Oracle® Cloud

Using Oracle Integration for Healthcare in Oracle Integration 3

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Preface

This guide describes how to use Oracle Integration for Healthcare.

Topics:

Audience

This guide is intended for developers who want to use Oracle Integration for Healthcare.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at https://www.oracle.com/corporate/accessibility/.

Access to Oracle Support

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Oracle is fully committed to diversity and inclusion. Oracle respects and values having a diverse workforce that increases thought leadership and innovation. As part of our initiative to build a more inclusive culture that positively impacts our employees, customers, and partners, we are working to remove insensitive terms from our products and documentation. We are also mindful of the necessity to maintain compatibility with our customers' existing technologies and the need to ensure continuity of service as Oracle's offerings and industry standards evolve. Because of these technical constraints, our effort to remove insensitive terms is ongoing and will take time and external cooperation.

Related Resources

See these Oracle resources:

- Oracle Cloud at http://cloud.oracle.com
- *Using Integrations in Oracle Integration 3*
- *Using the Oracle Mapper with Oracle Integration 3*
- Oracle Integration documentation on the Oracle Help Center.

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

1

Introduction to Oracle Integration for Healthcare

Learn about how Oracle Integration for Healthcare provides support for HL7 in Oracle Integration.

Topics:

About HL7

Health Level Seven (HL7) provides standards for the exchange, integration, sharing, and retrieval of health information between systems within and across healthcare providers. HL7 provides a delimited, flat file-based message structure. Messages are event-based (order blood tests, receive test results, update patient information, and others). There is a corresponding message for each event.

Health organizations typically include numerous healthcare systems to process different patient administrative or clinical tasks, including billing, medication management, patient tracking, and documentation. These systems communicate when they receive new information or need to retrieve information. HL7 provides standards, guidelines, and methodologies for these systems to communicate with each other. The standards allow for the interoperability of healthcare data as it's shared and processed by different systems. This interoperability allows clinical and non-clinical data to be shared more easily with the goal of improving patient care and health system performance.

Oracle Integration for Healthcare Support for HL7 and FHIR

Oracle Integration for Healthcare enables you to create integrations that interact with healthcare organizations that use HL7.

Oracle Integration for Healthcare provides the following capabilities:

- Available for use with Oracle Integration through installation of the Healthcare edition in the Oracle Cloud Infrastructure Console. See Oracle Integration Editions in *Provisioning and Administering Oracle Integration 3*.
- Supports HL7 version 2.
- Supports the following versions of the HL7 version 2 standard: 2.3.1, 2.4, 2.5.1, 2.5, 2.6, 2.7, 2.7.1, 2.8.1, 2.8, 2.8.2, and 2.9.

- Supports HL7 applications on different versions interacting with each other through Oracle Integration for Healthcare.
- Supports the following FHIR profile packages that have been tested.
  - US Core
  - FHIR Canadian
  - FHIR Australian
  - FHIR UK
  - FHIR iSiK

  If you are unable to successfully import a profile package not shown in this list, see this blog.
- Supports creating healthcare integrations in projects or in standalone environments (outside of a project). See Design, Manage, and Monitor Integrations in Projects and Create Healthcare Integrations in a Project in *Using Integrations in Oracle Integration 3*
- Supports common healthcare interoperability use cases, including:
  - Transfer of care
  - Inventory synchronization – employee medical record (EMR) and enterprise resource planning (ERP)
  - Payer/provider
  - Modernization programs:
    - Exposure of health data using Fast Healthcare Interoperability Resources (FHIR)
    - Mobile applications
    - Patient portal
  - Update of a state immunization registry upon patient checkout
- Supports message standards and transport protocols commonly used in the healthcare interoperability (integration) market:
  - Supports the Minimal Lower Layer Protocol (MLLP). MLLP is a TCP-based standard for sending and receiving HL7 messages. You configure the MLLP Adapter to receive inbound (trigger) HL7 messages or send outbound (invoke) HL7 messages. See MLLP Adapter Capabilities in *Using the MLLP Adapter with Oracle Integration 3*.
  - Supports Fast Healthcare Interoperability Resources (FHIR). FHIR is a set of rules and specifications for exchanging electronic healthcare data over the REST protocol in XML or JSON format. You configure the FHIR Adapter to invoke FHIR resources (for example, a patient resource, encounter resource, and others) in outbound messages in Oracle Integration. See FHIR Adapter Capabilities in *Using the FHIR Adapter with Oracle Integration 3*.
- Supports defining the connections to external systems with which to exchange HL7 messages.
- Supports designing and customizing the HL7 messages to exchange. See Create Oracle Integration for Healthcare Schemas and Documents.
- Supports integrating and processing HL7 messages in integrations with the healthcare action. The healthcare action converts inbound HL7 messages to XML format and outbound messages from XML format to HL7 format. See Design an Integration with a Healthcare Action.
- Supports tracking and monitoring HL7 integrations at runtime.

- Supports retaining runtime data for 184 days when selecting the **Production** tracing level during integration activation. See Activate an Integration in *Using Integration Insight in Oracle Integration 3*

Oracle Integration for Healthcare Restrictions

Be aware of the following Oracle Integration for Healthcare restrictions.

- Oracle Integration supports HL7 version 2. HL7 version 3 is not currently supported.

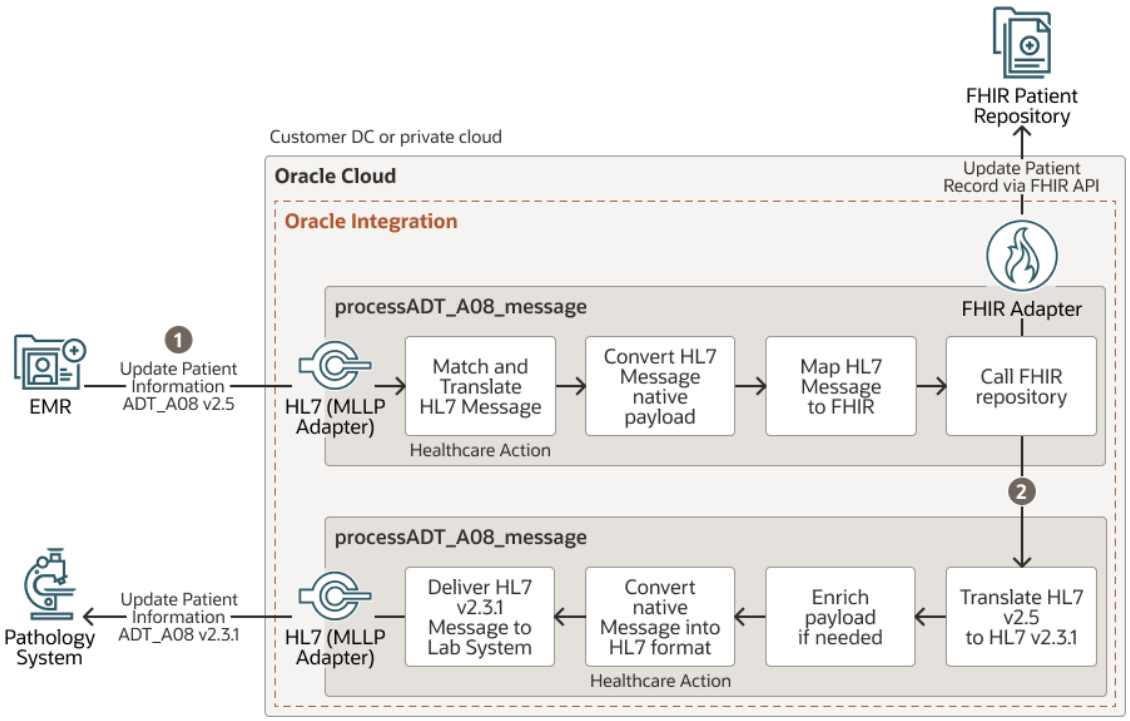
Quick Tour Through Oracle Integration for Healthcare Use Cases

This section provides high level overviews of several Oracle Integration for Healthcare use cases.

Topics:

Synchronize EMR Patient Updates in a FHIR Patient Repository and a Pathology System

This use case describes how an update to patient details in an employee medical record (EMR) application is automatically propagated to a FHIR patient repository and a pathology system through use of Oracle Integration for Healthcare.



1. Patient details are updated in an EMR, which emits an HL7 ADT_A08 message. The message is received by Oracle Integration and converted to a FHIR patient resource for updating in a FHIR-enabled patient repository.
2. The integration continues and Oracle Integration translates an HL7 message from version 2.5 to version 2.3.1 and sends it to a pathology system for updating the patient records.

EMR Application Patient Updates

- A doctor updates details about a patient (for this example, a change in name) in an EMR application. The updates are performed through use of an HL7 Update Patient Information message (ADT_A08). The EMR application uses HL7 version 2.5.
- The EMR application emits the updated HL7 ADT_A08 message.
- An MLLP Adapter running inside the connectivity agent and configured as a trigger connection in an integration receives the incoming message for processing.
- The HL7-formatted message is converted into an XML-formatted message by a healthcare action in the integration.

The following updates are automatically made in parallel in the FHIR patient repository and the pathology system:

- FHIR Patient Repository Updates
- Pathology System Updates

FHIR Patient Repository Updates

- The XML message is converted into a JSON-formatted, FHIR patient resource in the integration.
- The FHIR patient repository is invoked with the FHIR Adapter. Based on the type of patient, the following updates are applied in the FHIR repository:
  - For an existing FHIR repository patient: The patient is updated with the name change made in the EMR application.
  - For a new patient: All patient details are added to the FHIR repository.

Pathology System Updates

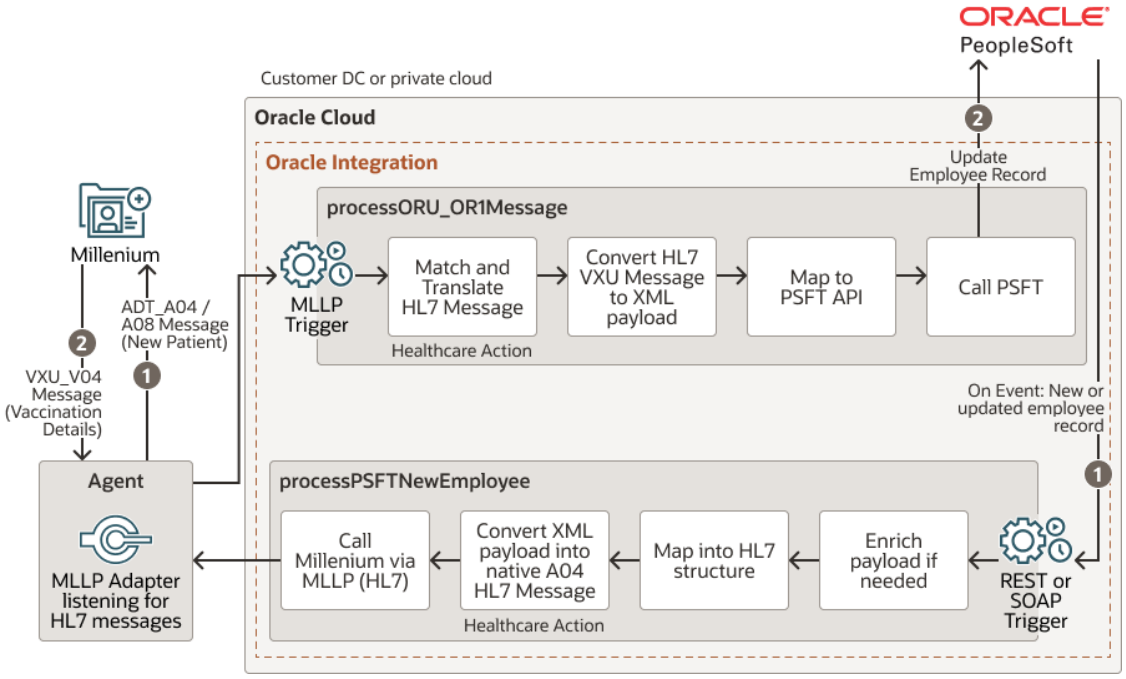
Because the pathology system uses an earlier version of HL7 (2.3.1), the message must be down-versioned from 2.5 to 2.3.1 for the message to be successfully processed.

- The ADT_A08 message is:
  - Converted from XML format back to HL7 format by a healthcare action in the integration.
  - Down-versioned from HL7 version 2.5 to version 2.3.1.
- The MLLP Adapter running inside the connectivity agent and configured as an invoke connection sends the down-versioned, HL7-formatted message to the pathology system, where the patient details are updated.

An overview of design instructions for this use case is provided. See Design Time and Runtime Overview of an Oracle Integration for Healthcare Use Case.

Synchronize Employee Information Between an HR Application and an EMR Application

This use case describes how a new employee hire added to a human resources (HR) application is also automatically added as a patient in an employee medical record (EMR) application. When this employee later receives a vaccination, the update made to the EMR application is automatically propagated back to the HR application.



1. Start of onboarding a new employee. A new employee event is sent to Oracle Integration, converted to an HL7 message, and sent to Mellennium.
2. Start of a new or updated employee vaccination record. A new HL7 vaccination message event is sent to Oracle Integration, converted to Oracle PeopleSoft format, and sent to Oracle PeopleSoft.

HR Application Employee Updates Synchronized in an EMR Application

Acme Hospital uses two applications to store information:

- An HR application (for this example, Oracle PeopleSoft) stores information about their employees (for example, date of hire, job title, compensation details, and so on).
- An EMR application (for this example, Mellennium) stores internal health records pertinent to employee jobs (for example, employee vaccination records, employee allergy records, and so on). The EMR application uses HL7.

The following actions occur:

- A new employee is hired and added to the HR application.

- The HR application update triggers a REST Adapter connection to start an integration between the HR application and the EMR application.
- The HR application message is converted to an HL7-formatted, ADT_A04 message (patient registration) by a healthcare action in the integration.
- An MLLP Adapter running inside the connectivity agent and configured as an invoke connection sends the outbound message to the EMR application at Acme Hospital.
- The ADT_A04 message (patient registration) is automatically added to the EMR application. The new employee is now available in both applications.

EMR Application Employee Updates Synchronized in the HR Application

Acme Hospital employees must periodically receive various vaccinations, allergy tests, and so on.

- An Acme Hospital nurse administers an employee's annual vaccination and updates their medical record in the EMR application.
- The EMR application emits an HL7 ORU_OR1 message (vaccination details message).
- An MLLP Adapter running inside the connectivity agent and configured as a trigger connection in a second integration receives the incoming message for processing.
- The HL7-formatted message is converted into an XML-formatted message by a healthcare action in the integration.
- A REST API call invokes the HR application and the employee's records are updated to reflect their vaccination details.

