

# Functional Requirements Document

## Lab Order and Result Interoperability Between iSantéPlus Clinics, SEDISH and LNSP

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This document defines the functional requirements for laboratory interoperability between iSantéPlus clinics, SEDISH and LNSP's Soft Computer (SCC) laboratory information system suite. The primary drivers for this integration focus on exchange viral load and Early Infant Diagnosis laboratory orders and results. The core integration follows the mechanisms outlined in the [IHE Pathology and Laboratory Medicine \(PaLM\) Technical Framework Revision 8.0](#) that was published in June 2017. In particular, this software requirement specification applies the standards outlined in the Laboratory Testing Workflow (LTW) profile that's outlined on [Volume 1](#) of the technical framework.

This software requirement specification aims to enable interoperability between the clinic Electronic Medical Record (EMR) system and the Laboratory Information System (LIS) at the regional or national laboratory. The core features include generating laboratory orders from the EMR and sending them to the LIS for processing. Once the order is filled, the result will be returned to the EMR and applied to the patient record. iSantéPlus is the "order placer" system and SCC is the "order filler" system.

The SEDISH Health Information Exchange acts as a mediator between the EMR and LIS due to the operational environment in Haiti. This middle layer allows both EMRs and LIS to send information to a central repository and synchronize information when internet is available. This adds complexity in the initial design phase, but will pay dividends operationally for clinics that are offline for extended periods of time.

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## Definitions

**Client Registry (CR):** The Client Registry is a Master Person Index is a software system within SEDISH that stores demographic information about people who have received care. The aim of this system is to maintain a single record for all people allowing other systems and organizations to link the care provided to this single record.

**Document Subscription (DSUB) system:** The document subscription system is a software system that receives notifications from the XDS repository and sends notifications to subscribers (notification broker). This allows the XDS repository to perform as an event based publish/subscribe system.

**Interoperability Layer (IL):** The interoperability layer is a software system that provides access to the SEDISH health information exchange. It provides access controls, auditing and smart routing of messages from multiple sources.

**iSantéPlus:** iSantéPlus is the clinic electronic medical record system developed and maintained by I-TECH. It is the system that is responsible for generating messages and sending them to SEDISH.

**Mirth:** Mirth is a software system that is responsible for automatically retrying messages that failed to send due to internet connectivity. It is deployed at the clinic level and works with iSantéPlus.

**Notification:** A notification is a message sent from a system to another system with information about an event that occurred.

**Notification Pull Point:** A notification pull point is a system that collects all notifications for a particular subscription. This allows iSantéPlus clinics to be offline for periods of time and “pull” their notifications when the internet becomes available again.

**Order:** An order is a diagnostic test or panel of tests that is requested for a patient by a physician. An order is fulfilled by a laboratory using one or more specimens.

**Order Filler:** The order filler is the system receiving the laboratory order from the order placer. In this case SCC will act as the order filler.

**Order Placer:** In this case, iSantéPlus will act as the system that generates order. The clinical team is responsible for creating the order in the system, which triggers events that ultimately send a standardized HL7 v2.5.1 document to the order filler system.

**Order Tracker:** iSantéPlus will need to keep a list of all orders that have been submitted, track their progress and notify providers when there is a change to the order. This process includes receiving the appropriate result messages and applying them to an order.

**SEDISH:** Système d'Échange d'Information Sanitaire Haïtien (SEDISH) is the health information exchange deployed and maintained by I-TECH.

**Shared Health Record (SHR):** The Shared Health Record is a system within SEDISH that stores all appropriate clinic information for the health information exchange.

**Specimen:** A specimen is a biological sample taken from a patient that is collected to aid in the diagnosis or staging of a disease. For this case, the common specimen is a blood sample taken from the patient that is analyzed to identify Viral Load and Early Infant Diagnosis for HIV.

**Submission Set:** A submission set is a package that's sent to the XDS repository that contains the appropriate documents for an intended recipient. Each submission set has metadata that allows it be queried by the XDS repository.

**XDS Repository:** The XDS repository is a software system that implements the [IHE Cross-enterprise Document Sharing standard](#). It acts as the document storage and retrieval system for SEDISH.

