



Document Subscription for Mobile (DSUBm), published by IHE IT Infrastructure Technical Committee. This is not an authorized publication; it is the continuous build for version 1.0.0-ballot. This version is based on the current content of <https://github.com/IHE/ITI.DSUBm/> and changes regularly. See the [Directory of published versions](#)

2.3.112 Resource Notify [ITI-112]

This section corresponds to the Resource Notify [ITI-112] transaction of the IHE Technical Framework. The Resource Notify [ITI-112] transaction is used by the Resource Notification Broker and Resource Notification Recipient.

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2.3.112.1 Scope

The Resource Notify [ITI-112] transaction delivers a notification from the Resource Notification Broker to the Resource Notification Recipient about an event which matches an existing subscription.

The notifications from the Resource Notification Broker also include the Handshake Notification and the Heartbeat Notification in order to verify the reachability of the Resource Notification Recipient in the subscription activation process and during the existence of the subscription itself. Further, the Subscription Deactivation Notification can be sent to inform about the deactivation of the Subscription.

2.3.112.2 Actors Roles

Table 2.3.112.3-1: Actor Roles

Actor	Role
Resource Notification Broker	Sends the Notification Bundle Request to the Resource Notification Recipient
Resource Notification Recipient	Receives the notification

2.3.112.3 Referenced Standards

FHIR-R4B HL7 FHIR Release 4.3.0

2.3.112.4 Interactions

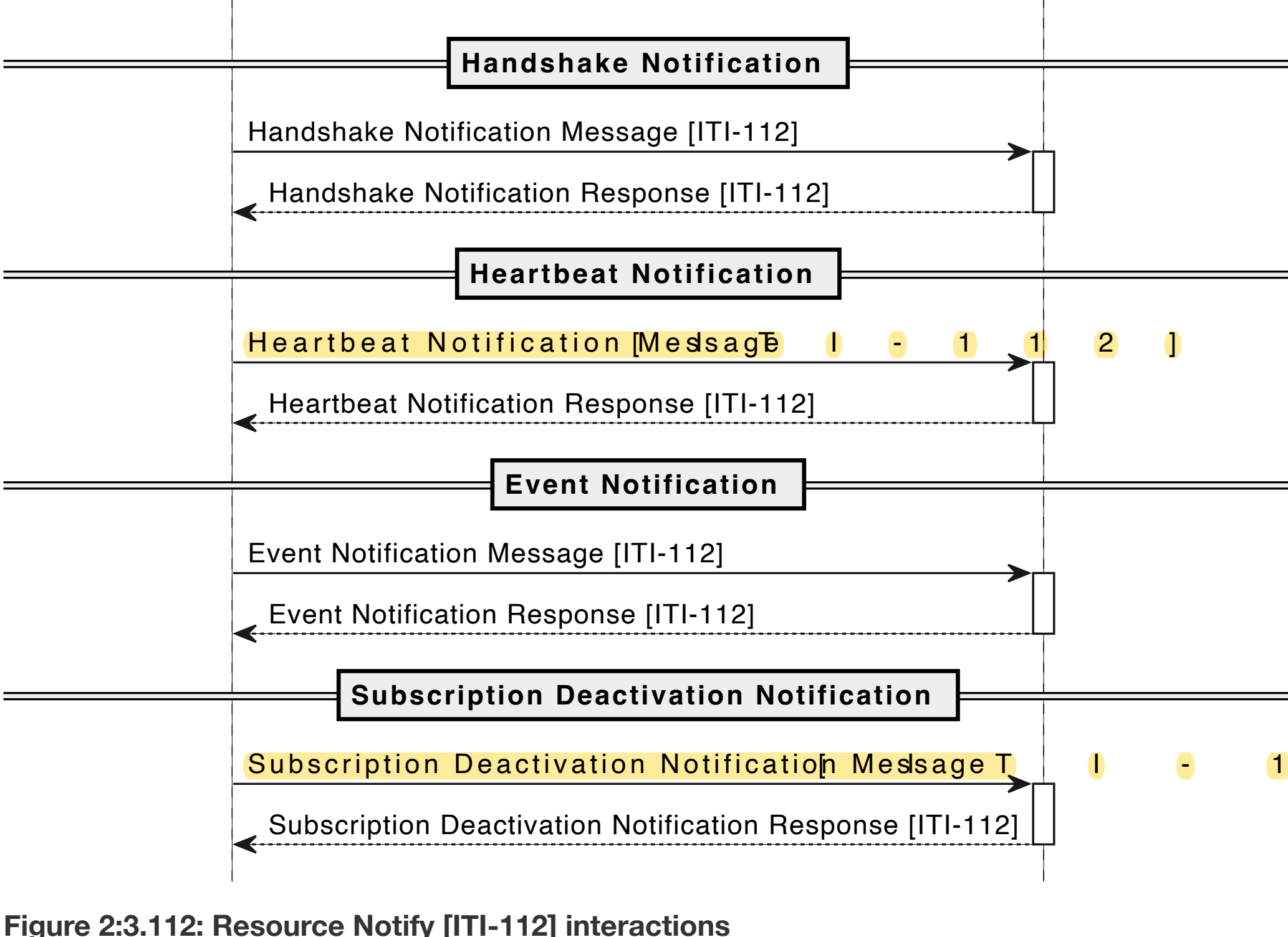


Figure 2.3.112: Resource Notify [ITI-112] interactions

2.3.112.5 Handshake Notification Message

This message uses the HTTP POST method on the target Resource Notification Recipient endpoint to submit the Handshake Notification.

2.3.112.5.1 Trigger Events

In order to verify the reachability of the Resource Notification Recipient in the subscription activation process, after receiving a [Create Subscription Request Message \[ITI-110\]](#), the Resource Notification Broker will trigger this message to the corresponding Resource Notification Recipient.

2.3.112.5.2 Message Semantics

The Resource Notification Subscriber shall initiate an HTTP request according to requirements defined in the HL7® FHIR® standard for "create" interaction. The message uses an HTTP POST method to submit a Bundle FHIR Resource.

The Bundle resource shall be compliant with [Bundle](#) and shall be compliant with [R4B Topic-Based Subscription Notification Bundle](#).

The Resource Notification Subscriber actor shall submit the FHIR Bundle resource in either XML format or JSON format thus the media type of the HTTP body shall be either `application/fhir+json` or `application/fhir+xml` respectively. The format shall match the MIME type on the `Subscription.channel.payload` element.