Workflow to Use Oracle Integration for Healthcare

You follow a simple workflow to create integrations in Oracle Integration for Healthcare.

> **Note:**
>
> To follow this workflow, you must first select the Healthcare edition during Oracle Integration instance provisioning. See Provision Oracle Integration for Healthcare.

Step	Description	More Information
1	Install the connectivity agent. The MLLP Adapter runs directly in the connectivity agent to send and receive HL7 messages to and from MLLP endpoints.	Download and Run the Connectivity Agent Installer in *Using Integrations in Oracle Integration 3*
2	Create adapter connections: • If your use case requires invoking a FHIR-based endpoint, create a FHIR Adapter connection. • If your use case requires receiving inbound (trigger) HL7 messages or sending outbound (invoke) HL7 messages, create an MLLP Adapter connection.	• Create a FHIR Adapter Connection in *Using the FHIR Adapter with Oracle Integration 3* • Create an MLLP Adapter Connection in *Using the MLLP Adapter with Oracle Integration 3*

Step	Description	More Information
3	Create a healthcare schema and HL7 message. You create a schema and then an HL7 message based on the schema to use in your integration. **Note**: You cannot use the healthcare action if you have not first created at least one HL7 message (message definition).	Create a New Healthcare Schema and Create a Custom HL7 Message
4	Design an integration with your adapter connections and a healthcare action. You select the HL7 message created in Step 3 for conversion when you configure the healthcare action.	Create Trigger and Invoke Connections that Support the HL7 and FHIR Standards and Design an Integration with a Healthcare Action
5	Activate the integration. Once activated, you can run the integration.	Activate an Integration in *Using Integrations in Oracle Integration 3*
6	Monitor the integration.	Monitor Integrations During Runtime and Monitor Integrations in a Project in *Using Integrations in Oracle Integration 3*

Provision Oracle Integration for Healthcare

Oracle Integration for Healthcare is available *only* as part of the Healthcare edition. It is *not* included with the Standard or Enterprise editions of Oracle Integration. You can select the Healthcare edition during Oracle Integration instance installation or change an existing instance from the Standard or Enterprise edition to the Healthcare edition.

This table provides an overview of key installation, edition change, and billing information and provides references to relevant documentation.

Subject	Description	See
Edition Features	The Healthcare edition includes the same features as the Enterprise Edition, plus Oracle Integration for Healthcare.	Oracle Integration Editions in *Provisioning and Administering Oracle Integration 3*
Installation	You select the Healthcare edition during instance installation.	Create an Oracle Integration Instance in *Provisioning and Administering Oracle Integration 3*
Changing editions	If your existing Oracle Integration instance is already configured with the Standard or Enterprise edition, you can change to the Healthcare edition. **Note**: Once you change to the Healthcare edition, you cannot change back to Standard or Enterprise.	Edit the Edition, License Type, Message Packs, and Custom Endpoint of an Instance in *Provisioning and Administering Oracle Integration 3*
Billing	Healthcare edition message packs are billed at a higher price than Standard or Enterprise.	See Monitor Oracle Integration 3 Instances in *Provisioning and Administering Oracle Integration 3*

How Do I Know If My Instance Includes the Healthcare Edition

If your existing Oracle Integration installation does not currently consist of the Healthcare edition, you see the following message when navigating through the user interface:

- When you select **Healthcare** in the left navigation pane
- When you click **Healthcare** inside a project

If you change this instance from the Standard or Enterprise edition to the Healthcare edition, you can edit these pages.

Oracle Integration for Healthcare Videos and Live Labs

Interested in viewing Oracle Integration for Healthcare live demo videos or completing a hands-on lab? Live demo videos show how to configure and run key Oracle Integration for Healthcare features. Oracle LiveLabs provide you with access to Oracle's technologies to run labs and workshops. See the following links for details.

- Healthcare live demo videos
- Oracle LiveLabs - Get Started with Healthcare

2

Create Oracle Integration for Healthcare Schemas and Documents

You create a healthcare schema using a standard HL7 schema definition as a starting point. All HL7 version 2 base schemas from version 2.3.1 onwards are supported and provided with Oracle Integration. You can also customize the schema according to your needs. You then create a document definition based on the schema. This document definition represents the HL7 message to use in your integrations. You then select this document to convert when configuring the healthcare action in your integration.

Topics:

Create a New Healthcare Schema

You can create a new HL7 schema based on a standard out-of-the-box HL7 message definition and customize it to match your requirements.

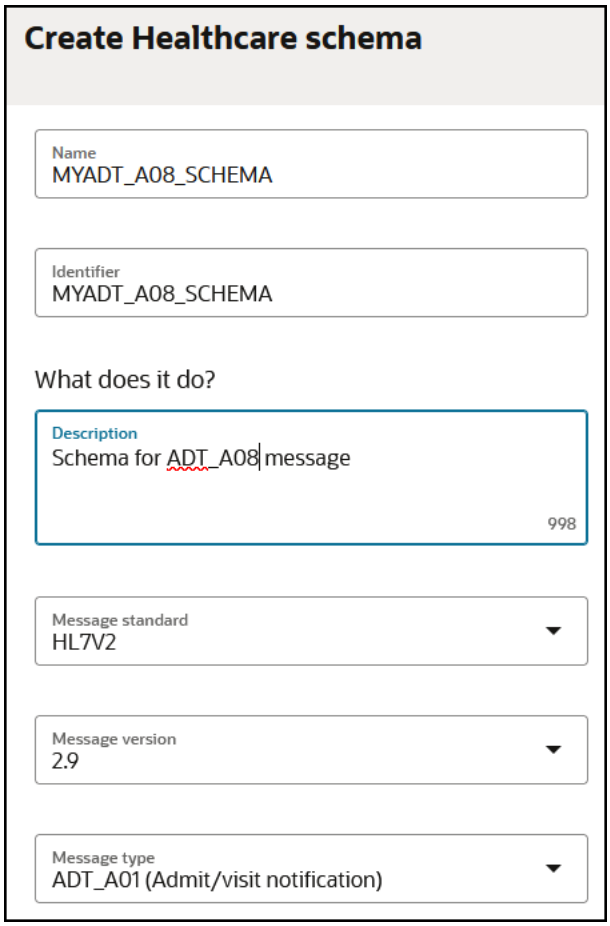
You can create a schema in a project or a standalone environment (outside of a project).

1. To create a schema in a project:
   a. In the navigation pane, click **Projects**.
   b. Click the project in which to create the schema.
   c. Click **Healthcare**  .
   d. In the **Schemas** section, click **Add**.
2. To create a schema in a standalone environment:
   a. In the navigation pane, click **Healthcare**, then **Schemas**.
   b. On the Schemas page, click **Create**.
3. Enter the following details.

Element	Description
Name	Enter a schema name.
Identifier	This field is automatically populated with a unique schema identifier based on your schema name. You can manually change this value, if needed.
Description	Enter an optional description of this schema.
Message standard	View the message standard. Only **HL7V2** is available and it cannot be deselected. The message standard identifies the business protocol to follow when exchanging messages between applications.

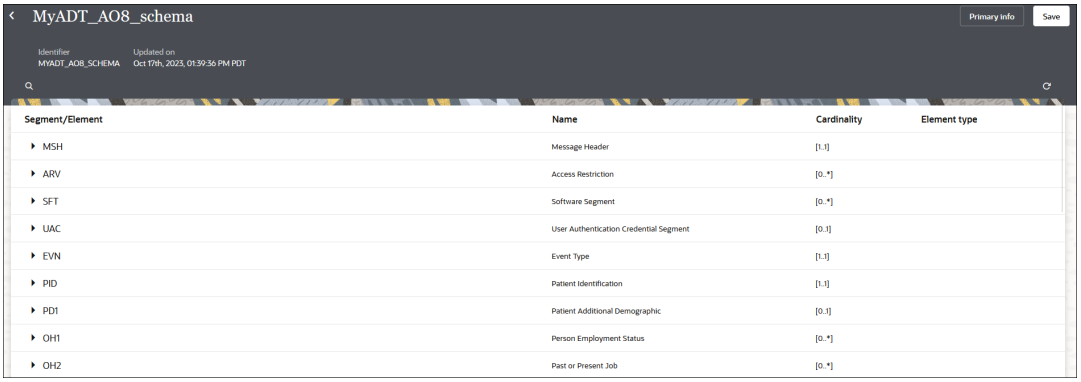
Element	Description
Message version	Select the message version. HL7 V2 versions 2.3.1, 2.4, 2.5.1, 2.5, 2.6, 2.7, 2.7.1, 2.8.1, 2.8, 2.8.2, and 2.9 are supported.
Message type	Select the message type. The types shown are based on the HL7 V2 version you selected.

For this example, ADT_A08 (update patient information) is selected.



4. Click **Create**.

   The details page for your new HL7 message is displayed. The standard segments and elements that come with the message type you selected are shown. A segment is a higher level construct, consisting of a sequence of elements and composites. An element is the smallest unit that represents a single data field of a primitive type, such as alphanumeric text, integer, decimal, date, time, or binary. If you create a schema in a project, the project name is displayed in the banner. For this example, the schema was created in a standalone environment (outside of a project).



You can customize the standard HL7 message. For example, the application with which you are integrating may require another segment or loop. You can add new constructs (such as new segments and loops) to a standard healthcare schema or edit existing constructs within it.

5. If you want to create a new segment, see Add a New Segment.
6. If you want to create a new loop, see Add a New Loop.

Add a New Segment

According to your organization's requirements, you can add new segments to a standard healthcare schema to customize it.

1. Hover over the row of a segment/element and click **Actions** ⋯, then **New segment**. The Add new segment panel is displayed.
2. If you want to use the contents of an existing segment definition to create a new segment, click **Existing segment**. This selection is useful when the contents of an existing segment are similar to the one you want to create.
   a. Expand **Advance Search**.
   b. Search by the version number or schema name to use.
   c. Begin typing the initial letters of the segment to show the available selections.
   d. Select the segment.
   e. Click **Add**.
   f. Enter a name, description, and cardinality value. For example, if you enter `[0..1]`, a value of either zero or one is expected.
   g. Click **Add**.
3. If you want to create a completely new segment without using existing information, click **New segment**.
   a. Enter a name, and click **Add**.
   The Properties panel is displayed.
   b. Enter a name, description, and cardinality value. For example, if you enter `[0..1]`, a value of either zero or one is expected.
   c. Click **Save**.
4. If you want to perform additional customizations, hover over the row of the segment/element and click **Actions** ⋯, then select to perform more customizations:

- **New child element**: The smallest unit that represents a single data field of a primitive type, such as alphanumeric text, integer, decimal, date, time, or binary.
- **New child composite**: A complex data type consisting of one or more elements.
- **New segment**: The next higher level construct, consisting of a sequence of elements and composites.
- **New loop**: A container for a specific set of segments or child loops, which makes its structure nested and hierarchical.

Add a New Loop

According to your organization's requirements, you can add new loops to a standard healthcare schema to customize it. A loop is a container for a specific set of segments or child loops, which make its structure nested and hierarchical.

1. Hover over the row of a segment/element and click **Actions** ⋯, then **New loop**. The Add new loop panel is displayed.
2. Enter a name for the segment, and click **Add**.
3. Enter a cardinality value. For example, if you enter `[0..1]`, a value of either zero or one is expected.
4. Click **Save**.

Create a Custom HL7 Message

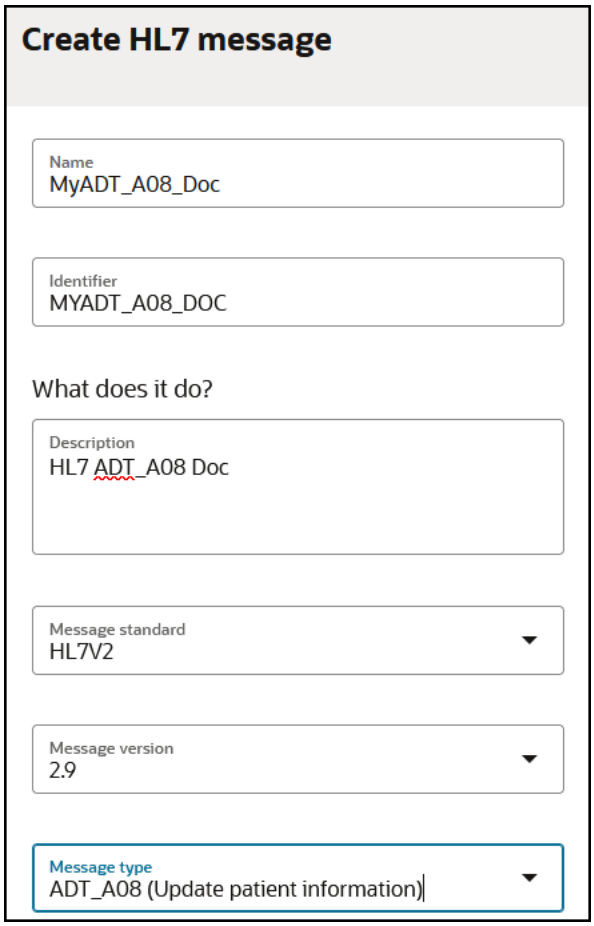
After you create a schema, you must create an HL7 message based on that schema for use in your integration. The message represents a specific snapshot of a schema to use in an integration. You later select the HL7 message for conversion into a supported format when you configure the healthcare action during design of your integration.

You can create an HL7 message in a project or a standalone environment (outside of a project).