## Assumptions

- This document focuses on transmitting digital orders and results between iSantéPlus, SEDISH and SCC. There may be a paper trail accompanying the process, but the paper trail process is currently out of scope for this integration.
- Early Infant Diagnosis (EID) and Viral Load (VL) tests require special equipment that is installed at the National Laboratory LNSP. All EID and VL orders must be routed to LNSP at this time. All other test types are out of scope for this initial integration.
- Some clinics have OpenELIS installed, which is an open source laboratory information system. Any interactions with OpenELIS is out of scope for this integration. EID and VL

orders and results all must be routed to LNSP, so they will directly route from iSantéPlus to SEDISH and SCC as defined in this document. Not through OpenELIS.

- This workflow will focus on exchanging information about a single laboratory order. We will not be exchanging information about groups of orders.
- Order results will be transmitted using the ORU^R01 message type, which provides an order centered result. The OUL^R22 message type allows systems to send specimen centered results, but that is not applicable to the initial feature set.
- The IHE profile defines an option for the Order Filler system to send an order update to the Order Requester system using the OML^O21 message type. This allows orders to be cancelled by SCC. The results section provides a similar functionality in the ORU^R01 message type, where results are able to provide updates on partial results. We assume SCC will implement the ORU^R01 interface so we do not have to implement the extra interface on both sides.

## Operational Environment Constraints

iSantéPlus is deployed at over 100 clinics across Haiti. It is a standalone electronic medical record system that fully operates at the clinic regardless of internet connectivity. The system is fully functional offline and is able to function locally for months without connecting to the internet. We must ensure the system architecture is able to account for these operational constraints.

- There are many power and internet outages at all levels that cause failures in transmissions. Examples include:
  - Power goes out during the transmission of the message, and the full message isn't received
  - Power goes out after the transmission has been received, but before the Acknowledgement has been received
- iSantéPlus clinics have connectivity to the internet, but do not have public IP addresses, which incur additional costs. Due to this, we have opted for a "pull" architecture at the clinic level when requesting updates from SEDISH. On a regular schedule iSantéPlus will connect to SEDISH and pull any updates from the system.
- There may be times when one of the receiving system is unresponsive when a document needs to be exchanged due to software problems and networking equipment. The system should be able to retry messages from the point of service systems (iSantéPlus and SCC).

## Referenced Standards

Numerous IHE and HL7 standards are referenced in this requirements document. This section aims to define the location for each standard so implementers can view those that are cited.

## **IHE Technical Frameworks**

The IHE IT Infrastructure (ITI) and Pathology and Laboratory Management (PaLM) domains are cited in this document. All cited standards start with the acronym for the domain followed by a number. For example, ITI-41 is often cited and it represents the 41st standard in the IT Infrastructure domain titled "Provide and Register Document Set-b".

Links:

[ITI Technical Framework Volume 1](#) defines the high level integration profiles.

[ITI Technical Framework Volume 2a](#) defines the transactions cited in Volume 1 sections ITI-1 - ITI-28

[ITI Technical Framework Volume 2b](#) defines the transactions cited in Volume 1 sections ITI-29 - ITI-64

[ITI Technical Framework Volume 3](#) defines the content specifications in the transactions defined in Vol 2a and 2b. Most applicable is the section on the metadata used in a document submission set

[ITI Technical Framework Supplement - Extensions to the Document Metadata Subscription Profile](#) is the latest profile that defines the pull process for notifications. This is a change that is currently being validated by the community in a trial implementation.

[PaLM Technical Framework Volume 2a](#) defines the transactions in the laboratory framework.

These transactions define the HL7 message types for exchange of orders and results between the clinic and laboratory.

