Integrating the Healthcare Enterprise

IHE ITI
Technical Framework Supplement

XCA Deferred Response Option
XCA Support For Two 2-way Messaging

Revision 1.0 – Draft for Public Comment

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Foreword

30 This is a supplement to the IHE IT Infrastructure Technical Framework V15.0. In addition, this supplement presumes the integration of the following:

- Asynchronous AS4 Option supplement, Rev. 1.1 – 2018-08-20.
- CP-ITI-1130 – Editorial updates to Asyc Option in existing TF to align with AS4 TI Supplement

35 Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

This supplement is published on May 24, 2019 for Public Comment. Comments are invited and can be submitted at https://www.ihe.net/ITI_Public_Comments. In order to be considered in development of the Trial Implementation version of the supplement, comments must be received 40 by June 23, 2019.

This supplement describes changes to the existing technical framework documents.

"Boxed" instructions like the sample below indicate to the Volume Editor how to integrate the relevant section(s) into the relevant Technical Framework volume.

Amend Section X.X by the following:

45 Where the amendment adds text, make the added text **bold underline**. Where the amendment removes text, make the removed text **bold strikethrough**. When entire new sections are added, introduce with editor's instructions to "add new text" or similar, which for readability are not bolded or underlined.

50 General information about IHE can be found at www.ihe.net.

Information about the IHE IT Infrastructure domain can be found at ihe.net/IHE_Domains.

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at http://ihe.net/IHE_Process and http://ihe.net/Profiles.

The current version of the IHE IT Infrastructure Technical Framework can be found at 55 http://ihe.net/Technical_Frameworks.

CONTENTS

145 Introduction to this Supplement

This supplement specifies the Deferred Response Option for the Document Consumer, Initiating Gateway, and Responding Gateway actors in the Cross-Community Access (XCA) Profile. This option affects these transactions:

- Registry Stored Query [ITI-18]
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- Retrieve Document Set [ITI-43]
- Cross Gateway Query [ITI-38]
- Cross Gateway Retrieve [ITI-39]

The Deferred Response Option is needed when the Responding Gateway requires extensive time for processing, as much as days or weeks. This need could arise through delegation of processing
155 to external/remote systems or human interaction. The option enables this by splitting the request and response into two separate two-way exchanges. This requires applications to manage the message correlation, create application level acknowledgements, and determine where to send the Deferred Response message. For general information about Deferred Response and Asynchronous messaging, see http://wiki.ihe.net/index.php?title=Asynchronous_Messaging.

160 XCA also provides the WS-Addressing-based Asynchronous and AS4 Asynchronous options, but Deferred Response should be used in the following cases:

- When the delay in responding may be as much as days or weeks.
- When applications must support recovery of the long-running request and response through system restart.

165 If neither of these cases applies and longer latency query and retrieve is needed, the WS-Addressing-Based Web Services Exchange Option or the AS4 Asynchronous Web Services Exchange Option may be used. Note that Deferred Response may be combined with the WS-Addressing-Based Web Services Exchange Option, but not with the AS4 Asynchronous Web Services Exchange Option at this time – future development may add that.

170 Open Issues and Questions

- **DEF-16: Should canceling an ongoing deferred request be supported?**
  - Think of the following examples:
    - A request is accidentally sent that is too broad.
    - A number of deferred results have been received, and although more
175 deferred processing is indicated, the requester has enough information.
    - An initial response indicates an estimated duration that is considered too long, and the requester may wish to use other means or contact the responder to make sure there isn't a problem and unnecessary work isn't done.

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- A responder performs value-added services for an additional charge using the deferred mechanism and returns the charge amount in the explanation of the initial response, and the requester does not wish to incur this charge.

  - Is canceling a response supported in AS4?

- **DEF-17: Should the requester be able to pass a value to indicate how long they**
185 **would wait for responses?**

Closed Issues

- **DEF-1: Should an alternate approach to XCA Deferred be used to handle long latency query and retrieve?**

  - **No**. The following alternates were considered and rejected:

190 - Option: AS4-style Asynchronous messaging

    - In this alternative, the interested party would use the AS4 asynchronous mechanism to send XCA transactions. Note that this means using AS4 instead of the Deferred mechanisms defined in this supplement. This is separate from the idea of combining the two, which is addressed in DEF-5.

195 - This would be simpler than the Deferred mechanisms. There would be only a single XCA response: the Responding Gateway would simply return when the long-latency XCA request has completed.

    - Pros

      - Existing mechanism; no new specifications development.

200   - The primary need of the use case is met: some degree of longer latency supported.

    - Cons

      - With its significantly distinct usage of the SOAP header, AS4 is better suited for an environment in which all web services operate
205   in this way.

      - The initial AS4 receipt for the request does not support returning business-level information. So a requester would have no way of knowing: first, that they will have to wait longer than normal, and second, an estimate of how long.

210   - AS4 does not support returning multiple responses to a single request using just the Two Way MEP, which would allow for piecemeal results.

- While it appears to support long latencies (e.g., days/weeks), AS4 is not typically used for this. See Closed Issue AS4-5 in the Asynchronous AS4 Supplement.

- o Option: DSUB

  - o In this alternative, the interested party would subscribe to notifications for the patient using the same filters they would use for a document query.

  - o Either notification pushes or stored notification pulls could be used.

  - o Pros

    - Existing mechanism.

    - Piecemeal responses: the interested party could receive documents as soon as they are available, rather than waiting for all to be completed.

  - o Cons

    - **There is a semantic mismatch**. DSUB is designed to notify that an event of interest has happened; the trigger for that event is unrelated to the interested party. Deferred is designed to notify that a long-running operation has completed; the trigger for that operation is the interested party.

    - **DSUB doesn't support all the parameters XCA query does**. Specifically, it doesn't support date-related queries. The interested parties that initially motivated this work item require date range queries.

    - **DSUB doesn't support long-latency retrieve**, which was the second use case agreed to in scope.

    - No way to explicitly know when the "query" is "done": For the use cases (e.g., legacy paper) where the requester wants clinical information that exists as of a point in time, but has not yet been assembled into XCA/XDS formats, there is the notion of "done", representing when all such clinical information is available to be returned. There is no way to express "done" explicitly.

      - o Option: Use Service-Level Agreements (SLAs) to implicitly enforce completion of all documents or high-priority documents within a certain time.

      - o Option: Add some way for the Subscriber to indicate they want to treat this subscription as an atomic transaction, to "register all documents that are available at this time". Add a way for the Broker to notify when this is complete, or a

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way for the Broker to cancel the subscription when complete and notify of that.

- o Option: Add a workflow that contains the explicit notification (see next option).

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- Cross-community versions of these transactions may have to be defined: at least Subscribe and Notify.

- All participants would have to know responder requires DSUB. Note that this would also be the case for XCA Deferred.

o Option: DSUB+XDW

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- o In this alternative, the interested party would subscribe to notifications for the patient using the same filters they would use for a document query, but would also trigger a specific workflow task representing a single long-latency query.

- o The first document to be returned would be an instance of this XDW workflow document, containing some identifying information for the query (maybe the WS-Addressing MessageID), and a status of "working".

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- o Once all clinical documents for this query have been returned, the responder would return the workflow document with a status of "complete".

- o Option: Trigger the workflow by requesting a specific format code.

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- There is already a format code for workflow documents: urn:ihe:iti:xdw:2011:workflowDoc. Because Responding Gateways may have other uses for workflow documents, we would need to define a more specific format code.

- o Option: Trigger the workflow by requesting a predefined document ID. The problem with this is that other requesters may also be triggering this same mechanism, so the ID would have to be treated as a pseudo-ID, and a unique document ID would need to be returned for the workflow document.

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- o Option: Trigger the workflow by extending the subscription format using WS-Notification extensibility mechanisms, perhaps by passing a flag requesting a workflow document for status of the query, for example:

```
<wsnt:Subscribe>

    <wsnt:ConsumerReference>

    ...

    <TriggerSingleQueryWorkflow>
```

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- o Pros
  - Existing mechanism: minimal additional specification development needed.
  - Piecemeal responses: the interested party could receive documents as soon as they are available, rather than waiting for all to be completed.
- o Cons
  - Would need to define new workflow document format.
  - Would need to define triggering mechanism for the workflow.
- o **As this depends on DSUB, it shares those shortcomings. In addition, the Technical Committee feels this option may be too complex.**
- o Option: WS-Addressing-style Asynchronous messaging
  - o In this alternative, the interested party would use the WS-Addressing asynchronous mechanism to send an XCA Cross Gateway Query.
  - o Pros
    - Existing mechanism; no new specifications development.
    - Some degree of longer latency supported.
  - o Cons – WS-Addressing-style async is handled within the web stack and has known limitations as typically implemented:
    - It is non-blocking for the requester but not the responder.
    - **It cannot handle long latencies (e.g., days)** or maintain requests across system restarts.
    - It does not allow management of acknowledgements at the application layer.
    - See the US CONNECT team analysis, as well as the original IHE white paper that justified the deferred mechanism.
- o Option: XDR+XDW
  - o In this alternative, the interested party would push two documents using XDR: a workflow document representing a single long-latency query, and a custom document containing clinical document filters, similar to a query or subscription.
  - o The workflow document would be similar to that used in DSUB+XDW.
  - o Pros

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- Compared to DSUB, may be more straightforward to implement for systems that already support XDR but not DSUB.
    - o Cons
        - Would need to define new mechanism for query-subscription filter, when existing ones exist for pull (XDS) and push (DSUB).
        - Would need to define new workflow document format.
        - **Technical Committee considered this option too novel and complex, as it did not take sufficient advantage of existing standards.**
    - o Option: HL7®[1] FHIR®[2] subscriptions and DocumentReference
        - o In this alternative, the interested party would use FHIR subscription mechanisms to subscribe to documents for a patient.
        - o Pros
            - Existing mechanism; no new specifications development.
        - o Cons
            - **Technical Committee felt that this work item was intended to target communities that use IHE web services profiles rather than FHIR.**

- **DEF-2: Will a Deferred Response Option also need to be added to the XDS.b Profile, due to groupings with XCA?**
    - o **Yes, but not for all groupings at this time.** The following groupings were considered:
    - o Responding Gateway, grouped with a Document Consumer.
        - o In this case, the Responding Gateway receives a deferred request, and needs to initiate ITI-18 or ITI-43 request(s) from Document Consumer(s). Do they also have to be deferred?
        - o **The committee decided no**. Not all federated requests would even need long latencies. For those that did, alternative mechanisms such as WS-Addressing style or AS4 style Asynchronous options, polling, or other unspecified mechanisms may be used.
    - o Initiating Gateway, grouped with a Document Consumer.

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[1] HL7 is the registered trademark of Health Level Seven International.

[2] FHIR is the registered trademark of Health Level Seven International.

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  - o In this case, the Initiating Gateway receives a deferred request, and needs to initiate ITI-18 or ITI-43 request(s) from local Document Consumer(s). Do they also have to be deferred?

  - o **The committee decided no**, using the same reasoning as the previous case.

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- o **Initiating Gateway, which supports the XDS Affinity Domain Option.**

  - o In this case, the Initiating Gateway receives ITI-18 or ITI-43 request(s) from Document Consumer(s), and needs to use the Deferred Response Option on ITI-38 or ITI-39 to Responding Gateway(s).

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  - o **The committee decided yes. This case cannot easily be supported without a Deferred Response Option on ITI-18 and ITI-43**. The long latencies possible in the XCA transactions will prevent even use of asynchronous mechanisms.

  - o **Chosen option: Add Deferred Response options for ITI-18 and ITI-43, only in this XCA context.**

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  - o Option: Explicitly limit the Deferred Response Option to triggering by Initiating Gateways through internal mechanisms, not triggering by ITI-18 or ITI-43.

  - o Option: Allow the Initiating Gateway to deal with this case internally.

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    - • Initiating Gateway could simply not include Responding Gateways that require Deferred in outgoing requests triggered by ITI-18 or ITI-43.

    - • Initiating Gateway could immediately return an error code like XDSRegistryNotAvailable, XDSRegistryBusy, or XDSRegistryError, while triggering a deferred request.

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    - • Note: See above notes on how Initiating Gateways know whether to use Deferred for Responding Gateways.

- • **DEF-3: Should this Vol 1 content be written towards the 2018 published content, or towards the AS4 supplement? AS4 changed how XDS.b Document Consumer groups with XCA Initiating Gateway.**

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  - o **Written towards the Asynchronous AS4 Option supplement.**

- • **DEF-4: Should this supplement include its own explicit use cases in Vol 1? The XCPD Deferred Response Option does not.**

  - o **Yes, a single diagram and process flow to incorporate Cases 1 and 3 below to reflect a high latency Responding Gateway.** All use cases in scope are shown:

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  - o Case 1: A document source has ownership / access to a very large number of paper-based clinical documents, and wishes to provide these documents

electronically using IHE Document Sharing profiles. However, it does not know a priori which of these documents will be requested, and it is not cost effective to proactively scan, parse and register all documents. As each step in the workflow potentially involves this manual process, which could take hours to days, the system may need to make use of deferred responses for XCPD, XCA Query, and XCA Retrieve:

- o Initiating Gateway sends deferred XCPD request.
- o User at responding system searches for patient records, determines matches, and triggers deferred XCPD response.
- o Initiating Gateway sends deferred XCA Query request.
- o User at responding system searches for appropriate clinical documents, scans, parses or otherwise generates document metadata, registers document entries, potentially stores documents, and triggers deferred XCA response.
- o Initiating Gateway sends deferred XCA Retrieve request.
- o User at responding system performs any remaining tasks to make documents available, and triggers deferred XCA response.

- o Case 2: A Responding Gateway uses an on-demand document entry to generate a comprehensive longitudinal record (e.g., a CCD®3) for a patient from a number of sources. In some cases, the time needed to generate this document runs into the minutes, causing Initiating Gateways to time out. This system would make use of deferred responses for XCA Retrieve:

  - o Initiating Gateway sends deferred XCA Retrieve request for on-demand entry.
  - o Responding Gateway compiles the on-demand document from various sources and triggers deferred XCA response.