The Bundle is sent to the base URL as defined in FHIR. See <http://hl7.org/fhir/R4B/http.html> for the definition of "HTTP" access methods and "base".

It is possible to use HTTP protocol or HTTPS protocol. The HTTPS protocol is highly recommended.

The Bundle Resource sent by the Resource Notification Broker shall have:

- [Handshake Notification](#)
 - the `Bundle.type` element set to `history`;
 - in the first entry the [Handshake Subscription Status](#) resource and the `request` element shall be filled out to match a request to the `$status` operation;
 - no other entry shall be present.

2.3.112.5.3 Expected Actions

The Resource Notification Recipient processes the message according to application-defined rules and produces a [Handshake Notification Response](#).

If the Resource Notification Broker has not been able to send the [Handshake Notification Message](#) because of connection problem, it shall not activate the Subscription and set the `Subscription.status=error`.

If the Resource Notification Broker has been able to send the [Handshake Notification Message](#) but it has not received any [Handshake Notification Response](#) from the Resource Notification Recipient, it shall not activate the Subscription and set the `Subscription.status=error`.

2.3.112.6 Heartbeat Notification Message

This message uses the HTTP POST method on the target Resource Notification Recipient endpoint to submit the Heartbeat Notification in order to verify the reachability of the Resource Notification Recipient.

2.3.112.6.1 Trigger Events

In order to verify the reachability of the Resource Notification Recipient during the existence of the Subscription, after its activation, the Resource Notification Broker will trigger this message to the corresponding Resource Notification Recipient. If in the Subscription the `heartbeatPeriod` element is set, the Resource Notification Broker shall attempt to send a Heartbeat Notification Message after each interval set in that element.

2.3.112.6.2 Message Semantics

The Resource Notification Subscriber shall initiate an HTTP request according to requirements defined in the HL7® FHIR® standard for "create" interaction. The message uses an HTTP POST method to submit a Bundle FHIR Resource.

The Bundle resource shall be compliant with [Bundle](#) and shall be compliant with [R4 Topic-Based Subscription Notification Bundle](#).

The Resource Notification Subscriber actor shall submit the FHIR Bundle resource in either XML format or JSON format thus the media type of the HTTP body shall be either `application/fhir+json` or `application/fhir+xml` respectively. The format shall match the MIME type on the `Subscription.channel.payload` element.

The Bundle is sent to the base URL as defined in FHIR. See <http://hl7.org/fhir/R4B/http.html> for the definition of "HTTP" access methods and "base".