## **High Level Workflow, Architecture and Roles**

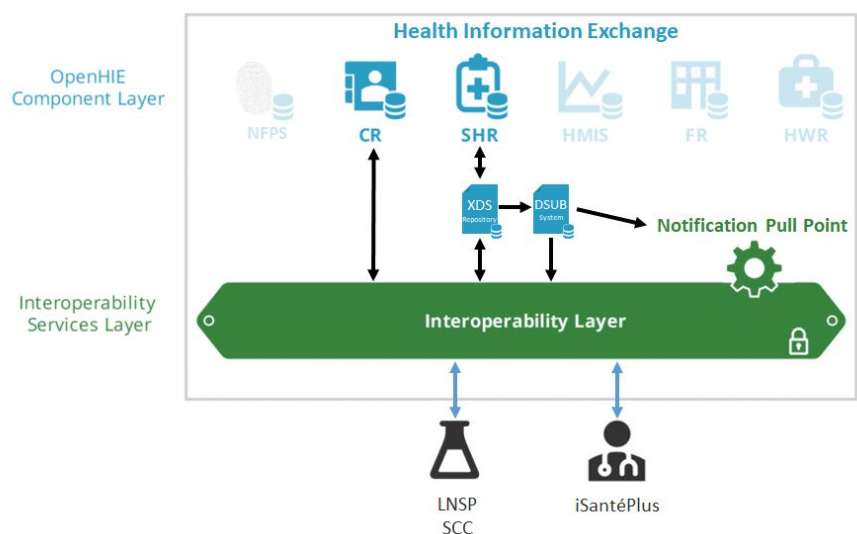
This section defines the high level workflow, systems architecture and roles. There are multiple systems involved in the integration, iSantéPlus and Mirth at the clinic level, SEDISH (Interoperability Layer, CR, XDS repository and SHR) at the national level and Soft Computer at the national laboratory.

### *Primary Workflow*

Orders will be sent from iSantéPlus clinics to the SEDISH health information exchange and stored in the XDS repository. On a regular schedule, SCC will receive a notification that a new document exists and they will query the XDS repository for the digital order. When SCC receives the digital order, they process the order. As they work through the process, SCC will send preliminary results to SEDISH, which will create a notification for each clinic that's added to the notification list. On a regular schedule iSantéPlus pulls notifications from SEDISH to see if there are any new documents that have been saved in the XDS repository. iSantéPlus queries the XDS repository for each notification, downloads the result and stores it in the iSantéPlus database, providing the information to the clinician in a timely manner.

### *Architecture*

This document defines the high level systems architecture based on the SEDISH architecture. As you can see from the diagram below, numerous other components of SEDISH are not active in this integration. They are other services that are not critical at this moment.



### Roles

The information below defines the roles of each system in the architecture.

**iSantéPlus:** iSantéPlus is responsible for all clinic interactions including generating orders, receiving results and presenting them to physicians. It is the ultimate source of truth for all laboratory orders and results because it is the single system that is viewed during patient and provider interactions. iSantéPlus has features that allow it to interact with SEDISH and the XDS repository as well as Mirth that focus on exchanging pertinent clinical information.

**Interoperability Layer:** The interoperability layer is responsible for maintaining access controls for all systems that interact with SEDISH. It acts as the single interface for all interactions from iSantéPlus and SCC. Additional features include smart routing of messages across the systems and a full audit log of all activities.

A new feature in this specification includes a notification pull point. The Interoperability Layer will act as a notification pull point for each clinic so they are able to access all notifications that have been sent while offline.

**Client Registry (CR):** The client registry is responsible for maintaining a single client demographic record for all patients who interact with the health system. Most importantly, each message must be validated against the Client Registry to ensure the client exists before it is received by the other components, the XDS repository and SHR.

**XDS Repository:** The XDS repository is a document store that is part of the SEDISH architecture. It is responsible for storing, parsing and routing cross-enterprise documents so they can be shared between the iSantéPlus clinics, the SHR and SCC. Each document contains metadata that allow for the appropriate querying, retrieval, and notification.

**DSUB (Document Subscription) System:** The XDS repository generates notifications when events happen that are pushed to the Document Subscription (DSUB) system. Once received, the DSUB system sends notifications as the notification broker. Some notifications are pushed to SCC when a lab order submission set is sent by the iSantéPlus clinic and others are stored so iSantéPlus clinics can pull their notifications when the internet becomes available.

**Shared Health Record (SHR):** The Shared Health Record is the repository of all clinic information that is stored in the SEDISH health information exchange. It interacts with the XDS repository to store the clinically appropriate information and making it available when queried by the point of service.

