

Integrating the Healthcare Enterprise



**IHE ITI**

5      **Technical Framework Supplement**

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

15      **Revision 1.1 – Trial Implementation**

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**Please verify you have the most recent version of this document. See [here](#) for Trial Implementation and Final Text versions and [here](#) for Public Comment versions.**

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## Foreword

This is a supplement to the IHE IT Infrastructure Technical Framework V16.0. In addition, this supplement presumes the integration of the following:

- 30       • Asynchronous AS4 Option supplement, Rev. 1.2 – 2019-07-12.

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

35       This supplement is published on August 15, 2019 for trial implementation and may be available for testing at subsequent IHE Connectathons. The supplement may be amended based on the results of testing. Following successful testing it will be incorporated into the IT Infrastructure Technical Framework. Comments are invited and may be submitted at [http://www.ihe.net/ITI\\_Public\\_Comments](http://www.ihe.net/ITI_Public_Comments).

This supplement describes changes to the existing technical framework documents.

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

<i>Amend Section X.X by the following:</i>
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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.

General information about IHE can be found at [www.ihe.net](http://www.ihe.net).

Information about the IHE IT Infrastructure domain can be found at [ihe.net/IHE\\_Domains](http://ihe.net/IHE_Domains).

50       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](http://ihe.net/IHE_Process) and <http://ihe.net/Profiles>.

The current version of the IHE IT Infrastructure Technical Framework can be found at [http://ihe.net/Technical\\_Frameworks](http://ihe.net/Technical_Frameworks).

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## 165 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]
- 170 • Retrieve Document Set [ITI-43]
- Cross Gateway Query [ITI-38]
- Cross Gateway Retrieve [ITI-39]

175 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 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](http://wiki.ihe.net/index.php?title=Asynchronous_Messaging).

180 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.

185 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.

## 190 Open Issues

None.

## Closed Issues

- **DEF-1: Should an alternate approach to XCA Deferred be used to handle long latency query and retrieve?**
- 195 ○ **No.** The following alternates were considered and rejected:
  - 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

- 200 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.
- 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
    - 205 • Existing mechanism; no new specifications development.
    - The primary need of the use case is met: some degree of longer  
latency supported.
  - Cons
    - 210 • With its significantly distinct usage of the SOAP header, AS4 is  
better suited for an environment in which all web services operate  
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  
215 second, an estimate of how long.
    - 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  
220 is not typically used for this. See Closed Issue AS4-5 in the  
Asynchronous AS4 Supplement.
  - Option: DSUB
    - In this alternative, the interested party would subscribe to notifications for  
the patient using the same filters they would use for a document query.
    - 225 ○ Either notification pushes or stored notification pulls could be used.
    - Pros
      - Existing mechanism.
      - Piecemeal responses: the interested party could receive documents  
as soon as they are available, rather than waiting for all to be  
230 completed.
    - 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.
  - Option: Use Service-Level Agreements (SLAs) to implicitly enforce completion of all documents or high-priority documents within a certain time.
  - 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 way for the Broker to cancel the subscription when complete and notify of that.
  - Option: Add a workflow that contains the explicit notification (see next option).
- 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.

- Option: DSUB+XDW

- 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.
- 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”.