- o Case 3: The access decision for a given set of documents and a given requester takes significant time, due to a human in the loop.

  - o Initiating Gateway sends deferred XCA Query request.
  - o User at responding system evaluates access decision, confirms this requester may access, and triggers deferred XCA response. Note that this may result in a PartialSuccess, where the requester may only see a subset of all documents matching the query.
  - o Initiating Gateway sends synchronous XCA Retrieve request and receives documents.

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3 CCD is the registered trademark of Health Level Seven International.

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- **DEF-5: Should this work item include combining with the AS4-style Asynchronous Option? The AS4 work item did not create a wrapper for Deferred XCPD.**
  - **No**, but we have designed it in such a way that it could be wrapped in the future.
  - Note that the AS4 Asynchronous Option does not blindly wrap transactions; there are specific mappings that must be defined for each transaction to use over AS4.
  - There are the following items that would need to be mapped:
    - Additional SOAP header blocks
      - **AS4 allows for this;** it just needs to be wrapped as a message property**.** See XCPD AS4 wrapper (CorrelationTimeToLive).
    - **Use ConversationId to tie all Results messages to the original request.**

- **DEF-6: How will the Initiating Gateway tell the Responding Gateway where to send the response?**
  - Option: Pass information in the request body.
    - Deferred XCPD passes response endpoint in the respondTo field in the body.
    - For XCA Query, the ebXML AdhocQueryRequest has no analog, but it is extensible with Slots.
    - For XCA Retrieve, there are no extensibility mechanisms – we would have to modify the schema.
  - **Chosen Option: Pass information in a SOAP header block**, with mustUnderstand=false (so it can be not understood safely). This allows the same design to be used for both query and retrieve, and avoids impacting current implementers by changing the schema.

- **DEF-7: Should the Initiating Gateway specify a response endpoint directly, or a HCID that the Responding Gateway resolves via a directory? Both?**
  - A HCID to resolve might help with some dynamic load balancing cases.
  - It might also be slightly more secure, as there is a layer of getting the endpoint through a trusted directory.
  - Finally, if the Initiating Gateway is grouped with an XUA X-Service User, its HomeCommunityID is included in the SOAP header already, so no additional HCID field would be needed.
  - **Endpoint only**. No compelling reason to do otherwise.

- **DEF-8: Could/should this mechanism be designed in such a way that it supports an Initiating Gateway making a request and not knowing a priori whether it will be fulfilled synchronously or deferred?**

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- o **Yes, and we have done so.** We opted not to follow the pattern established by XCPD Deferred, which defines an explicitly different interaction, with different WSDL, for the initial request. Instead, we simply added new optional fields on the request and response for deferred behavior. This allowed us to handle the case where some results were immediately available, by returning them as normal. It also removed the possibility of mistakenly sending a deferred request to a non-deferred endpoint. It also allowed the sender to avoid having to know which responders support deferred a priori.

- **DEF-9: Will we include in scope the possibility of multiple responses to a single request, each response coming asynchronously?**

  - o **Yes**. It was not included in the original scope, but once we designed a solution, it supported this easily.

- **DEF-10: Should we limit which errors should be returned in the initial response vs. deferred responses?**

  - o Example: a malformed request could be caught right away

  - o **No. Any error may be sent in either response.**

- **DEF-11: Will this option be backward-compatible with existing implementers that do not support it? In other words, will implementers not need to be configured to know whether other systems support this option?**

  - o **Yes, it will be backward-compatible, so prior configuration is not required, but could be done.** As currently designed, the changes to existing transactions consist of:

    - o New fields using extensibility mechanisms: SOAP header blocks and ebXML Slots

    - o Making use of existing optional fields: AdhocQueryRequest/@id and AdhocQueryResponse/@requestId

  - o In addition, the modified behavior does not break any assumptions.

- **DEF-12: Is there any additional behavior that can happen between deferred requests and responses that this option needs to take into account? Consider link/unlink merge/unmerge of the corresponding patient identifier.**

  - o **No**. The potential for changes to the patient id already exists when synchronous mechanisms are used. An XCPD transaction and a subsequent XCA transaction that uses the obtained patient id are not a single atomic operation. Changes can happen between the two. So, no additional complexities are added by using Deferred XCA. Existing error cases/codes (e.g., XDSUnknownPatientId) cover this.

- **DEF-13: The Responding Gateway has a lot of flexibility to return results, e.g., as soon as each result is ready, in groups on some schedule, or waiting until all are ready. Should the Initiating Gateway have similar flexibility in returning results to Document Consumers from multiple Responding Gateways?**

    o **No.** This flexibility was given to the Responding Gateway due to the fact that the internal mechanisms by which it receives long-latency results and assembles them into results messages are not specified. There could be arbitrarily complex workflows involved, as well as preferences negotiated partner-to-partner similar to subscribing to a mailing list. The Initiating Gateway, by contrast, does not appear to have a similar need for this flexibility – it can simply pass along Deferred responses as they come in.

- **DEF-14: Currently, the Initiating Gateway consolidates all estimates of Deferred processing from Responding Gateways into a single value, which it returns to its triggering actor. Should there be a more detailed way to report individual estimates for each Responding Gateway?**

    o **No.** The committee felt the benefit from this complexity was not worth the effort to define the processing.

- **DEF-15: ebRS states in Section 2.1 that "Each registry request is atomic and either succeeds or fails in entirety." Would this be a problem in allowing multiple responses to a single request?**

    o **No.** The Deferred-Capable query is not designed to be processed directly by an ebXML registry. It must be intercepted and interpreted by an intermediary, which may make use of a registry. If it does, then its internal interactions will still be atomic.

Volume 1 – Profiles

18 Cross-Community Access (XCA)

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> *Update Section 18.2 as shown. Note that this presumes the changes made by the Asynchronous AS4 Option supplement.*

18.2 XCA Integration Profile Options

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Table 18.2-1: XCA Integration Profile - Actors and Options

Actor	Options	Vol. & Section
Initiating Gateway	XDS Affinity Domain Option	ITI TF-1: 18.2.1
	Asynchronous Web Services Exchange	ITI TF-1: 18.2.2
	On-Demand Documents	ITI TF-1: 18.2.4
	AS4 Asynchronous Web Services Exchange	ITI TF-1: 18.2.6
	Deferred Response (Note 3)	**ITI TF-1: 18.2.7**
Responding Gateway	On-Demand Documents	ITI TF-1: 18.2.4
	Persistence of Retrieved Documents	ITI TF-1: 18.2.5
	Asynchronous Web Services Exchange (Note 1)	ITI TF-1: 18.2.2
	AS4 Asynchronous Web Services Exchange (Note 1)	ITI TF-1: 18.2.6
	Deferred Response (Note 3)	**ITI TF-1: 18.2.7**
Document Consumer	On-Demand Documents (Note 2)	ITI TF-1: 10.2.7
	Basic Patient Privacy Proof (Note 2)	ITI TF-2a: 3.18.4.1.3.6
	Basic Patient Privacy Enforcement (Note 2)	ITI TF-1: 10.2.9
	Asynchronous Web Services Exchange (Note 1)	ITI TF-1: 18.2.2
	AS4 Asynchronous Web Services Exchange (Note 1)	ITI TF-1: 18.2.6
	Deferred Response (Note 3)	**ITI TF-1: 18.2.7**

Note 1: The Responding Gateway shall implement at least one of these options: Asynchronous (WS-Addressing based) Web Services Exchange or AS4 Asynchronous Web Services Exchange.

Note 2: The Options on the Document Consumer, besides the two Asynchronous ones, are identical to those defined in the XDS Profile (see ITI TF-1: 10.2).

530   **Note 3: The Deferred Response Option cannot be combined with the AS4 Asynchronous Web Services Exchange Option.**

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> *Add the following **new** Section 18.2.7 as shown*

535 ### 18.2.7 Deferred Response Option

The Deferred Response Option is needed when the XCA Responding Gateway requires extensive time for processing, as much as days or weeks. This need could arise through delegation of processing to external/remote systems or human interaction. The mechanism enables this by splitting the XCA query and retrieve request and response messages into two
540 separate two-way exchanges, with the second exchange potentially repeating. This requires applications to manage the message correlation, create application level acknowledgements, and determine where to send the Deferred Response message.

For more information about Deferred Response and Asynchronous messaging in general see http://wiki.ihe.net/index.php?title=Asynchronous_Messaging.

545 The WS-Addressing and AS4 Asynchronous Options are available for longer latency, but Deferred Response should be used in the following cases:

- When the delay in responding may be as much as days or weeks.

- When applications must support recovery of the long-running request and response through system restart.

550 - When there is a need for Responding Gateways to return results incrementally, rather than waiting for all long-latency results to complete before returning a single response.

Initiating Gateways which support the Deferred Response Option shall support Deferred Response on the Cross Gateway Query [ITI-38] transaction, and Cross Gateway Retrieve [ITI-39] transaction.

555 If the Initiating Gateway supports both the XDS Affinity Domain Option and the Deferred Response Option it shall also support Deferred Response on the Registry Stored Query [ITI-18] and Retrieve Document Set [ITI-43] transactions.

If the Initiating Gateway supports both the Asynchronous (WS-Addressing based) Web Services Exchange Option and the Deferred Response Option it shall also support WS-Addressing based
560 Asynchronous Web Services Exchange on the Deferred Results messages within the Cross Gateway Query [ITI-38] and Cross Gateway Retrieve [ITI-39] transactions. If the Initiating Gateway also supports the XDS Affinity Domain Option it shall also support WS-Addressing based Asynchronous Web Services Exchange on the Deferred Results messages within the Registry Stored Query [ITI-18] and Retrieve Document Set [ITI-43] transactions.

565 Responding Gateways which support the Deferred Response Option shall support Deferred Response on the Cross Gateway Query [ITI-38] transaction, and Cross Gateway Retrieve [ITI-39] transaction.

If the Responding Gateway supports both the Asynchronous (WS-Addressing based) Web Services Exchange Option and the Deferred Response Option it shall also support WS-
570 Addressing based Asynchronous Web Services Exchange on the Deferred Results messages within the Cross Gateway Query [ITI-38] and Cross Gateway Retrieve [ITI-39] transactions.

Document Consumers which support the Deferred Response Option shall support Deferred Response on the Registry Stored Query [ITI-18] transaction, and on the Retrieve Document Set [ITI-43] transaction.

575 If the Document Consumer supports both the Asynchronous (WS-Addressing based) Web Services Exchange Option and the Deferred Response Option it shall also support WS-Addressing based Asynchronous Web Services Exchange on the Deferred Results messages within the Registry Stored Query [ITI-18] and Retrieve Document Set [ITI-43] transactions.

For an example of the Deferred workflow, see Section 18.3.3.2.
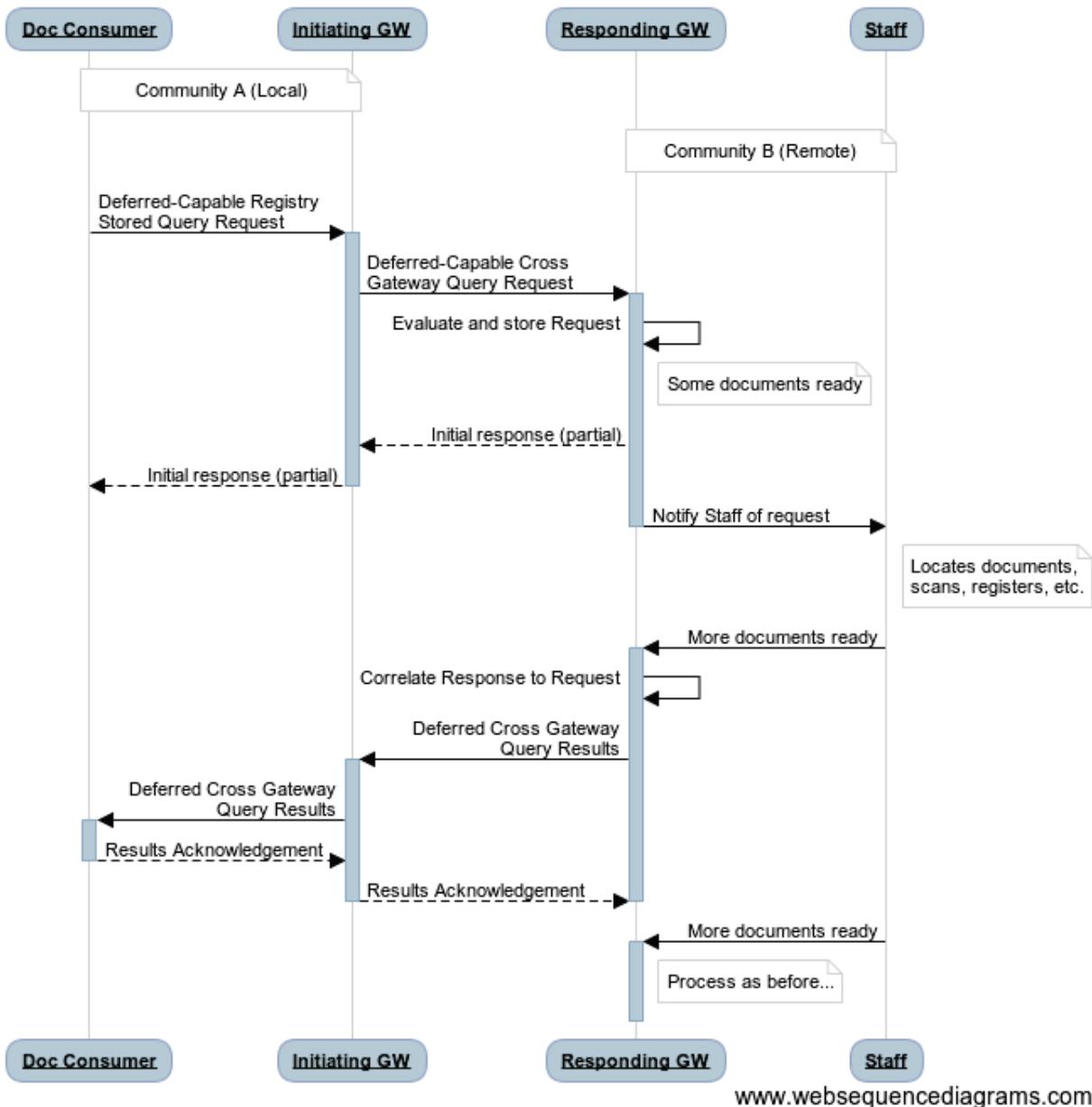
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> *Add the following **new** Section 18.3.3.2 as shown*

18.3.3.2 Use of Deferred Response Option

Figure 18.3.3-3 shows an example of Deferred responses in the case of a community that holds paper clinical documents and wishes to defer converting and registering those documents until
585 they are queried for in electronic form. Note that aside from this paper-based example, any time-intensive action may utilize this deferred mechanism. Other examples:

- Human evaluation of the access decisions for this requester and these documents.