It is possible to use HTTP protocol or HTTPS protocol. The HTTPS protocol is highly recommended.

The Bundle Resource sent by the Resource Notification Broker shall have:

- [Heartbeat Notification](#)
 - the `Bundle.type` element set to `history`;
 - in the first entry the [Heartbeat Subscription Status](#) resource and the `request` element shall be filled out to match a request to the `$status` operation;
 - no other entry shall be present.

2.3.112.6.3 Expected Actions

The Resource Notification Recipient processes the message according to application-defined rules and produces a [Heartbeat Notification Response](#).

If the Resource Notification Broker has not been able to send the [Heartbeat Notification Message](#) because of connection problem, it should deactivate the Subscription, setting the `Subscription.status=error`.

If the Resource Notification Broker has been able to send the [Heartbeat Notification Message](#) but it has not received any [Heartbeat Notification Response](#) from the Resource Notification Recipient, it should deactivate the Subscription, setting the `Subscription.status=error`.

The recommended way for the Resource Notification Broker to manage these two type of error is to continue to send the Heartbeat Notification Event for a reasonable number of times, and evaluating if these type of errors continue before deactivating the Subscription, setting the `Subscription.status=error`. This should be done based on the capability of the connection infrastructure.

If the Resource Notification Recipient is grouped with the Resource Notification Subscriber, the Resource Notification Subscriber may handle errors or broken connections by using the `$events` and `$status` operations on the transaction Resource Subscription Search [ITI-113] and following what is defined in [Detecting Errors as a Subscriber](#), [Broken Communication](#) and [Recovering from Errors](#) sections of the [Subscriptions R5 Backport](#).

2.3.112.7 Event Notification Message

This message uses the HTTP POST method on the target Resource Notification Recipient endpoint to submit the Event Notification.

2.3.112.7.1 Trigger Events

When an event occurs where the topics of the event match the filter requirements of one or more active Subscriptions, the Resource Notification Broker shall trigger this message to the corresponding Resource Notification Recipient.

2.3.112.7.2 Message Semantics

The Resource Notification Subscriber shall initiate an HTTP request according to requirements defined in the HL7® FHIR® standard for "create" interaction. The message uses an HTTP POST method to submit a Bundle FHIR Resource.

The Bundle resource shall be compliant with [Bundle](#) and shall be compliant with the [R4 Topic-Based Subscription Notification Bundle](#).

The Resource Notification Subscriber actor shall submit the FHIR Bundle resource in either XML format or JSON format thus the media type of the HTTP body shall be either `application/fhir+json` or `application/fhir+xml` respectively. The format shall match the MIME type on the `Subscription.channel.payload` element.

The Bundle is sent to the base URL as defined in FHIR. See <http://hl7.org/fhir/R4B/http.html> for the definition of "HTTP" access methods and "base".

It is possible to use HTTP protocol or HTTPS protocol. The HTTPS protocol is highly recommended.

The Bundle Resource sent by the Resource Notification Broker shall have:

- [Event Notification](#)
 - the `Bundle.type` element set to `history`;
 - in the first entry the [Notification Subscription Status](#) resource and the `request` element shall be filled out to match a request to the `$status` operation;
 - zero or more additional entries, with either URLs or resources representing content, depending on the `Subscription.payload.content` and the `notificationShape` defined in the Topic of the Subscription; for additional entries, the request should be filled out in a way that makes sense given the Subscription (e.g., a POST or PUT operation on the resource, matching the event happened to that resource that trigger the notification). However, a Resource Notification Broker may choose to simply include a GET to the relevant resource instead.

When the payload content includes the resources, the notification shape shall be based on the definitions from the Topic of the Subscription:

- the resource that is the trigger for the Topic shall be included by the Resource Notification Broker
- any other resource may be included by the Resource Notification Broker; in order to include resources that could be of interest for the Resource Notification Recipient, the Resource Notification Broker should follow what is defined by the Topic of the Subscription for the notification shape.

Note that Resource Notification Broker should attempt to provide the resources described in the topic, however Resource Notification Recipient shall expect that any resource beyond the focus resource are not guaranteed to be present.

2.3.112.7.3 Expected Actions

The Resource Notification Recipient processes the message according to application-defined rules and produces an [Event Notification Response](#).

If the Resource Notification Broker has not been able to send the [Event Notification Message](#) because of connection problem, it should deactivate the Subscription, setting the `Subscription.status=error`.

If the Resource Notification Broker has been able to send the [Event Notification Message](#) but it has not received any [Event Notification Response](#) from the Resource Notification Recipient, it should deactivate the Subscription, setting the `Subscription.status=error`.

