# RSNA ISN Conformity Assessment Tests: Edge Server 5.0

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# Document History

| Date | Author | Comments |
|---|---|---|
| 2017.09.05 | Steve Moore | First version for 5.0 architecture |
| | | |

# Edge Server

This document describes tests that are applied to an RSNA Image Sharing Network (ISN) Edge Server. The following diagram shows the system architecture for these tests.
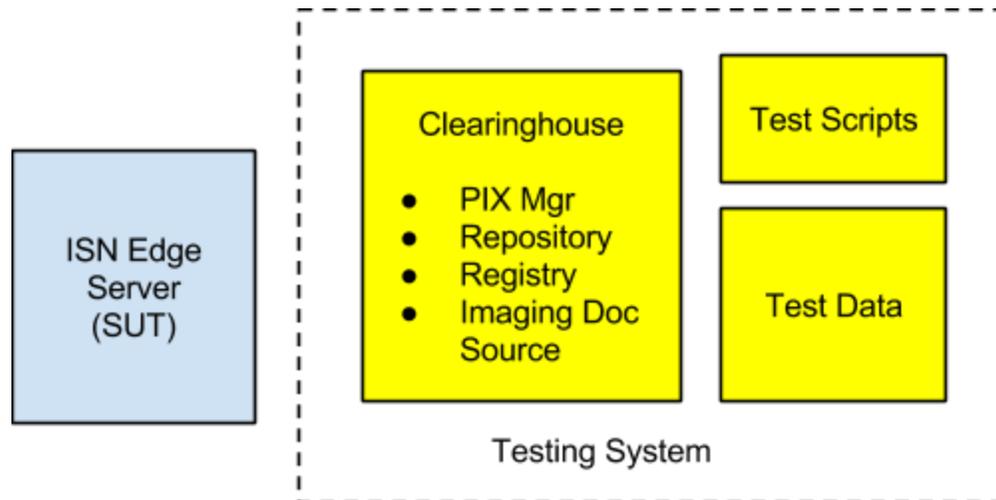


1. Clearinghouse: Accepts submission from the ISN Source (under test).
   a. ADT message with patient identifier known by Edge Server (HL7 V2)
   b. PIX Query to retrieve patient identifier known by Clearinghouse (HL7 V2)
   c. XDS.b Provide & Register to submit radiology report to Document Repository
   d. XDS.b Provide & Register to submit radiology images to Imaging Document Source
2. Test scripts: Drives the creation of test data that can be sent to the ISN Source and used to compare with known results.
3. Test Data: Written by hand and/or generated by program. These are images sent to the ISN Source and other metadata to be used as comparison data.

## Simulator Creation and Configuration Parameters

Appendix B describes the procedure for creating simulators to communicate with the Edge Server under test and how to identify the necessary configuration parameters including web service endpoints and identifiers.

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# Differences for RSNA ISN 3.x and 4.x Architecture

The 5.0 architecture requires changes to the Edge Server when compare to previous versions. Implementations of a 5.0 Edge Server will need to be aware of the following:

1. The Edge Server now generates a 9 character access code for use in computing the hash of the patient identifier. The previous version used a 20 character code.
2. The Assigning Authority value for patient identifiers generated by the Edge Server has changed. The value used in production is not yet defined. Testing will require configuration of the Edge Server.
3. The patient identifier used to submit images and reports is defined by the Clearinghouse and not the Edge Server. The Edge Server submits an ADT message to the Clearinghouse PIX and then submits a PIX query to retrieve the patient identifier in the Clearinghouse domain.
4. The Edge Server sends a single ADT message to the Clearinghouse PIX Manager; it no longer sends an ADT message to the Clearinghouse Registry.
5. The report is submitted as a PDF document. The previous version used a plain text file.
6. The report and image data are submitted separately. In the previous version, the report and image data were submitted in a single transaction.
7. The Edge Server needs to recognize separate endpoints for submitting the report (Clearinghouse Repository) and images (Clearinghouse Imaging Document Source). The Edge Server cannot assume the Clearinghouse uses the same endpoint for both functions.
8. The image submission does not include a DICOM KOS object as a manifest. In the previous version, the Edge Server includes a DICOM KOS object with a list of all images that are submitted.
9. Because the report and images are submitted separately, the system uses an Accession Number to link the two items. The Accession Number is included in the XDS.b metadata and uses an Assigning Authority that will be unique to each Edge Server.
10. Metadata values are defined that are more tightly linked to published standards. In the previous version, some of the encoded metadata values were defined by the RSNA Image Sharing Network. Values in the 5.0 architecture are taken from published standards.

# Configuration Parameters for Edge Server

# Code Tables, OIDs

**Identifiers**

For the tests in this document, we use fixed values for the Assigning Authority in Patient IDs. The table below lists the values used. Note that even when testing multiple Edge Server, each system is to configured with the same Patient ID Assigning Authority (to simplify configuration).

| Data Element Name | Value |
|---|---|
| Patient Identifier Assigning Authority (Edge Server Domain) | TBD |
| Patient Identifier Assigning Authority (Clearinghouse Domain) | TBD |
| Assigning Authority for Accession Numbers | TBD |

# Test Data

The tests for an Edge Server use a fixed set of images as input data. The images with patient names and identifiers are listed in Appendix A of this document. Test data are provided to the Edge Server under test as a zip file. The process to import the test data into the Edge Server under test is left to the Edge Server.