- Deep search: search secondary storage facilities, potentially involving transformation and registration of content.

590 - Content search: apply query filters to advanced content searching tools, bypassing metadata. May result in new higher-fidelity metadata added (e.g., EventCodeList values based on acts in the document).

Figure 18.3.3-3: Deferred response from paper-based community

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- In this example, a **Document Consumer** triggers the process flow by sending a Deferred-Capable Registry Stored Query request to its Initiating Gateway. The request includes an endpoint on the Document Consumer for the Deferred response.

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- The **Initiating Gateway** sends a Deferred-Capable Query request to one or more Responding Gateways. Each request includes an endpoint on the Initiating Gateway for the Deferred response.

- The **Responding Gateway** evaluates the query request for errors, stores the request information, checks for any results/errors that may be available immediately, returns to the Initiating Gateway a response containing those initial results and an indication that more results will be returned later, and finally notifies staff of the request for additional results, using unspecified mechanisms.

- The **Initiating Gateway** passes the initial response on to the Document Consumer, aggregating responses from multiple Responding Gateways if necessary.

- At this point, the first exchange is complete and all system actors are free to do other work.

- **Staff** members pull the request information and perform whatever work is needed to convert the paper documents to electronic form and persist them: scanning, optical character recognition (OCR), parsing, manual evaluation, storing in an XDS registry/repository or other mechanism, etc.

The remaining steps can repeat multiple times, until all results for this request are complete and returned:

- When **Staff** has completed work on some documents, it notifies the Responding Gateway, using unspecified mechanisms.

- The **Responding Gateway** correlates this response to the original request and sends the Cross Gateway Query Deferred Results message to the Initiating Gateway endpoint from the original request.

- The **Initiating Gateway** receives the response and forwards it as a Registry Stored Query Deferred Results message to the Document Consumer endpoint.

- The **Document Consumer** returns an acknowledgement to the Initiating Gateway.

- The **Initiating Gateway** returns an acknowledgement to the Responding Gateway.

Volume 2a – Transactions

3.18 Registry Stored Query [ITI-18]
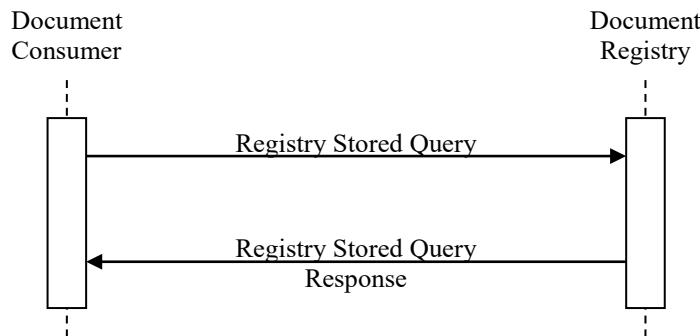
630   ...

Update Section 3.18.4 as shown. Add the second interaction diagram.
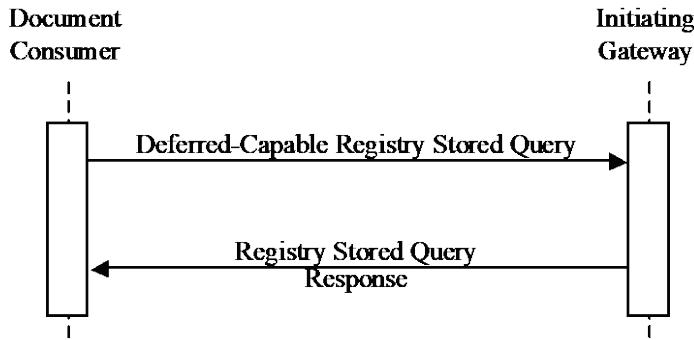
3.18.4 Interaction Diagram

<u>The standard interaction is shown below.</u>

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<u>If the Deferred Response Option is used, there are additional messages in the interaction.</u>

*Update Section 3.18.4.1.2.5: Add **new** Section heading 3.18.4.1.2.5.1.*

640   *Add new subsection heading 3.18.4.1.2.5.1*

Add new entire Section 3.18.4.1.2.5.2.

3.18.4.1.2.5 Compatibility of Options

3.18.4.1.2.5.1 On-Demand Documents Option

645 The presence or absence of the optional $XDSDocumentEntryType parameter triggers different behaviors on the Document Registry. If this parameter is specified, and the Document Registry does not support it, the Document Registry shall ignore. If it is specified, and the Document Registry does support it, the proper information is returned.

…

3.18.4.1.2.5.2 Deferred Response Option

650 If the Document Consumer supports the Deferred Response Option, it may trigger this pattern by modifying a Registry Stored Query Request to an Initiating Gateway as follows, to make it "Deferred-Capable":

- A DeferredResponseEndpoint element shall be present in the SOAP Header, containing a URL with the Web Services Endpoint where a deferred response may be sent. The
655 schema type is xsd:anyURI. An example follows:

```
<ihe:DeferredResponseEndpoint xmlns:S=http://www.w3.org/2003/05/soap-envelope
S:mustUnderstand="false">service entry point url</ihe:DeferredResponseEndpoint>
```

- The id attribute of the AdhocQueryRequest element shall be populated with a unique URI representing this initial request.

660 Both fields must be present for the request to be considered Deferred-Capable.

Note: This same formatting is used by the Initiating Gateway to make Cross Gateway Query requests Deferred-Capable.

The Deferred-Capable Registry Stored Query Request is fully compatible with Initiating Gateways that do not support the Deferred Response Option:

665 - If the Document Consumer knows the Initiating Gateway supports the Deferred Response Option, it should pass the SOAP mustUnderstand value of "true" or "1" to force handling of the DeferredResponseEndpoint.

- Otherwise (i.e., the Document Consumer does not know whether the Initiating Gateway supports the Deferred Response Option, or it knows that it does not support it), it should
670 either omit the DeferredResponseEndpoint or pass the SOAP mustUnderstand value of "false" or "0" to allow it to be safely ignored. The AdhocQueryRequest id may be included without impact.

Update Section 3.18.4.1.2.7 as shown.

---

675 ### 3.18.4.1.2.7 Web Services Transport

…

Table 3.18.4.1.2.7-1: Additional Attribute Requirements

Attribute	Value
/definitions/portType/operation@name	DocumentRegistry_RegistryStoredQuery
/definitions/portType/operation/input/@wsaw:Action	urn:ihe:iti:2007:RegistryStoredQuery
/definitions/portType/operation/output/@wsaw:Action	urn:ihe:iti:2007:RegistryStoredQuery Response
/definitions/binding/operation/wsoap12:operation/@soapActionRequired	false

Initiating Gateway: If the Deferred Response Option is supported, these are the additional
680 **requirements for the Synchronous or Asynchronous (WS-Addressing based) Registry Stored Query Request presented in the order in which they would appear in the Initiating Gateway WSDL definition:**

- **The following types shall be imported (xsd:import) in the /definitions/types section:**

    o **namespace="urn:ihe:iti:xds-b:2007", schemaLocation="**
685 **XDS.b_Deferred.xsd"**

The following WSDL fragment shows an example of Registry Stored Query transaction definition:

…

690 *Update Section 3.18.4.1.3 as shown.*

3.18.4.1.3 Expected Actions

The Document Registry shall:

1. Accept a parameterized query in an AdhocQueryRequest message
2. Verify the required parameters are included in the request. Additionally, special rules
695 documented in the above section 'Parameters for Required Queries' shall be verified.
3. Errors shall be returned for the following conditions:
   …
4. Process the query as appropriate:

- **For Document Registry Actors:**
700 **…**

- **For Initiating Gateway Actors:**

    - Initiating Gateway receives a Registry Stored Query by patient id: …

    - Initiating Gateway receives a Registry Stored Query by entryUUID or uniqueID: …

    - **Initiating Gateway that supports the Deferred Response Option receives a**
705 **Deferred-Capable Registry Stored Query Request: For each Responding**

___

Gateway it chooses to contact, it should determine whether to modify the request to make it Deferred-Capable, following the requirements of the Document Consumer in Section 3.18.4.1.2.5.2:

710

- **If the Initiating Gateway chooses to do so, the request shall include the Deferred Response endpoint of the Initiating Gateway (not the endpoint passed by the Document Consumer). The request shall also include an AdhocQueryRequest id value created by the Initiating Gateway (not the id passed by the Document Consumer). This id shall be unique for each request to an individual Responding Gateway.**

715

   The Initiating Gateway shall also retain the information needed to correlate and process future deferred results: the Deferred endpoint and original request ID from the Document Consumer, and the request ID for each Responding Gateway.

- **If the Initiating Gateway chooses not to do so, it shall send a regular Cross Gateway Query request.**

720

5. Return XML formatted metadata in an AdhocQueryResponse message…
6. When the Document Consumer receives the query response from the Initiating Gateway …

…

725   If the Document Consumer supports the Delayed Document Assembly Option it shall accept the following values of hash and size to indicate that the assembly of the document content has been delayed until the document is retrieved.

- size = 0 (zero)
- hash = da39a3ee5e6b4b0d3255bfef95601890afd80709 (SHA1 hash of a zero-length file)

730   **If the Document Consumer supports the Deferred Response Option it shall**

- **accept an AdhocQueryResponse as described in Section 3.18.4.1.3.4, indicating that some results of the request will be deferred until a later time,**

- **retain the id of the original AdhocQueryRequest in order to correlate future results.**

735 | *Replace Section 3.18.4.1.3.4 with the following text (note change in section name)* |

3.18.4.1.3.4 Deferred Response Option: AdhocQueryResponse

If the Initiating Gateway supports the Deferred Response Option, it may indicate Deferred processing by modifying a Registry Stored Query Response as follows. Within the AdhocQueryResponse element:

740   - A "DeferredProcessingRequired" slot shall be included.

___

o The Value, which is a 256-character maximum string, may be included to explain the nature of the delay. If present, the Value shall be appropriate for display.

• A "DeferredProcessingEstimatedCompletion" slot may be included.

o The Value is required, and shall be formatted as an absolute time, using HL7 V2.5

745   DTM format as defined in ITI TF-3: Table 4.2.3.1.7-2.

Note: the rules for the Initiating Gateway to populate these fields are specified in ITI TF-2b, 3.38.4.1.3.3.

An example of these slots is shown below:

```
<query:AdhocQueryResponse
    xmlns:query="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
    xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
    xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
    status="urn:ihe:iti:2007:ResponseStatusType:PartialSuccess">

    <!-- Results not available now -->
    <rs:ResponseSlotList>
        <rim:Slot name="DeferredProcessingRequired">
            <rim:ValueList>
                <rim:Value>This query requires more time. The full results will be
returned on the Deferred Response endpoint.</rim:Value>
            </rim:ValueList>
        </rim:Slot>
        <rim:Slot name="DeferredProcessingEstimatedCompletion">
            <rim:ValueList>
                <rim:Value>201906020304</rim:Value>
            </rim:ValueList>
        </rim:Slot>
    </rs:ResponseSlotList>

    <!-- Errors available now -->
    <rim:RegistryErrorList>
        ...
    </rim:RegistryErrorList>

    <!-- Registry objects available now -->
    <rim:RegistryObjectList>
        ...
    </rim:RegistryObjectList>

</query:AdhocQueryResponse>
```

*Add the following **new** Section 3.18.4.2 as shown*

3.18.4.2 Registry Stored Query Deferred Results

This message is used when a Document Consumer and an Initiating Gateway support the Deferred Response Option.

The message is sent from an Initiating Gateway to a Document Consumer to return Deferred results – registry objects and errors – from a prior Deferred-Capable query request.

3.18.4.2.1 Trigger Events

This message is initiated when the Initiating Gateway receives a Cross Gateway Query Deferred Results message from a Responding Gateway.

3.18.4.2.2 Message Semantics

The Registry Stored Query Deferred Results message semantics are based on the Registry Stored Query response, but the message is packaged as a SOAP request instead of a response. For the contents of the AdhocQueryResponse element, see Section 3.18.4.1.2 and ITI TF-3:4. For the web services details and sample messages, refer to Section 3.18.4.2.2.1 rather than Section 3.18.4.1.2.4.

In addition, the AdhocQueryResponse element shall contain the requestId attribute, containing the ID of the original AdhocQueryRequest this Results message is a response to.

The Registry Stored Query Deferred Results message may indicate in the AdhocQueryResponse element that additional Deferred processing is needed, as defined in Section 3.18.4.1.3.4.

The Registry Stored Query Deferred Results Acknowledgement message semantics are based on the ebRS 3.0 RegistryResponse message.