**LNSP SCC:** LNSP is the national laboratory with specialized equipment to process viral load and early infant diagnosis tests. The team implements a software system provided by Soft Computer (SCC) that handles all of the laboratory information. SCC is responsible for receiving notifications and downloading all digital orders, pairing them with physical specimens, processing the specimens, obtaining results and sending them to the SEDISH XDS Repository.

#### *Other Metadata*

Facilities and Health Workers are also stored in the SEDISH architecture. The facility registry and health worker registry systems will be used as validating mechanisms for each document that is stored in the XDS repository. This ensures each order and result has the appropriate location where it was generated and health worker who created the message. These systems do not have a core role in the primary workflows. Additionally, we should note that each facility, client and health worker is represented in both the iSantéPlus and SCC systems. Any discrepancies will be seen as errors on their end and they will need to be resolved by human intervention.

A common time standard is critical for the appropriate exchange of information across all systems. All systems that are configured for document exchange must have a common synchronized time based on the Network Time Protocol.

## High Level Functional Requirements

This section defines the high level functional requirements for each system defined in the architecture. Many of the functions are derived from Volume 1 of the IHE technical framework.

## iSantéPlus Functions

**Map Concepts to LOINC codes** - LOINC is the chosen dictionary to exchange information. iSantéPlus is standardized on the CIEL dictionary. We must ensure that all concept types that are available on the laboratory forms have an appropriate mapping to LOINC codes. All concepts will be mapped to LOINC codes when an order is generated and when results are received.

**Generate and Send Order as submission set (ITI-41 Provide and Register Document Set-b|XDS.b SubmissionSet|DocumentType: HL7 v2.5.1 OML^O21)** - Each time a provider saves a new laboratory order in the iSantéPlus interface, the system will be responsible for performing business logic on the file, generating an XDS.b submission set with a standardized HL7 order document and sending the package to the SEDISH XDS Repository.

**Pull Notifications from Notification Pull Point (ITI-70 Pull Notification|ITI-53 Document Metadata Notify)** - On a regular schedule, iSantéPlus will be responsible for pulling notifications from the notification pull point. Each notification will be parsed and generate a subsequent query of the XDS repository for the appropriate document.

**Query XDS Repository for document (ITI-43 Retrieve Document Set|HL7 v2.5.1 ORU^R01)** - All updates from SCC will be stored in the XDS repository. iSantéPlus will be responsible for querying the XDS repository for order updates that are returned as notifications. Each notification contains the information about one document that must be downloaded from the XDS repository. iSantéPlus will loop through each notification and download the corresponding document.

**Parse XDS Results and store as Lab Results (HL7 v2.5.1 ORU^R01)** - Once downloaded, each result must be parsed and stored in the iSantéPlus database. As stated in the assumptions section, these message types will be sent as a preliminary result utilizing the ORU^R01 message type and final results will be marked as final, once they are certified by LNSP. Both types of results will be applied to the iSantéPlus updates

**Track All Outstanding Orders** - Once the order has been received, the system is able to keep track of all orders have been sent in a way that a user can run a report to view outstanding orders by order number, patient and date sent. The ORL^O22 message type is the acknowledgement from SCC that signifies the order has been received.

**Send Some Orders to OpenELIS and Others to SCC** - As stated in the assumptions section, iSantéPlus may be configured to send some order types to OpenELIS and others to LNSP SCC for processing. We need to define a process where implementers can configure the destination of a particular encounterType. There needs to be a one-to-one map between encounterType and destination.



**Clinical Visibility and Reporting** - iSantéPlus will need to provide visibility to end users at multiple levels so they are able to track the progress of orders and identify when results have been returned. Additionally, there must be a notification in the user interface that a new result has been received so the clinician can review and take action.

## SEDISH Functions

SEDISH functionality must be divided into each component part.

### *Interoperability Layer*

**Receive XDS Documents, enrich if required and forward to XDS Repository (ITI-41 Provide and Register Document Set-b|ITI-9 PIX Query)** - The Interoperability layer is responsible for receiving XDS documents, enriching the message with the Enterprise Client ID, Facility ID and Health Worker Registry ID, if necessary, and forward it to the XDS Repository.