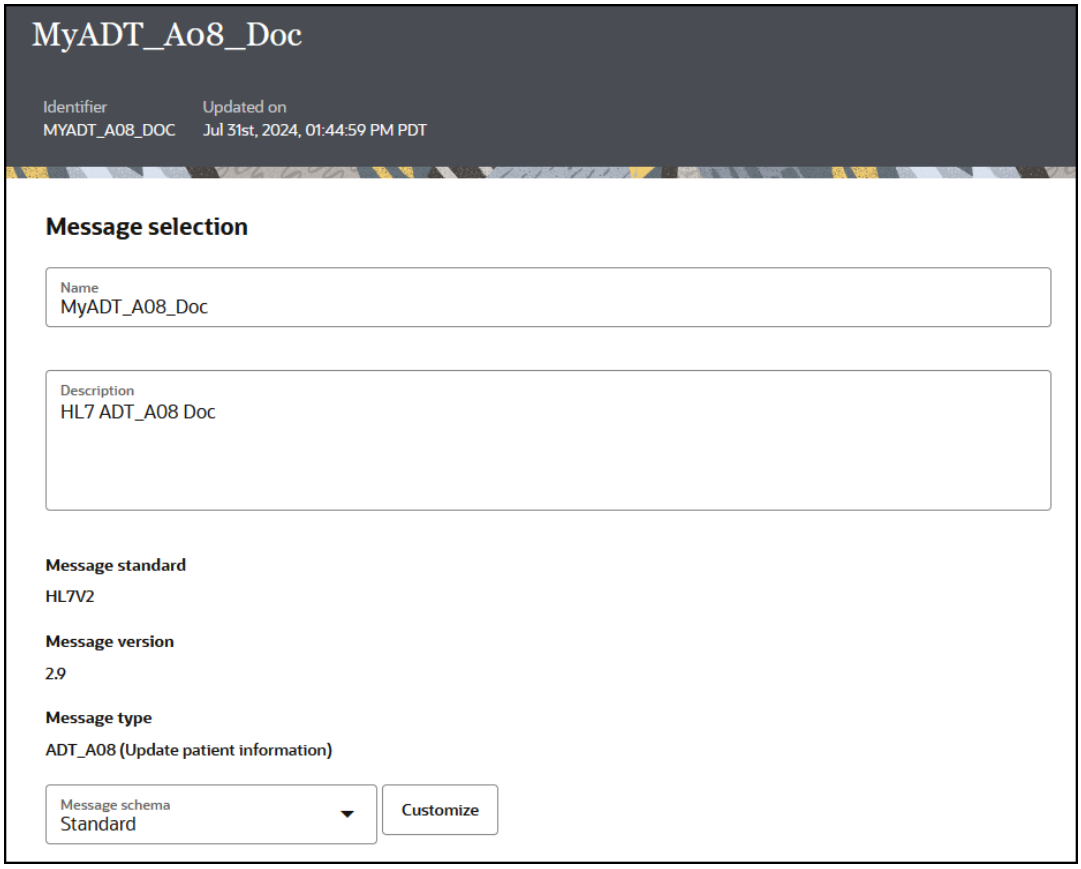
1. To create a message in a project:
   a. In the navigation pane, click **Projects**.
   b. Click the project in which to create the message.
   c. Click **Healthcare**  .
   d. In the **HL7 messages** section, click **Add**.
2. To create a message in a standalone environment:
   a. In the navigation pane, click **Healthcare**, then **HL7 messages**.
   b. On the HL7 messages page, click **Create**.
3. Enter the following details to create a new HL7 message definition.

Element	Description
Name	Enter a message name.
Identifier	This field is automatically populated with the message name. You can manually change this value.
Description	Enter an optional description of this message.

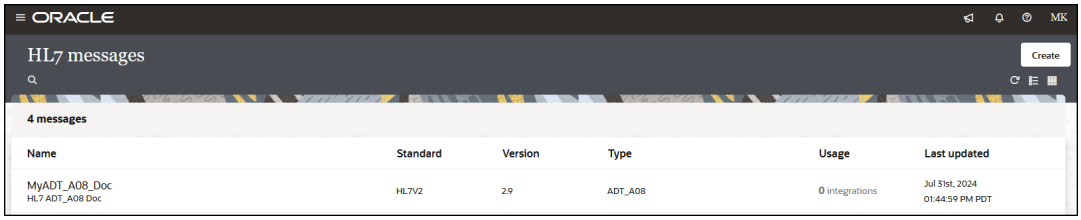
Element	Description
Message standard	View the message standard. Only **HL7V2** is available and it cannot be deselected. The message standard identifies the business protocol to follow when exchanging messages between applications.
Message version	Select the message version. HL7 message versions 2.3.1, 2.4, 2.5.1, 2.5, 2.6, 2.7, 2.7.1, 2.8.1, 2.8, 2.8.2, and 2.9 are supported.
Message type	Select the HL7 message type. The types shown are based on the HL7 message version you selected.



4. Click **Create**.
The details page for your new message is displayed.



5. Note that the message version and message type values you selected previously are displayed. These cannot be changed.
   The **Message schema** field shows **Standard** as the schema type by default. If you had previously created custom schemas, they are also displayed for selection in the drop-down list.
6. Select the schema to use or click **Customize** to display the Clone standard schema dialog to create a new schema. For this example, the schema created in Create a New Healthcare Schema is selected.
7. Click **Save**, and return to the HL7 messages page.
   If you create a document in a project, the project name is displayed in the banner. For this example, the document was created in a standalone environment (outside of a project).



The message is now available for conversion when you configure the healthcare action in an integration. See Design an Integration with a Healthcare Action.

Edit or Clone an HL7 Message

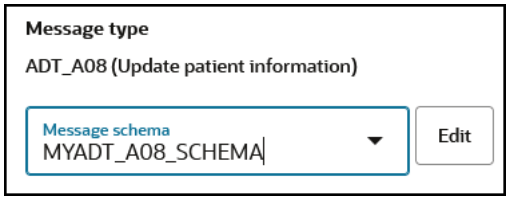
You can edit an existing message to associate a different schema. You can also clone an HL7 message to create a copy of it.

Edit an HL7 Message

1. To edit a message in a project:
   a. In the navigation pane, click **Projects**.
   b. Click the project in which to edit the message.
   c. Click **Healthcare**.
   d. Go to the **HL7 messages** section.
2. To edit a message in a standalone environment:
   a. In the navigation pane, click **Healthcare**, then **HL7 messages**.
3. Hover over a message row to see the actions you can perform on a message.
4. Click **Edit** .
5. Edit the message's name and description, as necessary.

> **Note:**
>
> You cannot change the message standard or version.

6. Select the message schema to use. You can select the standard schema or one you created.



7. Click **Save**.
   This message is now available for selection when you configure the healthcare action in an integration.

Clone an HL7 message

1. To clone a message in a project:
   a. In the navigation pane, click **Projects**.
   b. Click the project in which to clone the message.
   c. Click **Healthcare**.
2. Go to the **HL7 messages** section.
3. To clone a message in a standalone environment:

a. In the navigation pane, click **Healthcare**, then **HL7 messages**.

4. Hover over a message row to see the actions you can perform on a message.
5. Click **Actions** ⋮, then select **Clone** to clone the message.
   The Clone Healthcare message panel opens.
6. Make any necessary updates, then click **Clone**.

3

Design an Integration with a Healthcare Action

Once you have created your schema and message, you can design an integration with a healthcare action.

Topics:

Best Practices for Designing a Healthcare Integration

Note the following best practices for designing an optimal healthcare integration.

Build a Parent Routing Integration to Invoke Child Integrations that Process a Single HL7 Inbound Message

You may design an integration that receives many different HL7 inbound message types. For example:

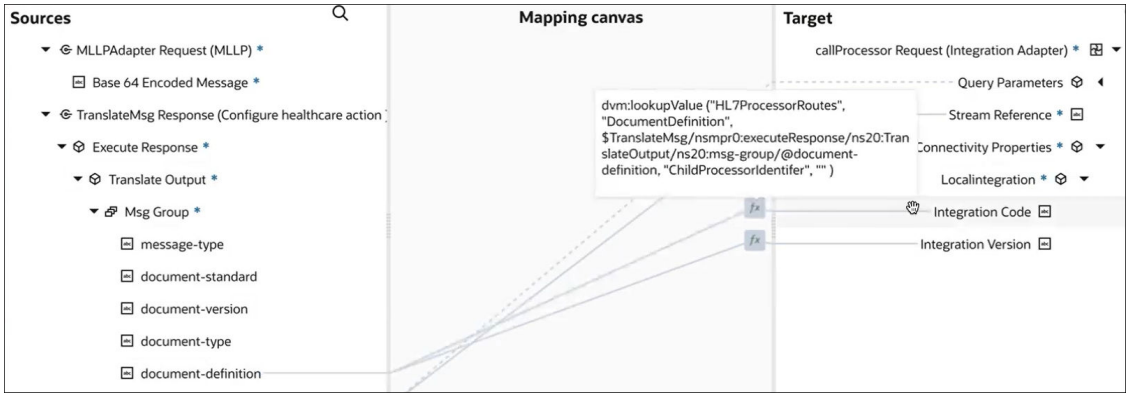
- ADT_A05 (Pre-admit a patient)
- ADT_A08 (Update patient information)
- ADT_A09 (Patient departing - tracking)

As a best practice, build a parent routing integration that invokes child integrations that each process a single HL7 inbound message type. For this example, create three child integrations. Do not attempt to build a single integration with a routing action (for example, a for-each action or switch action) to process each message.

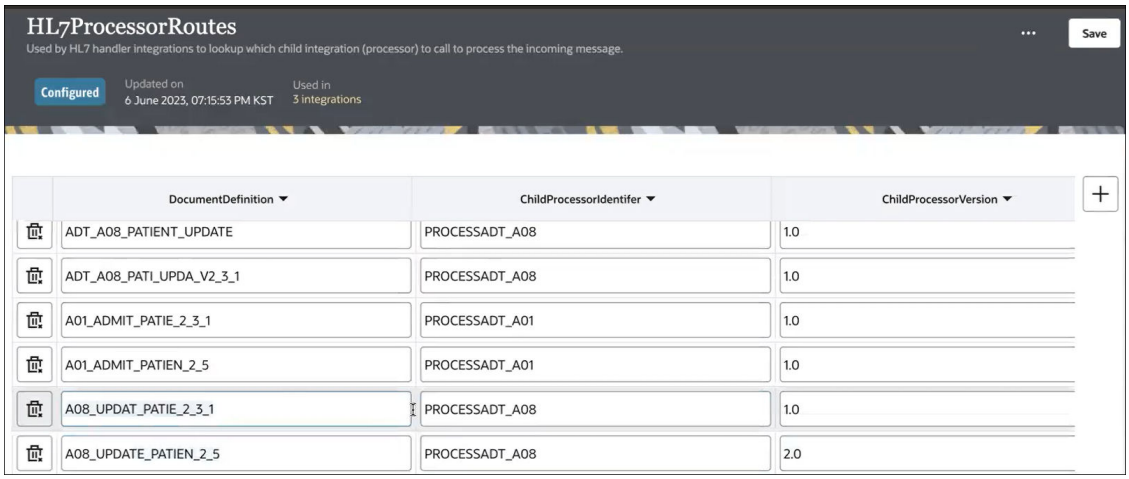
Create your child integration with a REST Adapter trigger connection that can accept a binary format as its request payload. Select the default application/octet-stream as the mime-type. You pass the message-reference object that you get back from calling the healthcare action into your child integration. See Overview of the Integration Receiving the Inbound HL7 Message During Runtime.

Use a Lookup Function in the Mapper to Select the Child Integration to Invoke

Use a lookup function in the mapper to select the child integration to invoke. Based on the message and message type, the lookup function returns the name of the integration (**Integration Code**) and the version of the integration (**Integration Version**) to invoke.

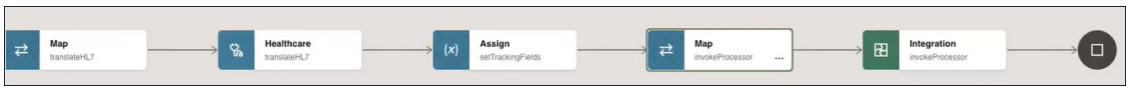


In the lookup table, based on the specific inbound message received, a specific integration is invoked.



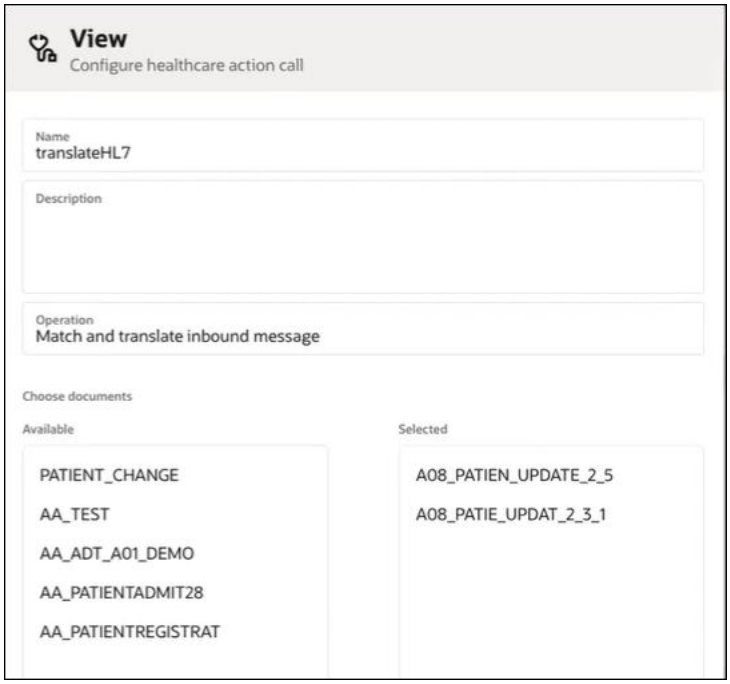
Add Fault Handling to Address Inbound Messages that are Not Selected in the Healthcare Action

A healthcare action is not designed to throw faults. You should design fault handling logic into your integration to catch message faults. For example, assume you design the following integration to receive inbound messages from an HL7 application:

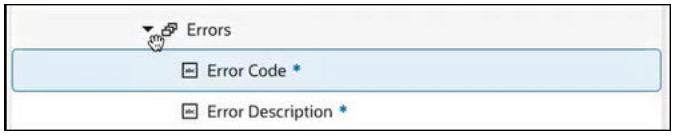


In the healthcare action, you select the following two inbound message types for translation:

- ADT_A08 (Update patient information) version 2.5
- ADT_A08 (Update patient information) version 2.3.1



Assume the healthcare action also receives an inbound ADT_A04 (Register a patient) message from the HL7 application. Because this message type has not been selected in the healthcare action, it cannot be translated into an Oracle Integration payload. The ADT_A04 message type is passed through the healthcare action, but fails in the subsequent map action with errors.



As a best practice, add and design a switch action immediately after the healthcare action and before the map action with the following branch logic:

- Route 1: If the message is not selected in the healthcare action, then address the fault in that branch with your own fault handling logic. For example, add a notification action that sends an email to the inbound HL7 application informing them that an unplanned message was received.
- Otherwise: If the message is selected in the healthcare action, translate it into an Oracle Integration payload, perform mapping, and call the child integration for further processing and delivery to the outbound application endpoint.