# Standard Testing Procedure

The tests below assume a standard testing procedure:

1. One Clearinghouse Repository/Registry simulator is created specifically for the Edge Server under test. The Repository/Registry simulator included with the NIST Xdstools2 software is a standin for an RSNA Clearinghouse system. Each Edge Server under test uses only the Repository/Registry simulator assigned to it and is not expected to communicate with other simulators.

2. One HL7 receiver is created and shared across all systems under test. A proxy system is used in front of the HL7 receiver that captures the inbound HL7 V2 messages and can distinguish that inbound data by IP address.
3. Input image data and reports are provided to the Edge Server under test as a zip file. The Edge Server under test imports those data, correlating patient identifiers in the test data with test cases.
4. The documentation for each test describes the test configuration, test data and expectations.
5. Each test requires the Edge Server under test to submit data to the Repository/Registry simulator and to the Imaging Document Source simulator. These steps are triggered by the owner of the Edge Server; there is no mechanism defined to signal an Edge Server to export data to an RSNA Clearinghouse.
   a. The radiology report is submitted to the Repository simulator.
   b. The images are submitted to the Imaging Document Source simulator in a separate (but single) submission set.
6. Because the Edge Server is a push only device (there are no defined queries/retrieves for the Edge Server), the testing software does not make any connections to the Edge Server.
7. After the Edge Server has submitted the requested data, evaluation software is executed on the testing system.

# Test Specifications

## Edge 5501-5.0 PnR Single

**Purpose / Context**

This test with a single image is designed to test the underlying communication requirements for an RSNA Edge Server. The Edge Server is required to generate the proper ADT messages and Document Set Submission and communicate these to the Clearinghouse simulator.

Data presented to Edge Server:
- One DICOM image
- One HL7 V2 ORM (scheduling message)
- One HL7 V2 ORU (report message)

**Test Steps**

In the instructions below, SUT refers to the person operating the system under test. That person is directing the Edge Server to perform some function.

Test Manager refers to the person administering or running the test. That person is controlling the test software.

*Setup*
1. SUT: For this test, use the data (image, scheduling message, report) for the patient with departmental ID: ISNS-DEPT001.
2. SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server.
3. SUT: Import the DICOM image and HL7 V2 ORU report message into your system.

*Instructions*
1. SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT001.
2. SUT: Trigger your system to export the imaging study for this patient to the Clearinghouse simulators. This involves the following:
   a. As part of the submission, the Edge Server generates a 9 character access code that is used to compute the hashed patient identifier. Record the 9 character access code and patient date of birth and provide these to the Test Manager.
   b. Submit Patient Feed (ITI-8) transactions to the Clearinghouse PIX simulator. The Patient Identifier is computed by performing a hash on the 9 character access code

and patient date of birth. This is submitted using the Assigning Authority for the Edge Server domain.

    c.   Submit a PIX query to the Clearinghouse PIX simulator. Provide the computed hash / patient identifier and request the patient identifier in the Clearinghouse domain.

    d.   Use the test data (one image, report) to generate a Provide and Register transaction with the Clearinghouse Repository/Registry simulator that contains one attachment in a single submission set.

        i.   The document sent to the Repository/Registry is a PDF version of the report.

        ii.   The metadata includes an accession number with the proper assigning authority to link the report to the image.

    e.   Use the same test data to generate a Provide and Register transaction that submits the test image to the Imaging Document Source simulator.

        i.   The metadata includes an accession number with the proper assigning authority to link the image to the report.

3. Test Manager: Use the procedure defined in *Test Manager Guide: Edge Server 5.0* to validate the data submitted by the Edge Server under test.

# Edge 5502-5.0 PnR Multi

**Purpose / Context**

This is an extension of test *EDGE 5501-5.0 PnR Single*. The test data consists of an imaging study with two separate series. This allows us to test:

1. Different modality (MR)
2. An imaging study with multiple series and multiple images

**Test Steps**

*Setup*

1. SUT: For this test, use the data (multiple images, one report) for the patient with departmental ID: ISNS-DEPT002.
2. SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server.
3. SUT: Import the DICOM images and HL7 V2 ORU report message into your system.

*Instructions*

1. SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT002.
2. SUT: Trigger your system to export the imaging study for this patient to the Clearinghouse simulators. This involves the following:
   a. As part of the submission, the Edge Server generates a 9 character access code that is used to compute the hashed patient identifier. Record the 9 character access code and patient date of birth and provide these to the Test Manager.
   b. Submit Patient Feed (ITI-8) transactions to the Clearinghouse PIX simulator. The Patient Identifier is computed by performing a hash on the 9 character access code and patient date of birth. This is submitted using the Assigning Authority for the Edge Server domain.
   c. Submit a PIX query to the Clearinghouse PIX simulator. Provide the computed hash / patient identifier and request the patient identifier in the Clearinghouse domain.
   d. Use the test data (multiple images, report) to generate a Provide and Register transaction with the Clearinghouse Repository/Registry simulator that contains one attachment in a single submission set.
      i. The document sent to the Repository/Registry is a PDF version of the report.
      ii. The metadata includes an accession number with the proper assigning authority to link the report to the images.
   e. Use the same test data to generate a Provide and Register transaction that submits the test images to the Imaging Document Source simulator.
      i. The metadata includes an accession number with the proper assigning authority to link the image to the report.
3. Test Manager: Use the procedure defined in *Test Manager Guide: Edge Server 5.0* to validate the data submitted by the Edge Server under test.