3.18.4.2.2.1 Web Services Transport

This section describes requirements for Web Services transport for:

- Synchronous
- WS-Addressing -based Asynchronous

For the support of both Synchronous and Asynchronous (WS-Addressing based) Web Service exchange cases, the requirements are the following:

The Results and Results Acknowledgement messages will be transmitted using Synchronous or WS-Addressing based Asynchronous Web Services Exchange, according to the requirements specified in ITI TF-2x: Appendix V.3.

Table 3.18.4.2.2.1-1: WSDL Namespace Definitions

soap	http://schemas.xmlsoap.org/wsdl/soap/
soap12	http://schemas.xmlsoap.org/wsdl/soap12/
wsaw	http://www.w3.org/2006/05/addressing/wsdl/
xsd	http://www.w3.org/2001/XMLSchema

ihe	urn:ihe:iti:xds-b:2007
rs	urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0
lcm	urn:oasis:names:tc:ebxml-regrep:xsd:lcm:3.0
query	urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0

815 The specific values for the WSDL describing the Registry Stored Query Deferred Results Service are described in this section.

The Document Consumer shall accept a Registry Stored Query Deferred Results message formatted as a SIMPLE SOAP message and respond with a Registry Stored Query Deferred Results Acknowledgement message formatted as a SIMPLE SOAP message. The Initiating Gateway shall generate the Registry Stored Query Deferred Results message formatted as a 820 SIMPLE SOAP message and accept a Registry Stored Query Deferred Results Acknowledgement message formatted as a SIMPLE SOAP message.

The following WSDL naming conventions shall apply:

```
          wsdl:definitions/@name="DocumentConsumer_Query":
825       input message     -> "RegistryStoredQueryDeferredResults_Message"
          output message    -> "RegistryStoredQueryDeferredResultsAcknowledgement_Message"
          portType          -> "DocumentConsumerQuery_PortType"
          operation         -> "DocumentConsumer_RegistryStoredQueryDeferredResults"
          SOAP 1.2 binding  -> "DocumentConsumerQuery_Binding_Soap12"
830       SOAP 1.2 port     -> "DocumentConsumerQuery_Port_Soap12"
```

IHE-WSP202) The targetNamespace of the WSDL shall be "urn:ihe:iti:xds-b:2007"

Document Consumer: These are the requirements for the Registry Stored Query Deferred Results transaction presented in the order in which they would appear in the Document Consumer 835 WSDL definition:

- The following types shall be imported (xsd:import) in the /definitions/types section:

    o namespace="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0", schemaLocation="query.xsd"

    o namespace ="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0", schemaLocation="rs.xsd"

840 - The /definitions/message/part/@element attribute of the Registry Stored Query Deferred Results message shall be defined as "query:AdhocQueryResponse"

- The /definitions/message/part/@element attribute of the Registry Stored Query Deferred Results Acknowledgement message shall be defined as "rs:RegistryResponse"

- Refer to Table 3.18.4.2.2.1-2 for additional attribute requirements.

845 - To support the Asynchronous Web Services Exchange Option (WS-Addressing based) on the Initiating Gateway, the Document Consumer will support the use of a non-anonymous response EPR in the WS-Addressing replyTo header.

Table 3.18.4.2.2.1-2: Additional Attribute Requirements

Attribute	Value
/definitions/portType/operation@name	DocumentConsumer_ RegistryStoredQueryDeferredResults
/definitions/portType/operation/input/@wsaw:Action	urn:ihe:iti:2019:RegistryStoredQueryDeferredResults
/definitions/portType/operation/output/@wsaw:Action	urn:ihe:iti:2019:RegistryStoredQueryDeferredResultsAcknowledgement
/definitions/binding/operation/wsoap12:operation/@soapActionRequired	false

850   The following WSDL fragment shows an example of Registry Stored Query Deferred Results transaction definition:

```
<?xml version="1.0" encoding="utf-8"?>
<definitions ...>
  ...
  <types>
      <xsd:schema elementFormDefault="qualified">
          <xsd:import
              namespace="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
              schemaLocation="..\schema\ebRS\query.xsd"/>
          <xsd:import
              namespace="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
              schemaLocation="..\schema\ebRS\rs.xsd"/>
          ...
      </xsd:schema>
  </types>
  <message name="RegistryStoredQueryDeferredResults_Message">
      <documentation>Registry Stored Query Deferred Results</documentation>
      <part name="body" element="query:AdhocQueryResponse"/>
  </message>
  <message name="RegistryStoredQueryDeferredResultsAcknowledgement_Message">
      <documentation>Registry Stored Query Deferred Results
Acknowledgement</documentation>
      <part name="body" element="rs:RegistryResponse"/>
  </message>
  ...
  <portType name="DocumentConsumerQuery_PortType">
      <operation name="DocumentConsumer_RegistryStoredQueryDeferredResults">
          <input message="ihe:RegistryStoredQueryDeferredResults_Message"

  wsaw:Action="urn:ihe:iti:2019:RegistryStoredQueryDeferredResults"/>
          <output
message="ihe:RegistryStoredQueryDeferredResultsAcknowledgement_Message"

  wsaw:Action="urn:ihe:iti:2019:RegistryStoredQueryDeferredResultsAcknowledgem
ent"/>
      </operation>
      ...
  </portType>
  ...
</definitions>
```

A full WSDL for the Document Consumer is found in ITI TF-2x: Appendix W.

3.18.4.2.2.1.1 Sample SOAP Messages

The samples in the following two sections show a SOAP request and its relative SOAP response when the Deferred results are a mix of successes and errors, and when further results are to be expected in a later message. The specific errors and registry objects are omitted for brevity; in a real scenario these will be populated with the appropriate results.

Samples presented in this section are also available online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.18.4.2.2.1.1.1 Sample Registry Stored Query Deferred Results SOAP Request

3.18.4.2.2.1.1.2.1 Synchronous Web Services Exchange

The sample messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…; these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

905

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action
s:mustUnderstand="1">urn:ihe:iti:2019:RegistryStoredQueryDeferredResults</a:A
ction>
    <a:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
fbeab9e2a77e</wsa:MessageID>
  </s:Header>
  <s:Body>
    <query:AdhocQueryResponse
      xmlns:query="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
      xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
      xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
      requestId="urn:uuid:df9b89ed-395e-40a7-8510-0b4a390434c4"
      status="urn:ihe:iti:2007:ResponseStatusType:PartialSuccess">

      <!-- Results not available now -->
      <rs:ResponseSlotList>
        <rim:Slot name="DeferredProcessingRequired">
          <rim:ValueList>
            <rim:Value>This query requires more time. The full response will
be returned on the Deferred Response endpoint.</rim:Value>
          </rim:ValueList>
        </rim:Slot>
        <rim:Slot name="DeferredProcessingEstimatedCompletion">
          <rim:ValueList>
            <rim:Value>201906020304</rim:Value>
          </rim:ValueList>
        </rim:Slot>
      </rs:ResponseSlotList>

      <!-- Errors available now -->
      <rim:RegistryErrorList>
        ...
      </rim:RegistryErrorList>

      <!-- Registry objects available now -->
      <rim:RegistryObjectList>
        ...
      </rim:RegistryObjectList>

    </query:AdhocQueryResponse>
  </s:Body>
</s:Envelope>
```

3.18.4.2.2.1.1.2.2 Asynchronous Web Services Exchange

For the Asynchronous Web Services Exchange Option (WS-Addressing based), the sample
messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…;

these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3:
Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action
s:mustUnderstand="1">urn:ihe:iti:2019:RegistryStoredQueryDeferredResults</a:A
ction>
    <a:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
fbeab9e2a77e</wsa:MessageID>
    <a:ReplyTo>
<a:Address>http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.svc</a:Addre
ss>
    </a:ReplyTo>
  </s:Header>
  <s:Body>
    <query:AdhocQueryResponse
      xmlns:query="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
      xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
      xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
      requestId="urn:uuid:df9b89ed-395e-40a7-8510-0b4a390434c4"
      status="urn:ihe:iti:2007:ResponseStatusType:PartialSuccess">

      <!-- Rest of AdhocQueryResponse message goes here -->

    </query:AdhocQueryResponse>
  </s:Body>
</s:Envelope>
```

3.18.4.2.2.1.1.2 Sample Registry Stored Query Deferred Results Acknowledgement SOAP Response

3.18.4.2.2.1.1.2.1 Synchronous Web Services Exchange

The sample messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…; these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action
s:mustUnderstand="1">urn:ihe:iti:2019:RegistryStoredQueryDeferredResultsAckno
wledgement</a:Action>
    <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-
821622C099DB</wsa:MessageID>
    <a:RelatesTo>urn:uuid:1795bb7a-8dc2-403a-9914-
fbeab9e2a77e</wsa:MessageID>
</s:Header>
  <s:Body>
    <rs:RegistryResponse
      xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
      status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"
    </rs:RegistryResponse>
  </s:Body>
</s:Envelope>
```

(line numbers: 995, 1000, 1005)

3.18.4.2.2.1.1.2.2 Asynchronous Web Services Exchange

(line number: 1010)

For the Asynchronous Web Services Exchange Option (WS-Addressing based), the sample messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…; these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action
s:mustUnderstand="1">urn:ihe:iti:2019:RegistryStoredQueryDeferredResultsAckno
wledgement</a:Action>
    <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-
821622C099DB</wsa:MessageID>
    <a:RelatesTo>urn:uuid:1795bb7a-8dc2-403a-9914-
fbeab9e2a77e</wsa:MessageID>
    <a:To
s:mustUnderstand="1">http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.sv
c</a:To>
  </s:Header>
  <s:Body>
    <rs:RegistryResponse
      xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
      status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"
    </rs:RegistryResponse>
  </s:Body>
</s:Envelope>
```

(line numbers: 1015, 1020, 1025, 1030, 1035)

3.18.4.2.3 Expected Actions

This message contains results from a prior Registry Stored Query. As such, the Document Consumer shall fulfill the same requirements as it does for the Registry Stored Query response, detailed in Section 3.18.4.1.3.

In addition:

1. The Document Consumer shall attempt to correlate this message to the appropriate original request, by matching the requestId attribute of the AdhocQueryResponse element in the results to the id attribute of the AdhocQueryRequest element in the original request.

2. The Document Consumer may verify the format and validity of the results message.

3. If the requestId attribute is not present, no matching request can be found, or the results message is not valid, the Document Consumer shall return a Registry Stored Query Deferred Results Acknowledgement message with RegistryResponse status = "urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Failure", and containing a RegistryError element with errorCode "XDSRegistryError" and codeContext explaining the nature of the error.

4. If the matching request can be found and the results message is valid,

   a. If this is the final set of results for this request, i.e., the AdhocQueryResponse does not indicate further Deferred Processing as described in Section 3.18.4.1.3.4, the Document Consumer shall delete or otherwise mark the request id as completed, such that no subsequent results messages will match the request.

   b. The Document Consumer shall return a Registry Stored Query Deferred Results Acknowledgement message with RegistryResponse status = "urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success".

Volume 2b – Transactions

3.38 Cross Gateway Query [ITI-38]

…
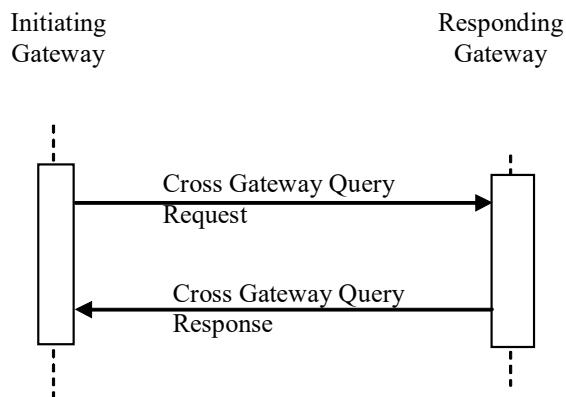
Update Section 3.38.4 as shown. Add the second interaction diagram.
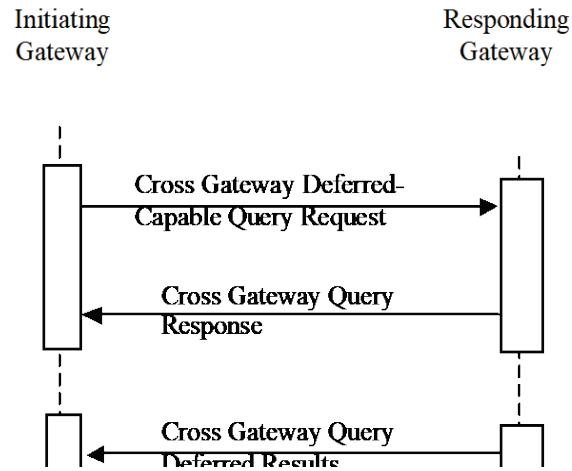
1065 **3.38.4 Interaction Diagram**

<u>The standard interaction is shown below.</u>

<u>If the Deferred Response Option is used, there are additional messages in the interaction.</u>

1070 <div>*Add the following to the end of Section 3.38.4.1.2 as shown.*</div>

3.38.4.1.2 Message Semantics

…

Initiating Gateways that support the Deferred Response Option shall be capable of sending a Deferred-Capable Cross Gateway Query Request (see ITI TF-2a: 3.18.4.1.2.5.2) either through
1075 internal mechanisms or, when the XDS Affinity Domain Option is also supported, through interaction with a Document Consumer that supports the Deferred Response Option.

<div>*Add the following **new** Section 3.38.4.1.3.3 as shown*</div>

3.38.4.1.3.3 Deferred Response Option

1080 If a Responding Gateway that supports the Deferred Response Option receives a Deferred-Capable Cross Gateway Query Request (see Section 3.38.4.1.2):

- The Responding Gateway may defer some or all of the results of the query request – registry objects and errors – to one or more subsequent Deferred Results messages, in order to allow for additional processing time. See Section 3.38.4.2 for details.