Plan for Future Oracle Integration for Healthcare Updates

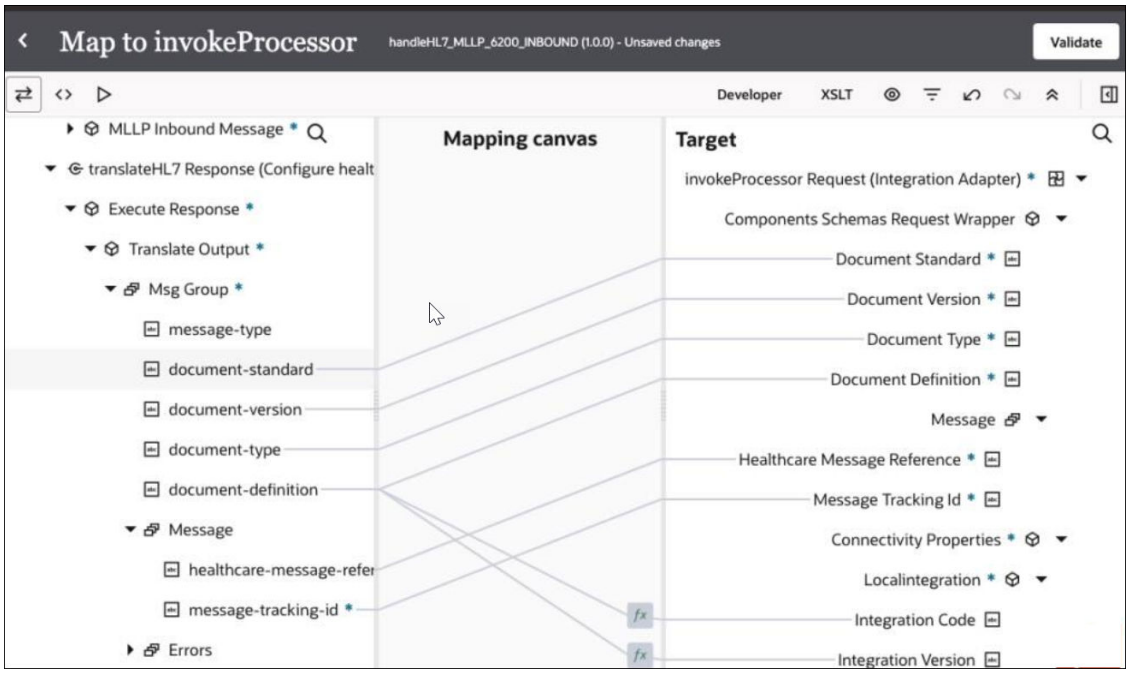
A common interface payload to use for the invocation from the handler integration to the child (processor) integration is provided. This JSON document forms the contract between the handler and the processor integrations.

```
<strong>{
    "document-standard": "HL7V2",
    "document-version": "2.3.1",
    "document-type": "ADT_A01",
```

```
    "document-definition": "HL7V2_ADT_A01",
    "message": [
        {
            "healthcare-message-reference": "clm:base64_meta.base64_payload1",
            "message-tracking-id": "123"
        },
        {
            "healthcare-message-reference": "clm:base64_meta.base64_payload2",
            "message-tracking-id": "abc"
        }
    ]
}</strong>
```

Use of this JSON message in your child integrations is not required. However, use of this message enables you to take advantage of potential future features. The idea is that if you use this JSON message as the contract in your child integrations now, change are not required in the future. You do not need to create a new handler integration. The incoming HL7 message is routed to the appropriate processor integration based on your routing rules. For this to work, you need to build your integration using this JSON payload.

This payload provides metadata about the message and capability to also support batch messages. You map this data using the data returned from the healthcare action when you call the operation **Match and translate inbound message**. An example of this mapping is shown below.



Create Trigger and Invoke Connections that Support the HL7 and FHIR Standards

You must create trigger (inbound) and invoke (outbound) connections to communicate with applications that support the HL7 or FHIR standards.

- Create MLLP Adapter Connections
- Create a FHIR Connection

Create MLLP Adapter Connections

You can create MLLP Adapter trigger and invoke connections for integrations to communicate with health care systems that use HL7 version 2. Separate adapter connections are required for a trigger (incoming) and an invoke (outgoing).

- Trigger connection: The MLLP Adapter listens for and receives inbound HL7 messages from an application.
- Invoke connection: The MLLP Adapter establishes a connection and sends outbound HL7 messages to an application.

See Create an MLLP Adapter Connection in *Using the MLLP Adapter with Oracle Integration 3*.

Create a FHIR Connection

You can exchange health care data using the FHIR standard in XML or JSON. You configure the FHIR Adapter to allow FHIR resources (for example, a patient resource, encounter resource, and others) to be used as outbound (invoke) messages in Oracle Integration. The is similar to the REST Adapter, but with a FHIR-specific configuration experience.

As an alternative, you can also configure the REST Adapter to allow FHIR resources to be used as inbound (trigger) and outbound (invoke) messages.

- See Create a FHIR Adapter Connection in *Using the FHIR Adapter with Oracle Integration 3*.
- See Create a REST Adapter Connection in *Using the REST Adapter with Oracle Integration 3*.

Convert HL7 Messages with a Healthcare Action

You can convert a message to or from HL7 format with a healthcare action in an integration. The healthcare action converts native inbound HL7 messages into Oracle Integration XML payloads for use in your integrations and generates native HL7 messages from Oracle Integration XML payloads to send to external applications that support HL7.

> **Note:**
>
> If your Oracle Integration instance does not include the Healthcare edition, you cannot drag the healthcare action into an integration. See Create an Oracle Integration Instance in *Provisioning and Administering Oracle Integration 3*.

1. To create an integration in a project:
   a. In the navigation pane, click **Projects**.
   b. Click the project in which to create the integration.
   c. In the **Integrations** section, click **Add** if no integrations currently exist or **+** if integrations already exist.
   d. Click **Create**, then select **Application** or **Schedule**.
2. To create an integration in a standalone environment:
   a. In the navigation pane, click **Design**, then **Integrations**.
   b. Click **Create**, then select **Application** or **Schedule**.
3. Design your integration, including adding and configuring your connections. See Create Trigger and Invoke Connections that Support the HL7 and FHIR Standards.
4. Add a healthcare action to the integration in either of the following ways:
   - On the right side of the canvas, click **Actions**  and drag the **Healthcare** action to the appropriate location.
   - Click  at the location where you want to add the healthcare action, then select **Healthcare**.

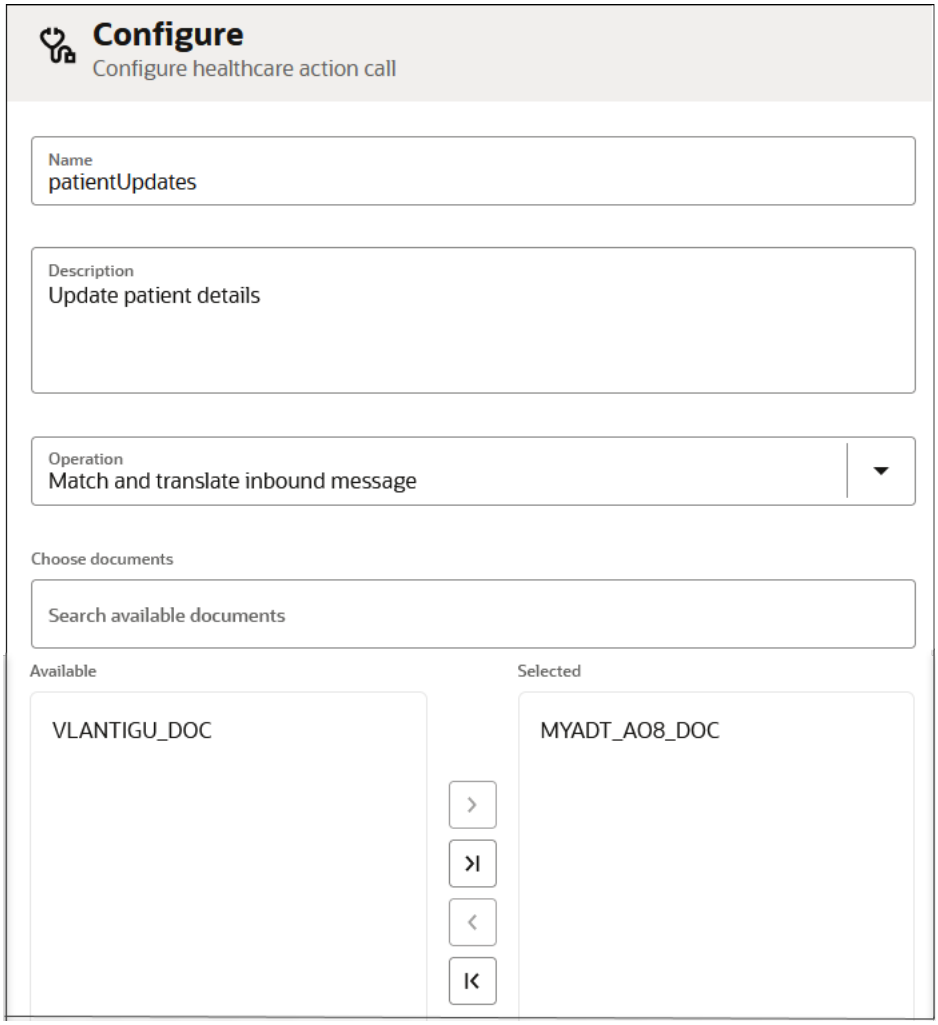
   The Configure healthcare action call wizard is displayed.
5. Enter the following details:

Element	Description
Name	Enter a name.
Description	Enter an optional descriptions for what this action does.

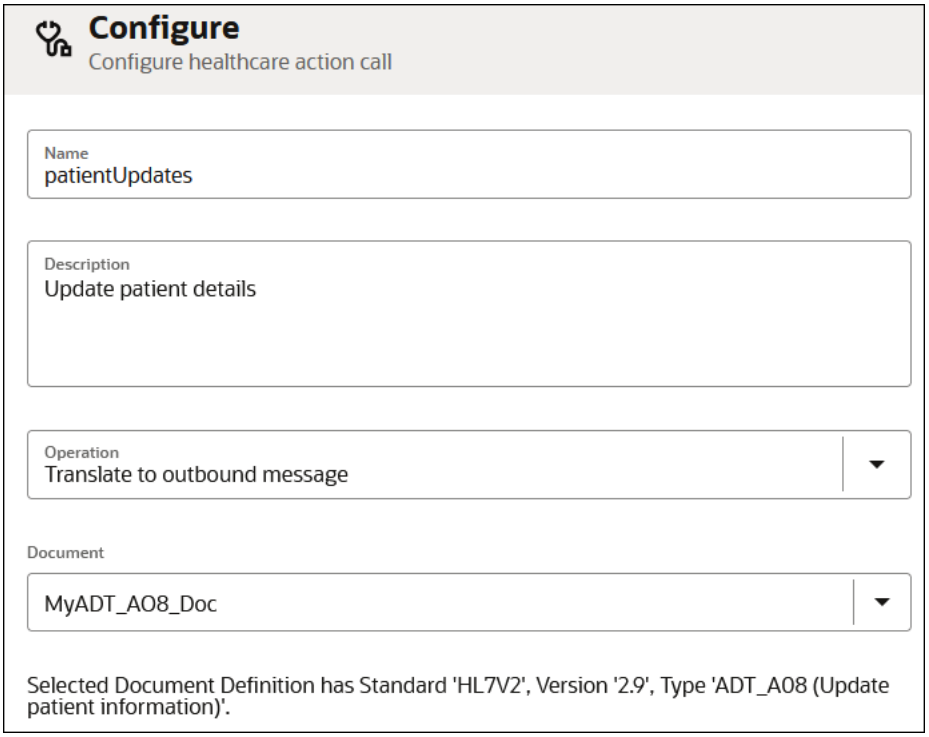
Element	Description
Operation	Select an operation to perform: • **Convert message reference to document**: Use this operation to identify the incoming message type and version. This operation returns a reference to a translated message and metadata needed to route the integration to an appropriate child integration to process the message. When you call the operation, you need to specify a list of HL7 documents with which you want to match. • **Match and translate inbound message**: Use this operation to convert inbound HL7-formatted messages into XML format. Specify the documents you want this action to receive. These are the documents that you configured during design time. This operation takes a raw HL7 message off the wire, parses it, and matches it with the document definition you select in the **Choose documents** section. The message is then converted to an Oracle Integration XML payload. • **Translate to outbound message**: Use this operation to convert an XML payload message to an outbound HL7 message.
Choose documents This field is displayed if you select the **Match and translate inbound message** operation.	Select *all* the HL7 message definitions that you expect to receive on the port number you configured for your MLLP Adapter connection. This integration receives and routes all messages sent to that port number. Documents that are not selected are ignored. If you created the integration in a project, only documents available in that project are visible for selection.
Document This field is displayed if you select the **Convert message reference to document** or **Translate to outbound message** operation.	Select the document to use. If you created the integration in a project, only documents available in that project are visible for selection.

For example:

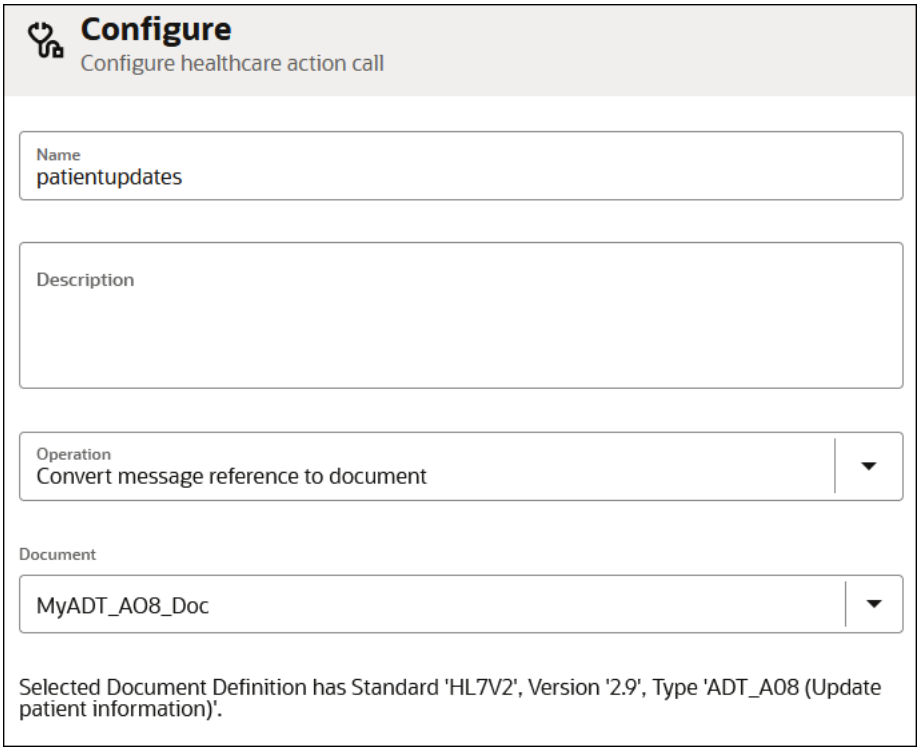
- If you select **Match and translate inbound message**, the selected ADT_A08 message document is converted from HL7 format to an Oracle Integration XML-formatted message.