- Once all clinical documents for this query have been returned, the responder would return the workflow document with a status of “complete”.
- 275 ○ Option: Trigger the workflow by requesting a specific format code.
  - 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.
- 280 ○ 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.
- 285 ○ 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>
      290 ...
      <TriggerSingleQueryWorkflow>
```
- Pros
  - Existing mechanism: minimal additional specification development needed.
  - 295 • Piecemeal responses: the interested party could receive documents as soon as they are available, rather than waiting for all to be completed.
- Cons
  - Would need to define new workflow document format.
  - 300 • Would need to define triggering mechanism for the workflow.
- **As this depends on DSUB, it shares those shortcomings. In addition, the Technical Committee feels this option may be too complex.**
- Option: WS-Addressing-style Asynchronous messaging
  - In this alternative, the interested party would use the WS-Addressing asynchronous mechanism to send an XCA Cross Gateway Query.
  - 305 ○ Pros

- Existing mechanism; no new specifications development.
- Some degree of longer latency supported.
- 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.
- Option: XDR+XDW
  - 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.
  - The workflow document would be similar to that used in DSUB+XDW.
  - Pros
    - Compared to DSUB, may be more straightforward to implement for systems that already support XDR but not DSUB.
  - 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.**
- Option: XDM+XDR+XDW over SMTP+S/MIME
  - This alternative would be identical to XDR+XDW, but with a different transport layer. SMTP would be used as the transport mechanism, and the XDR messages would be wrapped as XDM files to be sent as S/MIME attachments. This would utilize an existing standard of XDM+XDR over SMTP+S/MIME defined by the Direct Project:  
[http://wiki.directproject.org/w/images/3/3e/2011-03-09\\_PDF\\_-\\_XDR\\_and\\_XDM\\_for\\_Direct\\_Messaging\\_Specification\\_FINAL.pdf](http://wiki.directproject.org/w/images/3/3e/2011-03-09_PDF_-_XDR_and_XDM_for_Direct_Messaging_Specification_FINAL.pdf)

- Pros
  - Would allow support for existing SMTP-based systems.
- Cons
  - 345 • **The same cons as XDR+XDW exist, plus there is an additional layer of complexity in the wrapping and transport layer.**
- Option: HL7<sup>®1</sup> FHIR<sup>®2</sup> subscriptions and DocumentReference
  - In this alternative, the interested party would use FHIR subscription mechanisms to subscribe to documents for a patient.
- 350 ○ Pros
  - Existing mechanism; no new specifications development.
- Cons
  - 355 • **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?**
  - **Yes, but not for all groupings at this time.** The following groupings were considered:
    - 360 ○ Responding Gateway, grouped with a Document Consumer.
      - 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?
    - 365 ○ **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.
  - Initiating Gateway, grouped with a Document Consumer.
    - 370 ○ 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?
    - **The committee decided no**, using the same reasoning as the previous case.

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<sup>1</sup> HL7 is the registered trademark of Health Level Seven International.

<sup>2</sup> FHIR is the registered trademark of Health Level Seven International.

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

- 375 ○ 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).
- 380 ○ **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.
- 385 ○ **Chosen option: Add Deferred Response options for [ITI-18] and [ITI-43], only in this XCA context.**
- Option: Explicitly limit the Deferred Response Option to triggering by Initiating Gateways through internal mechanisms, not triggering by [ITI-18] or [ITI-43].
- Option: Allow the Initiating Gateway to deal with this case internally.
  - 390 ● 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.
  - 395 ● 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.**
  - **Written towards the Asynchronous AS4 Option supplement.**
- 400 ● **DEF-4: Should this supplement include its own explicit use cases in Vol 1? The XCPD Deferred Response Option does not.**
  - **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:
  - 405 ○ 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