1085 - o How the Responding Gateway determines which results to return immediately and which to defer is not specified.

  - o How the Responding Gateway returns subsequent results in Deferred Results messages is not specified, for example: whether it returns individual results as soon as

1090 each one is available, returns groups of results, or waits until all results are available and returns them in a single Deferred Results message.

- o How and where processing delays are introduced behind the Responding Gateway is not specified. They may occur in non-XDS mechanisms, or in the unspecified interactions between the Responding Gateway and a grouped Document Consumer. 1095 Note that the Deferred Response Option is not supported on Document Registries, so if the Responding Gateway is grouped with a Document Consumer, the Registry Stored Query [ITI-18] transactions it triggers to a Document Registry in its community will not be Deferred.

- The Responding Gateway shall return any results it chooses to make immediately available in the initial Cross Gateway Query Response. If none are available, the 1100 Responding Gateway shall return an empty response (i.e., no registry objects or errors).

  - o The response status shall reflect only those results that are being returned in this message. For an empty response, the response status shall be `urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success`.

  - o If any remaining results require additional processing time, the message shall not 1105 include those results and shall indicate Deferred processing in the AdhocQueryResponse as described in ITI TF-2a: 3.18.4.1.3.4.

  - o If the DeferredProcessingEstimatedCompletion is provided, it shall reflect an estimate of all deferred processing remaining for the request.

- When Deferred processing is complete for a set of results and the Responding Gateway 1110 wishes to return them, it shall send a Cross Gateway Query Deferred Results message, as described in Section 3.38.4.2.

  - o The message shall include all results available at this time, including any already returned.

  - o The response status shall reflect only those results that are being returned in this 1115 message.

  - o If any remaining results require additional processing time, the message shall not include those results and shall indicate Deferred processing in the AdhocQueryResponse as described in ITI TF-2a: 3.18.4.1.3.4.

  - o If the DeferredProcessingEstimatedCompletion is provided, it shall reflect an estimate 1120 of all deferred processing remaining for the request.

- The Responding Gateway shall attempt to return all results of the request, through the combination of initial and Deferred responses.

  - o The Responding Gateway should attempt retries if an Initiating Gateway is unavailable. The details and number of attempts are not specified.

1125 - o The Responding Gateway shall not send the final Deferred Results message for a request, defined as a Deferred Results message that does not indicate additional

Deferred processing, until the initial Cross Gateway Query Response and any other Deferred Results messages have successfully been received/acknowledged.

1130 If the Responding Gateway receives a request that includes a DeferredResponseEndpoint element (see ITI TF-2a: 3.18.4.1.2.5.2) but not the id attribute of the AdhocQueryRequest element, it shall return the error code XDSRegistryError, and details of the error in the attribute codeContext.

1135 If an Initiating Gateway supports the Deferred Response Option, it shall fulfill the requirements on a Document Consumer that supports the Deferred Response Option, as detailed in ITI TF-2a: 3.18.4.1.3 Expected Actions. In addition:

- If the XDS Affinity Domain Option is supported, when consolidating results from multiple Responding Gateways, the Initiating Gateway shall consolidate the reporting of any Deferred processing for this request as follows:

  1140 o If any responses indicate Deferred processing, the Initiating Gateway shall indicate Deferred processing in the Registry Stored Query response by adding the DeferredProcessingRequired slot. The Initiating Gateway should also consolidate any descriptions of the delay, e.g., by including each Value from a Responding Gateway in the ValueList.

  1145 o If a consolidated estimate of all processing time remaining for all Responding Gateways for this request can be determined (i.e., latest time for completion), the Initiating Gateway may include it in the Registry Stored Query response.

- In the response to the initiator of the transaction – either the Document Consumer or the internal actor – in addition to the query results that were returned by Responding Gateways in Cross Gateway Query responses, the Initiating Gateway may also include 1150 any Deferred results that were received before it had returned this response.

- Note: Later Deferred results for this request, when they become available, will be sent by the Responding Gateway in one or more Cross Gateway Query Deferred Results messages, as described in Section 3.38.4.2. While there are requirements on the Responding Gateway to ensure correct and complete delivery of results, the Initiating 1155 Gateway should handle the cases where a particular Responding Gateway never returns Deferred Results messages for a request or returns only after a very long time. Details of this processing are unspecified. Some potential behaviors follow:

  o The Initiating Gateway does no additional processing; it simply passes through Deferred results as received. The burden of managing the overall request is on the 1160 triggering actor.

  o The Initiating Gateway determines if a timeout has been reached and notifies its triggering actor. If the triggering actor is a Document Consumer, the Initiating Gateway could report the timeout in a Deferred Results message, adding a RegistryError in the same way as it would report a non-responsive Responding 1165 Gateway in a synchronous Cross Gateway Query response.

3.38.4.2 Cross Gateway Query Deferred Results

This message is used when a Responding Gateway and an Initiating Gateway support the Deferred Response Option.

The message is sent from a Responding Gateway to an Initiating Gateway to return Deferred results – registry objects and errors – from a prior Deferred-Capable query request.

3.38.4.2.1 Trigger Events

This message is initiated when Deferred processing is complete for a set of results and the Responding Gateway wishes to return them to the Initiating Gateway.

3.38.4.2.2 Message Semantics

The message semantics are based on the Registry Stored Query Deferred Results and Registry Stored Query Deferred Results Acknowledgement messages. See ITI TF-2a: 3.18.4.2.2.

3.38.4.2.3 Expected Actions

The Initiating Gateway shall support the Expected Actions described in ITI TF-2a: 3.18.4.2.3 for the Document Consumer.

In addition, the Initiating Gateway shall support the Expected Actions described in Section 3.38.4.1.3 for the Initiating Gateway Actor.

In addition, if the Initiating Gateway supports the XDS Affinity Domain Option:

- It shall determine if this results message correlates to a prior Deferred-Capable request from a Document Consumer, by comparing the AdhocQueryResponse requestId to the set of request IDs retained from prior Document Consumer Deferred-Capable requests. If it does, the Initiating Gateway shall initiate a Registry Stored Query Deferred Results message (see ITI TF-2a: 3.18.4.2) to the appropriate Document Consumer, as follows:
  - o Direct the message to the Deferred response endpoint of the Document Consumer that it previously retained.
  - o Include the results (registry objects and errors) that were passed in the Cross Gateway Query Deferred Results message.
  - o Set the requestId of the AdhocQueryResponse to the id of the original [ITI-18] AdhocQueryRequest from the Document Consumer that it previously retained.
  - o Consolidate the reporting of any remaining Deferred processing for this request:
    - ▪ If the Cross Gateway Query Deferred Results message indicates additional Deferred processing, or if any of the requests to other Responding Gateways are not complete (i.e., the most recent response or Deferred Results message indicates

1200   additional Deferred processing), then the Initiating Gateway shall indicate additional Deferred processing by adding the DeferredProcessingRequired slot. The Initiating Gateway should also consolidate any descriptions of the delay, e.g., by including each Value from a Responding Gateway with a request that is not yet complete in the ValueList.

1205   ▪ If a consolidated estimate of all processing time remaining for all Responding Gateways for this request can be determined (i.e., latest time for completion), the Initiating Gateway may include it.

Update Section 3.38.5 as shown.

1210 3.38.5 Protocol Requirements

…

Responding Gateway: These are the requirements for the Synchronous or Asynchronous (WS-Addressing based) Cross Gateway Query Response presented in the order in which they would appear in the Responding Gateway WSDL definition:

1215   • The following types shall be imported (xsd:import) in the /definitions/types section:

         o namespace=" urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0", schemaLocation="query.xsd"

         o **If Deferred Response Option is supported:**

1220   ▪ **namespace="urn:ihe:iti:xds-b:2007", schemaLocation=" XDS.b_Deferred.xsd"**

     • The /definitions/message/part/@element attribute of the Cross Gateway Query Request message shall be defined as "query:AdhocQueryRequest"

     • The /definitions/message/part/@element attribute of the Cross Gateway Query Response message shall be defined as "query:AdhocQueryResponse"

1225   • Refer to Table 3.38.5-1 below for additional attribute requirements

Table 3.38.5-1: Additional Attribute Requirements

Attribute	Value
/definitions/portType/operation@name	RespondingGateway_CrossGatewayQuery
/definitions/portType/operation/input/@wsaw:Action	urn:ihe:iti:2007:CrossGatewayQuery
/definitions/portType/operation/output/@wsaw:Action	urn:ihe:iti:2007:CrossGatewayQueryRespon se
/definitions/binding/operation/wsoap12:operation/@soapAction Required	false

---

1230 **The Cross Gateway Query Deferred Results and Cross Gateway Query Deferred Results Acknowledgement messages are transmitted using Synchronous or WS-Addressing based Asynchronous Web Services Exchange, according to the requirements specified in ITI TF-2x: Appendix V.3. The protocol requirements are identical to the Registry Stored Query Deferred Results except as noted below.**

1235 **Initiating Gateway: These are the requirements for the Synchronous or Asynchronous (WS-Addressing based) Cross Gateway Query Deferred Results transaction presented in the order in which they would appear in the Initiating Gateway WSDL definition:**

- **The following types shall be imported (xsd:import) in the /definitions/types section:**

  - **namespace=" urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0", schemaLocation="rs.xsd"**

1240 - **namespace=" urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0", schemaLocation="query.xsd"**

- **The /definitions/message/part/@element attribute of the Cross Gateway Query Deferred Results message shall be defined as "query:AdhocQueryResponse"**

1245 - **The /definitions/message/part/@element attribute of the Cross Gateway Query Deferred Results Acknowledgement message shall be defined as "rs:RegistryResponse"**

- **Refer to Table 3.38.5-2 below for additional attribute requirements**

Table 3.38.5-2: Additional Attribute Requirements

Attribute	Value
/definitions/portType/operation@name	**InitiatingGateway_CrossGatewayQueryDeferredResults**
/definitions/portType/operation/input/@wsaw:Action	**urn:ihe:iti:2019:CrossGatewayQueryDeferredResults**
/definitions/portType/operation/output/@wsaw:Action	**urn:ihe:iti:2019:CrossGatewayQueryDeferredResultsAcknowledgement**
/definitions/binding/operation/wsoap12:operation/@soapActionRequired	**false**

1250 These are the requirements that affect the wire format of the SOAP message. The other WSDL properties are only used within the WSDL definition and do not affect interoperability. Full sample request and response messages are in Section 3.38.5.1 Sample SOAP Messages.

For informative WSDL for the Responding Gateway **and the Initiating Gateway,** see ITI TF-2x: Appendix W.

…

1255

*Add the following **new** Sections 3.38.5.1.3 and 3.38.5.1.4 as shown*

3.38.5.1.3 Sample Cross Gateway Query Deferred Results SOAP Request

These samples show a SOAP request when the Deferred results are a mix of successes and errors, and when further results are to be expected in a later message.

1260   The specific errors and registry objects are omitted for brevity; in a real scenario these will be populated with the appropriate results.

3.38.5.1.3.1 Synchronous Web Services Exchange

The sample messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…; these WS-Addressing headers are populated according to ITI TF-2x: Appendix
1265   V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action
s:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayQueryDeferredResults</a:Act
ion>
    <a:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
fbeab9e2a77e</wsa:MessageID>
  </s:Header>
  <s:Body>
    <query:AdhocQueryResponse
      xmlns:query="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
      xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
      xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
      requestId="urn:uuid:df9b89ed-395e-40a7-8510-0b4a390434c4"
      status="urn:ihe:iti:2007:ResponseStatusType:PartialSuccess">

      <!-- Results not available now -->
      <rs:ResponseSlotList>
        <rim:Slot name="DeferredProcessingRequired">
          <rim:ValueList>
            <rim:Value>This query requires more time. The full response will
be returned on the Deferred Response endpoint.</rim:Value>
          </rim:ValueList>
        </rim:Slot>
        <rim:Slot name="DeferredProcessingEstimatedCompletion">
          <rim:ValueList>
            <rim:Value>201906020304</rim:Value>
          </rim:ValueList>
        </rim:Slot>
      </rs:ResponseSlotList>

      <!-- Errors available now -->
      <rim:RegistryErrorList>
        ...
      </rim:RegistryErrorList>

      <!-- Registry objects available now -->
      <rim:RegistryObjectList>
        ...
      </rim:RegistryObjectList>

    </query:AdhocQueryResponse>
  </s:Body>
</s:Envelope>
```

3.38.5.1.3.2 Asynchronous Web Services Exchange

For the Asynchronous Web Services Exchange Option (WS-Addressing based), the sample
messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…;
these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3:
Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
1320
      <s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
      xmlns:a="http://www.w3.org/2005/08/addressing">
        <s:Header>
          <a:Action
      s:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayQueryDeferredResults</a:Act
      ion>
1325      <a:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
      fbeab9e2a77e</wsa:MessageID>
          <a:ReplyTo>
      <a:Address>http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.svc</a:Addre
      ss>
          </a:ReplyTo>
1330    </s:Header>
        <s:Body>
          <query:AdhocQueryResponse
            xmlns:query="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
            xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
1335        xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
            requestId="urn:uuid:df9b89ed-395e-40a7-8510-0b4a390434c4"
            status="urn:ihe:iti:2007:ResponseStatusType:PartialSuccess">

            <!-- Rest of AdhocQueryResponse message goes here -->
1340
          </query:AdhocQueryResponse>
        </s:Body>
      </s:Envelope>
```

1345 3.38.5.1.4 Sample Cross Gateway Query Deferred Results Acknowledgement SOAP Response