- If you select **Translate to outbound message**, the selected ADT_A08 message is converted from an Oracle Integration XML message to an HL7-formatted message for delivery to an external application that supports HL7.



- If you select **Convert message reference to document**, the message reference is converted into a mappable payload. This operation returns the contents of the HL7 message as a variable in your integration that is ready to use in the business logic and mapper of your integration. The variable appears on the source side of the mapper.



6. Click **Finish**.

7. Continue designing the remaining parts of your integration, including adding and configuring your invoke connections.

Examples of using all three operations in a use case are provided. See Design Time and Runtime Overview of an Oracle Integration for Healthcare Use Case.

4

Import FHIR Profile Packages

You can import FHIR profile packages into Oracle Integration. You then select the profile package to use when configuring the FHIR Adapter in an integration.

Topics:

See Profile Definitions and Documentation.

Import a FHIR Profile Package

You can import a FHIR profile package into Oracle Integration and use the resource definitions in that profile with the FHIR Adapter.

The HL7 FHIR standard defines a set of base resources (for example, patient and observation). The standard base resources have generic definitions. FHIR profile packages enables you to create customized resource definitions by specifying a set of constraints and/or extensions on a base resource.

1. Import a FHIR profile into a project.
   a. In the navigation pane, click **Projects**.
   b. Click the project in which to import the FHIR profile package.
   c. Click **Healthcare**  .
   d. In the **FHIR profiles** section, click **Add**.
2. Import a FHIR profile into a standalone environment.
   - In the navigation pane, click **Healthcare**, then **FHIR profiles**.
3. Click **Import**.

   The Import FHIR profile panel opens.
4. Enter the following details.

Element	Description
Name	Enter a FHIR profile package name.
Identifier	This field is automatically populated with a unique FHIR profile identifier based on your FHIR profile package name. You can manually change this value, if needed.
Description	Enter an optional description of this profile package.
Drag and Drop	Click to select a TGZ file from your host or drag and drop a file into the field. See Oracle Integration for Healthcare Support for HL7 and FHIR for a list of tested profile packages.

5. Click **Import**.

Import of the FHIR profile package occurs in the background and can take up to five minutes.

Once imported, you can browse the contents of the profile package. See Browse the Contents of the FHIR Profile Package.

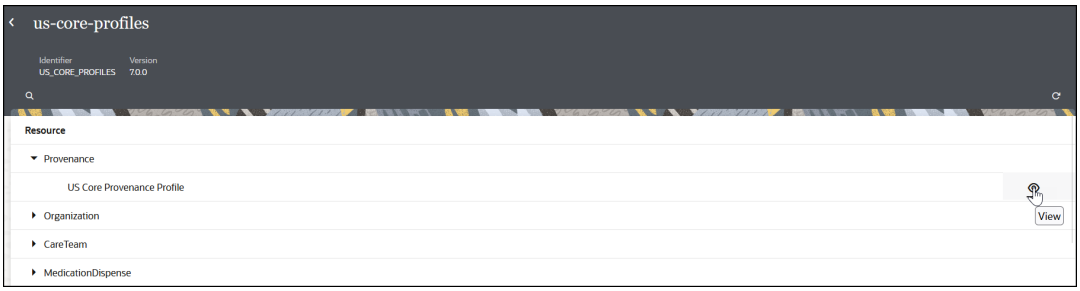
The profile package is now available for selection when you configure the FHIR Adapter in an integration. See Add the FHIR Adapter Connection to an Integration in *Using the FHIR Adapter with Oracle Integration 3*.

Browse the Contents of the FHIR Profile Package

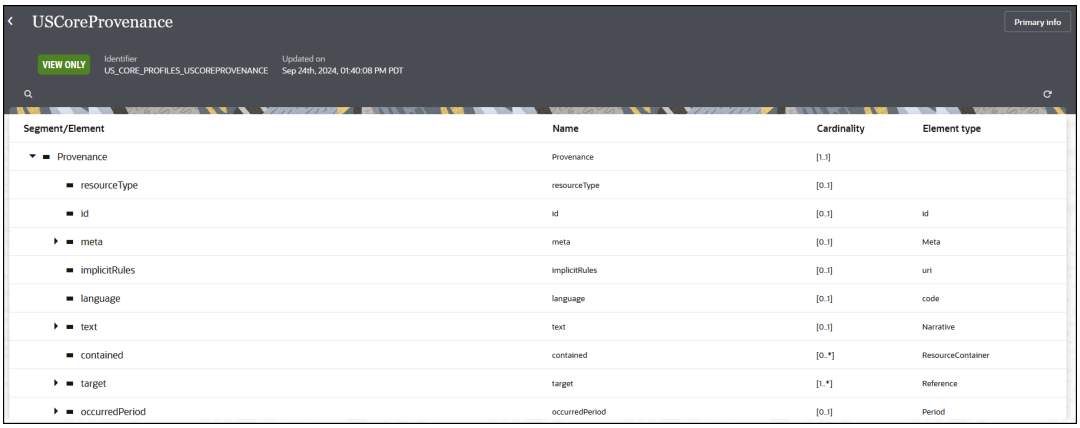
You can browse the contents of the imported FHIR profile package.

1. Browse a FHIR profile package in a project.
   a. In the navigation pane, click **Projects**.
   b. Click the project in which to browse the FHIR profile package.
   c. Click **Healthcare**.
   d. Go to the **FHIR profiles** section.
2. Browse a FHIR profile package in a standalone environment.
   - In the navigation pane, click **Healthcare**, then **FHIR profiles**.
3. Click the FHIR profile package to browse.

   The supported FHIR resources are shown.
4. Expand a resource and click **View**.



The segments and elements for the resource are displayed.



5. Hover your cursor over a row and click **View**  to view property details.

5

Design Time and Runtime Overview of an Oracle Integration for Healthcare Use Case

This section provides an overview of key design-time and runtime component capabilities in the healthcare use case that synchronizes EMR application patient updates with a FHIR patient repository and a pathology system.

Topics:

A quick tour of this use case is provided. See Synchronize EMR Patient Updates in a FHIR Patient Repository and a Pathology System.

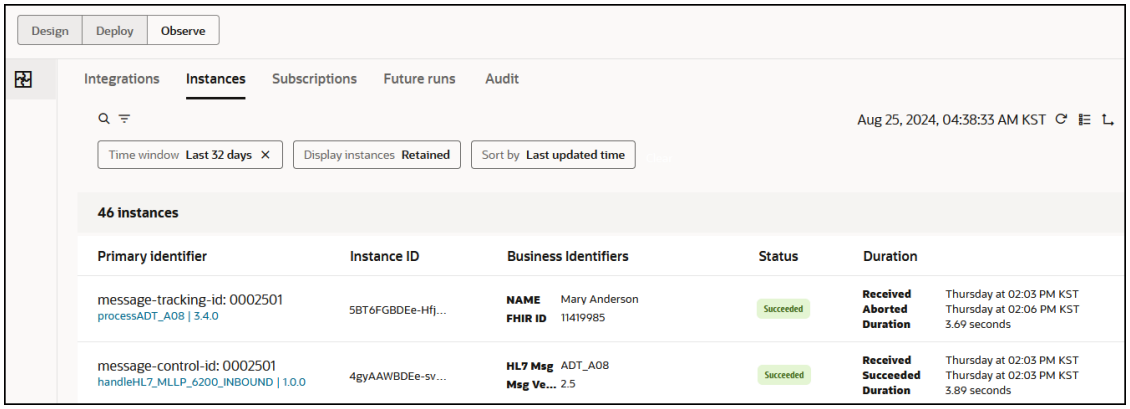
Use Case Overview

This use case provides a design-time and runtime overview of two integrations that perform the following tasks.

The integrations are referred to as *handlers* and *processors*. The handler integration handles all incoming HL7 messages for a given TCP/IP connection. The processor integration processes each specific type of HL7 message.

- handleHL7_MLLP_6200_INBOUND: A parent integration that receives inbound HL7 messages from an EMR application. In this example, the EMR sends ADT_A08 (update patient information) messages.
- processADT_A08: A child integration called by handleHL7_MLLP_6200_INBOUND to process the inbound HL7 message and synchronize a FHIR patient repository and pathology system with the same patient updates.

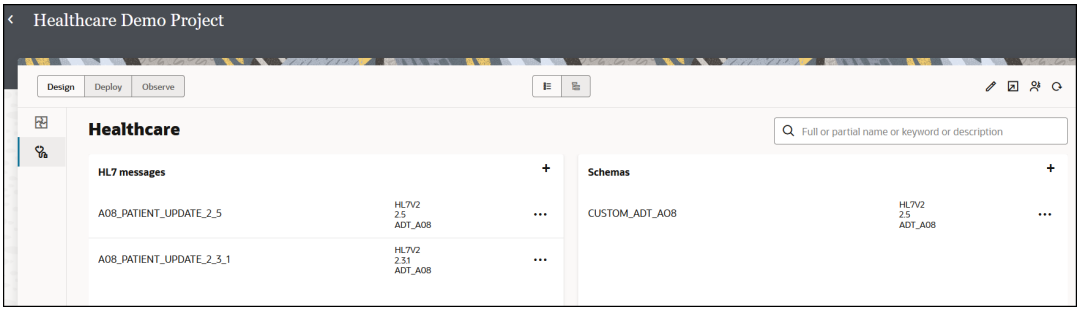
Both integrations are shown as successfully completed on the Instances page under the **Observe** tab in the project.



Overview of the Design-Time Messages

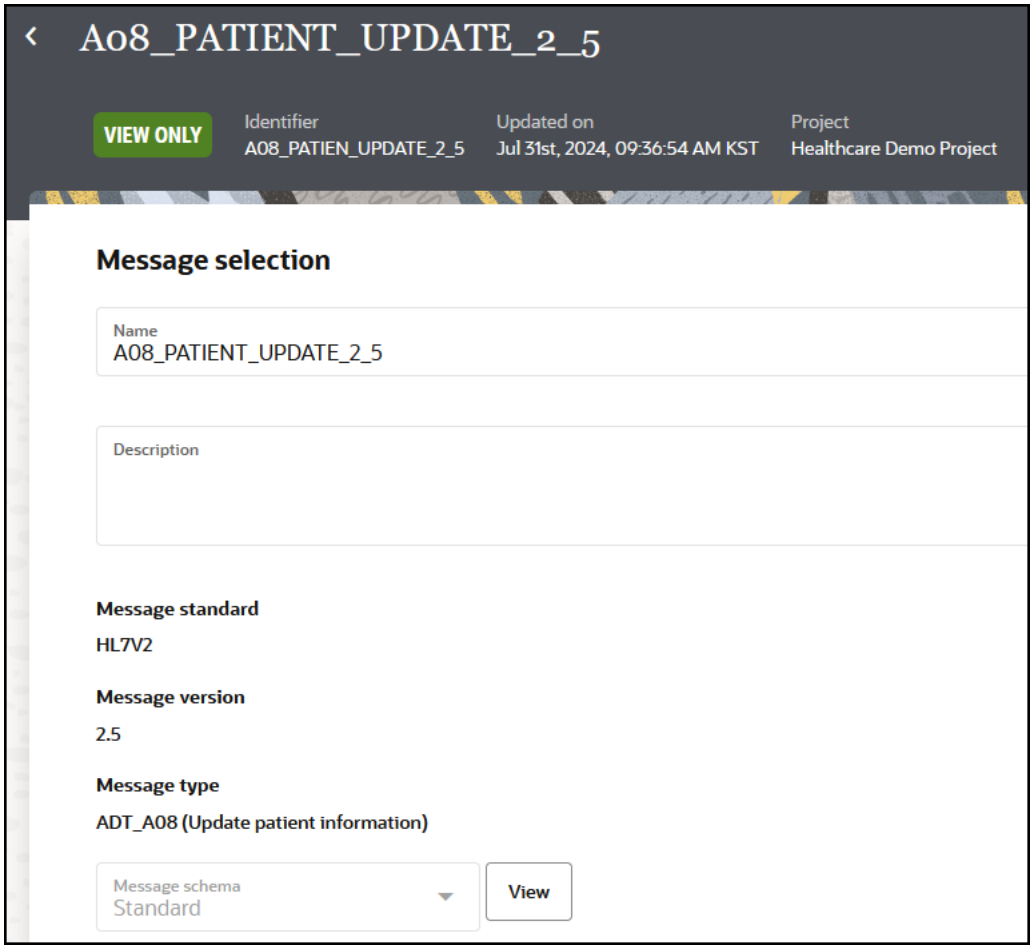
This section provides a design-time overview of the HL7 messages used in this use case. This use case is created inside a project.

1. The **Healthcare** tab for the project shows the available messages. A message is based on an associated HL7 schema. The workflow is as follows:
   - You create the schema and select the HL7 version, message version, and message type to use.
   - You create the message based on the schema.
   - The message that you create is the HL7 message definition for the message that your integration processes at runtime.
   - You select the messages to use when configuring the healthcare action during integration design.



As an example, the contents of the **A08 Patient Update 2_5** message are as follows:

- HL7 version 2
- Message version 2.5
- Message type ADT_A08 (Update patient information)



Overview of the Integration Receiving the Inbound HL7 Message During Runtime

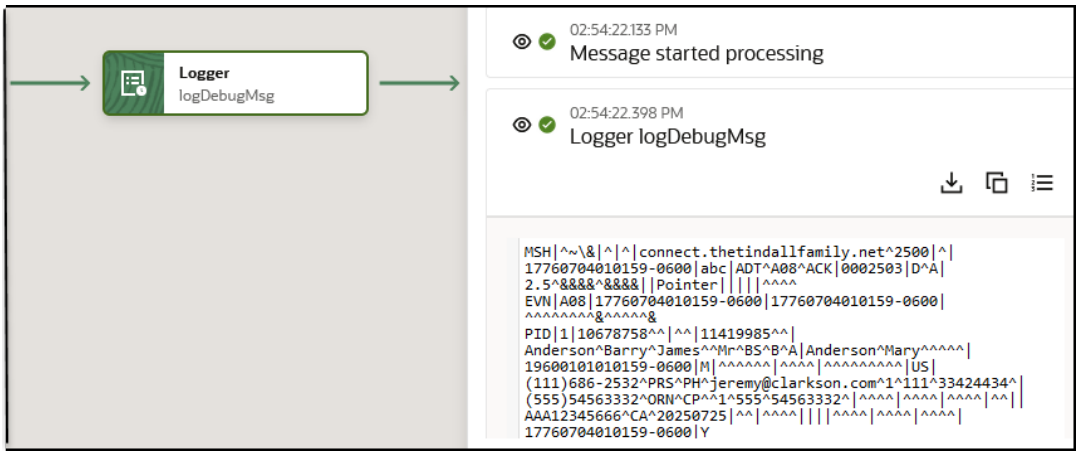
This section provides a runtime overview of key component responsibilities in the handleHL7_MLLP_6200_INBOUND parent integration that receives the initial HL7 inbound message from the EMR application. The EMR application was updated with patient details that must also be automatically updated in a FHIR patient repository and pathology system.

