
HIMSS and RSNA
Integrating the Healthcare Enterprise

**IHE/MESA Image
Manager/Archive Tests**

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1 Image Manager/Archive Tests

1.1 Introduction

Read the document *IHE Tests: Transaction Sequences*. This document lists all the transactions in a series of use cases which drive tests for individual actors. Image Manager/Archives (hereafter referred to as Image Managers) will participate in a subset of the transactions. Reading that document will allow you to understand the full set of transactions for each test. These are the 1xx series tests.

There are other tests that do not depend on message flow as defined in *IHE Tests: Transaction Sequences*. These other tests (the 4xx series tests) are used to evaluate more static features of the Image Manager, such as responses for specific keys as defined in the IHE Technical Framework.

Each test is run using the same procedure. We assume you are using an interactive terminal or terminal emulator and are logged on to the MESA test system. Change directory to `$MESA_TARGET/ mesa_tests/rad/actors/imgmgr`. Make sure the `$MESA_TARGET` and `$MESA_STORAGE` environment variables are set properly.

1.1.1 Integration Profiles and Test Procedures

This document lists a number of tests for Image Archive/Image Manager Systems. You may not be responsible for all of these tests.

Please refer to the Connectathon web tool to list the required tests for your system. The web address of this tool depends on the year and project manager. Please contact the appropriate project manager to obtain this information.

1.2 Message Attributes

Image Managers are required to forward MPPS messages to the MESA Order Filler, accept images for storage, respond to Storage Commitment requests, respond to DICOM C-Find commands and respond to DICOM C-Move requests. The tables below list the attributes evaluated by the MESA software for various tests.

Attributes Evaluated for MPPS Messages Forwarded by Image Manager

Attribute Name	Tag
Performed Procedure Step Relationship	
Scheduled Step Attribute Sequence	0040 0270
>Study Instance UID	0020 000D
>Referenced Study Sequence	0008 1110
>> Referenced SOP Class UID	0008 1150
>>Referenced SOP Instance UID	0008 1155
>Accession Number	0008 0050

>Requested Procedure ID	0040 1001
>Requested Procedure Description	0032 1060
>Scheduled Procedure Step ID	0040 0009
>Scheduled Procedure Step Description	0040 0007
> Scheduled Action Item Code Sequence	0040 0008
>>Code Value	0008 0100
>>Coding Scheme Designator	0008 0102
>>Code Meaning	0008 0104
Patient's Name	0010 0010
Patient ID	0010 0020
Patient's Birth Date	0010 0030
Patient's Sex	0010 0040
Performed Procedure Step Information	
Performed Procedure Step ID	0040 0253
Performed Station AE Title	0040 0241
Performed Station Name	0040 0242
Performed Location	0040 0243
Performed Procedure Step Start Date	0040 0244
Performed Procedure Step Status	0040 0252
Performed Porcedure Step Description	0040 0254
Performed Procedure Type Description	0040 0255
Procedure Code Sequence	0008 1032
>Code Value	0008 0100
>Coding Scheme Designator	0008 0102
>Code Meaning	0008 0104
Performed Procedure Step End Date	0040 0250
Performed Procedure Step End Time	0040 0251
Image Acquisition Results	
Modality	0008 0060
Study Id	0020 0010
Performed Action Item Code Sequence	0040 0260
>Code Value	0008 0100
>Coding Scheme Designator	0008 0102
>Code Meaning	0008 0104

Performed Series Sequence	0040 0340
>Performing Physician's Name	0008 1050
>Protocol Name	0018 1030
>Operator's Name	0008 1070
>Series Instance UID	0020 000E
>Series Description	0008 103E
>Retrieve AE Title	0008 0054
>Referenced Image Sequence	0008 1140
>>Referenced SOP Class UID	0008 1150
>>Referenced SOP Instance UID	0008 1155
>Referenced Standalone SOP Instance Sequence	0040 0220
>>Referenced SOP Class UID	0008 1150
>>Referenced SOP Instance UID	0008 1150

Attributes Evaluated in C-Find Responses

Attribute Name	Tag
Study Level	
Study Date	0008 0020
Study Time	0008 0030
Accession Number	0008 0050
Patient Name	0010 0010
Patient ID	0010 0020
Study ID	0020 0010
Study Instance UID	0020 000D
Modalities in Study	0008 0061
Referring Physician's Name	0008 0090
Patient's Birth Date	0010 0030
Patient's Sex	0010 0040
Number of Study Related Series	0020 1206
Number of Study Related Instances	0020 1208
Series Level	
Modality	0008 0060
Series Number	0020 0011
Series Instance UID	0020 000E

Number of Series Related Instances	0020 1209
Request Attribute Sequence	0040 0275
>Requested Procedure ID	0040 1001
>Scheduled Procedure Step ID	0040 0009
Performed Procedure Step Start Date	0040 0244
Performed Procedure Step Start Time	0040 0245
Composite Object Instance Level	
Image Number	0020 0013
SOP Instance UID	0008 0018
SOP Class UID	0008 0016
Image Specific Attributes	
Rows	0028 0010
Columns	0028 0011
Bits Allocated	0028 0100
Number of Frames	0028 0008
Presentation State Specific Attributes	
Presentation Label	0070 0080
Presentation Description	0070 0081
Presentation Creation Date	0070 0082
Presentation Creation Time	0070 0083
Presentation Creator's Name	0070 0084
Referenced Series Sequence	0008 1115
>Series Instance UID	0020 000E
>Referenced Image Sequence	0008 1140
>>Referenced SOP Class UID	0008 1150
>>Referenced SOP Instance UID	0008 1155

Attributes Evaluated in SOP Instances Retrieved via C-Move

Attribute Name	Tag
Study Level	
Study Date	0008 0020
Study Time	0008 0030

1.3 Message Values

These tests expect the Image Manager to reproduce values that were sent to the Image Manager via DICOM or HL7 messages. There is no documentation which lists all expected values; there would be too many values to document. The evaluation software will print the expected values and the values supplied by the Image Manager in the event of mismatches (or always if you use the verbose mode).