3.38.5.1.4.1 Synchronous Web Services Exchange

The sample messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…; these WS-Addressing headers are populated according to ITI TF-2x: Appendix
1350 V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action
s:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayQueryDeferredResultsAcknowl
edgement</a:Action>
    <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-
821622C099DB</wsa:MessageID>
    <a:RelatesTo>urn:uuid:1795bb7a-8dc2-403a-9914-
fbeab9e2a77e</wsa:MessageID>
</s:Header>
  <s:Body>
    <rs:RegistryResponse
      xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
      status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"
    </rs:RegistryResponse>
  </s:Body>
</s:Envelope>
```

1370

3.38.5.1.4.2 Asynchronous Web Services Exchange

For the Asynchronous Web Services Exchange Option (WS-Addressing based), the sample messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…; these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action
s:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayQueryDeferredResultsAcknowl
edgement</a:Action>
    <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-
821622C099DB</wsa:MessageID>
    <a:RelatesTo>urn:uuid:1795bb7a-8dc2-403a-9914-
fbeab9e2a77e</wsa:MessageID>
    <a:To
s:mustUnderstand="1">http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.sv
c</a:To>
  </s:Header>
  <s:Body>
    <rs:RegistryResponse
      xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
      status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"
    </rs:RegistryResponse>
  </s:Body>
</s:Envelope>
```

3.39 Cross Gateway Retrieve [ITI-39]
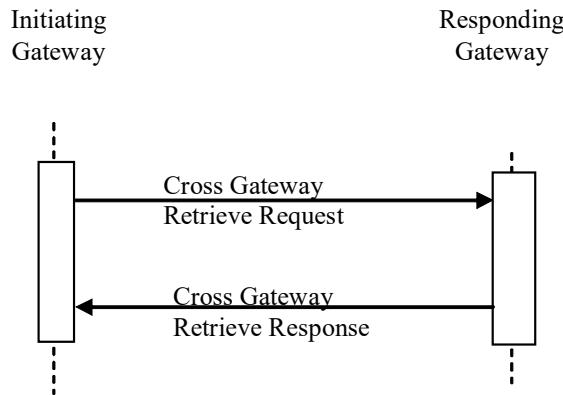
1400   …

*Update Section 3.39.4 as shown. Add the second interaction diagram.*
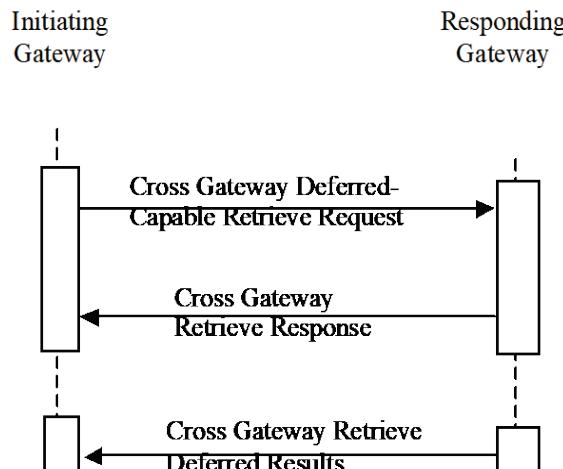
3.39.4 Interaction Diagram

The standard interaction is shown below.

1405   **If the Deferred Response Option is used, there are additional messages in the interaction.**

> *Add the following to the end of Section 3.39.4.1.2 as shown.*

3.39.4.1.2 Message Semantics

1410 …

Initiating Gateways that support the Deferred Response Option shall be capable of sending a Deferred-Capable Cross Gateway Retrieve Request (see Section 3.43.4.1.2.1) either through internal mechanisms or, when the XDS Affinity Domain Option is also declared, through interaction with a Document Consumer that supports the Deferred Response Option.

1415

> *Add the following **new** Section 3.39.4.1.3.2 as shown*

3.39.4.1.3.2 Deferred Response Option

If a Responding Gateway that supports the Deferred Response Option receives a Deferred-Capable Cross Gateway Retrieve request (see Section 3.43.4.1.2.1):

1420
- The Responding Gateway may defer some or all of the results of the retrieve request – documents and registry errors – to one or more subsequent Deferred Results messages, in order to allow for additional processing time. See Section 3.39.4.3 for details.
  - How the Responding Gateway determines which results to return immediately and which to defer is not specified.

1425
  - How the Responding Gateway returns subsequent results in Deferred Results messages is not specified, for example: whether it returns individual results as soon as each one is available, returns groups of results, or waits until all results are available and returns them in a single Deferred Results message.

  - How and where processing delays are introduced behind the Responding Gateway is
1430 not specified. They may occur in non-XDS mechanisms, or in the unspecified interactions between the Responding Gateway and a grouped Document Consumer. Note that the Deferred Response Option is not supported on Document Repositories, so if the Responding Gateway is grouped with a Document Consumer, the Retrieve Document Set [ITI-43] transactions it triggers to a Document Repository in its
1435 community will not be Deferred.

- The Responding Gateway shall include any results it chooses to make immediately available in the initial Cross Gateway Retrieve Response. If none are available, the Responding Gateway shall generate an empty response (i.e., no documents or registry errors).

1440
  - The response status shall reflect only those results that are being returned in this message. For an empty response, the response status shall be `urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success`.

- o If any remaining results require additional processing time, the message shall not include those results and shall indicate Deferred processing in the RegistryResponse as described in Section 3.43.4.2.2.1.

- o If the DeferredProcessingEstimatedCompletion is provided, it shall reflect an estimate of all deferred processing remaining for the request.

- When Deferred processing is complete for a set of results and the Responding Gateway wishes to return them, it shall generate a Cross Gateway Retrieve Deferred Results message, as described in Section 3.39.4.3.

  - o The message shall include only those results that are available at this time, and that have not already been returned.

  - o The response status shall reflect only those results that are being returned in this message.

  - o If any remaining results require additional processing time, the message shall not include those results and shall indicate Deferred processing in the RegistryResponse as described in Section 3.43.4.2.2.1.

  - o If the DeferredProcessingEstimatedCompletion is provided, it shall reflect an estimate of all deferred processing remaining for the request.

- The Responding Gateway shall attempt to return all results of the request, through the combination of initial and Deferred responses.

  - o The Responding Gateway should attempt retries if an Initiating Gateway is unavailable. The details and number of attempts are not specified.

  - o The Responding Gateway shall not send the final Deferred Results message for a request, defined as a Deferred Results message that does not indicate additional Deferred processing, until the initial Cross Gateway Retrieve Response and any other Deferred Results messages have successfully been received/acknowledged.

> *Add the following **new** Section 3.39.4.2.3.1 as shown*

3.39.4.2.3.1 Deferred Response Option

If an Initiating Gateway supports the Deferred Response Option, it shall fulfill the requirements on a Document Consumer that supports the Deferred Response Option, as detailed in Section 3.43.4.2.3.3 Expected Actions. In addition:

- If the XDS Affinity Domain Option is supported, when consolidating results from multiple Responding Gateways, the Initiating Gateway shall consolidate the reporting of any Deferred processing for this request as follows:

  - o If any responses indicate Deferred processing, the Initiating Gateway shall indicate Deferred processing in the Retrieve Document Set response by adding the

1480   DeferredProcessingRequired slot. The Initiating Gateway should also consolidate any descriptions of the delay, e.g., by including each Value from a Responding Gateway in the ValueList.

- o If a consolidated estimate of all processing time remaining for all Responding Gateways for this request can be determined (i.e., latest time for completion), the Initiating Gateway may include it in the Retrieve Document Set response.

1485   • In the response to the initiator of the transaction – either the Document Consumer or the internal actor – in addition to the retrieve results that were returned by Responding Gateways in Cross Gateway Retrieve responses, the Initiating Gateway may also include any Deferred results that were received before it had returned this response.

Note: Later Deferred results for this request, when they become available, will be sent by the
1490 Responding Gateway in one or more Cross Gateway Retrieve Deferred Results messages, as described in Section 3.39.4.3. While there are requirements on the Responding Gateway to ensure correct and complete delivery of results, the Initiating Gateway should handle the cases where a particular Responding Gateway never returns Deferred Results messages for a request or returns only after a very long time. Details of this processing are unspecified. Some potential
1495 behaviors follow:

- The Initiating Gateway does no additional processing; it simply passes through Deferred results as received. The burden of managing the overall request is on the triggering actor.

- The Initiating Gateway determines if a timeout has been reached and notifies its triggering actor. If the triggering actor is a Document Consumer, the Initiating Gateway
1500   could report the timeout in a Deferred Results message, adding a RegistryError in the same way as it would report a non-responsive Responding Gateway in a synchronous Cross Gateway Retrieve response.

---

*Add the following **new** Section 3.39.4.3 as shown*

1505 **3.39.4.3 Cross Gateway Retrieve Deferred Results**

This message is used when a Responding Gateway and an Initiating Gateway support the Deferred Response Option.

The message is sent from a Responding Gateway to an Initiating Gateway to return Deferred results – documents and registry errors – from a prior Deferred-Capable retrieve request.

1510 **3.39.4.3.1 Trigger Events**

This message is initiated when Deferred processing is complete for a set of results and the Responding Gateway wishes to return them to the Initiating Gateway.

3.39.4.3.2 Message Semantics

The message semantics are based on the Retrieve Document Set Deferred Results. See Section 3.43.4.3.2.

3.39.4.3.3 Expected Actions

The Initiating Gateway shall support the Expected Actions described in Section 3.43.4.3.3 for the Document Consumer.

In addition, the Initiating Gateway shall support the Expected Actions described in Section 3.39.4.1.3 for the Initiating Gateway Actor.

In addition, if the Initiating Gateway supports the XDS Affinity Domain Option:

- It shall determine if this results message correlates to a prior Deferred-Capable request from a Document Consumer, by comparing the requestId attribute of the RegistryResponse element in the results to the set of WS-Addressing MessageIDs retained from prior Document Consumer Deferred-Capable requests. If it does, the Initiating Gateway shall initiate a Retrieve Document Set Deferred Results message (see Section 3.43.4.3) to the appropriate Document Consumer, as follows:

  - Direct the message to the Deferred response endpoint of the Document Consumer that was previously retained.

  - Include the results (documents and registry errors) that were passed in the Cross Gateway Retrieve Deferred Results message.

  - Set the requestId of the RegistryResponse to the WS-Addressing MessageID of the original [ITI-43] Retrieve Document Set request from the Document Consumer that was previously retained.

  - Consolidate the reporting of any remaining Deferred processing for this request:

    - If the Cross Gateway Retrieve Deferred Results message indicates additional Deferred processing, or if any of the requests to other Responding Gateways are not complete (i.e., the most recent response or Deferred Results message indicates additional Deferred processing), then the Initiating Gateway shall indicate additional Deferred processing by adding the DeferredProcessingRequired slot. The Initiating Gateway should also consolidate any descriptions of the delay, e.g., by including each Value from a Responding Gateway with a request that is not yet complete in the ValueList.

    - If a consolidated estimate of all processing time remaining for all Responding Gateways for this request can be determined (i.e., latest time for completion), the Initiating Gateway may include it.

1550   *Add the following **new** Section 3.39.4.4 as shown*

3.39.4.4 Cross Gateway Retrieve Deferred Results Acknowledgement

This message is used when an Initiating Gateway and a Responding Gateway support the Deferred Response Option.

1555   The message is sent from an Initiating Gateway to a Responding Gateway to acknowledge the receipt of Deferred results – documents and registry errors – from a prior Deferred-Capable retrieve request.

3.39.4.4.1 Trigger Events

This message will be triggered by a Cross Gateway Retrieve Deferred Results Message.

3.39.4.4.2 Message Semantics

1560   The Cross Gateway Retrieve Deferred Results Acknowledgement message semantics are based on the ebRS 3.0 RegistryResponse message.

3.39.4.4.3 Expected Actions

The Initiating Gateway shall return the Cross Gateway Retrieve Deferred Results Acknowledgement message generated from the results.

1565

Update Section 3.39.5 as shown.

3.39.5 Protocol Requirements

…

Responding Gateway: These are the requirements for the Synchronous or Asynchronous (WS-
1570   Addressing based) Cross Gateway Retrieve Response presented in the order in which they would appear in the Responding Gateway WSDL definition:

- The following types shall be imported (xsd:import) in the /definitions/types section:
  - namespace="urn:ihe:iti:xds-b:2007", schema="IHEXDS.xsd"
  - **If the Deferred Response Option is supported:**
1575   - **namespace="urn:ihe:iti:xds-b:2007", schemaLocation=" XDS.b_Deferred.xsd"**
- The /definitions/message/part/@element attribute of the Cross Gateway Retrieve Request message shall be defined as "ihe:RetrieveDocumentSetRequest"

- The /definitions/message/part/@element attribute of the Cross Gateway Retrieve
1580   Response message shall be defined as "ihe:RetrieveDocumentSetResponse"

- Refer to Table 3.39.5-1 below for additional attribute requirements

Table 3.39.5-1: Requirements for portType and Binding attributes

Attribute	Value
/definitions/portType/operation@name	RespondingGateway_CrossGatewayRetrieve
/definitions/portType/operation/input/@wsaw:Action	urn:ihe:iti:2007:CrossGatewayRetrieve
/definitions/portType/operation/output/@wsaw:Action	urn:ihe:iti:2007:CrossGatewayRetrieveResponse
/definitions/binding/operation/wsoap12:operation/@soapActionRequired	false

1585   **For the support of both Synchronous and WS-Addressing based Asynchronous Web Service exchange cases the requirements are the following: The Cross Gateway Retrieve Deferred Results and Cross Gateway Retrieve Deferred Results Acknowledgement messages will be transmitted using Synchronous or WS-Addressing based Asynchronous Web Services Exchange, according to the requirements specified in ITI TF-2x: Appendix V.3. The protocol requirements are identical to the Retrieve Document Set Deferred**
1590   **Results except as noted below.**

Initiating Gateway: These are the requirements for the Synchronous or Asynchronous (WS-Addressing based) Cross Gateway Retrieve Deferred Results transaction presented in the order in which they would appear in the Initiating Gateway WSDL definition:

- **The following types shall be imported (xsd:import) in the /definitions/types section:**

1595   o **namespace=" urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0", schemaLocation="rs.xsd"**

   o **namespace="urn:ihe:iti:xds-b:2007", schema="XDS.b_DocumentRepository.xsd"**

- **The /definitions/message/part/@element attribute of the Cross Gateway Retrieve**
1600   **Deferred Results message shall be defined as "ihe:RetrieveDocumentSetResponse"**

- **The /definitions/message/part/@element attribute of the Cross Gateway Retrieve Deferred Results Acknowledgement message shall be defined as "rs:RegistryResponse"**

- **Refer to Table 3.39.5-2 below for additional attribute requirements**

1605 **Table 3.39.5-2: Requirements for portType and Binding attributes**

Attribute	Value
/definitions/portType/operation@name	InitiatingGateway_CrossGatewayRetrieveDeferredResults
/definitions/portType/operation/input/@wsaw:Action	urn:ihe:iti:2019:CrossGatewayRetrieveDeferredResults
/definitions/portType/operation/output/@wsaw:Action	urn:ihe:iti:2019:CrossGatewayRetrieveDeferredResultsAcknowledgement
/definitions/binding/operation/wsoap12:operation/@soapActionRequired	false

These are the requirements that affect the wire format of the SOAP message. The other WSDL properties are only used within the WSDL definition and do not affect interoperability. Full sample request and response messages are in Section 3.39.5.1 Sample SOAP Messages.