# Edge 5503-5.0 XRA

**Purpose / Context**
This is an extension of test *EDGE 5501-5.0 PnR Single*. The test data consists of an imaging study with XRA data.


**Test Steps**
*Setup*


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1. SUT: For this test, use the data (multiple images, one report) for the patient with departmental ID: ISNS-DEPT021.
2. SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server.
3. SUT: Import the DICOM images and HL7 V2 ORU report message into your system.

*Instructions*
1. SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT021.
2. SUT: Trigger your system to export the imaging study for this patient to the Clearinghouse simulators. This involves the following:
   a. As part of the submission, the Edge Server generates a 9 character access code that is used to compute the hashed patient identifier. Record the 9 character access code and patient date of birth and provide these to the Test Manager.
   b. Submit Patient Feed (ITI-8) transactions to the Clearinghouse PIX simulator. The Patient Identifier is computed by performing a hash on the 9 character access code and patient date of birth. This is submitted using the Assigning Authority for the Edge Server domain.
   c. Submit a PIX query to the Clearinghouse PIX simulator. Provide the computed hash / patient identifier and request the patient identifier in the Clearinghouse domain.
   d. Use the test data (multiple images, report) to generate a Provide and Register transaction with the Clearinghouse Repository/Registry simulator that contains one attachment in a single submission set.
      i. The document sent to the Repository/Registry is a PDF version of the report.
      ii. The metadata includes an accession number with the proper assigning authority to link the report to the images.
   e. Use the same test data to generate a Provide and Register transaction that submits the test images to the Imaging Document Source simulator.
      i. The metadata includes an accession number with the proper assigning authority to link the image to the report.
3. Test Manager: Use the procedure defined in *Test Manager Guide: Edge Server 5.0* to validate the data submitted by the Edge Server under test.

# Edge 5504-5.0 Ultrasound

**Purpose / Context**

This is an extension of test *EDGE 5501-5.0 PnR Single*. The test data consists of an imaging study with Ultrasound data.

**Test Steps**

*Setup*

1. SUT: For this test, use the data (multiple images, one report) for the patient with departmental ID: ISNS-DEPT022.
2. SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server.
3. SUT: Import the DICOM images and HL7 V2 ORU report message into your system.

*Instructions*

1. SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT022.
2. SUT: Trigger your system to export the imaging study for this patient to the Clearinghouse simulators. This involves the following:
   a. As part of the submission, the Edge Server generates a 9 character access code that is used to compute the hashed patient identifier. Record the 9 character access code and patient date of birth and provide these to the Test Manager.
   b. Submit Patient Feed (ITI-8) transactions to the Clearinghouse PIX simulator. The Patient Identifier is computed by performing a hash on the 9 character access code and patient date of birth. This is submitted using the Assigning Authority for the Edge Server domain.
   c. Submit a PIX query to the Clearinghouse PIX simulator. Provide the computed hash / patient identifier and request the patient identifier in the Clearinghouse domain.
   d. Use the test data (multiple images, report) to generate a Provide and Register transaction with the Clearinghouse Repository/Registry simulator that contains one attachment in a single submission set.
      i. The document sent to the Repository/Registry is a PDF version of the report.
      ii. The metadata includes an accession number with the proper assigning authority to link the report to the images.

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e. Use the same test data to generate a Provide and Register transaction that submits the test images to the Imaging Document Source simulator.
    i. The metadata includes an accession number with the proper assigning authority to link the image to the report.
3. Test Manager: Use the procedure defined in *Test Manager Guide: Edge Server 5.0* to validate the data submitted by the Edge Server under test.

# Edge 5505-5.0 Mammography

**Purpose / Context**

This is an extension of test *EDGE 5501-5.0 PnR Single*. The test data consists of an imaging study with Mammography data.

**Test Steps**

*Setup*
1. SUT: For this test, use the data (multiple images, one report) for the patient with departmental ID: ISNS-DEPT023.
2. SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server.
3. SUT: Import the DICOM images and HL7 V2 ORU report message into your system.

*Instructions*
1. SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT023.
2. SUT: Trigger your system to export the imaging study for this patient to the Clearinghouse simulators. This involves the following:
    a. As part of the submission, the Edge Server generates a 9 character access code that is used to compute the hashed patient identifier. Record the 9 character access code and patient date of birth and provide these to the Test Manager.
    b. Submit Patient Feed (ITI-8) transactions to the Clearinghouse PIX simulator. The Patient Identifier is computed by performing a hash on the 9 character access code and patient date of birth. This is submitted using the Assigning Authority for the Edge Server domain.
    c. Submit a PIX query to the Clearinghouse PIX simulator. Provide the computed hash / patient identifier and request the patient identifier in the Clearinghouse domain.

d. Use the test data (multiple images, report) to generate a Provide and Register transaction with the Clearinghouse Repository/Registry simulator that contains one attachment in a single submission set.
  i. The document sent to the Repository/Registry is a PDF version of the report.
  ii. The metadata includes an accession number with the proper assigning authority to link the report to the images.
e. Use the same test data to generate a Provide and Register transaction that submits the test images to the Imaging Document Source simulator.
  i. The metadata includes an accession number with the proper assigning authority to link the image to the report.