1.4 Configuration

The Image Manager scripts described below use an ASCII configuration file to identify parameters such as host names and port numbers. The configuration file is named *imgmgr_test.cfg* and is included in the directory *\$MESA_TARGET/ mesa_tests/rad/actors/imgmgr*. Edit the file and change entries (host name, port number) that pertain to your system. Your system is identified by entries that begin with TEST.

For IHE Basic Security tests, all messages are exchanged using TLS. MESA servers are run on the same ports but with the TLS option. The configuration file that identifies your information is *imgmgr_secure.cfg*. This separate file allows you to use different port numbers for your secure and standard configurations. You may decide to use the same port numbers for both types of communication. The MESA software will only use all secure or all standard communication for a test; we do not mix communication protocols.

The table below gives parameters for MESA servers that will receive messages from your system. Other MESA servers are started and exchange messages, but do not receive messages from the Image Manager.

Application	AE Title	Port Number
MESA MPPS Manager and MWL Server	MESA_FILLER	2250
MESA Modality (for Storage Commitment)	MESA_MOD	2400
MESA Workstation (to receive SOP instances as the result of C-Move requests)	MESA_WKSTATION	3001
MESA Audit Record Repository	<none>	4000

Read the *Runtime Notes* section of the *Installation Guide* to determine the proper settings for the MESA runtime environment.

1.5 Starting the MESA Servers

These instructions assume you are using a terminal emulator on Unix systems or an MS DOS command window under Windows NT. Each test uses a command line interface; there is no graphical user interface. Before you start the test procedure, you need to start several MESA servers. Make sure the appropriate database is running (PostgreSQL, SQL Server). To start the MESA servers:

1. Enter the Image Manager exam directory: `mesa_tests/rad/actors/imgmgr`
2. Execute the perl script to start the servers:

```
perl scripts/start_mesa_servers.pl [loglevel]
```

loglevel is an optional argument (0 is default). Log levels are:

- | | |
|---|---------------------------------|
| 0 | no logging |
| 1 | errors |
| 2 | warnings |
| 3 | verbose |
| 4 | conversational (really verbose) |

When you are finished running one or more tests, you can stop the servers:

```
perl scripts/stop_mesa_servers.pl
```

Log files are stored in `$MESA_TARGET/logs`.

For the security tests, the MESA servers are started with different scripts. These are `scripts/start_mesa_secure.csh` and `scripts\start_mesa_secure.bat`. The log levels are the same as for the standard tests. The syntax for starting the servers in secure mode is:

```
scripts/start_mesa_secure.csh <log level> Unix
```

```
set LOGLEVEL=X (1, 2, 3, 4) (Windows)
```

```
scripts\start_mesa_secure.bat
```

The MESA servers are stopped using these scripts: `scripts/stop_mesa_secure.csh` and `scripts\stop_mesa_secure.bat`.

NB: The method for starting the MESA servers in “standard” mode changes with the 6.6.0 release. This better allows the MESA servers to listen for connections on ports other than our assumed defaults. This helps with some Solaris installations where there is conflict with the ports we chose as default values.

1.6 Unique Identifiers

1.7 Test Instructions

Please note the test instructions change starting with the 6.7.0 release.

Each test is independent of the others. You must collect the results of one test before starting a new test.

1. Enter the Image Manager exam directory: `mesa_tests/rad/actors/imgmgr`.
-

2. Remember the MESA servers were started according to the directions in section 1.5.

Workflow tests (1xx series) use a test engine that manages the test process. This test engine is used for all 1xx series tests and is driven by a text file that describes the events for a specific test. Each test below will indicate which script is appropriate (usually the swf script for Scheduled Workflow). The arguments to the script are the test number and the log level for output:

- 1 errors only
- 2 warnings
- 3 verbose
- 4 reference information (pointers into IHE Technical Framework)

An example of the syntax used to invoke the script for the 131 test is:

```
perl scripts/imgmgr_swf.pl 131 1
```

The test script will announce what events are about to happen and will request that you send specific events according to the sequence defined in *IHE Tests: Transaction Sequences*. When you have completed the sequence of events, results can be evaluated by running the evaluation script:

```
perl <test>/eval_<test>.pl <log level> <MPPS Mgr AE Title>
```

For example: `perl 131/eval_131.pl 3 AE_TITLE_FILLER`

The log level for evaluation is defined as:

- 1 errors only
- 2 warnings
- 3 context information (verbose)
- 4 reference information (pointer into IHE Technical Framework)

Starting with version 6.7.0 of the MESA software, the user can change the patient name and patient ID of the test subject prior to running the test. This allows one to rerun a test without clearing the database of the prior subject. This is done from the directory `$MESA_TARGET/mesa_tests/rads/msgs`.