**Notification Pull Point (ITI-69 Create Destroy Pull Point|ITI-70 Pull Notification)** - The Interoperability layer will have a new service that acts as a notification pull point for each iSantéPlus clinic. This notification pull point will receive all notifications that are due to be sent to each clinic and serve each message to the iSantéPlus clinic when they initiate a Pull Notification workflow. This notification pull point will be fully audited using ATNA auditing and be restricted based on the iSantéPlus login credentials using the built in role based access controls.

**Other Existing Functionality (authentication, audit, routing, visibility)** - The Interoperability Layer already contains the core functionality to provide authentication of point of service applications, audit all transactions, routing to the XDS repository and visibility into the entire process.

### *Client Registry*

**(Existing) Respond to Queries from SCC about patients using PDQ message types** - The client registry is already setup to respond to queries for patient demographic information. This feature allows SCC to verify patient information from SEDISH.

**(Existing) Register Patients from iSantéPlus using PIX message types** - The client registry is already setup to allow iSantéPlus to create patients using the IHE PIX profile. Each client must be registered in the client registry before the order or result can be saved in the XDS repository.

### *XDS Repository*

**Receive orders from iSantéPlus and notify DSUB System (ITI-41 Provide and Register Document Set-b|ITI-52 Document Metadata Subscribe)** - The XDS repository is responsible for storing orders and notifying SCC that a new order is available. The XDS repository must

store the appropriate metadata about each order so it is able to be queried. Additionally, the XDS repository must send the notification to the DSUB system that will notify SCC.

**(Existing) Parse and store Orders in the Shared Health Record** - Each order must be parsed and stored in the shared health record so the information is available in the patient's record.

**Receive results from SCC and notify DSUB System(ITI-41 Provide and Register Document Set-b)** - The XDS repository is responsible for receiving and storing results, both preliminary and final so they can be queried by the iSantéPlus clinic.

**Respond to Document Set Queries from iSantéPlus and SCC(ITI-43 Retrieve Document Set)** - The XDS repository will need to respond to queries from both iSantéPlus clinic systems and SCC.

*Document Subscription System (DSUB)*

**Maintain Subscriptions (ITI-51 Document Metadata Subscribe)** - Each point of service system is able to subscribe to notifications and the DSUB system is responsible for maintaining those subscriptions.

**Receive notifications from XDS Repository and send to recipients (ITI-53 Document Metadata Notify)** - Every time a document is saved in the XDS repository, the DSUB system will receive a notification. This notification will be used to generate new notifications as the notification broker. Some of these notifications will go directly to SCC and some will go to the notification pull point in the Interoperability Layer.

*Shared Health Record*

**Receive orders from XDS Repository** - The shared health record must be able to store the orders that are pushed from the XDS repository.

**Receive results from XDS Repository** - The shared health record must be able to store the final results that are pushed from the XDS repository. Note that preliminary results are operational and do not need to be stored in the Shared Health Record.

## SCC Functions

**Map Test Catalog to LOINC codes** - LOINC is the chosen dictionary to exchange information. SCC contains a custom set of terminologies for each deployment. We must ensure that all tests in the test catalog have an appropriate mapping to LOINC codes and that these codes are the same as what's being sent from iSantéPlus. All tests will be mapped to LOINC codes when an order is received and when results are sent.

**Create Subscription for XDS Repository Submission Set (ITI-51 Document Metadata Subscribe)** - SCC must be able to create a subscription with the Document Metadata

Subscriber so they receive a notification from the document metadata notification broker when there is a submission set with SCC as the intended recipient.

**Receive Notifications and Query XDS Repository (ITI-53 Document Metadata Notify|ITI-43 Retrieve Document Set)** - SCC must be able to receive notifications of submission sets that have SCC as the intended recipient in the XDS repository. Once the notification is received, SCC will query the XDS repository for the particular document.

**Parse and Store Orders (HL7 v2.5.1 OML^O21)** - SCC must be able to parse and validate orders. When the order is received SCC must parse and add the order to the queue of orders to be processed

**Send Preliminary Results (ITI-41 Provide and Register Document Set-b|HL7 v2.5.1 ORU^R01)** - Order updates are able to be sent to provide the clinician with up-to-date information on the status of each order in the system. This allows the provider to follow the progress of the order at each stage in the process. SCC must be able to send preliminary results to the XDS repository as a submission set with intended recipient set to the iSantéPlus clinic. The document type will be an HL7 v2.5.1 ORU^R01 message)

**Send Final Results (ITI-41 Provide and Register Document Set-b|HL7 v2.5.1 ORU^R01)** - Final results are reported when an order is certified by LNSP. SCC will package the result as an XDS.b submission set with ORU^R01 message type and send it to the XDS repository.