3. Test Manager: Use the procedure defined in *Test Manager Guide: Edge Server 5.0* to validate the data submitted by the Edge Server under test.

# Edge 5506-5.0 PET

**Purpose / Context**
This is an extension of test *EDGE 5501-5.0 PnR Single*. The test data consists of an imaging study with PET data.

**Test Steps**
*Setup*
1. SUT: For this test, use the data (multiple images, one report) for the patient with departmental ID: ISNS-DEPT024.
2. SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server.
3. SUT: Import the DICOM images and HL7 V2 ORU report message into your system.

*Instructions*
1. SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT023.
2. SUT: Trigger your system to export the imaging study for this patient to the Clearinghouse simulators. This involves the following:
  a. As part of the submission, the Edge Server generates a 9 character access code that is used to compute the hashed patient identifier. Record the 9 character access code and patient date of birth and provide these to the Test Manager.

b.  Submit Patient Feed (ITI-8) transactions to the Clearinghouse PIX simulator. The Patient Identifier is computed by performing a hash on the 9 character access code and patient date of birth. This is submitted using the Assigning Authority for the Edge Server domain.

c.  Submit a PIX query to the Clearinghouse PIX simulator. Provide the computed hash / patient identifier and request the patient identifier in the Clearinghouse domain.

d.  Use the test data (multiple images, report) to generate a Provide and Register transaction with the Clearinghouse Repository/Registry simulator that contains one attachment in a single submission set.

    i.  The document sent to the Repository/Registry is a PDF version of the report.

    ii.  The metadata includes an accession number with the proper assigning authority to link the report to the images.

e.  Use the same test data to generate a Provide and Register transaction that submits the test images to the Imaging Document Source simulator.

    i.  The metadata includes an accession number with the proper assigning authority to link the image to the report.

3.  Test Manager: Use the procedure defined in *Test Manager Guide: Edge Server 5.0* to validate the data submitted by the Edge Server under test.

# Edge 5507-5.0 Multi-Modality

**Purpose / Context**

This is an extension of test *EDGE 5501-5.0 PnR Single*. The test data consists of an imaging study with multiple modalities.

**Test Steps**

*Setup*

1.  For this test, use the data (multiple images, one report) for the patient with departmental ID: ISNS-DEPT027.
2.  SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server.
3.  SUT: Import the DICOM images and HL7 V2 ORU report message into your system.

*Instructions*

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1. SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT023.
2. SUT: Trigger your system to export the imaging study for this patient to the Clearinghouse simulators. This involves the following:
   a. As part of the submission, the Edge Server generates a 9 character access code that is used to compute the hashed patient identifier. Record the 9 character access code and patient date of birth and provide these to the Test Manager.
   b. Submit Patient Feed (ITI-8) transactions to the Clearinghouse PIX simulator. The Patient Identifier is computed by performing a hash on the 9 character access code and patient date of birth. This is submitted using the Assigning Authority for the Edge Server domain.
   c. Submit a PIX query to the Clearinghouse PIX simulator. Provide the computed hash / patient identifier and request the patient identifier in the Clearinghouse domain.
   d. Use the test data (multiple images, report) to generate a Provide and Register transaction with the Clearinghouse Repository/Registry simulator that contains one attachment in a single submission set.
      i. The document sent to the Repository/Registry is a PDF version of the report.
      ii. The metadata includes an accession number with the proper assigning authority to link the report to the images.
   e. Use the same test data to generate a Provide and Register transaction that submits the test images to the Imaging Document Source simulator.
      i. The metadata includes an accession number with the proper assigning authority to link the image to the report.
3. Test Manager: Use the procedure defined in *Test Manager Guide: Edge Server 5.0* to validate the data submitted by the Edge Server under test.

# Edge 5508-5.0 Three Separate Imaging Studies

**Purpose / Context**
This test uses three separate imaging studies for the same patient, each with a distinct DICOM Study Instance UID and a distinct Accession Number. There is a 1:1 correspondence between the DICOM Study Instance UID and the Accession Number. This is not a test with a single Accession Number linked to image acquisitions with different Study Instance UIDs.

**Test Steps**

*Setup*

1. For this test, use the data (multiple studies, multiple reports) for the patient with departmental ID: ISNS-DEPT051.
2. SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server. There are separate scheduling messages for each imaging study.
3. SUT: Import the DICOM images and HL7 V2 ORU report message for each imaging study into your system.