A perl script is used to query the user for a new patient name and other demographics; the script automatically generates the new patient identifier. The perl script can also use an existing text file to specify the new demographics. The software is shipped with text files that are designed for IHE United States. It would be a simple task to make different text files for other countries. As listed in each section below, invoke the perl script with no arguments for interactive questions. If you specify an argument, it is the name of a text file with the demographic values.

2 Image Manager 1xx Tests

Each section below lists one Image Manager test. As mentioned above, the individual transactions involving the Image Manager under test are described in other documents.

In some cases, the MESA software will send a message to your Image Manager and will have no way to evaluate the response of your system. These messages must be accepted by your system, but are not listed in the sections below as being evaluated by the MESA software.

2.1 Image Manager Test 103: PIR Case 1: Unidentified Patient Registered at ADT and Ordered at the Order Placer

Test Case 103 involves transactions for the patient Jay Silverheels and tests the Unidentified Case 1: Unidentified Patient Registered at ADT and Ordered at the Order Placer (see IHE TF Vol I, section 4.4.1).

2.1.1 References

2.1.2 Instructions

The nominal patient name is SILVERHEELS^JAY.

To run this test, follow these steps using a DOS window or terminal emulator:

1. Set the current directory to *\$MESA_TARGET/ mesa_tests/rad/actors/imgmgr*.
2. Make sure the MESA servers have been started as described in section 1.5 above.
3. Run the test script as follows:

```
perl scripts/imgmgr_swf.pl 103 <log>
```

4. Run the evaluation script below.

2.1.3 Evaluation

1. Run the evaluation script

```
perl 103/eval_103.pl <log> <MPPS AE Title> <SC AE Title>
```

2. The evaluation output is found in *103/grade_103.txt*. The final result should indicate 0 errors. Submit the result run at log level 4 to the Project Manager.

2.1.4 Miscellaneous

To change patient name, patient ID prior to the test:

```
cd $MESA_TARGET/ mesa_tests/rad/mgs
```

```
perl mesa_reset/103.pl ihe-us/103.var (or)
```

```
perl mesa_reset/103.pl
```

2.2 Image Manager Test 105: PIR Case #3: Unidentified Patient Registered at ADT but Completed at Modality Prior to Order

Test Case 105 involves transactions for the patient Stephen Mustard and tests the Unidentified Case 3: Unidentified Patient Registered at ADT but Completed at Modality Prior to Order (see IHE TF Vol I, section 4.4.3).

Note that the Study Instance UID is generated by the Modality.

2.2.1 References

2.2.2 Instructions

The nominal patient name is MUSTARD^STEPHEN.

To run this test, follow these steps using a DOS window or terminal emulator:

1. Set the current directory to `$MESA_TARGET/ mesa_tests/rad/actors/imgmgr`.
2. Make sure the MESA servers have been started as described in section 1.5 above.
3. Run the test script as follows:

```
perl scripts/imgmgr_swf.pl 105 <log>
```

4. Run the evaluation script below.

2.2.3 Evaluation

1. Run the evaluation script

```
perl 105/eval_105.pl <log> <MPPS AE Title> <SC AE Title>
```

2. The evaluation output is found in `105/grade_105.txt`. The final result should indicate 0 errors. Submit the result run at log level 4 to the Project Manager.

2.2.4 Miscellaneous

To change patient name, patient ID prior to the test:

```
cd $MESA_TARGET/ mesa_tests/rad/mgs  
perl mesa_reset/105.pl ihe-us/105.var (or)  
perl mesa_reset/105.pl
```

2.3 Image Manager Test 106: Green

This test is different from the other 1xx series tests. This is a test of the Presentation of Grouped Procedures Integration Profile. Your system will accept HL7 scheduling messages for two Requested Procedures, one series of images (IHE Group Case) and two separate GSPS objects. After you have received these messages, you perform these steps:

1. Display the images for the separate procedures using the appropriate GSPS objects.
-

2. Perform a screen capture (electronic, camera) of your display system that indicates you can display information to indicate that these are grouped procedures but that you can split them according to the GSPS objects.
3. Send the screen capture (electronic, paper) to the Technical Project Manager.

Step 2 is intentionally vague. We do not want to evaluate the quality of your user interface or display. We do want to see if you support the splitting of these groups according to this Integration Profile. It is difficult for us to give guidelines for how to prove this. “We will know it when we see it.”

To run this test, follow these steps:

```
perl 106/106_imgmgr.pl
```

After the message exchange is complete, perform appropriate screen captures and send results to the Project Manager.

2.4 Image Manager Test 109: Exception Management

The Exception Management test uses a typical sequence of messages for the Scheduled Workflow profile. The final MPPS N-Set message sets the procedure step status to DISCONTINUED and includes the reason code:

```
110514, Incorrect worklist entry selected
```

According to the IHE Technical Framework, vol II, sec. 4.7.4.1.3.1, the Image Manager shall

- not return SOP Instances UIDs for the images in query responses

In this test, the Image Manager should receive and recognize the reason code. The MESA tools send a C-Find request at the IMAGE level for the discontinued procedure step. The Image Manager under test should return 0 responses. It is considered a failure if the Image Manager returns responses to this C-Find request.

2.4.1 References

2.4.2 Instructions

To run this test, follow these steps using a DOS window or terminal emulator:

1. Set the current directory to *\$MESA_TARGET/ mesa_tests/rad/actors/imgmgr*.
2. Make sure the MESA servers have been started as described in section 1.5 above.
3. Run the test script as follows:

```
perl scripts/imgmgr_swf.pl 109 <log> <MPPS AE Title> <SC AE Title>
```

4. Run the evaluation script below.

2.4.3 Evaluation

1. Run the evaluation script

```
perl 109/eval_109.pl <log>
```

2. The evaluation output is found in *105/grade_109.txt*. The final result should indicate 0 errors. Submit the result run at log level 4 to the Project Manager.