- 410 system may need to make use of deferred responses for XCPD, XCA Query, and XCA Retrieve:
- Initiating Gateway sends deferred XCPD request.
  - User at responding system searches for patient records, determines matches, and triggers deferred XCPD response.

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  - Initiating Gateway sends deferred XCA Query request.
  - 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.

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  - Initiating Gateway sends deferred XCA Retrieve request.
  - User at responding system performs any remaining tasks to make documents available, and triggers deferred XCA response.
  - Case 2: A Responding Gateway uses an on-demand document entry to generate a comprehensive longitudinal record (e.g., a CCD<sup>3</sup>) for a patient from a number of

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  - 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:
  - Initiating Gateway sends deferred XCA Retrieve request for on-demand entry.

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

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  - 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.
  - Initiating Gateway sends synchronous XCA Retrieve request and receives

440

  - documents.
    - **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.

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<sup>3</sup> CCD is the registered trademark of Health Level Seven International.

- 445      ○ 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.

450      ○ There are the following items that would need to be mapped:

  - Custom SOAP header blocks
    - AS4 allows for this; it just needs to be wrapped as a message property. See XCPD AS4 wrapper (CorrelationTimeToLive). We would also need to account for the mustUnderstand attribute, either by adding a message property for it or omitting it.
  - Use ConversationId to tie all Results messages to the original request in lieu of WS-Addressing MessageID.
- 455      • **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.
- 465      • **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.
- 470      ○ **Endpoint only.** No compelling reason to do otherwise.

475      • **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?**

- 480           ○ **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.
- 485
- **DEF-9: Will we include in scope the possibility of multiple responses to a single request, each response coming asynchronously?**
    - **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?**
    - Example: a malformed request could be caught right away.
    - **No. Any error may be sent in either response.**
  - 495 • **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?**
    - **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:
      - New fields using extensibility mechanisms: SOAP header blocks and ebXML Slots
      - Making use of existing optional fields: AdhocQueryRequest/@id and AdhocQueryResponse/@requestId
    - 500
    - 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.**
    - **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.
    - 510

- 515      • **DEF-13: The Responding Gateway has a lot of flexibility to return Deferred 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 Deferred results to Document Consumers from multiple Responding Gateways?**
- 520              ○ **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
- 525              Deferred results 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?**
- 530              ○ **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?**
- 535              ○ **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.
- **DEF-16: Should canceling an ongoing deferred request be supported?**
- 540              ○ 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 deferred processing is indicated, the requester has enough information.
- 545                      ○ 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.
- A responder performs value-added services for an additional charge using the deferred mechanism and returns the charge amount in the explanation
- 550                      of the initial response, and the requester does not wish to incur this charge.
- **The group did not decide to pursue this mechanism at this time.** Given that deferred processing takes a certain amount of time, in the exceptional situation



that something needs to be canceled, manual/administrative processes could be used.

555