*Instructions*

1. SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT051.
2. SUT: Trigger your system to export the imaging studies for this patient to the Clearinghouse simulators. We expect six separate submissions corresponding to the three separate imaging studies (one submission each for report and images). Order of submission is not important. This involves the following:
    a. As part of the submission, the Edge Server generates a 9 character access code that is used to compute the hashed patient identifier. Record the 9 character access code and patient date of birth and provide these to the Test Manager.
    b. Submit Patient Feed (ITI-8) transactions to the Clearinghouse simulator PIX and Registry actors. The Patient Identifier is computed by performing a hash on the 9 character access code and patient date of birth.
    c. Submit a PIX query to the Clearinghouse PIX simulator. Provide the computed hash / patient identifier and request the patient identifier in the Clearinghouse domain.
    d. Submit the three reports separately using distinct Access Numbers for each report.
    e. Submit the three imaging studies separately. Use the proper Access Number to link each imaging study to the appropriate report.
3. Test Manager: Use the procedure defined in *Test Manager Guide: Edge Server 5.0* to validate the data submitted by the Edge Server under test.

# Edge 5509-5.0 No Report With the Study

**Purpose / Context**

This test does not include a report. The Edge Server under test is expected to send a submission that includes the imaging data but no report.

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**Test Steps**

*Setup*

1. For this test, use the data (multiple images, no report) for the patient with departmental ID: ISNS-DEPT061.
2. SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server.
3. SUT: Import the DICOM images into your system.

*Instructions*

1. SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT061.
2. SUT: Trigger your system to export the imaging study for this patient to the Clearinghouse simulators. This involves the following:
   a. As part of the submission, the Edge Server generates a 9 character access code that is used to compute the hashed patient identifier. Record the 9 character access code and patient date of birth and provide these to the Test Manager.
   b. Submit Patient Feed (ITI-8) transactions to the Clearinghouse simulator PIX and Registry actors. The Patient Identifier is computed by performing a hash on the 9 character access code and patient date of birth.
   c. Submit a PIX query to the Clearinghouse PIX simulator. Provide the computed hash / patient identifier and request the patient identifier in the Clearinghouse domain.
   d. Use the test data (images) to generate a Provide and Register transaction with the Clearinghouse Imaging Document Source simulator that contains multiple attachments in a single submission set. The patient identifier is the one returned by the Clearinghouse PIX manager.
3. Test Manager: Use the procedure defined in *Test Manager Guide: Edge Server 5.0* to validate the data submitted by the Edge Server under test. Note that there is no report for this test case; no report should be included in the submission set.

# Edge 5510-5.0 PIX Manager Down

**Purpose / Context**

This test simulates the case where the Clearinghouse PIX Manager is not receiving HL7 feeds. We simulate that by asking the ISN Source to configure the PIX feed to go to a port on the Clearinghouse simulator that is not active.

**Test Steps**

*Setup*

1. For this test, use the data (one imaging study, one report) for the patient with departmental ID: ISNS-DEPT071.
2. SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server.
3. SUT: Import the DICOM images and HL7 V2 ORU report message into your system.
4. SUT: Configure your system to use an incorrect port number for the PIX Manager ADT feed. You will be given a port number that is known not to respond.

*Instructions*

1. SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT071.
2. SUT: Trigger your system to export the imaging study for this patient to the Clearinghouse simulators. This involves the following:
    a. As part of the submission, the Edge Server generates a 9 character access code that is used to compute the hashed patient identifier. Record the 9 character access code and patient date of birth and provide these to the Test Manager.
    b. Submit Patient Feed (ITI-8) transactions to the Clearinghouse PIX Manager simulator. The Patient Identifier is computed by performing a hash on the 9 character access code and patient date of birth.
3. SUT: At this point, the submission process should stop/pause. The Edge Server should not submit the imaging data/report to the Repository simulator.
4. SUT: Provide evidence to the Test Manager that:
    a. The initial send was triggered.
    b. The export was paused because of the **failed** HL7 V2 transaction to the **PIX Manager** simulator.
5. Test Manager: Review the Repository simulator for evidence of a submission for this test patient. There should be no submission/no activity. If the Edge Server did submit data for this patient, this is an error, and the test fails.

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# Edge 5511-5.0 Registry ADT Down

**Purpose / Context**

This test simulates the case where the Clearinghouse Registry is not receiving HL7 feeds. We simulate that by asking the ISN Source to configure the Registry ADT feed to go to a port on the Clearinghouse simulator that is not active.

**Test Steps**

*Setup*

1. For this test, use the data (one imaging study, one report) for the patient with departmental ID: ISNS-DEPT072.
2. SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server.
3. SUT: Import the DICOM images and HL7 V2 ORU report message into your system.
4. SUT: Configure your system to use an incorrect port number for the Registry ADT feed. You will be given a port number that is known not to respond.

*Instructions*

1. SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT072.
2. SUT: Trigger your system to export the imaging study for this patient to the Clearinghouse simulators. This involves the following:
   a. As part of the submission, the Edge Server generates a 20 character access code that is used to compute the hashed patient identifier. Record the 20 character access code and patient date of birth and provide these to the Test Manager.
   b. Submit Patient Feed (ITI-8) transactions to the Clearinghouse simulator PIX and Registry actors. The Patient Identifier is computed by performing a hash on the 20 character access code and patient date of birth.
3. SUT: At this point, the submission process should stop/pause. The Edge Server should not submit the imaging data/report to the Repository simulator. It is possible that the Edge Server can **successfully** send the ADT message to the **PIX Manager** endpoint.
4. SUT: Provide evidence to the Test Manager that:
   a. The initial send was triggered.
   b. The export was paused because of the **failed** HL7 V2 transaction to the **Registry** simulator.
   c. If the Edge Server did send the HL7 V2 transaction to the **PIX Manager** simulator, provide evidence of that transaction.