- Receive and Convert the Inbound HL7 Message
- Invoke Child Integration

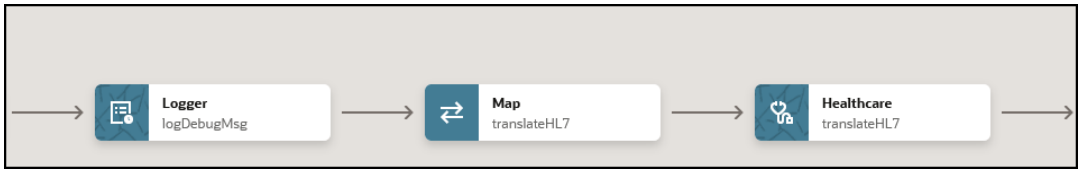
Receive and Convert the Inbound HL7 Message

1. The MLLP Adapter trigger connection (**MLLPAdapter**) listens for messages from an EMR application that uses HL7. For this use case, the MLLP Adapter receives an HL7 Update Patient Information message (ADT_A08) from the EMR application and starts the integration.

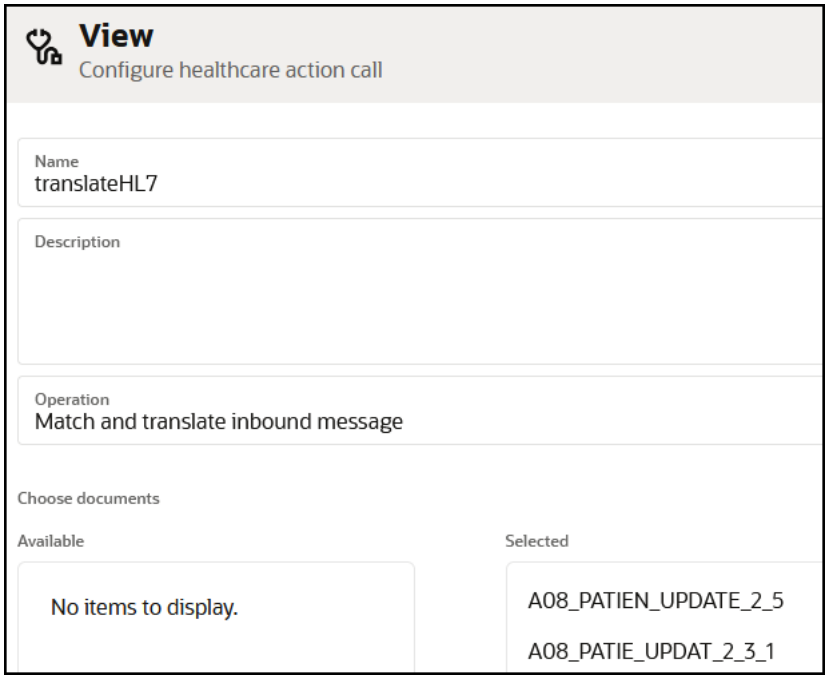
2. The logger action (**logDebugMsg**) logs the message to the debugger. A review of the logger action in the activity stream shows the HL7-formatted message received from the EMR application.



The message is then passed to the map and healthcare (**translateHL7**) actions. The message is known as a healthcare message reference.



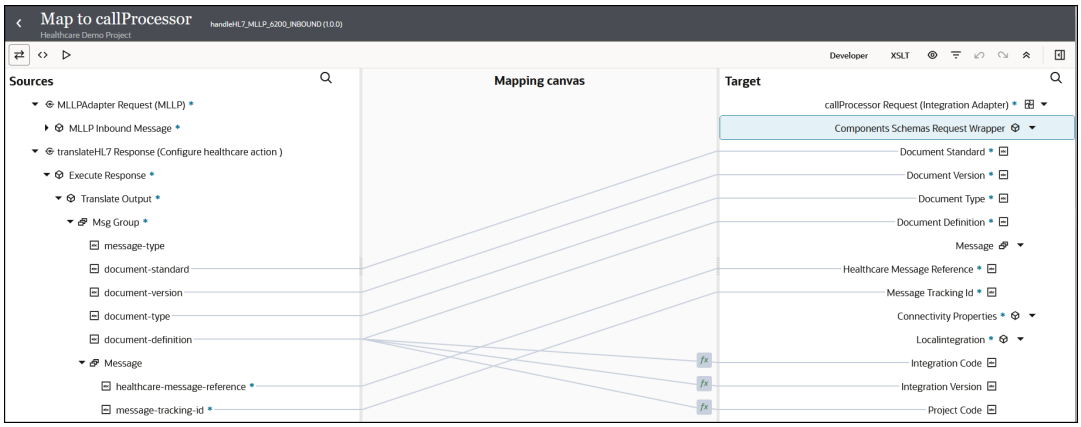
3. A view of the healthcare action configuration shows that the **Match and translate inbound message** operation is selected. This operation converts the inbound HL7-formatted messages selected in the **Choose documents** field to Oracle Integration XML-formatted payload messages. The two messages selected for conversion were created during design-time. See Overview of the Design-Time Messages.
Each message is based on an HL7 message schema that you want to process. For this example, two different HL7 versions (2.3.1 and 2.5) of the ADT_A08 message are selected. Any inbound messages that are received, but not selected in the **Choose documents** field, are ignored and not processed.



See Create Oracle Integration for Healthcare Schemas and Documents.

Invoke Child Integration

1. The map action (**callProcessor**) shows the source **healthcare-message-reference** element of the **translateHL7** healthcare action. This element contains the contents of the healthcare action message in XML, but in an opaque message reference format. This output is mapped as a binary object into the integration action that invokes the processADT_MLLP_A08 child integration.



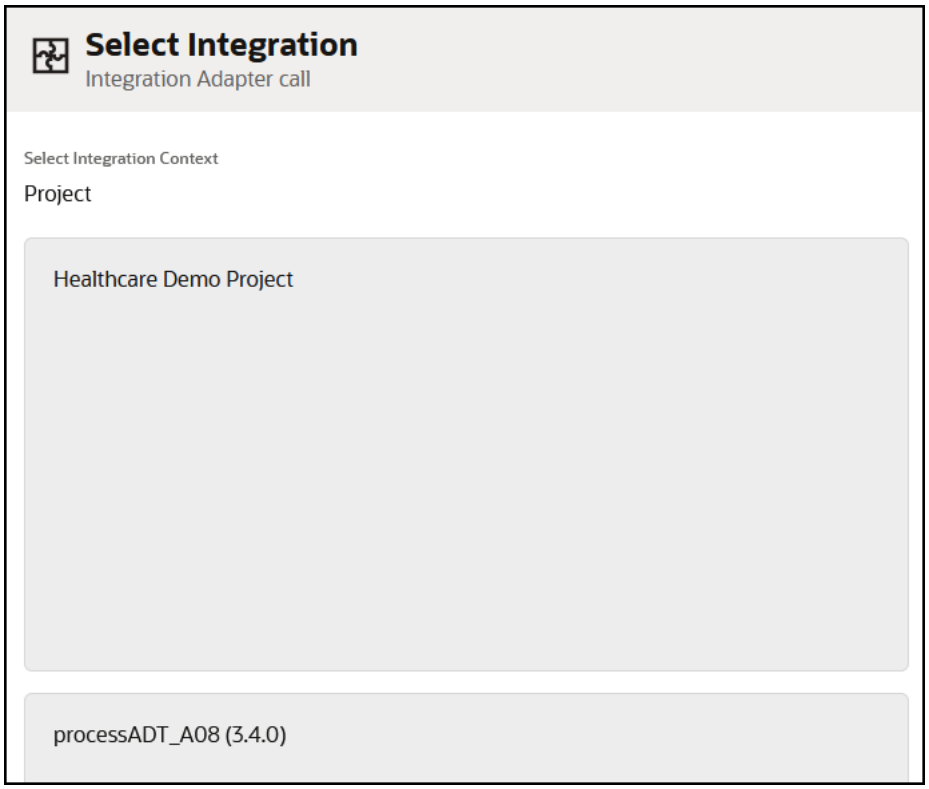
The target **Connectivity Properties** section shows the integration name, integration version, and project code being called. This information is obtained from a lookup function. For example, for **Integration Code**, if the message definition value is **A08 Update Patient**

2_5, it is routed to the **processADT_A08** child integration. The use of lookup functions offers a way to enable specific child integrations to process specific HL7 messages.

2. The integration action (**callProcessor**) invokes the processADT_A08 child integration to process the ADT_A08 message.

> **Tip:**
>
> As a best practice, build a parent routing integration that can invoke a different child integration to process a different HL7 inbound message type (one child integration per message). Do not build a single integration with routing logic (for example, a switch or for-each action) to process each message.

3. A view of the integration action configuration shows the **processADT_A08** child integration is selected to be invoked.



Overview of the Integration Processing the Patient Updates During Runtime

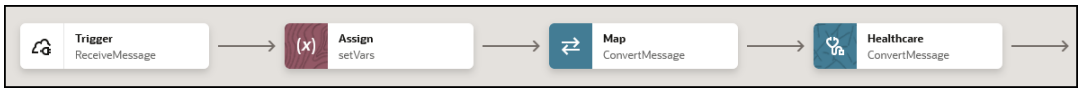
This section provides a runtime overview of key component responsibilities in the processADT_A08 child integration that is invoked by the handleHL7_MLLP_6200_INBOUND

parent integration to process the patient updates. The processADT_A08 child integration automatically updates the FHIR patient repository and pathology system with the patient details initially updated in the EMR application.

- Process the Integration
- Update the FHIR Patient Repository
- Update the Pathology System

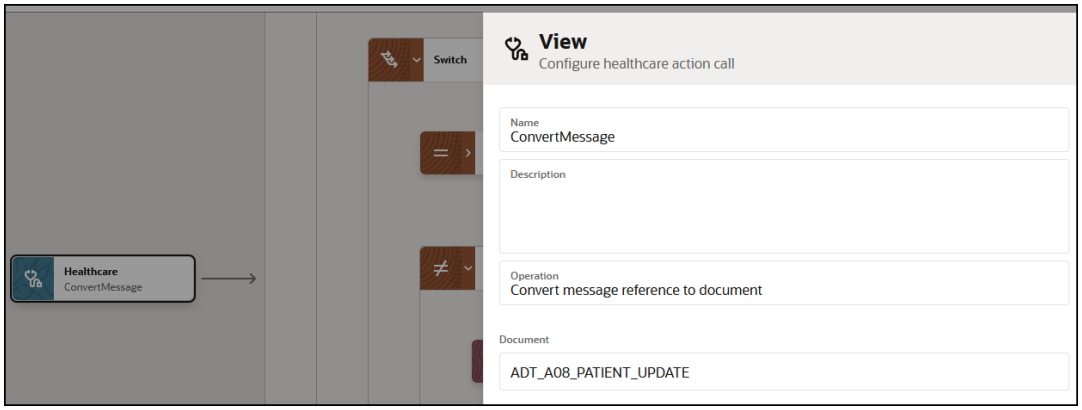
Process the Integration

1. A REST Adapter trigger connection (**ReceiveMessage**) receives the inbound message from the handleHL7_MLLP_6200_INBOUND parent integration.

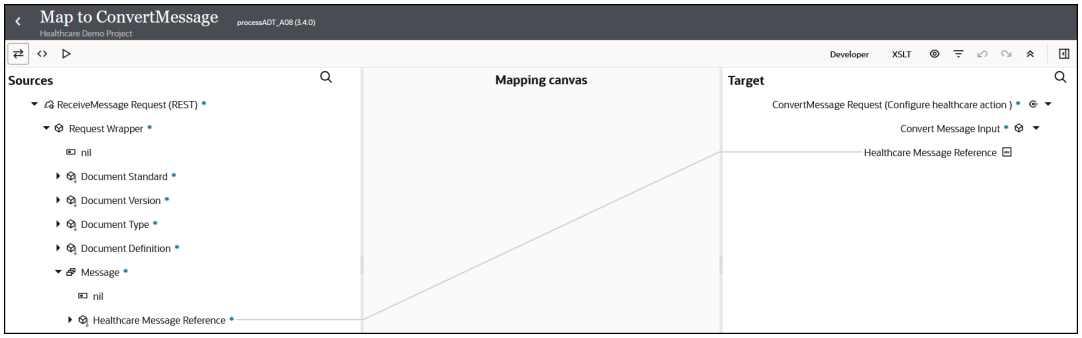


   The child integration includes a healthcare action (**ConvertMessage**) after the map action of the same name.