- **DEF-17: Should the requester be able to pass a value to indicate how long they would wait for responses?**
  - **The group did not decide to pursue this mechanism at this time.** Implementers may negotiate SLAs through other means.

# **Volume 1 – Profiles**

560 **18 Cross-Community Access (XCA)**

...

*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**

565 ...

**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
	<b><u>Deferred Response (Note 3)</u></b>	<b><u>ITI TF-1: 18.2.7</u></b>
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
	<b><u>Deferred Response (Note 3)</u></b>	<b><u>ITI TF-1: 18.2.7</u></b>
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
	<b><u>Deferred Response (Note 3)</u></b>	<b><u>ITI TF-1: 18.2.7</u></b>

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.

570 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).

**Note 3: The Deferred Response Option does not define an encoding for AS4 Asynchronous Web Services Exchange.**

...

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

575 **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 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](http://wiki.ihe.net/index.php?title=Asynchronous_Messaging).

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

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

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 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.

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-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.

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-

615 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.

<i>Add the following <b>new</b> Section 18.3.3.2 as shown</i>
---

## 620 **18.3 XCA Process Flow**

### **18.3.1 Use Cases**

...

#### **18.3.3.2 Use of Deferred Response Option**

625 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 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.
- 630 • Deep search: search secondary storage facilities, potentially involving transformation and registration of content.
- 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).

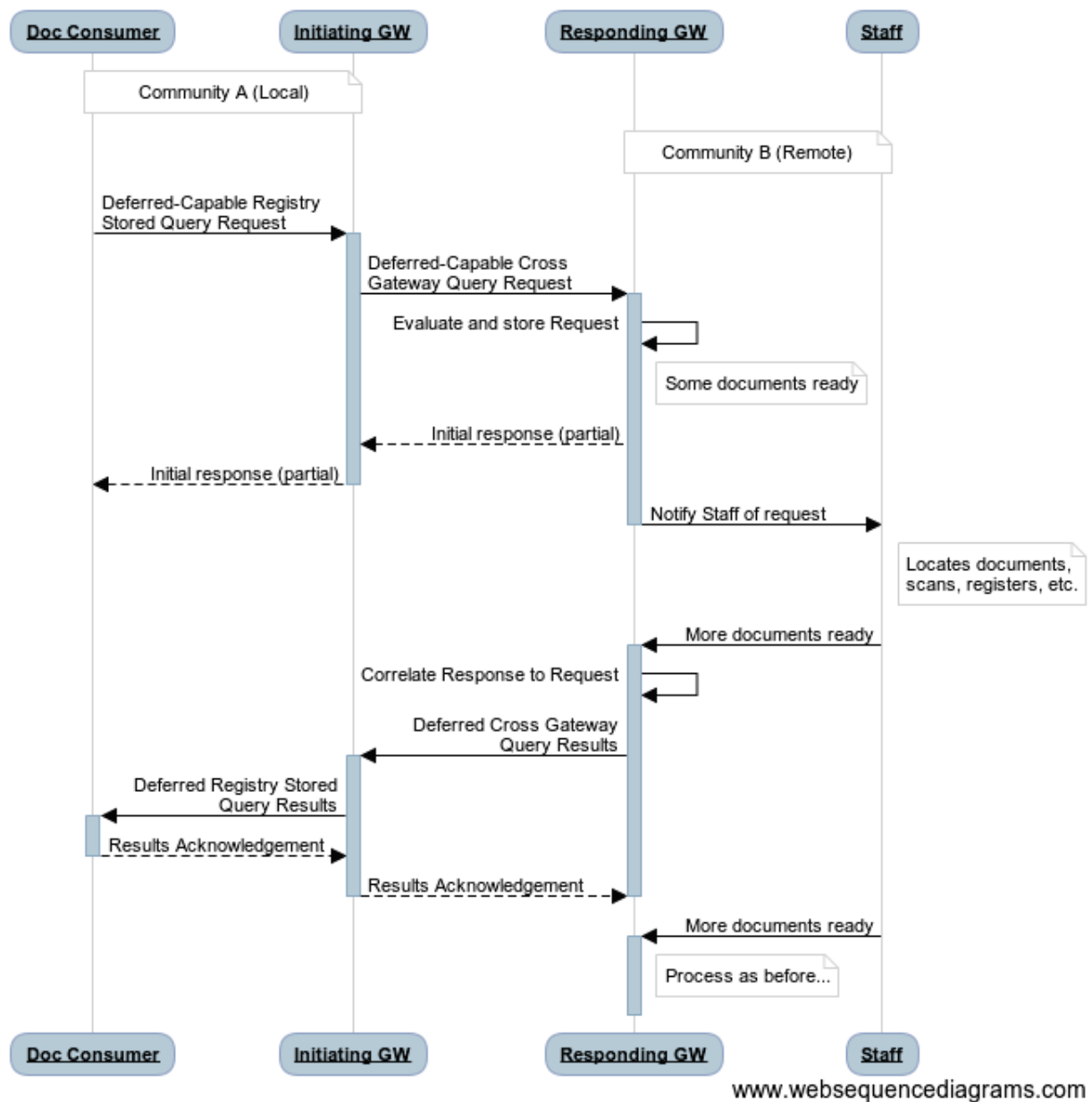


Figure 18.3.3-3: Deferred response from paper-based community

- 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.
- 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.

- 645      • 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.
  - 650      • The **Initiating Gateway** passes the initial response on to the Document Consumer, aggregating responses from multiple Responding Gateways if necessary.
  - 655      • At this point, the first exchange is complete and all system actors are free to do other work.
  - 655      • **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:*
- 660      • When **Staff** has completed work on some documents, it notifies the Responding Gateway, using unspecified mechanisms.
  - 660      • 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.
  - 665      • The **Initiating Gateway** receives the response and forwards it as a Registry Stored Query Deferred Results message to the Document Consumer endpoint.
  - 665      • The **Document Consumer** returns an acknowledgement to the Initiating Gateway.
  - 665      • The **Initiating Gateway** returns an acknowledgement to the Responding Gateway.

## Volume 2a – Transactions

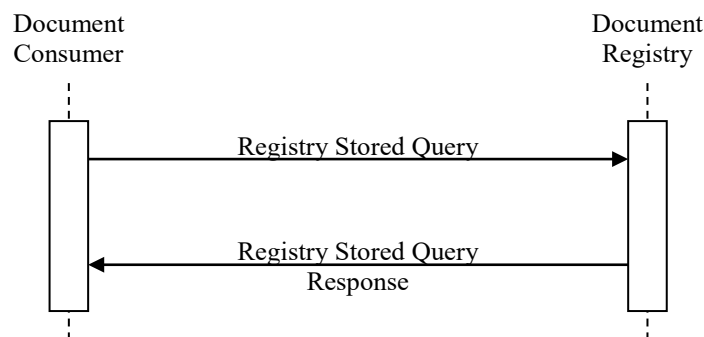
### 3.18 Registry Stored Query [ITI-18]

...

*Update Section 3.18.4 as shown. Add the second interaction diagram.*

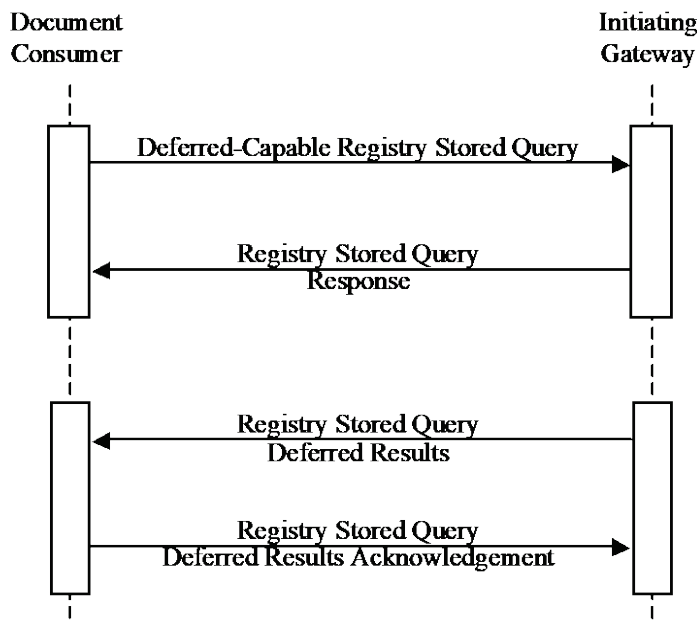
#### 3.18.4 Messages

The standard interaction is shown below.



**Figure 3.18.4-1: Interaction Diagram**

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



**Figure 3.18.4-2: Deferred Response Option Interaction Diagram**



*Update Section 3.18.4.1.2.5:*

*Add new subsection heading 3.18.4.1.2.5.1 “On-Demand Documents Option”*

*Add new entire Section 3.18.4.1.2.5.2.*

### **3.18.4.1 Registry Stored Query**

685 ...

#### **3.18.4.1.2 Message Semantics**

...

#### **3.18.4.1.2.5 Compatibility of Options**

##### **3.18.4.1.2.5.1 On-Demand Documents Option**

690 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.

...

##### **695 3.18.4.1.2.5.2 Deferred Response Option: Deferred-Capable Registry Stored Query Request**

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”:

- 700
- A custom SOAP Header element named DeferredResponseEndpoint in the urn:ihe:iti:xds-b:2007 namespace 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:

705