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5. ~~Test Manager: Review the proxy for evidence of the HL7 V2 transaction to the **PIX Manager** simulator. This transaction may or may not be present depending on the implementation of the Edge Server. If you see two HL7 V2 transactions (one for the Registry, one for the PIX Manager), this is an indication that the Edge Server is not configured correctly. Ask the Edge Server to rerun the test~~
6. ~~Test Manager: Review the Repository simulator for evidence of a submission for this test patient. There should be no submission/no activity. If the Edge Server did submit data for this patient, this is an error, and the test fails.~~

# Edge 5512-5.0 Repository PnR Down

**Purpose / Context**

This test simulates the case where the Clearinghouse Repository is not receiving Provide and Register transactions. We simulate that by asking the ISN Source to configure the Provide and Register transaction to go to a port on the Clearinghouse simulator that is not active.

**Test Steps**

*Setup*
1. For this test, use the data (one imaging study, one report) for the patient with departmental ID: ISNS-DEPT073.
2. SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server.
3. SUT: Import the DICOM images and HL7 V2 ORU report message into your system.
4. SUT: Configure your system to use an incorrect port number for the Provide and Register transaction to the Repository simulator. You will be given a port number that is known not to respond.

*Instructions*
1. SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT073.
2. SUT: Trigger your system to export the imaging study for this patient to the Clearinghouse simulators. This involves the following:
   a. As part of the submission, the Edge Server generates a 9 character access code that is used to compute the hashed patient identifier. Record the 9 character access code and patient date of birth and provide these to the Test Manager.

b. Submit Patient Feed (ITI-8) transactions to the Clearinghouse simulator PIX and Registry actors. The Patient Identifier is computed by performing a hash on the 9 character access code and patient date of birth.

c. Submit a PIX query to the Clearinghouse PIX simulator. Provide the computed hash / patient identifier and request the patient identifier in the Clearinghouse domain.

d. Use the test data (multiple images, report) to generate a Provide and Register transaction with the Clearinghouse Repository/Registry simulator that contains one attachment in a single submission set.

   i. The document sent to the Repository/Registry is a PDF version of the report.

   ii. The metadata includes an accession number with the proper assigning authority to link the report to the images.

3. SUT: At this point, the submission process should stop/pause. The Edge Server should be able to submit an ADT message (HL7 V2) and a PIX query (HL7 V2) but will not be able to send the Provide and Register transaction with the report.

4. SUT: Provide evidence to the Test Manager that:

   a. The initial send was triggered.

   b. The HL7 V2 ADT message was sent.

   c. The export was paused because of the failed Provide and Register transaction.

5. Test Manager: Review the proxy for evidence of the HL7 V2 transaction to the **PIX Manager** simulator.

6. Test Manager: Review the Repository simulator for evidence of a submission for this test patient. There should be no submission/no activity. If the Edge Server did submit data for this patient, this is an error, and the test fails.

   a. If submission data is found, it is an indication that the Edge Server is not configured to use an incorrect port.

# Appendices

## Appendix A: Patient Identifiers and Data Sets for Source Tests

Some tests will share test data. The table below lists the test name with patient demographics. Shared test data is indicated by common patient identifiers.

| Departmental Identifier | DOB | Patient Name | Test Case/Name(s) |
|---|---|---|---|
| ISNS-DEPT001 | 1985-01-01 | Computed-Rad^Single | 5501: PnR Single |
| ISNS-DEPT002 | 1985-01-02 | Multi^Mr | 5502: PnR Multi |
| ISNS-DEPT021 | 1986-02-01 | Xra^William | 5503: XRA |
| ISNS-DEPT022 | 1986-02-02 | Ultrasound^Will | 5504: Ultrasound |
| ISNS-DEPT023 | 1986-02-03 | Mammography^Ellen | 5505: Mammography |
| ISNS-DEPT024 | 1986-02-04 | Pet^Scout | 5506: PET |
| ISNS-DEPT025 | | Enhanced^Mag | 55ww: Enhanced MR Images |
| ISNS-DEPT026 | | Enhanced^Comp | 55zz: Enhanced CT Images |
| ISNS-DEPT027 | 1986-02-07 | Multi^Pat | 5507: Multi-Modality |
| ISNS-DEPT041 | | Compressed^Lossless | 55xx: Lossless Compression |
| ISNS-DEPT042 | | Compressed^Lossy | 55yy: Lossy Compression |
| ISNS-DEPT051 | 1988-05-01 | Several^Pat | 5508: Three separate imaging studies |
| ISNS-DEPT061 | | Report^None | 5509: No report with the study |

| | | | |
|---|---|---|---|
| `ISNS-DEPT071` | `19890601` | `Pix^Down` | 5510: PIX Manager Down |
| `ISNS-DEPT072` | | `Registry^Down` | 5511: Registry ADT Down |
| `ISNS-DEPT073` | | `Repository^Down` | 5512: Repository PnR Down |

# Appendix B: Simulator Configuration for Edge Server Tests

These instructions are intended for the person or group managing the testing system and administering the test process. If you are running this software in your own environment, these instructions are also for you.