2.4.4 Miscellaneous

To change patient name, patient ID prior to the test:

```
cd $MESA_TARGET/ mesa_tests/rad/messages
perl mesa_reset/109.pl ihe-us/109.var (or)
perl mesa_reset/109.pl
```

2.5 Image Manager Test 110: Billing and Material Option

2.6 Image Manager Test 111: Performed Work Status Update

Test 111 covers the Performed Work Status Update under the assumption that the Image Manager wants to receive this status from the Order Filler. Read the list of transactions that are listed in *IHE Tests: Transaction Sequences*.

2.6.1 References

2.6.2 Instructions

To run this test, follow these steps using a DOS window or terminal emulator:

1. Set the current directory to `$MESA_TARGET/ mesa_tests/rad/actors/imgmgr`.
2. Make sure the MESA servers have been started as described in section 1.5 above.
3. Run the test script as follows:

```
perl scripts/imgmgr_swf.pl 111 <log>
```

4. Run the evaluation script below.

2.6.3 Evaluation

You will receive these status messages and do not need to produce them. There is no formal evaluation. Submit a file to the Project Manager indicating that you have received the messages properly.

2.6.4 Miscellaneous

To change patient name, patient ID prior to the test:

```
cd $MESA_TARGET/ mesa_tests/rad/msgsg  
perl mesa_reset/111.pl ihe-us/111.var (or)  
perl mesa_reset/111.pl
```

2.7 Image Manager Test 131: Administrative and Procedure Performance Process Flow

Test 131 covers Administrative and Procedure Performance Process Flow in the Scheduled Workflow profile (see IHE TF Vol I, section 3.2.1).

2.7.1 References

2.7.2 Instructions

The nominal patient name is BLACK^CHARLES.

To run this test, follow these steps using a DOS window or terminal emulator:

1. Set the current directory to *\$MESA_TARGET/ mesa_tests/rad/actors/imgmgr*.
2. Make sure the MESA servers have been started as described in section 1.5 above.
3. Run the test script as follows:

```
perl scripts/imgmgr_swf.pl 131 <log>
```
4. Run the evaluation script below.

2.7.3 Evaluation

1. Run the evaluation script

```
perl 131/eval_131.pl <log> <MPPS AE Title> <SC AE Title>
```
2. The evaluation output is found in 131/grade_131.txt. The final result should indicate 0 errors. Submit the result run at log level 4 to the Project Manager.

2.7.4 Miscellaneous

To change patient name, patient ID prior to the test:

```
cd $MESA_TARGET/ mesa_tests/rad/msgs  
perl mesa_reset/131.pl ihe-us/131.var (or)  
perl mesa_reset/131.pl
```

2.8 Image Manager Test 132: Order Change Flow Initiated by Order Filler

Test 132 covers order change flow initiated by the Order Filler in the Scheduled Workflow profile (see IHE TF Vol I, section 3.2.4).

2.8.1 References

2.8.2 Instructions

The nominal patient name is WISTERIA^MATTHEW.

To run this test, follow these steps using a DOS window or terminal emulator:

1. Set the current directory to `$MESA_TARGET/ mesa_tests/rad/actors/imgmgr`.
2. Make sure the MESA servers have been started as described in section 1.5 above.
3. Run the test script as follows:

```
perl scripts/imgmgr_swf.pl 132<log>
```

4. Run the evaluation script below.

2.8.3 Evaluation

1. Run the evaluation script

```
perl 132/eval_132.pl <log> <MPPS AE Title> <SC AE Title>
```

2. The evaluation output is found in `132/grade_132.txt`. The final result should indicate 0 errors. Submit the result run at log level 4 to the Project Manager.

2.8.4 Miscellaneous

To change patient name, patient ID prior to the test:

```
cd $MESA_TARGET/ mesa_tests/rad/msgs  
perl mesa_reset/132.pl ihe-us/132.var (or)  
perl mesa_reset/132.pl
```

2.9 Image Manager Test 133: PIR Case 2: Unidentified Patient Registered at ADT and Ordered at Department System Scheduler/Order Filler

Test Case 133 involves transactions for the patient Ivan Indigo and tests the Unidentified Case 2: Unidentified Patient Registered at ADT and Ordered at the DSS/Order Filler (see IHE TF Vol I, section 4.4.2).

2.9.1 References

2.9.2 Instructions

The nominal patient name is INDGO^IVAN.

To run this test, follow these steps using a DOS window or terminal emulator:

1. Set the current directory to *\$MESA_TARGET/ mesa_tests/rad/actors/imgmgr*.
2. Make sure the MESA servers have been started as described in section 1.5 above.
3. Run the test script as follows:

```
perl scripts/imgmgr_swf.pl 133 <log>
```

4. Run the evaluation script below.

2.9.3 Evaluation

1. Run the evaluation script

```
perl 133/eval_133.pl <log> <MPPS AE Title> <SC AE Title>
```

2. The evaluation output is found in *133/grade_133.txt*. The final result should indicate 0 errors. Submit the result run at log level 4 to the Project Manager.