The recommended way for the Resource Notification Broker to manage these two type of error is to continue to send the Event Notification Event, if events occur, for a reasonable number of times, and evaluating if these type of errors continue before deactivating the Subscription, setting the `Subscription.status=error`. This should be done based on the capability of the connection infrastructure.

If the Resource Notification Recipient is grouped with the Resource Notification Subscriber, the Resource Notification Subscriber may handle errors like error or broken connection by using the `$events` and `$status` operations on the transaction Resource Subscription Search [ITI-113] and following what is defined in [Detecting Errors as a Subscriber](#), [Broken Communication](#) and [Recovering from Errors](#) sections of the [Subscriptions R5 Backport](#).

2.3.112.8 Subscription Deactivation Notification Message

This message uses the HTTP POST method on the target Resource Notification Recipient endpoint to submit the notification.

2.3.112.8.1 Trigger Events

When a Subscription deactivation occurs, performed by the Resource Notification Broker at the termination time or, with the [ITI-110] Resource Subscription transaction, by the same Resource Notification Subscriber that made the subscription or by another Resource Notification Subscriber, the Resource Notification Broker should trigger this message to the corresponding Resource Notification Recipient, in order to inform that the Subscription is no longer active.

2.3.112.8.2 Message Semantics

The Resource Notification Subscriber shall initiate an HTTP request according to requirements defined in the HL7® FHIR® standard for "create" interaction. The message uses an HTTP POST method to submit a Bundle FHIR Resource.

The Bundle resource shall be compliant with [Bundle](#) and shall be compliant with the [R4 Topic-Based Subscription Notification Bundle](#).

The Resource Notification Subscriber actor shall submit the FHIR Bundle resource in either XML format or JSON format thus the media type of the HTTP body shall be either `application/fhir+json` or `application/fhir+xml` respectively. The format shall match the MIME type on the `Subscription.channel.payload` element.

The Bundle is sent to the base URL as defined in FHIR. See <http://hl7.org/fhir/R4B/http.html> for the definition of "HTTP" access methods and "base".

It is possible to use HTTP protocol or HTTPS protocol. The HTTPS protocol is highly recommended.

The Bundle Resource sent by the Resource Notification Broker shall have:

- [Subscription Deactivation Notification](#)
 - the `Bundle.type` element valued `history`;
 - in the first entry the [Deactivation Subscription Status](#) resource and the `request` element shall be filled out to match a request to the `$status` operation;
 - no other entry shall be present.

2.3.112.8.3 Expected Actions

The Resource Notification Recipient processes the message according to application-defined rules and produces an [Subscription Deactivation Response](#).

If the Resource Notification Recipient is grouped with the Resource Notification Subscriber, the Resource Notification Subscriber should be aware if this notification received is related to its own unsubscription, if it is related to an unsubscription performed by another Resource Notification Subscriber, or if it is related to deactivation performed by the Resource Notification Broker at the expiration time of the Subscription, and then proceeds according to its application-defined rules.

2.3.112.9 Handshake Notification Response

The Resource Notification Recipient sends a Handshake Notification Response to respond to a [Handshake Notification Message](#).

2.3.112.9.1 Trigger Events

When the Resource Notification Recipient receives the [Handshake Notification Message](#) from the Resource Notification Broker, it send this message to acknowledging the reception of the notification.

2.3.112.9.2 Message Semantics

When the Resource Notification Recipient has processed the request, it shall return an HTTP response with an overall status code and produce a response that shall conform to requirements defined in the HL7® FHIR® standard for "create" interaction.

2.3.112.9.3 Expected Actions

The Resource Notification Broker processes the message according to application-defined rules.

If the Resource Notification Broker receives a positive response, it shall activate the Subscription that triggered the handshake process, setting the `Subscription.status=active`.

If the Resource Notification Broker receives a negative response (based on HTTP status or the `OperationOutcome` receives), it shall deactivate the Subscription setting the `Subscription.status=error`.

2.3.112.10 Heartbeat Notification Response

The Resource Notification Recipient sends a Heartbeat Notification Response to respond to a [Heartbeat Notification Message](#).

2.3.112.10.1 Trigger Events

When the Resource Notification Recipient receives the [Heartbeat Notification Message](#) from the Resource Notification Broker, it send this message to acknowledge the reception of the notification.

2.3.112.10.2 Message Semantics

When the Resource Notification Recipient has processed the request, it shall return an HTTP response with an overall status code and produce a response that shall conform to requirements defined in the HL7® FHIR® standard for "create" interaction.