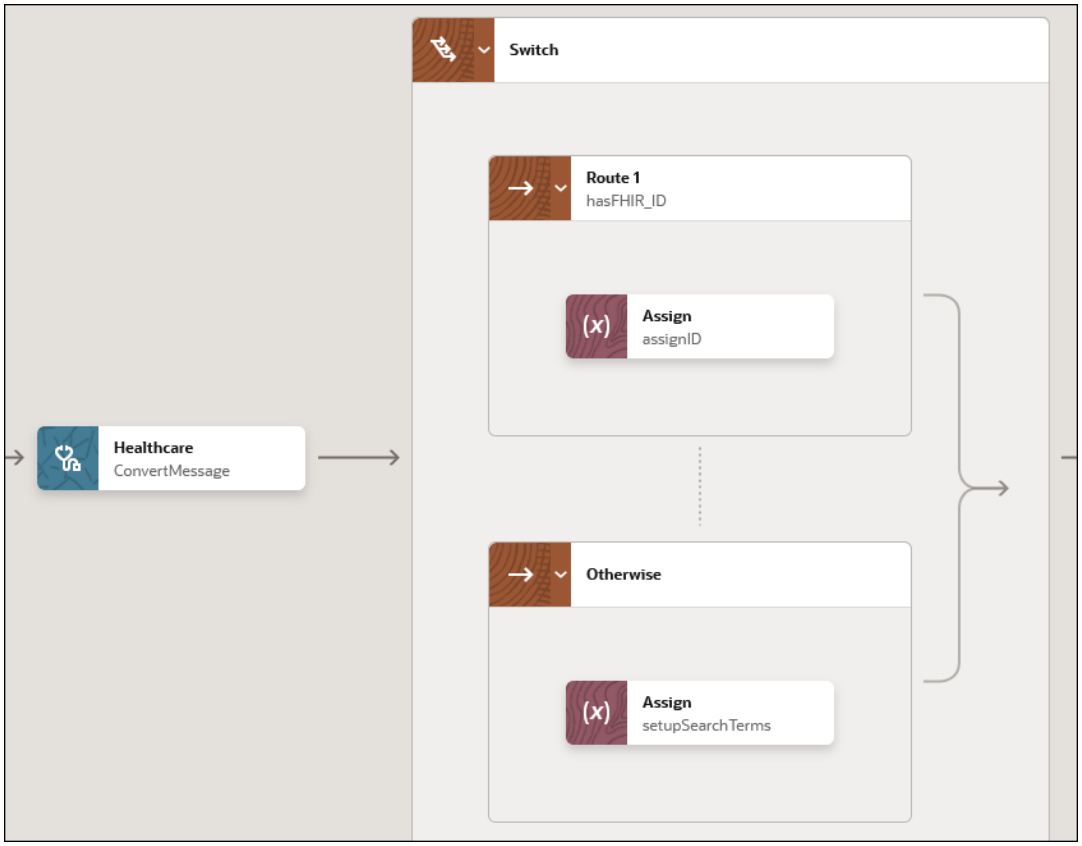
2. A view of the healthcare action configuration shows that the **Convert message reference to document** operation is selected. This operation converts the inbound HL7 document into an Oracle Integration-mappable format.



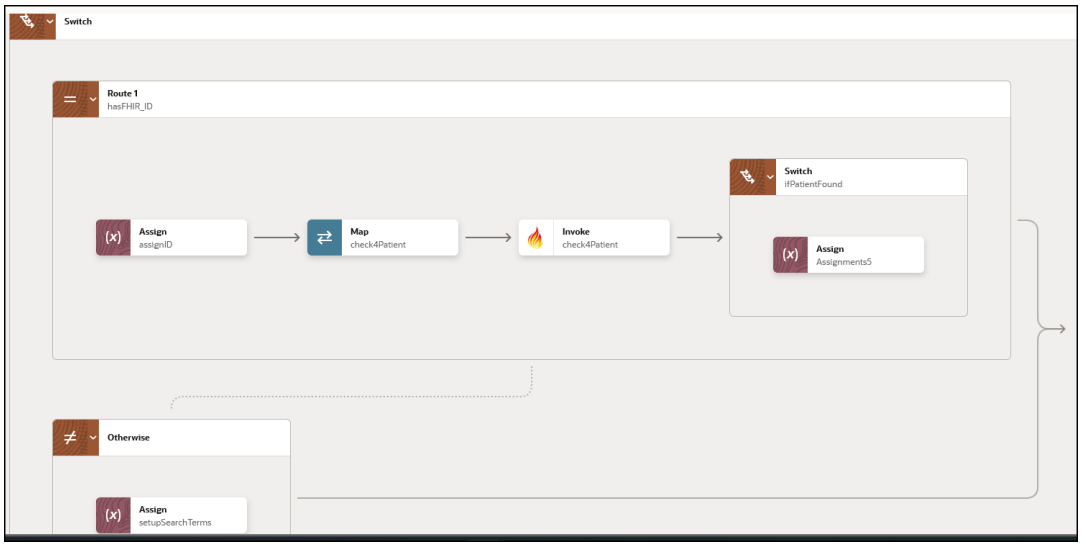
3. The map action (**ConvertMessage**) shows the mapping.



4. The assign action (**assignID**) in the **Route 1** branch of the switch action checks for a FHIR patient ID in the message. If there is an ID, it is extracted from the message.

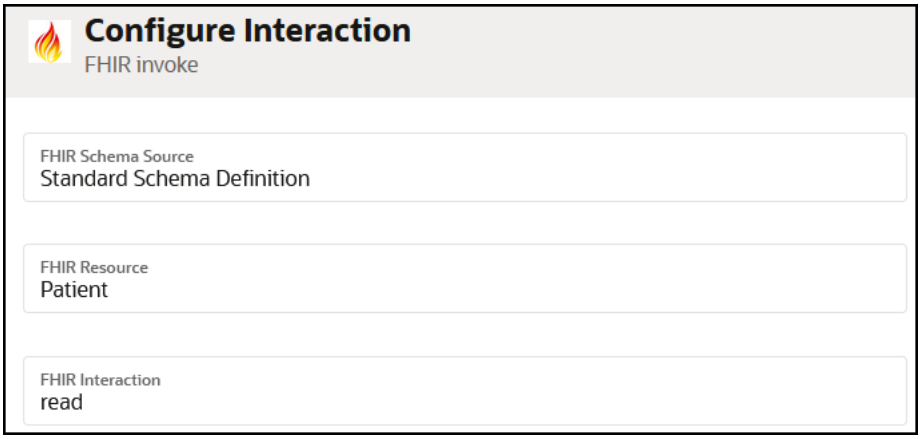


5. A check is made with the extracted ID to ensure that the patient exists in the FHIR patient repository.

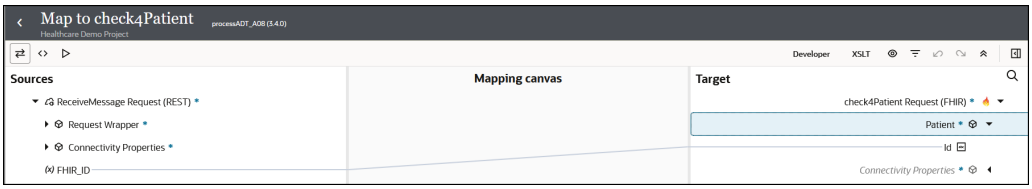


The following actions are performed.

a. The FHIR Adapter (**check4Patient**) is invoked to check if the patient exists in the FHIR server repository.



b. The map action (**check4Patient**) passes the FHIR patient ID.



6. If the patient ID is found in the repository, a variable is assigned in the assign action (**Assignment5**).

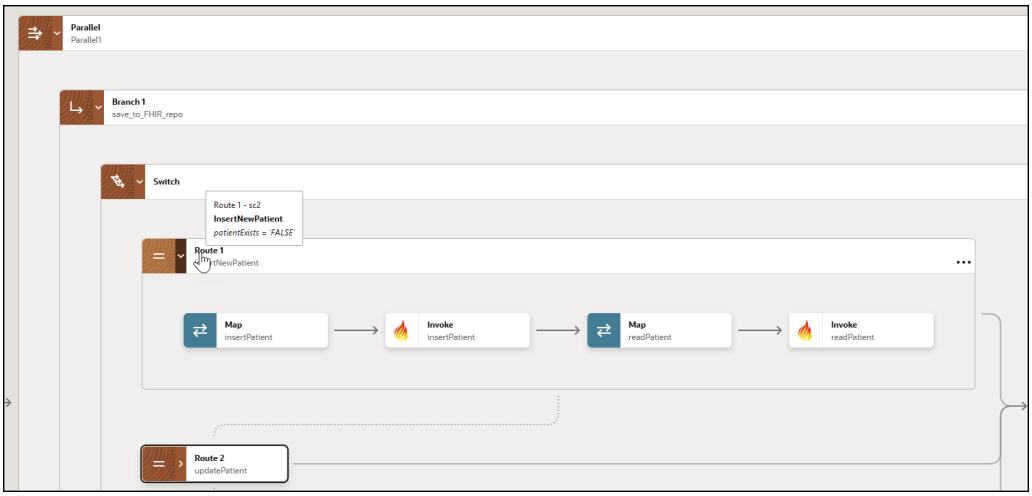
```
patientExists = 'TRUE'
```

7. The FHIR ID is passed to a parallel action (**Parallel**) with two branches. A parallel action allows the path of an integration to be split into multiple branches. Each branch is processed in parallel due to their independence from each other. For this use case, a parallel branch is provided to update both external applications:
   - FHIR patient repository (branch 1)
   - Pathology system (branch 2)

Update the FHIR Patient Repository

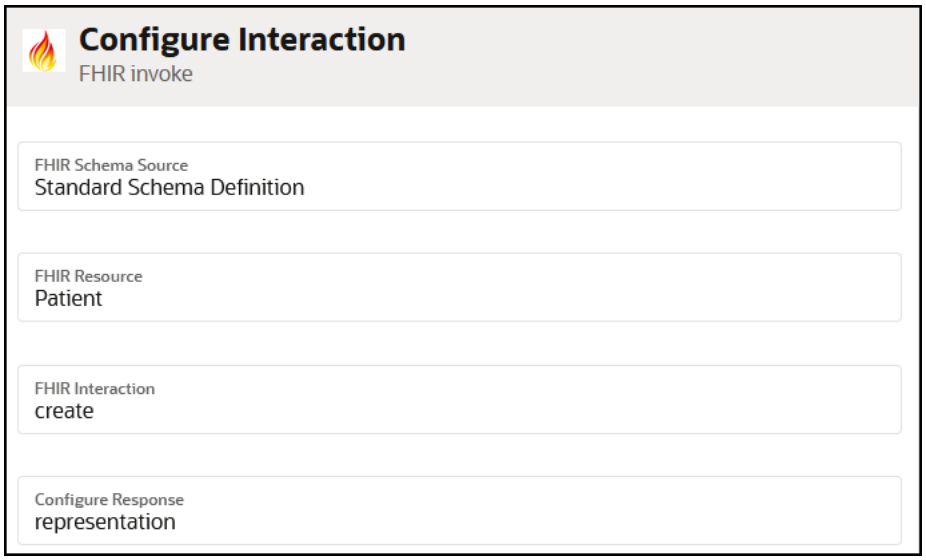
1. The first branch in the parallel action includes a switch action with two routes.
   - The first branch in the switch action identifies whether to add a new patient in the FHIR patient repository. The popup message on the first branch indicates that if the

assignment of **patientExists** equals **false**, insert the patient into the FHIR patient repository.

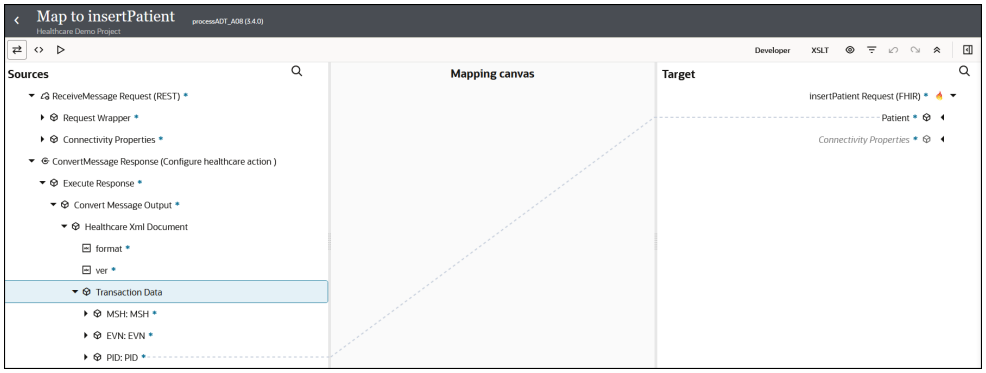


The following actions are performed.

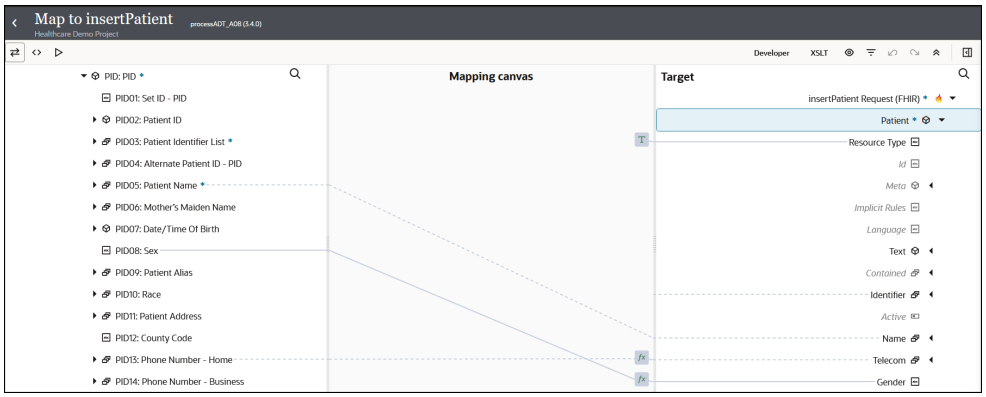
a. The FHIR Adapter (**insertPatient**) inserts the patient into the FHIR server repository.



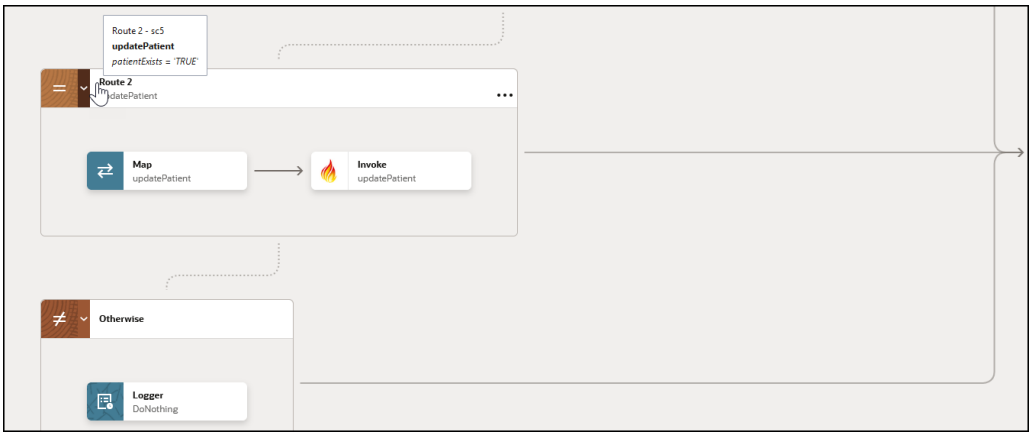
b. The map action (**insertPatient**) shows the source HL7 message payload under **Transaction Data** that is mapped to the target **Patient**.



c. The expanded **PID:PID** element shows the specific patient mappings, such as patient name, gender, and home phone number.