2.9.4 Miscellaneous

To change patient name, patient ID prior to the test:

```
cd $MESA_TARGET/ mesa_tests/rad/messages
perl mesa_reset/133.pl ihe-us/133.var (or)
perl mesa_reset/133.pl
```

To run this test:

```
perl scripts/imgmgr_swf.pl 133 <log>
```

To evaluate this test:

```
perl 133/eval_133.pl <log> <MPPS Mgr AE title> <SC AE title>
```

To change patient name, patient ID prior to the test:

```
cd $MESA_TARGET/ mesa_tests/rad/messages
perl mesa_reset/133.pl ihe-us/133.var (or)
perl mesa_reset/133.pl
```

2.10 Image Manager Test 134: Instance Availability Notification

Test 134 covers Image Manager/Image Archive notifies interested workflow actors about the availability status of instances at specified storage locations.

2.10.1 References

2.10.2 Instructions

The nominal patient name is BLACK^CHARLES.

To run this test, follow these steps using a DOS window or terminal emulator:

1. Set the current directory to `$MESA_TARGET/ mesa_tests/rad/actors/imgmgr`.
2. Make sure the MESA servers have been started as described in section 1.5 above.
3. Run the test script as follows:

```
perl scripts/imgmgr_swf.pl 134 <log>
```

4. Run the evaluation script below.

2.10.3 Evaluation

1. Run the evaluation script

```
perl 134/eval_134.pl <log> <IM/IA AE Title>
```

2. The evaluation output is found in `134/grade_134.txt`. The final result should indicate 0 errors. Submit the result run at log level 4 to the Project Manager.

2.10.4 Miscellaneous

To change patient name, patient ID prior to the test:

```
cd $MESA_TARGET/ mesa_tests/rad/msgs  
perl mesa_reset/134.pl ihe-us/134.var (or)  
perl mesa_reset/134.pl
```

3 Other Tests

The tests described in this section test other features of Image Managers that are important for System Integration but are not covered in the Workflow Tests of Section 2. Each test will have separate and specific instructions.

All tests use a set of queries that must be constructed in a one-time step. Run the script *scripts/construct_queries.pl* (`perl scripts/construct_queries.pl`). This will construct C-Find queries to be used in later steps.

3.1 Image Manager Test 401: Modalities in Study

The DICOM attribute 0008 0061 is named “Modalities in Study”. Image Managers are required to support this as both a query and return key at the Study Level. In this test, we will send studies with one modality and two modalities to your Image Manager and then query the Image Manager for results.

1. Start the MESA servers as instructed in section 1.5.
2. Clear your Image Manager of all images.
3. Run the script *scripts/clearMESA.pl* (`perl scripts/clearMESA.pl`) to clear the MESA image manager of all images.
4. Run the script *40x/load_img_mgr.pl* (`perl 40x/load_img_mgr.pl`). This will send 6 studies to your Image Manager with the following values for Modality (MR, MR & CT, CT, CR, OT, OT).
 - If your Image Manager does not support GSPS objects, use the script *40x/load_img_mgr_images_only.pl*.
 - If your Image Manager only supports NM, US and XA data, use the script *40x/load_img_mgr_cardiology.pl*
5. Run the script *401/401_imgmgr.pl* : (`perl 401/401_imgmgr.pl`) This runs 5 different queries against your Image Manager. Query A requests the 0008 0061 attribute for all studies in your Image Manager. You should see the 6 studies mentioned above and the values mentioned above. Your system might transpose the MR\CT value to CT\MR. Query B queries for all studies with MR images. This should generate two responses. Query C queries for all studies with CT images. This should generate two responses. Query D queries for all studies with CR images. This should generate one response. Query E queries for all studies with US images. This should generate no responses.

Query F queries for modalities: MR\CT. This is an illegal query just for your own testing. Clients should not send you this query. The evaluation scripts do not test your response to this query, so you are free to ignore this query. ***We may be incorrect in stating this is an illegal query. It requires some research. The evaluation scripts do not examine this response as of the 6.11.0 release.***

- If you are a Cardiology specific Image Manager, you will have loaded different test data as described in Step 4. The 401 test script is

```
perl 401/401_imgmgr_cardiology.pl.
```

6. Run the script *401/eval_401.pl*. This will evaluate the performance of the above queries and will indicate pass/fail.

- If you are a Cardiology specific Image Manager, the evaluation script is:

```
perl 401/eval_401_cardiology.pl
```

3.2 Image Manager Test 402: Related Series/SOP Instances

These tests query Image Managers for DICOM attributes such as Number of Study Related Series, Number of Study Related SOP Instances. This test uses the same sites as test 401 but with different queries.

1. Clear your Image Manager of all images.
2. Run the script *40x/load_img_mgr.pl*. This will send 6 studies to your Image Manager.
 - If your Image Manager only supports NM, US and XA data, use the script *40x/load_img_mgr_cardiology.pl*
3. Run the script *402/402_imgmgr.pl*. This sends two queries to your Image Manager. The first queries for Number of Study Related Series and Number of Study Related Instances. The second queries one study for Number of Series Related Instances.
4. Run the script *402/eval_402.pl*. This will evaluate the performance of the 402 queries and indicate pass/fail.
5. For extra credit, run the *40x/load_img_mgr.pl* script again. This will send the images to you a second time. Run the query scripts again. The counts should remain the same.

3.3 Image Manager Test 403: Other Image Manager Attribute

This test is not defined for IHE Year 4.