```
<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.

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

710 Note: The Initiating Gateway uses the same semantics 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:

- The AdhocQueryRequest id is an existing optional field, so it may be included without impact.
- 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 either omit the DeferredResponseEndpoint or pass the SOAP mustUnderstand value of “false” or “0” to allow it to be safely ignored.

*Update Section 3.18.4.1.2.7 as shown.*

### 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/wssoap12:operation/@soapActionRequired	false

**Initiating Gateway: If the Deferred Response Option is supported, these are the additional 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:**
  - **namespace="urn:ihe:iti:xds-b:2007", schemaLocation="XDS.b Deferred.xsd"**

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

*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 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:**
      - ...
    - **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 Deferred-Capable Registry Stored Query Request: For each Responding Gateway it chooses to contact, it shall determine whether to keep the request Deferred-Capable:**
        - **If the Initiating Gateway chooses to do so, the Deferred-Capable Registry Stored Query Request shall follow the requirements of the Document Consumer in Section 3.18.4.1.2.5.2. In addition:**
          - **The request shall include the Deferred Response endpoint of the Initiating Gateway (not the endpoint passed by the Document Consumer). Note that the mustUnderstand value may need to change based on the Initiating Gateway’s knowledge of the Responding Gateway’s support for Deferred.**
          - **The request shall 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.**
          - **The Initiating Gateway shall 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, removing the DeferredResponseEndpoint element.**
5. Return XML formatted metadata in an AdhocQueryResponse message...
6. When the Document Consumer receives the query response from the Initiating Gateway ...