**User Visibility and Reporting** - The system will need to provide visibility into the list of orders that have been received by iSantéPlus. Additional reports may be needed to provide a status of each order and whether the specimen or order result has been successfully transmitted to the XDS repository.

## Cross-System Time Synchronization

All systems deployed across this integration require a common time synchronization process all set to UTC. This can be done by synchronizing with the [NTP time pool](#) and setting the timezone to 'America/Port-au-Prince.'

## Detailed Workflows

This section defines the core workflows for the integration. These workflows operate across multiple systems with each system defined. Error handling is also outlined in the steps of each workflow.

## Workflow 1 - iSantéPlus New Lab Order

This workflow focuses on sending a new laboratory order from iSantéPlus to the XDS repository, notifying SCC of document availability and retrieval by SCC. ([IHE PaLM TF Vol 2a LAB-1 transaction Page 13](#)| XDS.b Provide and Register Document Set-b - ITI-41 Page 155 |)

### Steps:

- iSantéPlus: Provider saves lab order for patient
- iSantéPlus: Validate lab order, generate HL7 OML^O21 message and package as XDS.b document with valid metadata
- iSantéPlus: Send XDS.b document to XDS Repository using the Provide and Register document profile (Wait for Response)
  - XDS Repository Available:
    - XDS Repository: Receive document and add it to the registry
    - XDS Repository: Send a notification to DSUB system
    - DSUB system: Send a notification to SCC
    - SCC: Receive notification and query XDS repository
      - Receive XDS document
      - Validate, parse and store OML^O21
      - Error: Add ERROR information to ORL^O22 and package as XDS.b submission set with intended recipient as iSantéPlus clinic
      - Send XDS.b document with ACK ORL^O22 to XDS repository using provide and register workflow
    - XDS Repository: Receive ACK document and add it to the registry
    - XDS Repository: Send notification to DSUB System
    - DSUB System: Send a notification to intended recipient's Notification Pull Point in Interability Layer
  - XDS Not Available:
    - Store the message in the outgoing message table for automated retry

## Workflow 2 - iSantéPlus Cancel Lab Order

This workflow allows a provider to cancel an existing laboratory order that has already been sent to SCC. ([IHE PaLM TF Vol 2a LAB-1 transaction Page 14](#))

### Steps:

- iSantéPlus: Provider chooses "Cancel Lab Order" in user interface and saves lab order
- iSantéPlus: Validate lab order, generate HL7 OML^O21 message with field Order Control Segment ORC-1 set to "CA"
- iSantéPlus: Package lab order as an XDS.b submission set with intended recipient SCC
- iSantéPlus: Send package to XDS repository

- XDS Repository Available:
  - XDS Repository: Receive document and add it to the registry
    - XDS Repository: Send a notification to DSUB system
    - DSUB System: Send a notification to SCC
    - SCC: Receive notification and query XDS repository
      - Receive XDS document
      - Validate and parse OML^O21
      - Error: Add ERROR information to ORL^O22
      - Check if work has already been done on the order
        - If No work has started:
          - Cancel the laboratory order
        - Else:
          - Add ERROR information to ORL^O22 stating can't cancel
      - SCC: Package ACK ORL^O22 as an XDS.b submission set with intended recipient the iSantéPlus clinic
      - SCC: Send package to XDS Repository
    - XDS Repository: Receive document and store
      - XDS Repository: Send notification to DSUB System
      - DSUB System: Send a notification to intended recipient's Notification Pull Point in Interability Layer
- XDS Repository Not Available:
  - Store the message in the outgoing message table for automated retry

### Workflow 3 - SCC Result Reporting

This workflow allows SCC to notify iSantéPlus when there is a result or a status change as the order is being processed using the ORU^R01 message type. In this case SCC generates the ORU^R01 message, packages it as an XDS.b submission set, and sends it to the XDS repository for retrieval by the appropriate iSantéPlus clinic. ([IHE PaLM TF Vol 2a](#) LAB-1 transaction Page 40). Section 3.4 of the Laboratory to EHR HL7 v2.5.1 message profile defines all possible interactions of the ORU^R01 message type ([Link](#) Page 29 of 103). As you can see in the following table, the OBR-25 value is the key to defining if this is a preliminary or final result. iSantéPlus is responsible for the business logic on the receiving end to appropriately store the result based on these values.