3.4 Image Manager Test 404: Image Specific Queries

The Image Specific Queries tests transmit DICOM C-Find commands to Image Managers with return keys that are specific to Image SOP Instances. The test reuses the images loaded into your system for the other 40x tests. The table below lists the attributes requested in the queries.

0008 0016	SOP Class UID
0028 0010	Rows
0028 0011	Columns
0028 0100	Bits allocated
0028 0008	Number of Frames

1. Clear your Image Manager of all images.
2. Run the script *40x/load_img_mgr.pl*. This will send 6 studies to your Image Manager.
 - If your Image Manager only supports NM, US and XA data, use the script *40x/load_img_mgr_cardiology.pl*
3. Run the script *404/404_imgmgr.pl*. Two queries are sent, one each for a series in two different studies.
4. Run the script *404/eval_404.pl*. This will evaluate the performance of the 404 queries and indicate pass/fail.

3.5 Image Manager Test 405: Storage Commitment

The Storage Commitment tests use different images from the 40x series tests. Images are sent to your Image Manager and storage commitment requests are made. You are expected to send the Storage Commitment N-Event reports to the MESA modality at port 2400.

1. Run the script *405/produce_images.pl*. This produces test images.
 - If you are a Cardiology specific Image Manager, run the script

```
perl 405/produce_images_cardiology.pl
```
2. Run the script *scripts/clearMESA.pl*. This clears the MESA system of test data and responses from your Image Manager.
3. Start the MESA servers as instructed in section 1.5.
4. Clear your image manager.
5. Run the script *405/405_imgmgr.pl*. This will run the 405 test and indicate pass/fail. This script runs an application that acts as an SCU of the Storage Commitment Push Model SOP Class and requests associations with different association negotiation parameters. It makes one proper request that your application should accept and one improper request that your application should reject. The script will indicate pass/fail. An optional `-v` argument will enable verbose mode:

```
perl 405/405_imgmgr.pl [-v]
```

6. Run the script *405/load_img_mgr.pl*. This will send test images for four studies to your Image Manager.
7. Run the script *405/c405a.pl*. This sends storage commitment requests to your Image Manager for two studies.
8. Run the script *405/e405a.pl*. This evaluates the Storage Commitment N-Event reports that you sent to the MESA modality (on a separate association). One required argument is the AE title of your Storage Commitment SCP when it initiates DICOM associations to send the N-Event reports. An optional `-v` argument will enable verbose mode:

```
perl 405/e405a.pl <AE Title> [-v]
```

If you need to repeat this test, stop the MESA servers then restart at step 2.

3.6 Image Manager Test 411: Presentation State Query

Images and related Presentation State objects are sent to the Image Manager under test. We query the Image Manager for attributes specific to Presentation State objects and test other query/retrieve features. These images are different from those used in the 40x series of tests.

1. Run the script *40x/load_img_mgr.pl*. This will send studies to your Image Manager that include Presentation State objects. (Yes, use the *40x/load_img_mgr.pl* script).

2. Run the script *411/411_imgmgr.pl*. This will query for presentation state specific attributes from the studies sent to your Image Manager.
3. Run the script *411/eval_411.pl*. This will evaluate the responses and indicate pass/fail.

3.7 Image Manager Test 412: Presentation State Retrieve

The Image Manager is sent C-Move requests to retrieve studies that contain Presentation State objects. The Image Manager should correctly send both images and Presentation State objects to the server.

In the 412 tests, the Image Manager will be sent C-Move requests with a destination AE title of WORKSTATION1. The MESA tools use these settings for that application:

AE Title	WORKSTATION1
Port	3001
Host	The MESA test system

1. Start the MESA servers as indicated in Section 1.5.
2. Run the script *40x/load_img_mgr.pl*. This will send studies to your Image Manager that include Presentation State objects.
3. Run the script *412/412_imgmgr.pl*. This will clear the MESA workstation and send C-Move requests to move images and presentation state objects to the MESA workstation server.
4. Run the script *412/eval_412.pl*. This will evaluate the objects retrieved from your Image Manager and indicate pass/fail.

3.8 Image Manager Test 413: Key Object Note Query

The Key Object Note Query test transmits one DICOM C-Find command to Image Managers with return keys that are specific to Key Image Note SOP Instances. The test uses the Key Object Notes loaded into your system for the other 41x tests. The table below lists the attributes requested in the queries.

0008 0023	Content Date
0008 0033	Content Time
0040 A032	Observation DateTime
0040 A043	Concept Name Code Sequence

1. Start the MESA servers as described in section 1.5 above.
2. Clear your Image Manager of all images.
3. Run the script *41x/load_img_mgr.pl*. This will send studies to your Image Manager containing Key Object Notes.
4. Run the script *413/413_imgmgr.pl*. One query is sent for a Key Object Note.
5. Run the script *413/eval_413.pl*. This will evaluate the performance of the 413 query.

3.9 Image Manager Test 414: Key Object Note Retrieve

The Image Manager is sent C-Move requests to retrieve studies that contain Key Object Notes.