2.3.112.10.3 Expected Actions

The Resource Notification Broker processes the message according to application-defined rules.

If the Resource Notification Broker receives a negative response (based on HTTP status or the `OperationOutcome` receives), it should deactivate the Subscription setting the `Subscription.status=error`.

The recommended way for the Resource Notification Broker to manage an error in the Heartbeat Notification Response is to continue to send the Heartbeat Notification Event for a reasonable number of times, and evaluating if errors continue before deactivating the Subscription, setting the `Subscription.status=error`. This should be done based on the capability of the connection infrastructure.

2.3.112.11 Event Notification Response

The Resource Notification Recipient sends an Event Notification Response to respond to an [Event Notification Message](#).

2.3.112.11.1 Trigger Events

When the Resource Notification Recipient receives the [Event Notification Message](#) from the Resource Notification Broker, it send this message to acknowledge the reception of the notification.

2.3.112.11.2 Message Semantics

When the Resource Notification Recipient has processed the request, it shall return an HTTP response with an overall status code and produce a response that shall conform to requirements defined in the HL7® FHIR® standard for "create" interaction.

2.3.112.11.3 Expected Actions

The Resource Notification Broker processes the message according to application-defined rules.

If the Resource Notification Broker receives a negative response (based on HTTP status or the `OperationOutcome` receives), it shall deactivate the Subscription that triggered the notification process, setting the `Subscription.status=error`.

The recommended way for the Resource Notification Broker to manage an error in the Event Notification Response is to continue to send the Event Notification Event for a reasonable number of times, and evaluating if errors continue before deactivating the Subscription, setting the `Subscription.status=error`. This should be done based on the capability of the connection infrastructure.

2.3.112.12 Subscription Deactivation Notification Response

The Resource Notification Recipient sends an Event Notification Response to respond to a [Subscription Deactivation Message](#).

2.3.112.12.1 Trigger Events

When the Resource Notification Recipient receives the [Subscription Deactivation Message](#) from the Resource Notification Broker, it send this message to acknowledge the reception of the notification.

2.3.112.12.2 Message Semantics

When the Resource Notification Recipient has processed the request, it shall return an HTTP response with an overall status code and produce a response that shall conform to requirements defined in the HL7® FHIR® standard for "create" interaction.

2.3.112.12.3 Expected Actions

The Resource Notification Broker processes the message according to application-defined rules.

2.3.112.13 CapabilityStatement Resource

The Resource Notification Broker implementing this transaction shall provide a [CapabilityStatement Resource](#) as described in [ITI TF-2x: Appendix Z.3](#) indicating the transaction has been implemented.

- FHIR Capability Statement for [Resource Notification Broker](#)
- FHIR Capability Statement for [Resource Notification Broker](#) that support the [Updates to document sharing resources](#) option.

The Resource Notification Recipient implementing this transaction shall provide a [CapabilityStatement Resource](#) as described in [ITI TF-2x: Appendix Z.3](#) indicating the transaction has been implemented.

- FHIR Capability Statement for [Resource Notification Recipient](#)

2.3.112.14 Security Considerations

See [DSUBm Security Considerations](#).

This Resource Notification Recipient should confirm that the Resource Notification Recipient is still authorized to receive the information that it is searching for. To assess if a Resource Notification Recipient is still authorized to receive the information the Resource Notification Broker may utilize additional policy defined between the actors in order to prevent the sending of notifications in particular cases. If an authorization token is used to verify the authorization of a Recipient to receive notifications, the Resource Notification Broker shall also verify that this token has not been revoked before sending the Notification Bundle Request message.

It's highly recommended that the Resource Notification Broker should use some form of authentication method when sending a notification Message and in this transaction Recipient should always verify the authentication token used in this transaction.

The Resource Notification Recipient should also be defensive and robust to a malicious client that may send a large volume of fake notifications with empty notifications, which would cause the Resource Notification Recipient to send many (potentially expensive) queries to a server.

2.3.112.14.1 Security Audit Considerations

The Resource Notification Broker, when grouped with [ATNA](#) Secure Node or Secure Application Actor, shall be able to record fundamental [AuditEvents](#) for [BALP](#) [Create](#), when performing this transaction.

The Resource Notification Recipient, when grouped with [ATNA](#) Secure Node or Secure Application Actor, shall be able to record fundamental [AuditEvents](#) for [BALP](#) [Create](#), when performing this transaction.