1610 For informative WSDL for the Responding Gateway **and the Initiating Gateway** see ITI TF-2x: Appendix W.

…

---

*Add the following **new** sections 3.39.5.1.3 and 3.39.5.1.4 as shown*

1615 **3.39.5.1.3 Sample Cross Gateway Retrieve Deferred Results SOAP Request**

These samples show a SOAP request when the Deferred results are a mix of successes and errors, and when further results are to be expected in a later message.

The specific errors and registry objects are omitted for brevity; in a real scenario these will be populated with the appropriate results.

1620 **3.39.5.1.3.1 Synchronous Web Services Exchange**

The sample messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…; these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
1625  <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"
      xmlns:wsa="http://www.w3.org/2005/08/addressing">
          <S:Header>
              <wsa:Action
      S:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayRetrieveDeferredResults</ws
1630  a:Action>
              <wsa:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
      fbeab9e2a77e</wsa:MessageID>
          </S:Header>
          <S:Body>
1635          <RetrieveDocumentSetResponse xmlns="urn:ihe:iti:xds-b:2007"
                  xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
                  xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0">
                  <rs:RegistryResponse
                      requestId="urn:uuid:df9b89ed-395e-40a7-8510-0b4a390434c4"
1640              status="urn:ihe:iti:2007:ResponseStatusType:PartialSuccess">

                      <!-- Results not available now -->
                      <rs:ResponseSlotList>
                          <rim:Slot name="DeferredProcessingRequired">
1645                          <rim:ValueList>
                                  <rim:Value>'This request requires more time. The
      full results will be returned on the Deferred Response endpoint.'</rim:Value>
                              </rim:ValueList>
                          </rim:Slot>
1650                      <rim:Slot name="DeferredProcessingEstimatedCompletion">
                              <rim:ValueList>
                                  <rim:Value>201906020304</rim:Value>
                              </rim:ValueList>
                          </rim:Slot>
1655                  </rs:ResponseSlotList>

                      <!-- Errors available now -->
                      <rim:RegistryErrorList>
                      </rim:RegistryErrorList>
1660
                  </rs:RegistryResponse>

                  <!-- Documents available now -->
                  <DocumentResponse>
1665                  <homeCommunityId>urn:oid:1.2.3.4</homeCommunityId>
                      <RepositoryUniqueId>1.3.6.1.4...1000</RepositoryUniqueId>
                      <DocumentUniqueId>1.3.6.1.4...2300</DocumentUniqueId>
                      <mimeType>text/xml</mimeType>

1670  <Document>UjBsR09EbGhjZ0dTQUxNQUFBBUUNBRU1tQ1p0dU1GUXhEUzhi</Document>
                  </DocumentResponse>
                  <DocumentResponse>
                      <homeCommunityId>urn:oid:1.2.3.4</homeCommunityId>
                      <RepositoryUniqueId>1.3.6.1.4...1000</RepositoryUniqueId>
1675                  <DocumentUniqueId>1.3.6.1.4...2300</DocumentUniqueId>
                      <mimeType>text/xml</mimeType>
```

```
       <Document>UjBsR09EbGhjZ0dTQUxNQUFBUUNBRU1tQ1p0dU1GUXhhEUzhi</Document>
                   </DocumentResponse>
1680             </RetrieveDocumentSetResponse>
           </S:Body>
   </S:Envelope>
```

3.39.5.1.3.2 Asynchronous Web Services Exchange

1685 For the Asynchronous Web Services Exchange Option (WS-Addressing based), the sample messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…; these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
1690 <s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
     xmlns:a="http://www.w3.org/2005/08/addressing">
       <s:Header>
         <a:Action
     s:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayRetrieveDeferredResults</a:
1695 Action>
         <a:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
     fbeab9e2a77e</wsa:MessageID>
         <a:ReplyTo>
     <a:Address>http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.svc</a:Addre
1700 ss>
         </a:ReplyTo>
       </s:Header>
       <s:Body>
         <RetrieveDocumentSetResponse xmlns="urn:ihe:iti:xds-b:2007"
1705       xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
           xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0">
           <!-- Rest of RetrieveDocumentSetResponse goes here -->
         </RetrieveDocumentSetResponse>
       </s:Body>
1710 </s:Envelope>
```

3.39.5.1.4 Sample Cross Gateway Retrieve Deferred Results Acknowledgement SOAP Response

3.39.5.1.4.1 Synchronous Web Services Exchange

1715 The sample messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…; these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
      <s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
1720  xmlns:a="http://www.w3.org/2005/08/addressing">
        <s:Header>
          <a:Action
      s:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayRetrieveDeferredResultsAckn
      owledgement</a:Action>
1725      <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-
      821622C099DB</wsa:MessageID>
          <a:RelatesTo>urn:uuid:1795bb7a-8dc2-403a-9914-
      fbeab9e2a77e</wsa:MessageID>
      </s:Header>
1730    <s:Body>
          <rs:RegistryResponse
            xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
            status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"
          </rs:RegistryResponse>
1735    </s:Body>
      </s:Envelope>
```

3.39.5.1.4.2 Asynchronous Web Services Exchange

For the Asynchronous Web Services Exchange Option (WS-Addressing based), the sample
1740 messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…;
these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3:
Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
      <s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
1745  xmlns:a="http://www.w3.org/2005/08/addressing">
        <s:Header>
          <a:Action
      s:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayRetrieveDeferredResultsAckn
      owledgement</a:Action>
1750      <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-
      821622C099DB</wsa:MessageID>
          <a:RelatesTo>urn:uuid:1795bb7a-8dc2-403a-9914-
      fbeab9e2a77e</wsa:MessageID>
          <a:To
1755  s:mustUnderstand="1">http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.sv
      c</a:To>
        </s:Header>
        <s:Body>
          <rs:RegistryResponse
1760        xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
            status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"
          </rs:RegistryResponse>
        </s:Body>
      </s:Envelope>
```

1765
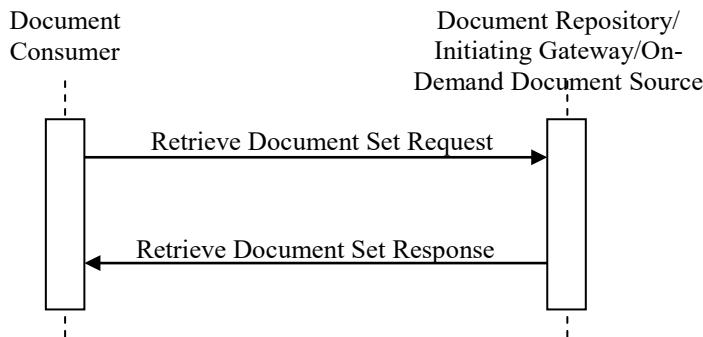
3.43 Retrieve Document Set [ITI-43]

…
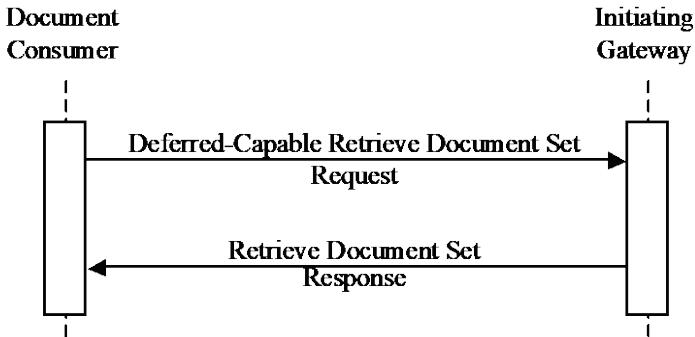
Update Section 3.43.4 as shown. Add the second interaction diagram.

3.43.4 Interaction Diagram

1770 **The standard interaction is shown below.**

If the Deferred Response Option is used, there are additional messages in the interaction.

1775

*Add the following **new** Section 3.43.4.1.2.1 as shown*

3.43.4.1.2.1 Deferred Response Option

If the Document Consumer supports the Deferred Response Option, it may trigger this pattern by modifying a Retrieve Document Set Request to an Initiating Gateway as follows, to make it
1780 "Deferred-Capable":

- A DeferredResponseEndpoint element shall be present in the SOAP Header, containing a URL with the Web Services Endpoint where a deferred response may be sent. The schema type is xsd:anyURI. An example follows:

1785
```
<ihe:DeferredResponseEndpoint xmlns:S=http://www.w3.org/2003/05/soap-envelope
S:mustUnderstand="false">service entry point url</ihe:DeferredResponseEndpoint>
```

Note: The Deferred mechanism also makes use of the WS-Addressing MessageID SOAP header block, which is already required.

Note: This same formatting is used by the Initiating Gateway to make Cross Gateway Retrieve requests Deferred-Capable.

1790 The Deferred-Capable Retrieve Document Set Request is fully compatible with Initiating Gateways that do not support the Deferred Response Option:

- If the Document Consumer knows the Initiating Gateway supports the Deferred Response Option, it should pass the SOAP mustUnderstand value of "true" or "1" to force handling of the Deferred-Capable aspects.

1795 - Otherwise (i.e., the Document Consumer does not know whether the Initiating Gateway supports the Deferred Response Option, or it knows that it does not support it), it should either omit the DeferredResponseEndpoint or pass the SOAP mustUnderstand value of "false" or "0" to allow it to be safely ignored.

1800 *Add the following **new** Section 3.43.4.1.3.3 as shown*

3.43.4.1.3.3 Deferred Response Option

If an Initiating Gateway that supports the Deferred Response Option receives a Deferred-Capable Retrieve Document Set Request: For each Responding Gateway it chooses to contact, it should determine whether to modify the request to make it Deferred-Capable, following the
1805 requirements of the Document Consumer in Section 3.43.4.1.2.1:

- If the Initiating Gateway chooses to do so, the request shall include the Deferred Response endpoint of the Initiating Gateway (not the endpoint passed by the Document Consumer).

1810 The Initiating Gateway shall also retain the information needed to correlate and process future deferred results: the Deferred endpoint and original WS-Addressing MessageID from the Document Consumer, and the MessageID for each request to a Responding Gateway.

- If the Initiating Gateway chooses not to do so, it shall send a regular Cross Gateway Retrieve request.

1815

*Add the following **new** Section 3.43.4.2.2.1 as shown*

3.43.4.2.2.1 Deferred Response Option: RegistryResponse

1820 If the Initiating Gateway supports the Deferred Response Option, it may indicate Deferred processing by modifying a Retrieve Document Set Response adding the following slots in the RegistryResponse element: "DeferredProcessingRequired" and optionally "DeferredProcessingEstimatedCompletion". The formatting rules for these slots are the same as those in ITI TF-2a: 3.18.4.1.3.4 for Registry Stored Query.

1825 An example of these slots is shown below:

```
<RetrieveDocumentSetResponse xmlns="urn:ihe:iti:xds-b:2007"
    xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
    xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0">
    <rs:RegistryResponse status="urn:ihe:iti:2007:ResponseStatusType:PartialSuccess">

        <!-- Results not available now -->
        <rs:ResponseSlotList>
            <rim:Slot name="DeferredProcessingRequired">
                <rim:ValueList>
                    <rim:Value>This request requires more time. The full results will be
returned on the Deferred Response endpoint.</rim:Value>
                </rim:ValueList>
            </rim:Slot>
            <rim:Slot name="DeferredProcessingEstimatedCompletion">
                <rim:ValueList>
                    <rim:Value>201906020304</rim:Value>
                </rim:ValueList>
            </rim:Slot>
        </rs:ResponseSlotList>

        <!-- Errors available now -->
        <rim:RegistryErrorList>
            ...
        </rim:RegistryErrorList>

    </rs:RegistryResponse>

    <!-- Documents available now -->
    <DocumentResponse>
        <homeCommunityId>urn:oid:1.2.3.4</homeCommunityId>
        <RepositoryUniqueId>1.3.6.1.4...1000</RepositoryUniqueId>
        <DocumentUniqueId>1.3.6.1.4...2300</DocumentUniqueId>
        <mimeType>text/xml</mimeType>
        <Document>UjBsR09EbGhjZ0dTQUxNQUFBUUNBRU1tQ1p0dU1GGUXhEUzhi</Document>
    </DocumentResponse>
</RetrieveDocumentSetResponse>
```

3.43.4.2.3.3 Deferred Response Option

1865 If a Document Consumer supports the Deferred Response Option it shall

- accept an RegistryResponse as described in Section 3.43.4.2.2.1, indicating that some results of the request will be deferred until a later time.

- retain the WS-Addressing MessageID of its original Retrieve Document Set Request in order to correlate future results.