Event	Description	Usage	When Used	Message Type	Receiver Action	Sender	Data Values

Order Received, No specimen	Order received; specimen not yet received	O	Preliminary Result	ORU^R0 1^ORU_ R01	Commit Accept, Commit Reject or Commit Error	Laboratory Result Sender	ORC-1=RE OBR-25=O
Specimen Received	No results available; specimen received, procedure incomplete	O	Preliminary Result	ORU^R0 1^ORU_ R01	Commit Accept, Commit Reject or Commit Error	Laboratory Result Sender	ORC-1=RE OBR-25=I
Preliminary Result	Preliminary: A verified early result is available, final results not yet obtained	R	Preliminary Result	ORU^R0 1^ORU_ R01	Commit Accept, Commit Reject or Commit Error	Laboratory Result Sender	ORC-1=RE OBR-25=P
Result	Some, but not all, results available	O	Some Final Result	ORU^R0 1^ORU_ R01	Commit Accept, Commit Reject or Commit Error	Laboratory Result Sender	ORC-1=RE OBR-25=A
Final Result	Final results; results stored and verified. Can only be changed with a corrected result.	R	Final Result	ORU^R0 1^ORU_ R01	Commit Accept, Commit Reject or Commit Error	Laboratory Result Sender	ORC-1=RE OBR-25=F
Correction	Correction to results	R	Corrected Result	ORU^R0 1^ORU_ R01	Commit Accept, Commit Reject or Commit Error	Laboratory Result Sender	ORC-1=RE OBR-25=C
Testing Not Done	No results available; Order canceled.	O	Cancelled Test	ORU^R0 1^ORU_ R01	Commit Accept, Commit Reject or Commit Error	Laboratory Result Sender	ORC-1=RE OBR-25=X

**Steps:**

- SCC: A laboratory worker performs an action that triggers an event in the system to send a Preliminary Result ORU^R01 message with the appropriate event based data values (see table above)
- SCC: Generate and send the ORU^R01 message and package it as an XDS.b submission set with intended recipient as the iSantéPlus clinic
- SCC: Send the XDS package to the XDS repository
  - XDS Repository Available:
    - XDS Repository: Receive document and add it to the registry
    - XDS Repository: Send a notification to DSUB system
    - DSUB System: Send a notification to intended recipient's Notification Pull Point in Interability Layer

## Workflow 4 - iSantéPlus Pull Notifications, Query XDS Repository and Store Results

This workflow focuses on the activities in the iSantéPlus clinic that pulls notifications from the notification pull point, queries the XDS repository to get the document and stores the results in the clinic application. This workflow happens on a regular schedule, allowing the clinic to try to pull all notifications and results when the internet is available. Each notification will result in one submission set download at a time, allowing the looping to happen in small packages. The ITI-70 transaction is the primary transaction for this workflow and it can be found in the [ITI DSUB Supplement](#).

**Steps:**

- (On a Regular Schedule)
- iSantéPlus: Query the Notification Pull Point for new notification
  - If 0 Notifications are returned, do nothing
  - If 1 Notification is returned
    - START LOOP
      - Parse Notification
      - Query XDS Repository for submission set
      - Receive submission set
      - Parse and receive ORU^R01
        - Validate and parse ORU^R21
        - Search the database for the order
        - Update the order in the database with the preliminary result status message
        - Error: Add ERROR information to ACK^R01
    - iSantéPlus: Package ACK^R01 as XDS.b submission set and send to XDS repository

- XDS Repository: Receive document and store
  - XDS Repository: Send notification to DSUB System
  - DSUB System: Send a notification to SCC
- SCC: Receive notification and query XDS repository for document
- SCC: Receive ACK
- Query Notification Pull Point to see if there is another notification
- END LOOP