...

*Near the end of Section 3.18.4.1.3, add the following preface for the Document Consumer Actor (to match what is above, and create a bullet list for existing text)*

**For Document Consumer Actors:**

- 780     • 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)
- 785     • If the Document Consumer supports the Deferred Response Option it shall
  - **when sending a Deferred-Capable Registry Stored Query, retain the id of the AdhocQueryRequest in order to correlate future results messages to it,**
  - **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.**

790

***Replace existing Section 3.18.4.1.3.4 (that is Intentionally Left Blank) with the following text (note change in section name)***

**3.18.4.1.3.4 Deferred Response Option: AdhocQueryResponse**

795     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:

- A “DeferredProcessingRequired” slot shall be included.
  - 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.
- 800     • A “DeferredProcessingEstimatedCompletion” slot may be included.
  - The Value is required, and shall be formatted as an absolute time, using HL7 V2.5 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.

805     An example of these slots is shown below:

810

```

<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">

```

815

```

  <!-- Results not available now -->
  <rs:ResponseSlotList>
    <rim:Slot name="DeferredProcessingRequired">
      <rim:ValueList>

```

820

```

        <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>

```

825

```

        <rim:Value>201906020304</rim:Value>
      </rim:ValueList>
    </rim:Slot>
  </rs:ResponseSlotList>

```

830

```

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

```

835

```

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

```

840

```

</query:AdhocQueryResponse>

```

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

### 3.18.4.2 Registry Stored Query Deferred Results

845 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 – in response to a prior Deferred-Capable Registry Stored Query Request (see Section 3.18.4.1.2.5.2).

### 3.18.4.2.1 Trigger Events

850 This message will be triggered when the Initiating Gateway receives a Cross Gateway Query Deferred Results message from a Responding Gateway, when that message corresponds to a prior Deferred-Capable Registry Stored Query Request. See ITI TF-2b: 3.38.4.2.

### 3.18.4.2.2 Message Semantics

855 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.

860 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.

### 865 3.18.4.2.2.1 Web Services Transport

This section describes requirements for Web Services transport for:

- Synchronous
- WS-Addressing -based Asynchronous

870 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

875

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 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":
input message      -> "RegistryStoredQueryDeferredResults_Message"
output message     -> "RegistryStoredQueryDeferredResultsAcknowledgement_Message"
portType           -> "DocumentConsumerQuery_PortType"
operation          -> "DocumentConsumer_RegistryStoredQueryDeferredResults"
SOAP 1.2 binding   -> "DocumentConsumerQuery_Binding_Soap12"
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 WSDL definition:

- The following types shall be imported (xsd:import) in the /definitions/types section:
  - namespace="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0", schemaLocation="query.xsd"
  - namespace="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0", schemaLocation="rs.xsd"
- 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.
- 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/soap12:operation/@soapActionRequired	false

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

```

915 <?xml version="1.0" encoding="utf-8"?>
    <definitions ...>
        ...
        <types>
920             <xsd:schema elementFormDefault="qualified">
                <xsd:import
                    namespace="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
                    schemaLocation="..\schema\ebRS\query.xsd"/>
                <xsd:import
925                     namespace="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
                     schemaLocation="..\schema\ebRS\rs.xsd"/>
                ...
            </xsd:schema>
        </types>
930        <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
935 Acknowledgement</documentation>
            <part name="body" element="rs:RegistryResponse"/>
        </message>
        ...
940        <portType name="DocumentConsumerQuery_PortType">
            <operation name="DocumentConsumer_RegistryStoredQueryDeferredResults">
                <input message="ihe:RegistryStoredQueryDeferredResults_Message"

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

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

