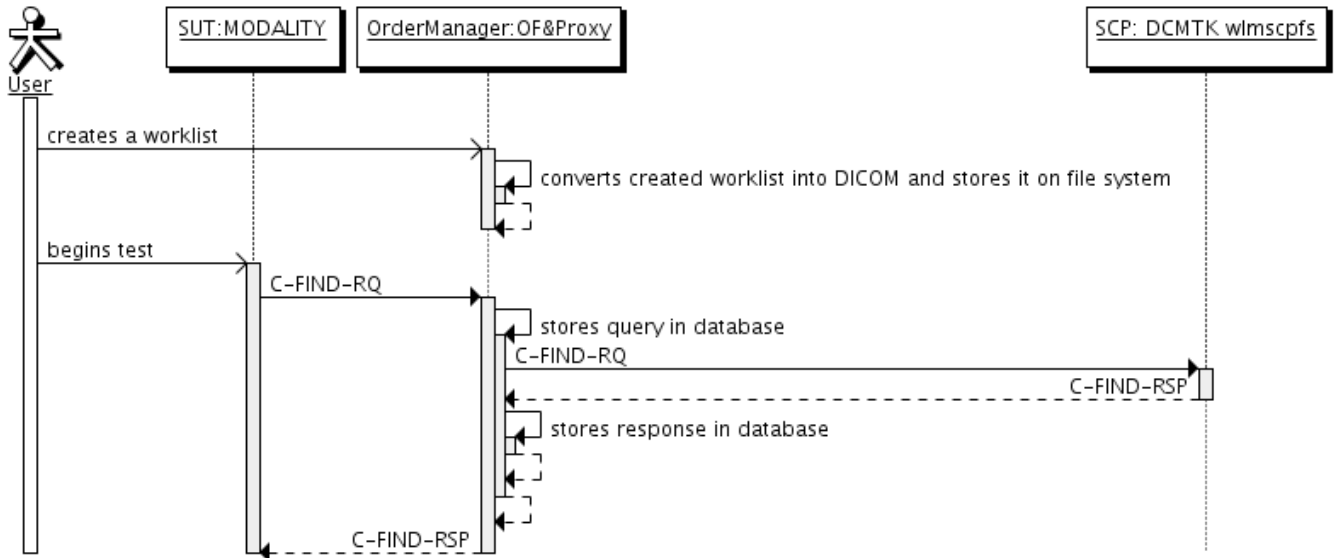
The DICOM messages intercepted by the OrderManager are all available under menu *Radiology/Worklists/Worklist query messages*.

For each message, we have extracted the data set and its content is converted into an XML file using the dcm2xml tool from OFFIS's toolkit. This file is displayed in the application using an XSL transformation, the XSL file we have written is available here.

In the same way, for a given message you will find a table gathering all the other messages received within the same channel of the proxy. It appears that a new channel is openned for each new association.

9.4   Worklist query logs

The error output of wlmscpfs tool is parsed as text is appended and the results of the parsing is stored in the database. You can view these logs in the page *Radiology/Worklists/Worklist query logs or Eye care/Worklists/Worklist query logs*.

10   DICOM Modality Worklist Query

The Order Manager tool integrates a feature which allows the user to send Modality Worklist Information Model C-Find queries to order fillers.

10.1   Register your SUT as a DICOM SCP

If you are already a user of the Order Manager tool, you may have registered your System Under Test as an Order Filler, giving its HL7 configuration. In order to send the DICOM queries to your SUT, the tool also needs some informations about your DICOM configuration.

Create a new configuration under SUT Configurations / DICOM SCP. You need to provide a name (to easily retrieve your configuration), the hostname or IP address, the port and the AE title used by your SUT. If you are logged in when creating the configuration, you will be asked if you want this configuration to remain private or if you want to share it with others.

The AE Title sent by the tool is **Gazelle_OM**. If your SUT accepts only some AE titles, do not forget to add this one.

10.2   Configure the message to be sent

Go to Radiology / Acquisition Modality / [RAD-5] Modality Worklist Query.

In the top part of the page, select the configuration of your SUT. Connection information will be displayed on the right hand of the sequence diagram, check they are still up-to-date.

Then, the page is divided into two parts, on the left hand you have a tree representation of the C-FIND message being sent and on the right hand you have a panel to append additional tags to the query.

10.2.1   Tree representation and value setting

Each leaf of the tree represents a DICOM attribute: **name** tag <VR> <value>

To set a value to a leaf, just click on "value" and enter the attribute value to send. Then press ENTER key or click on the green mark. If you want to remove a value, either edit the tag and delete its content, either right-click on it and select "Empty attribute" in the contextual menu.

Each branch of the tree represents a DICOM sequence attribute : **name** tag <VR>

10.2.2   Appending attributes

To append an attribute to the root of the query, use the panel located on the right hand of the page; either enter the tag (use hexa format, eg. 0x0101,0x1010) the hit the "Add" button either select its name in the drop-down menu and hit the "Add" button. The list contains the name attribute which can be found in a worklist. If one of the attribute is missing, add it using its tag.

To append an attribute to a sequence, right-click on the sequence name and select "Add an item". Then process as described just below.

To value a newly added attribute, proceed as described in the previous section.

10.2.3   Removing tags

Each attribute/sequence attribute can be removed from the tree. Right-click on the attribute to delete and select "Remove attribute".

10.3 Options

The technical framework defines to set of matching key attributes to be supported by the acquisition modality and/or importer actors. You can choose to highlight those attributes in the tree.

Below the tree, an "Options" panel is available. You can expand it by clicking on its header. Three choices are available:

- None: nothing is highlighted

- Keys for Query by Patient: the attributes listed in table 4.5-1 of the technical framework will be highlighted. There are the matching keys to be supported when querying a worklist for a particular patient.

- Keys for Broad Worklist Query: the attributes listed in table 4.5-2 of the technical framework will be highlighted. There are the matching keys to be supported when performing a query for a broad worklist.

10.4 Send message

Once the query is ready to be sent to your system, hit the "Execute" button.

10.5 View exchanged messages

A proxy catches all the messages sent and received by the tool. When the execution of the query is complete, the list of messages exchanged between your system under test and the Gazelle tool will be available.

11 Test results management

This page describes the Test Result Management part of the Order Manager. This part involved

- Analyzer (LAW)
- Analyzer Manager (LAW)
- Order Filler (LTW)
- Order Result Tracker (LTW)
- Automation Manager (LTW)

12 HL7 messages validation

The simulator communicates with our HL7 validator based on message profiles developed at INRIA and HAPI validation. For each received and sent messages, you can ask the simulator to validate the messages. Below is the meaning of the different icons you can meet in the Test Report section of each page or under the HL7 messages menu (gathers all the messages received and sent by the simulator).

🔍	Opens the pop-up containing the received and sent messages beside their validation results. The validation service is automatically called each time you hit this button. Consequently, the validation result you see is always the one matching the newest version of the message profile.
⏩	The message has not been validated yet. Hitting this button leads to the same action as the previous icon (magnifying glass).
✔	The message has been successfully validated. Hitting this button leads to the same action as the previous ones.
✖	The message has been validated but the message contains errors. Hitting this button leads to the same action as the previous ones.
↩	Opens a pop-up asking you to which system under test you want to send this message again. The simulator is able to replay a message it has already sent. The messages which have been received by the simulator (as responder) cannot be send a second time.