In the 414 tests, the Image Manager will be sent C-Move requests with a destination AE title of WORKSTATION1. The MESA tools use these settings for that application:

AE Title	WORKSTATION1
Port	3001
Host	The MESA test system

1. Start the MESA servers as described in section 1.5 above.
2. Run the script *41x/load_img_mgr.pl*. This will send studies to your Image Manager containing Key Object Notes.

```
perl 41x/load_img_mgr.pl
```
3. Run the script to send C-Move requests to your system:

```
perl 414/414_imgmgr.pl
```
4. Run the script *414/evaluate_414.pl*. This will evaluate the Key Object Note retrieved in the last step:

```
perl 414/evaluate_414
```

4 Charge Processing Tests

4.1 Image Manager Test 1301: Charge Processor Test 1

4.2 Image Manager Test 1302: Charge Processor Test 2

4.3 Image Manager Test 1303: Charge Processor Test 3

5 Post Processing Tests

5.1 Image Manager Test 1402: Store Evidence Documents

The Store Evidence Document test uses C-Store to transmit Evidence Documents to Image Managers. Subsequent 140x tests will use these Evidence Document SOP Instances.

1. Start the MESA servers as described in section 1.5 above.
2. Clear your Image Manager of all images.
3. Run the script *1402/load_img_mgr.pl*. This will send documents to your Image Manager.
4. There is no evaluation script for this test. Successful completion of this test is prerequisite for completion of the remaining 140x tests.

5.2 Image Manager Test 1403: Query Evidence Documents

The Evidence Document Query test transmits one DICOM C-Find command to Image Managers with return keys that are specific to Evidence Document SOP Instances. The test uses the Evidence Documents loaded into your system in the 1402 test. The table below lists the attributes requested in the IMAGE level query.

0008 0023	Content Date
0008 0033	Content Time
0040 A370	Reference Request Sequence
0020 000D	>Study Instance UID
0008 0050	>Accession Number
0040 1000	>Requested Procedure ID
0032 1064	>Requested Procedure Code Sequence
0008 0100	>>Code Value
0008 0102	>>Coding Scheme Designator
0008 0103	>>Coding Scheme Version
0008 0104	>>Code Meaning
0040 A504	Content Template Sequence
0040 DB00	>Template Identifier
0040 A043	Concept Name Code Sequence
0008 0100	>Code Value
0008 0102	>Coding Scheme Designator
0008 0103	>Coding Scheme Version
0008 0104	>Code Meaning

1. The MESA servers should be running from test 1402.
 2. Your Image Manager should contain the documents sent to it in test 1402.
 3. Run the script *1403/1403_imgmgr.pl*. One query is sent for Evidence Documents.
-

4. Run the script *1403/eval_1403.pl*. This will evaluate the performance of the 1403 query.

5.3 Image Manager Test 1404: Retrieve Evidence Documents

The Image Manager is sent C-Move requests to retrieve studies that contain Evidence Documents.

In the 414 tests, the Image Manager will be sent C-Move requests with a destination AE title of WORKSTATION1. The MESA tools use these settings for that application:

AE Title	WORKSTATION1
Port	3001
Host	The MESA test system

1. The MESA servers should be running from test 1402.
2. Your Image Manager should contain Evidence Documents sent in test 1402.
3. Run the script to send C-Move requests to your system:

```
perl 1404/1404_imgmgr.pl
```
4. Run the script *1404/evaluate_1404.pl*. This will evaluate the Evidence Document retrieved in the last step:

```
perl 1404/evaluate_1404
```

5.4 Image Manager Test 1412: PWF CT

Test 1412 is a test of the steps for Post Processing Workflow in a CT 3D reconstruction scenario. The Image Manager will participate in Scheduled Workflow steps for the scheduling of one procedure step for a CT case and for the creation of the appropriate images and MPPS objects. Once the images and MPPS objects for that procedure step are completed, you will be asked to schedule a post processing step and to participate in the post processing workflow.

1. Run the test script:

```
perl 1412/1412_imgmgr_active.pl
```

2. Follow the test instructions

3. Run the evaluation script:

```
perl 1412/eval_1412.pl
```

The evaluation script should yield 0 errors.

5.5 Image Manager Test 1421: PWF Double Claim

This sequence of messages tests the response of the Post Processing Manager to consecutive claims of a single workitem. This is to simulate a situation where two Image Creators are querying for the same set of workitems. This test first uses the 142x script to do the scheduled workflow to schedule a CT 3D reconstruction post processing workitem. The 1421 script will then attempt to claim this workitem twice. Your system should accept the first claim and reject the second claim.

1. Run the active manager test script:

```
perl 142x/142x_imgmgr.pl
```

2. Follow the test instructions

3. Run the active manager test script:

```
perl 1421/1421_imgmgr_active.pl
```

4. Follow the test instructions

5. Run the evaluation script:

```
perl 1421/eval_1421.pl
```

The evaluation script should yield 0 errors.

5.6 Image Manager Test 1422: PWF Release Claim

This sequence of messages tests the response of the Post Processing Manager to a request to release a claim. That is, a MESA Image Creator will claim a workitem from the PPM worklist, then release the workitem without completing it, and then query a second time to determine if the workitem is again available.

This test relies on the use of Test 1421 to set up a workitem in progress. Please run Test 1421 immediately prior to running this test.

1. Run the test script:

```
perl 1422/1422_imgmgr_active.pl
```

2. Follow the test instructions

3. Run the evaluation script:

```
perl 1422/eval_1422.pl
```

The evaluation script should yield 0 errors.

6 Basic Security Tests

This section describes tests that are specific to the IHE Basic Security integration profile. If you have the MESA servers running for the “standard” tests, you should stop those servers now. You will need to start the MESA secure servers with a different script.

6.1 Image Manager Test 1502: Pre-reg/Order Cancel/Reorder

This test is obsolete; do not perform this test.