```

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



#### **3.18.4.2.2.1.1 Sample SOAP Messages**

960 The samples in the following two sections show a SOAP request and its related 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**

##### **3.18.4.2.2.1.1.1.1 Synchronous Web Services Exchange**

965 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.

```

970 <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>
975 <a:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
fbeb9e2a77e</wsa:MessageID>
    </s:Header>
    <s:Body>
    <query:AdhocQueryResponse
980   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">
985
    <!-- Results not available now -->
    <rs:ResponseSlotList>
    <rim:Slot name="DeferredProcessingRequired">
    <rim:ValueList>
990 <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">
995 <rim:ValueList>
    <rim:Value>201906020304</rim:Value>
    </rim:ValueList>
    </rim:Slot>
    </rs:ResponseSlotList>
1000
    <!-- Errors available now -->
    <rim:RegistryErrorList>
    ...
    </rim:RegistryErrorList>
1005
    <!-- Registry objects available now -->
    <rim:RegistryObjectList>
    ...
    </rim:RegistryObjectList>
1010
    </query:AdhocQueryResponse>
    </s:Body>
</s:Envelope>

```

#### 1015 3.18.4.2.2.1.1.1.2 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.

```

1020 <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
1025 s:mustUnderstand="1">urn:ihe:iti:2019:RegistryStoredQueryDeferredResults</a:A
      ction>
      <a:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
      fbeab9e2a77e</wsa:MessageID>
      <a:ReplyTo>
1030 <a:Address>http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.svc</a:Adre
      ss>
      </a:ReplyTo>
      </s:Header>
      <s:Body>
1035 <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">
1040
      <!-- Rest of AdhocQueryResponse message goes here -->

      </query:AdhocQueryResponse>
      </s:Body>
1045 </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

1050 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.

```

1055 <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
1060 s:mustUnderstand="1">urn:ihe:iti:2019:RegistryStoredQueryDeferredResultsAckno
      wledge</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>
1065 <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>
1070 </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.

```

1080 <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
1085 s:mustUnderstand="1">urn:ihe:iti:2019:RegistryStoredQueryDeferredResultsAckno
      wledge</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
1090 s:mustUnderstand="1">http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.sv
      c</a:To>
      </s:Header>
      <s:Body>
        <rs:RegistryResponse
1095 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>

```

### 3.18.4.2.3 Expected Actions

- 1100 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:
- 1105 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.
- 1110 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.
- 1115 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.
- 1120 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 (cont.)

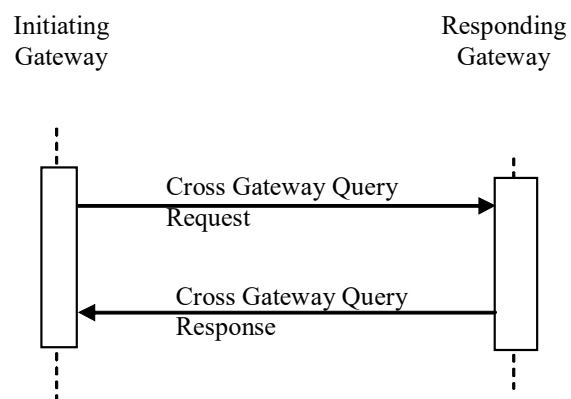
### 3.38 Cross Gateway Query [ITI-38]

1125 ...