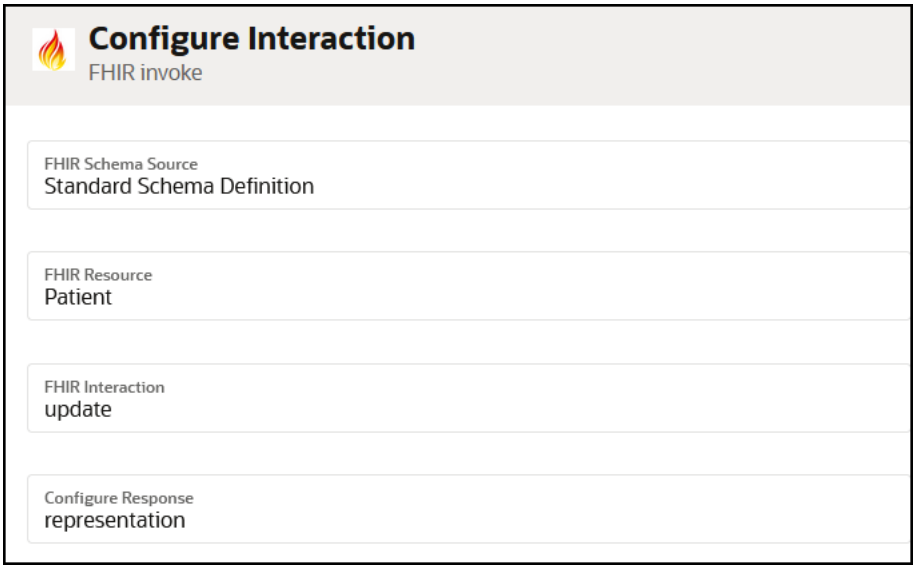


- The second branch in the switch action identifies whether to update an existing patient. The popup message on the first branch indicates that if the assignment of **patientExists** equals **true**, update the patient in the FHIR patient repository.

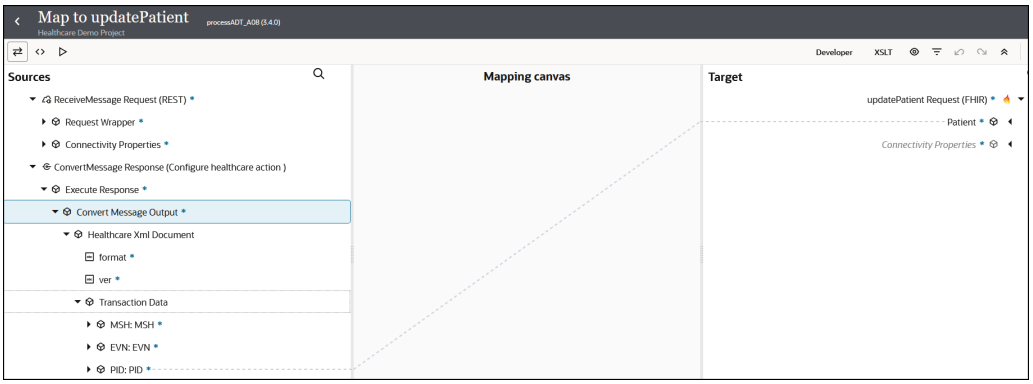


The following actions are performed.

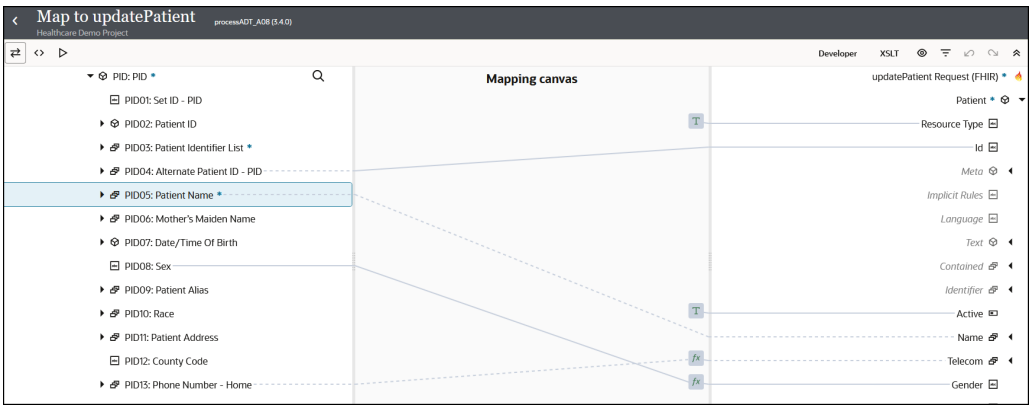
a. The FHIR Adapter (**updatetPatient**) updates the patient in the FHIR server repository.



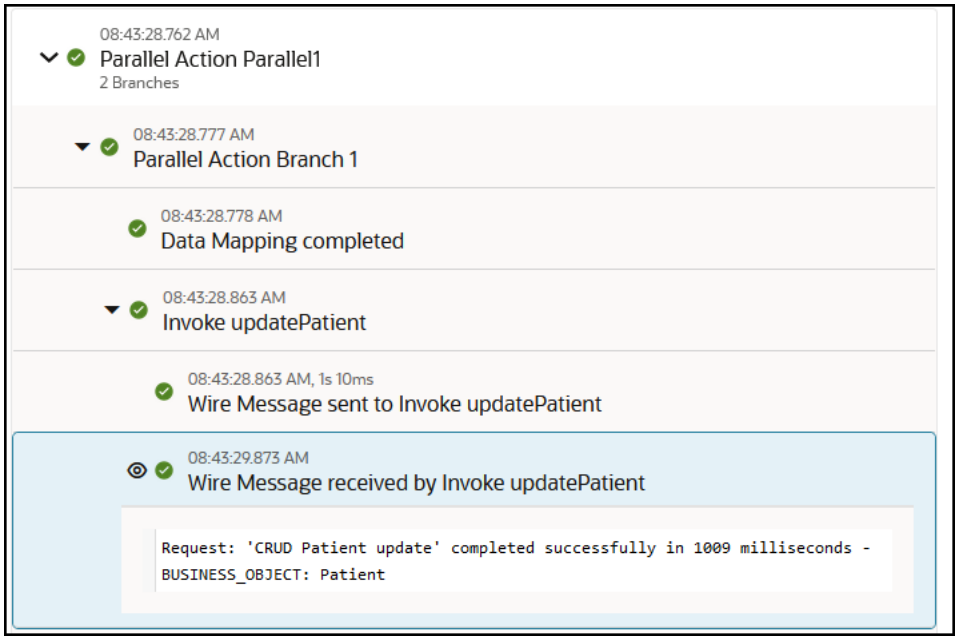
b. The map action (**updatetPatient**) shows the source HL7 message payload under **Transaction Data** that is mapped to the target **Patient**.



c. The expanded **PID:PID** element shows the specific patient mappings, such as patient ID, name, gender, and home phone number.

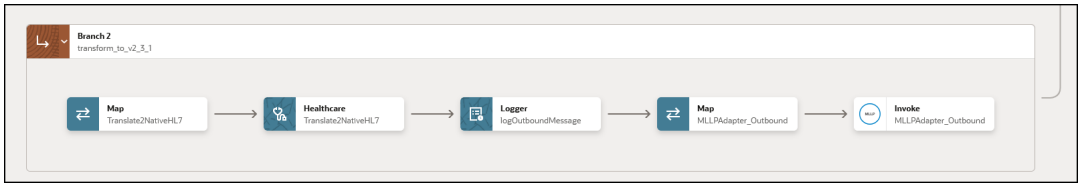


2. The expanded activity stream shows that the patient already existed and was updated in the FHIR server repository.

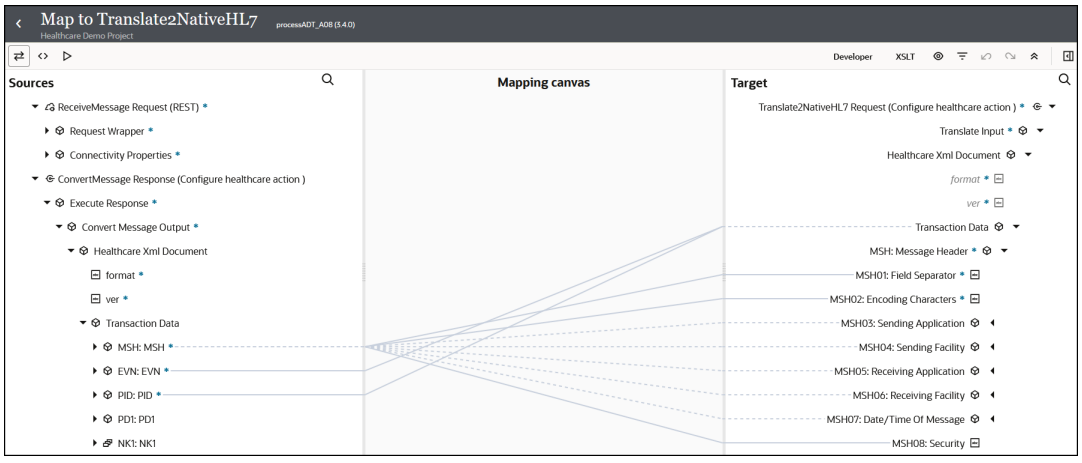


Update the Pathology System

1. The second branch in the parallel action updates the pathology system. Because the EMR application uses HL7 version 2.5 and the pathology system uses HL7 version 2.3.1, a message conversion to the earlier version must be performed.

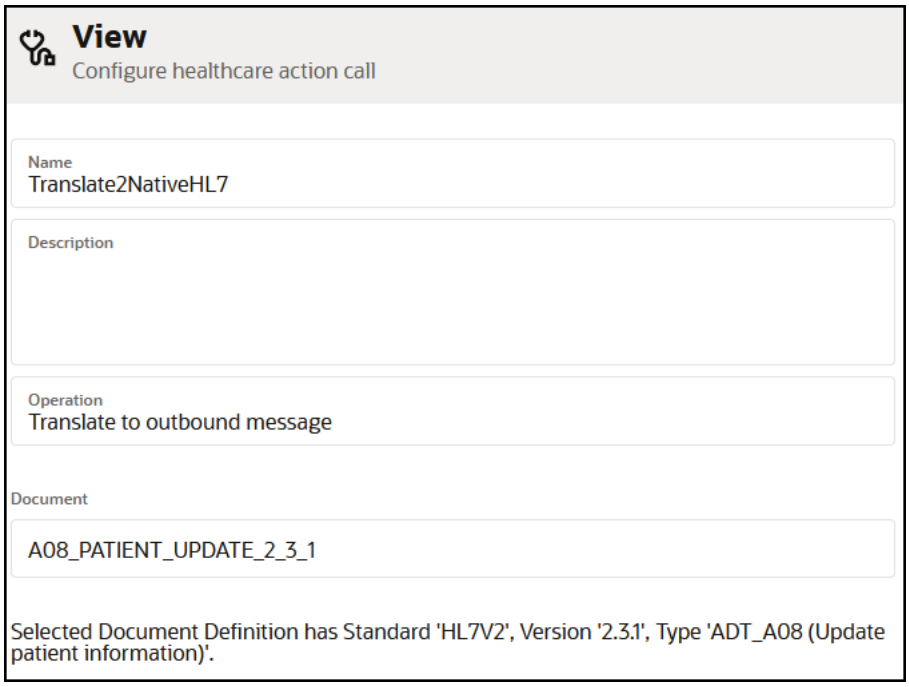


2. The expanded mapper (**Translate2NativeHL7**) shows the HL7 version 2.5 source and HL7 version 2.3.1 target element mappings performed by the user at design time (patient ID, patient name, date of birth, and more).

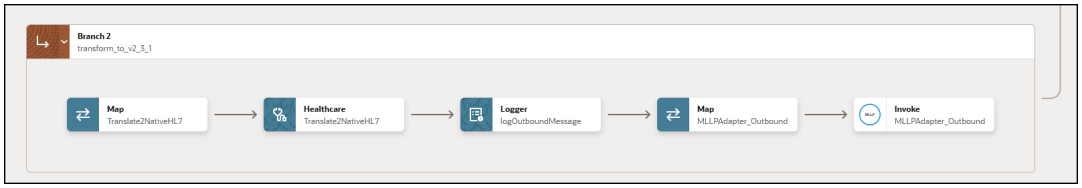


Before sending the document to the pathology system, it must be converted from Oracle Integration XML format back to HL7 format in a healthcare action.

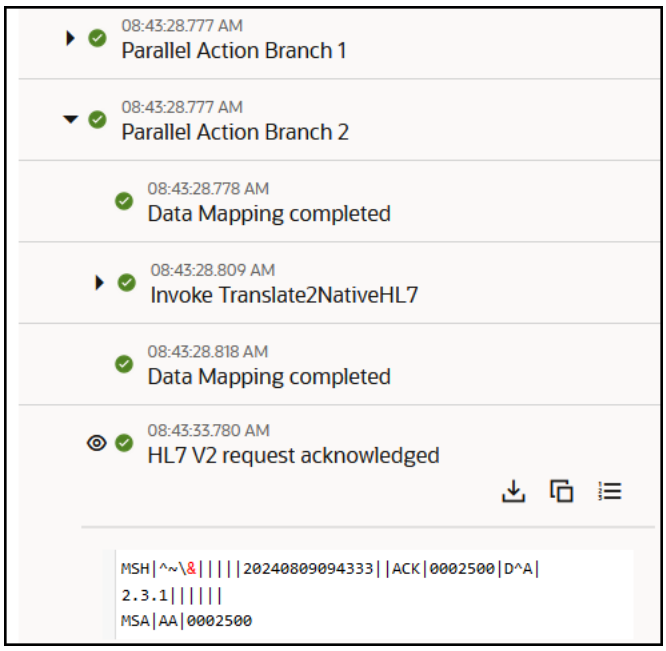
3. A view of the healthcare action (**Translate2NativeHL7**) configuration shows that the **Translate to outbound message** operation is selected. This operation converts the outbound XML-formatted payload message to the HL7 version 2.3.1-formatted payload message selected in the **Choose documents** field. The healthcare action produces a healthcare message reference to pass directly to the MLLP Adapter invoke connection.



4. An MLLP Adapter invoke connection (**MLLPAdapter_Outbound**) sends the HL7 version 2.3.1 message to the pathology system for updating.



5. The logger action (**logOutboundMessage**) in the expanded activity stream shows that the HL7 2.3.1 message was sent.



The integration is now complete. The EMR application patient detail updates have been automatically synchronized in the FHIR patient repository and pathology system.