Simulators are configured using the NIST xdstools2 software. For each Edge Server under test, we create separate simulators to segregate the test data.

**Naming Conventions**

The simulator names are generated and can become long. Please follow the naming convention suggested below. One name is used to label a Test Session in the test software. The Test Session identifies the system under test; we recommend using a recognizable but short label for this name. Rather than use a full company or product name, use an acronym or some other short label. In the examples below, we are using the company name **azure**.

Please use all lowercase and no special characters when providing names.

**Test Session**
1. You need to create a new test session for the Edge Server under test.
2. In the toolkit, select Simulator Manager in the left flap.
3. In the Simulator Manager window, select the Environment: xdsi
4. In the Simulator Manager window, enter a new value for Test Session (e.g., **azure**) and activate the Add button.
5. As you do further work in managing simulators, make sure that both the Environment (xdsi) and Test Session are properly selected.

**Document Repository/Registry Simulator**

You will need to create one Document Repository/Registry simulator. This simulator acts as the Clearinghouse in these tests.
1. In the toolkit, select Simulator Manager in the left flap.

2.  Select the proper Environment (xdsi) and Test Session (in this example, **azure**).
3.  Create the Document Repository/Registry
    a.  In the section to create a simulator, select actor type: Document Repository/Registry.
    b.  For Simulator ID, enter **rep_reg_edge**
4.  Configure the Document Repository/Registry
    a.  In the Simulator Manager, select the Configure control for the Repository/Registry you just created.
    b.  In the configuration screen, uncheck the box "Validate Against Patient Identity Feed".
    c.  Set the value of the repositoryUniqueId: 1.3.6.1.4.1.21367.13.90.101
    d.  Make a note of the URLs for the Edge Server to submit the KOS + Images to this Repository/Registry.
    e.  Make a note of the HL7 port used to accept inbound ADT messages.

# Appendix Z: Future Tests

## Edge 5508 Lossless

**Purpose / Context**

This is an extension of test *EDGE 5501 PnR Single*. The test data consists of an imaging study data stored with lossless compression.

**Test Steps**

*Setup*
1.  SUT: For this test, use the data (multiple images, one report) for the patient with departmental ID: ISNS-DEPT041.
2.  SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server.
3.  SUT: Import the DICOM images and HL7 V2 ORU report message into your system.

*Instructions*
1.  SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT041.
2.  SUT: Trigger your system to export the Clearinghouse simulators. This involves the following:

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<ol type="a" start="1">
<li>As part of the submission, the Edge Server generates a 20 character access code that is used to compute the hashed patient identifier. Record the 20 character access code and patient date of birth and provide these to the Test Manager.</li>
<li>Submit Patient Feed (ITI-8) transactions to the Clearinghouse simulator PIX and Registry actors. The Patient Identifier is computed by performing a hash on the 20 character access code and patient date of birth.</li>
<li>Use the test data (images, report) to generate a Provide and Register transaction with the Clearinghouse Repository/Registry simulator that contains multiple attachments in a single submission set. The patient identifier is the same identifier computed for sending the HL7 ADT messages. The attachments in the single submission set are:
<ol type="i">
<li>Multiple images</li>
<li>Report</li>
<li>KOS object that references the image</li>
</ol>
Note: Some implementations may include other attachments such as a DICOM Secondary Capture object with a rendering of the report. This attachment is allowed. Other attachments should be reviewed/discussed with the test manager.</li>
</ol>

<ol start="3">
<li>Test Manager: Use the procedure defined in <em>Test Manager Guide: Edge Server 5.0</em> to validate the data submitted by the Edge Server under test.</li>
</ol>

## Edge 5509 Lossy

**Purpose / Context**

This is an extension of test <em>EDGE 5501 PnR Single</em>. The test data consists of an imaging study data stored with lossy compression.

**Test Steps**

<em>Setup</em>

<ol>
<li>SUT: For this test, use the data (multiple images, one report) for the patient with departmental ID: ISNS-DEPT042.</li>
<li>SUT: In this optional setup step, you may import the HL7 V2 ORM scheduling message into your system to enable your Edge Server.</li>
<li>SUT: Import the DICOM images and HL7 V2 ORU report message into your system.</li>
</ol>

<em>Instructions</em>

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1. SUT: Per the setup above, you should have data in your system for the patient with departmental ID: ISNS-DEPT042.
2. SUT: Trigger your system to export the Clearinghouse simulators. This involves the following:
   a. As part of the submission, the Edge Server generates a 20 character access code that is used to compute the hashed patient identifier. Record the 20 character access code and patient date of birth and provide these to the Test Manager.
   b. Submit Patient Feed (ITI-8) transactions to the Clearinghouse simulator PIX and Registry actors. The Patient Identifier is computed by performing a hash on the 20 character access code and patient date of birth.
   c. Use the test data (images, report) to generate a Provide and Register transaction with the Clearinghouse Repository/Registry simulator that contains multiple attachments in a single submission set. The patient identifier is the same identifier computed for sending the HL7 ADT messages. The attachments in the single submission set are:
      i. Multiple images
      ii. Report
      iii. KOS object that references the image
      Note: Some implementations may include other attachments such as a DICOM Secondary Capture object with a rendering of the report. This attachment is allowed. Other attachments should be reviewed/discussed with the test manager.
3. Test Manager: Use the procedure defined in *Test Manager Guide: Edge Server 5.0* to validate the data submitted by the Edge Server under test.