Image Manager Test 1502 uses the same sequence of events as test 102 with some added DICOM C-Find requests. The Image Manager is expected to communicate with other systems using TLS negotiation and to send appropriate audit messages to the MESA syslog server.

The MESA software sends one DICOM C-Find query to the Image Manager. This should trigger at least one message to the Audit Record Repository. You might trigger other messages to the Audit Record Repository based on your interaction with your Image Manager.

1. Start the secure MESA servers as instructed in section 1.5.
2. Clear your Image Manager of all images.
3. Run the test script:

```
perl 1502/1502_imgmgr.pl
```

This script will send messages to your system and prompt you along the way. You are expected to send audit messages in response to certain events (such as DICOM C-Find requests).

4. Run the evaluation script:

```
perl 1502/eval_1502.pl <AE Title MPPS Mgr>
```
5. Send the test result (*1502/grade_1502.txt*) to the Project Manager.
6. Grab all of the files (tar/zip) in *\$MESA_TARGET/logs/syslog* and send these to the Project Manager.

6.2 Image Manager Test 1503: Unidentified Patient Case #1

This test is obsolete; do not perform this test.

Image Manager Test 1503 uses the same sequence of events as test 103. The Image Manager is expected to communicate with other systems using TLS negotiation and to send appropriate audit messages to the MESA syslog server.

The MESA software sends one DICOM C-Find query to the Image Manager. This should trigger at least one message to the Audit Record Repository. You might trigger other messages to the Audit Record Repository based on your interaction with your Image Manager.

1. Start the secure MESA servers as instructed in section 1.5.
2. Clear your Image Manager of all images.
3. Run the test script:

```
perl 1503/1503_imgmgr.pl
```

This script will send messages to your system and prompt you along the way. You are expected to send audit messages in response to certain events (such as DICOM C-Find requests).

4. Run the evaluation script:

```
perl 1503/eval_1503.pl <AE Title MPPS Mgr>
```

5. Send the test result (*1503/grade_1503.txt*) to the Project Manager.
6. Grab all of the files (tar/zip) in *\$MESA_TARGET/logs/syslog* and send these to the Project Manager.

6.3 Image Manager Test 1531: Basic Security, Administrative and Procedure Performance Process Flow

Test case 1531 uses the same transactions as defined for test 131: Administrative and Procedure Performance Process Flow.

The nominal patient name is BLACK^CHARLES.

Notes:

Before starting this test, make sure you have stopped the MESA servers for the standard mode tests and started the MESA servers for the secure mode tests.

To run this test (the reference to 131 below is intentional):

```
perl scripts/imgmgr_secure.pl 131 <log>
```

To evaluate this test (1531, not 131):

```
perl 1531/eval_1531.pl <log> <MPPS Mgr AE title> <SC AE title>
```

To change patient name, patient ID prior to the test (131 is intentional):

```
cd $MESA_TARGET/mesa_tests/rad/msgs
perl mesa_reset/131.pl ihe-us/131.var (or)
perl mesa_reset/131.pl
```

7 Evidence Document Tests

This section describes tests that are specific to the IHE Evidence Document integration profile.

7.1 Image Manager Test 1701: Evidence Document Management in Scheduled Workflow

Test 1701 covers evidence document management in scheduled workflow, part of the Evidence Document profile. The test itself is an implementation of the scheme shown in Figure 14.2-1 (see IHE TF Vol I, section 14).

To run this test:

```
perl scripts/imgmgr_swf.pl 1701 <log>
```

To evaluate this test:

```
perl 1701/eval_1701.pl <log>
```

8 Nuclear Medicine Profile Tests

This section describes tests that are specific to the IHE Nuclear Medicine integration profile.

8.1 Image Manager Test 2601: NM Storage SOP Classes

Reference: Rad TF-2: 4.8.4.1.3.1.

Test 2601 is used to determine if an Image Manager supports storage of required NM image types.

8.2 Image Manager Test 2602: NM Query Keys

Reference: Rad TF-2: 4.14.4.1.2

Test 2602 is used to determine if an Image Manager supports query keys required by the NM Integration Profile.

9 Tests for Cardiology

9.1 Image Manger Test 20106: C5: Patient NOT Registered (no Order)

Test 20106 covers C5: Patient Not Registered. (see CARD TF-1: 3.4.5)

9.1.1 References

9.1.2 Instructions

To run this test, follow these steps using a DOS window or terminal emulator:

1. Set the current directory to *\$MESA_TARGET/ mesa_tests/card/actors/imgmgr*.
2. Make sure the MESA servers have been started as described in section 1.5 above.
3. Run the test script as follows:

```
perl scripts/imgmgr_cath.pl 20106 <log>
```

4. Run the evaluation script below.

9.1.3 Evaluation

1. Run the evaluation script

```
perl 20106/eval_20106.pl <log> <AE Title MPPS Mgr>
```

2. The evaluation output is found in 20106/grade_20106.txt. The final result should indicate 0 errors. Submit the result run at log level 4 to the Project Manager.

9.2 Test Case 20602: ED: Describe Image Manager/Image Archive Methods

Test 20602: Do not divulge any proprietary information. Create a Word document with the following naming convention: *CompanyName_Product_20602_IM_2005.doc* and send it to the appropriate Domain (cardiology, radiology, ITI) Technical Project Manager.

In 500 words or less for each, describe the following:

1. Which SOP Classes does your product support? (e.g, Comprehensive, Basic Text, etc.)
 2. Confirm that your IM product can support any Template within a SOP Class.
-