1870

3.43.4.3 Retrieve Document Set Deferred Results

This message is used when a Document Consumer and an Initiating Gateway support the Deferred Response Option.

1875 The message is sent from an Initiating Gateway to a Document Consumer to return Deferred results – documents and registry errors – from a prior Deferred-Capable retrieve request.

3.43.4.3.1 Trigger Events

This message is initiated when the Initiating Gateway receives a Cross Gateway Retrieve Deferred Results message from a Responding Gateway.

1880 ### 3.43.4.3.2 Message Semantics

The Retrieve Document Set Deferred Results message semantics are based on the Retrieve Document Set Response, but the message is packaged as a SOAP request instead of a response. For the contents of the Retrieve Document Set Response, see Section 3.43.4.2.2. For the web services details and sample messages, see Section 3.43.5.

1885 In addition, the RegistryResponse element shall contain the requestId attribute, containing the WS-Addressing MessageID of the original Retrieve Document Set Request this Results message is a response to.

The Retrieve Document Set Deferred Results message may indicate in the RegistryResponse element that additional Deferred processing is needed, as defined in Section 3.43.4.2.2.1.

1890 ### 3.43.4.3.3 Expected Actions

This message contains results from a prior Retrieve Document Set. As such, the Document Consumer shall fulfill the same requirements as it does for the Retrieve Document Set Response, detailed in Section 3.43.4.2.3.

In addition:

1895   1. The Document Consumer shall attempt to correlate this message to the appropriate original request, by matching the requestId attribute of the RegistryResponse element in the results to the WS-Addressing MessageID of the original request.

2. The Document Consumer may verify the format and validity of the results message.

3. If the requestId attribute is not present, no matching request can be found, or the results
1900   message is not valid, the Document Consumer shall generate a Retrieve Document Set Deferred Results Acknowledgement message with RegistryResponse status = "urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Failure", and containing a RegistryError element with errorCode "XDSRegistryError" and codeContext explaining the nature of the error.

1905   4. If the matching request can be found and the results message is valid,

a. If this is the final set of results for this request, i.e., the RegistryResponse does not indicate further Deferred Processing as described in Section 3.43.4.2.2.1, the Document Consumer shall delete or otherwise mark as completed the retained WS-Addressing MessageID of the original request, such that no subsequent results
1910   messages will match the request.

b. The Document Consumer shall generate a Retrieve Document Set Deferred Results Acknowledgement message with RegistryResponse status = "urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success".

1915   *Add the following **new** Section 3.43.4.4 as shown*

3.43.4.4 Retrieve Document Set Deferred Results Acknowledgement

This message is used when a Document Consumer and an Initiating Gateway support the Deferred Response Option.

The message is sent from a Document Consumer to an Initiating Gateway to acknowledge the
1920   receipt of Deferred results – documents and registry errors – from a prior Deferred-Capable retrieve request.

3.43.4.4.1 Trigger Events

This message will be triggered by a Retrieve Document Set Deferred Results Message.

3.43.4.4.2 Message Semantics

1925   The Retrieve Document Set Deferred Results Acknowledgement message semantics are based on the ebRS 3.0 RegistryResponse message.

3.43.4.4.3 Expected Actions

The Document Consumer shall return the Registry Stored Query Deferred Results Acknowledgement message generated from the results.

1930

Update Section 3.43.5 as shown.

3.43.5 Protocol Requirements

The Retrieve Document Set transaction shall comply with all requirements described in ITI TF-2x: Appendix V: Web Services for IHE Transactions.

1935   The Retrieve Document Set transaction:

…

Document Repository or Initiating Gateway: These are the requirements for the Retrieve Document Set transaction presented in the order in which they would appear in the Document Repository WSDL definition:

1940
- …
- Refer to Table 3.43.5-1 below for additional attribute requirements

Initiating Gateway: If the Deferred Response Option is supported, these are the additional requirements for the Retrieve Document Set transaction presented in the order in which they would appear in the Initiating Gateway WSDL definition:

1945
- **The following types shall be imported (xsd:import) in the /definitions/types section:**
  - **namespace="urn:ihe:iti:xds-b:2007", schemaLocation=" XDS.b_Deferred.xsd"**

…

1950   ITI TF-2x: Appendix V.4.8 includes an example of the SOAP Body for a Provide and Register Document Set-b Request message applicable to the AS4 Asynchronous Web Services stack

The Retrieve Document Set Deferred Results transaction:

A. **shall comply with the Synchronous Web Services Exchange protocol stack with all**
1955   **requirements specified in ITI TF-2x: Appendix V.3: Synchronous and Asynchronous (WS-Addressing) Web Services. These are based on SOAP 1.2 and MTOM with XOP encoding (labeled MTOM/XOP in this specification).**

For the Synchronous Web Services Exchange protocol stack, the Document Consumer that supports the Deferred Response Option shall:

1960

- o **Accept the Retrieve Document Set Deferred Results message in MTOM/XOP format.**
- o **Generate the Retrieve Document Set Deferred Results Acknowledgement message in MTOM/XOP format.**

1965

For the Synchronous Web Services Exchange protocol stack, the Initiating Gateway that supports the Deferred Response Option shall:

- o **Generate the Retrieve Document Set Deferred Results message in MTOM/XOP format.**
- o **Accept the Retrieve Document Set Deferred Results Acknowledgement message in MTOM/XOP format.**

1970

Document Consumer: These are the requirements for the Retrieve Document Set Deferred Results transaction presented in the order in which they would appear in the Document Repository WSDL definition:

- **The following types shall be imported (xsd:import) in the /definitions/types section:**

1975

- o **namespace=" urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0", schemaLocation="rs.xsd"**
- o **namespace="urn:ihe:iti:xds-b:2007", schema="XDS.b_DocumentRepository.xsd"**

1980

- **The /definitions/message/part/@element attribute of the Retrieve Document Set Deferred Results message shall be defined as "ihe:RetrieveDocumentSetResponse"**
- **The /definitions/message/part/@element attribute of the Retrieve Document Set Deferred Results Acknowledgement message shall be defined as "rs:RegistryResponse"**

1985

- **Refer to Table 3.43.5-2 below for additional attribute requirements**

Table 3.43.5-2: Synchronous Web Services Attribute Requirements

Attribute	Value
/definitions/portType/operation@name	DocumentConsumer_RetrieveDocumentSet DeferredResults
/definitions/portType/operation/input/@ws aw:Action	urn:ihe:iti:2019:RetrieveDocumentSetDefe rredResults
/definitions/portType/operation/output/@w saw:Action	urn:ihe:iti:2019: RetrieveDocumentSetDeferredResultsAckn owledgement
/definitions/binding/operation/wsoap12:op eration/@soapActionRequired	false

1990 **These are the requirements that affect the wire format of the SOAP message. The other WSDL properties are only used within the WSDL definition and do not affect interoperability. Full sample request and response messages are in Section 3.43.5.1 Sample SOAP Messages.**

For informative WSDL for the Document Consumer see ITI TF-2x: Appendix W.

1995 **B. May comply with the WS-Addressing based Asynchronous Web Services Exchange protocol stack. When the Asynchronous Web Services Exchange Option (WS-Addressing based) is selected on a Document Consumer or the Initiating Gateway, it shall meet all requirements specified in ITI TF-2x: Appendix V.3: Synchronous and WS-Addressing Asynchronous Web Services. These are based on SOAP 1.2 and MTOM with XOP encoding as used by the Synchronous Web Services Exchange**

2000 **protocol stack (labeled MTOM/XOP in this specification).**

To support the Asynchronous Web Services Exchange Option (WS-Addressing based) on the Initiating Gateway, the Document Consumer will support the use of a non-anonymous response EPR in the WS-Addressing replyTo header.

2005 The <xds:RetrieveDocumentSetRequest/> element is defined as:

…

> *Add the following **new** Section 3.43.5.1.4 as shown*

3.43.5.1.4 Sample Retrieve Document Set Deferred Results SOAP Request

2010 These samples show a SOAP request when the Deferred results are a mix of successes and errors, and when further results are to be expected in a later message.

The specific errors and registry objects are omitted for brevity; in a real scenario these will be populated with the appropriate results.

3.43.5.1.4.1 Synchronous Web Services Exchange

2015 The sample messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…; these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
2020    <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"
        xmlns:wsa="http://www.w3.org/2005/08/addressing">
            <S:Header>

        <wsa:Action>urn:ihe:iti:2019:RetrieveDocumentSetDeferredResults</wsa:Action>
                <wsa:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
2025    fbeab9e2a77e</wsa:MessageID>
            </S:Header>
            <S:Body>
                <RetrieveDocumentSetResponse xmlns="urn:ihe:iti:xds-b:2007"
                    xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
2030                xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0">
                    <rs:RegistryResponse
                        requestId="urn:uuid:df9b89ed-395e-40a7-8510-0b4a390434c4"
                        status="urn:ihe:iti:2007:ResponseStatusType:PartialSuccess">

2035                    <!-- Results not available now -->
                        <rs:ResponseSlotList>
                            <rim:Slot name="DeferredProcessingRequired">
                                <rim:ValueList>
                                    <rim:Value>'This request requires more time. The
2040    full results will be returned on the Deferred Response endpoint.'</rim:Value>
                                </rim:ValueList>
                            </rim:Slot>
                            <rim:Slot name="DeferredProcessingEstimatedCompletion">
                                <rim:ValueList>
2045                                <rim:Value>201906020304</rim:Value>
                                </rim:ValueList>
                            </rim:Slot>
                        </rs:ResponseSlotList>

2050                    <!-- Errors available now -->
                        <rim:RegistryErrorList>
                        </rim:RegistryErrorList>

                    </rs:RegistryResponse>
2055
                    <!-- Documents available now -->
                    <DocumentResponse>
                        <homeCommunityId>urn:oid:1.2.3.4</homeCommunityId>
                        <RepositoryUniqueId>1.3.6.1.4...1000</RepositoryUniqueId>
2060                    <DocumentUniqueId>1.3.6.1.4...2300</DocumentUniqueId>
                        <mimeType>text/xml</mimeType>

        <Document>UjBsR09EbGhjZ0dTQUxNQUFBUUNBRU1tQ1p0dU1GGUXhEUzhi</Document>
                    </DocumentResponse>
2065                <DocumentResponse>
                        <homeCommunityId>urn:oid:1.2.3.4</homeCommunityId>
                        <RepositoryUniqueId>1.3.6.1.4...1000</RepositoryUniqueId>
                        <DocumentUniqueId>1.3.6.1.4...2300</DocumentUniqueId>
                        <mimeType>text/xml</mimeType>
2070
        <Document>UjBsR09EbGhjZ0dTQUxNQUFBUUNBRU1tQ1p0dU1GGUXhEUzhi</Document>
```

```
              </DocumentResponse>
            </RetrieveDocumentSetResponse>
        </S:Body>
2075  </S:Envelope>
```

3.43.5.1.4.2 Asynchronous Web Services Exchange

For the Asynchronous Web Services Exchange Option (WS-Addressing based), the sample
messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…;
2080 these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3:
Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
      <s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
      xmlns:a="http://www.w3.org/2005/08/addressing">
2085    <s:Header>
          <a:Action
      s:mustUnderstand="1">urn:ihe:iti:2019:RetrieveDocumentSetDeferredResults</a:A
      ction>
          <a:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
2090  fbeab9e2a77e</wsa:MessageID>
          <a:ReplyTo>
      <a:Address>http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.svc</a:Addre
      ss>
          </a:ReplyTo>
2095    </s:Header>
        <s:Body>
          <RetrieveDocumentSetResponse xmlns="urn:ihe:iti:xds-b:2007"
            xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
            xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0">
2100
          <!-- Rest of RetrieveDocumentSetResponse goes here -->

          </RetrieveDocumentSetResponse>
        </s:Body>
2105  </s:Envelope>
```

*Add the following **new** Section 3.43.5.1.5 as shown*

3.43.5.1.5 Sample Retrieve Document Set Deferred Results Acknowledgement SOAP Response

2110 ### 3.43.5.1.5.1 Synchronous Web Services Exchange

The sample messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>,
<a:ReplyTo/>…; these WS-Addressing headers are populated according to ITI TF-2x: Appendix
V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
2115   <s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
       xmlns:a="http://www.w3.org/2005/08/addressing">
         <s:Header>
           <a:Action
       s:mustUnderstand="1">urn:ihe:iti:2019:RetrieveDocumentSetDeferredResultsAckno
       wledgement</a:Action>
2120       <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-
       821622C099DB</wsa:MessageID>
           <a:RelatesTo>urn:uuid:1795bb7a-8dc2-403a-9914-
       fbeab9e2a77e</wsa:MessageID>
       </s:Header>
2125     <s:Body>
           <rs:RegistryResponse
             xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
             status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"
           </rs:RegistryResponse>
2130     </s:Body>
       </s:Envelope>
```

3.43.5.1.5.2 Asynchronous Web Services Exchange

For the Asynchronous Web Services Exchange Option (WS-Addressing based), the sample
2135 messages show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…;
these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3:
Synchronous and Asynchronous (WS-Addressing based) Web Services.

```
2140   <s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
       xmlns:a="http://www.w3.org/2005/08/addressing">
         <s:Header>
           <a:Action
       s:mustUnderstand="1">urn:ihe:iti:2019:RetrieveDocumentSetDeferredResultsAckno
       wledgement</a:Action>
2145       <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-
       821622C099DB</wsa:MessageID>
           <a:RelatesTo>urn:uuid:1795bb7a-8dc2-403a-9914-
       fbeab9e2a77e</wsa:MessageID>
           <a:To
2150   s:mustUnderstand="1">http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.sv
       c</a:To>
         </s:Header>
         <s:Body>
           <rs:RegistryResponse
2155         xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
             status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"
           </rs:RegistryResponse>
         </s:Body>
       </s:Envelope>
```

2160