## Edge: Enhanced MR Images

**Purpose / Context**
This is an extension of test *ISN Source: Single Image Study*. The test data consists of an imaging study with Enhanced MR data.


**Testable Assertions**
See *ISN Source: Single Image Study*.


**Test Steps**
*Setup*
1. For this test, use the data (multiple images, one report) for the patient with departmental ID: ISNS-DEPT-025-x


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*Instructions*
1. Construct a report from the text file included with the test data. You will generate an HL7 V2 report using a mechanism not defined by this test procedure.
2. As part of the submission, the ISN Source generates a 20 character access code that is used to compute the hashed patient identifier. Record the 20 character access code and patient date of birth.
3. Use the test data to submit Patient Feed (ITI-8) transactions to the Clearinghouse simulator PIX and Registry actors. The Patient Identifier is computed by performing a hash on the 20 character access code and patient date of birth.
4. Use the test data (multiple images, report) to generate a Provide and Register transaction with the Clearinghouse simulator that contains all attachments in a single submission set. The patient identifier is the same identifier computed for sending the HL7 ADT messages. The attachments in the single submission set are:
   a. All images
   b. Report
   c. KOS object that references the image
5. Test Manager: TBD


## Edge: Enhanced CT Images

**Purpose / Context**
This is an extension of test *ISN Source: Single Image Study*. The test data consists of an imaging study with Enhanced CT data.


**Testable Assertions**
See *ISN Source: Single Image Study*.


**Test Steps**
*Setup*
1. For this test, use the data (multiple images, one report) for the patient with departmental ID: ISNS-DEPT-026-x


*Instructions*
1. Construct a report from the text file included with the test data. You will generate an HL7 V2 report using a mechanism not defined by this test procedure.

2. As part of the submission, the ISN Source generates a 20 character access code that is used to compute the hashed patient identifier. Record the 20 character access code and patient date of birth.
3. Use the test data to submit Patient Feed (ITI-8) transactions to the Clearinghouse simulator PIX and Registry actors. The Patient Identifier is computed by performing a hash on the 20 character access code and patient date of birth.
4. Use the test data (multiple images, report) to generate a Provide and Register transaction with the Clearinghouse simulator that contains all attachments in a single submission set. The patient identifier is the same identifier computed for sending the HL7 ADT messages. The attachments in the single submission set are:
   a. All images
   b. Report
   c. KOS object that references the image
5. Test Manager: TBD

## Edge: Unrecognized Certificate, Clearinghouse PIX

**Purpose / Context**

This test simulates the case where the ISN Source does not have the proper certificate for the Clearinghouse PIX system.

**Testable Assertions**
1. ISN-xx

**Test Steps**
*Setup*
1. For this test,

*Instructions*
1. Construct

## Edge: Unregistered Certificate, PIX Feed

**Purpose / Context**

This test simulates the case where the certificate for the ISN Source has not been registered with the Clearinghouse for ADT feeds to the Clearinghouse PIX.

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**Testable Assertions**
1. ISN-xx

**Test Steps**
*Setup*
1. For this test,

*Instructions*
1. Construct

## Edge: Unrecognized Certificate, Clearinghouse Registry ADT

**Purpose / Context**
This test simulates the case where the ISN Source does not have the proper certificate for the Clearinghouse Registry for ADT feeds.

**Testable Assertions**
1. ISN-xx

**Test Steps**
*Setup*
1. For this test,

*Instructions*
1. Construct

## Edge: Unregistered Certificate, Registry ADT

**Purpose / Context**
This test simulates the case where the certificate for the ISN Source has not been registered with the Clearinghouse for ADT feeds to the Clearinghouse Registry.

**Testable Assertions**
1. ISN-xx

**Test Steps**

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*Setup*
1. For this test,

*Instructions*
1. Construct

## Edge: Unrecognized Certificate, Clearinghouse Repository

**Purpose / Context**

This test simulates the case where the ISN Source does not have the proper certificate for the Clearinghouse Repository for the Provide and Register transaction.

**Testable Assertions**
1. ISN-xx

**Test Steps**

*Setup*
1. For this test,

*Instructions*
1. Construct

## Edge: Unregistered Certificate, Clearinghouse Repository

**Purpose / Context**

This test simulates the case where the certificate for the ISN Source has not been registered with the Clearinghouse for Provide and Register transactions to the Clearinghouse Repository.

**Testable Assertions**
1. ISN-xx

**Test Steps**

*Setup*
1. For this test,

*Instructions*
1. Construct

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