<i>Update Section 3.38.4 as shown. Add the second interaction diagram.</i>
--

#### 3.38.4 Messages

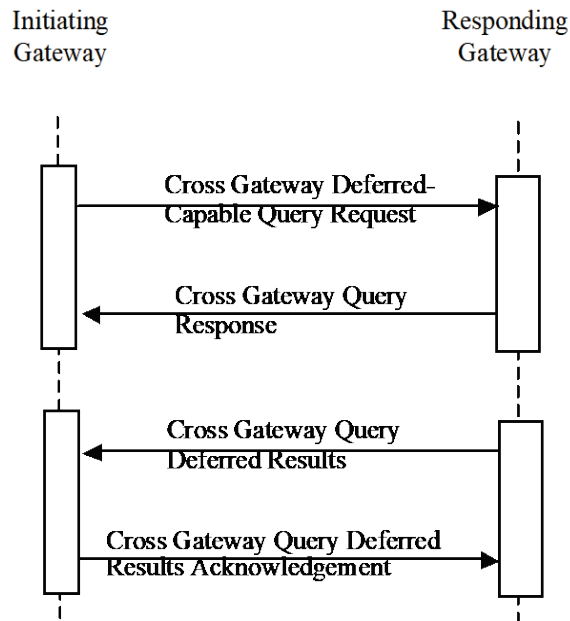
The standard interaction is shown below.



1130

**Figure 3.38.4-1: Interaction Diagram**

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



**Figure 3.38.4-2: Deferred Response Option Interaction Diagram**

*Add the following to the end of Section 3.38.4.1.2 as shown.*

### 1135 3.38.4.1 Cross Gateway Query

...

#### 3.38.4.1.2 Message Semantics

...

1140 An Initiating Gateway that supports 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) triggered either through internal mechanisms or, when it also supports the XDS Affinity Domain Option, through interaction with a Document Consumer that supports the Deferred Response Option.

*Add the following **new** Section 3.38.4.1.3.3 as shown*

### 1145 3.38.4.1.3 Expected Actions

...

#### 3.38.4.1.3.3 Deferred Response Option

##### For Responding Gateway Actors:

1150 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 Cross Gateway Query Deferred Results messages, in order to allow for additional processing time. See Section 3.38.4.2 for details.
- 1155      ○ How the Responding Gateway determines which results to return immediately and which to defer is not specified.
- 1160      ○ How the Responding Gateway returns subsequent results in Cross Gateway Query 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.
- 1165      ○ 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. 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.
- 1170      • 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 Responding Gateway shall return an empty response (i.e., no registry objects or errors).
- 1175      ○ 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`.
- 1175      ○ 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.
- 1175      ○ If the Responding Gateway includes `_DeferredProcessingEstimatedCompletion` in the response, the value shall reflect an estimated time by which all deferred processing remaining for the request will be completed and all results/errors returned.
- 1180      • When Deferred processing is complete for a set of results and the Responding Gateway wishes to return them, it shall send a Cross Gateway Query Deferred Results message, as described in Section 3.38.4.2.
- 1180      ○ The message shall include all results available at this time, including any already returned.
- 1185      ○ The response status shall reflect only those results that are being returned in this message.



- 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.
- 1190 ○ If the Responding Gateway includes DeferredProcessingEstimatedCompletion in the response, the value shall reflect an estimated time by which of all deferred processing remaining for the request will be completed and all results/errors returned.
- The Responding Gateway shall attempt to return all results of the request, through the combination of initial and Deferred responses.
- 1195 ○ The Responding Gateway should attempt retries if an Initiating Gateway is unavailable. The details and number of attempts are not specified.
- 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
- 1200 Deferred Results messages have successfully been received/acknowledged.

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.

#### 1205 **For Initiating Gateway Actors:**

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
- 1210 multiple Responding Gateways in the Registry Stored Query response, the Initiating Gateway shall consolidate the reporting of any Deferred processing for this request as follows:
  - If any responses indicate Deferred processing, the Initiating Gateway shall indicate Deferred processing in the Registry Stored Query response by adding the
  - 1215 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.
  - If an 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
  - 1220 may include it in the Registry Stored Query response.
- In the initial 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

- 1225 any results that were received in Cross Gateway Query Deferred Results messages for this request before it had returned the initial response.
- 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 Gateway should
- 1230 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:
- The Initiating Gateway does no additional processing; it simply passes through
- 1235 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 could report the timeout in a Deferred Results message, adding a
- 1240 RegistryError in the same way as it would report a non-responsive Responding Gateway in a synchronous Cross Gateway Query response.

<i>Add the following <b>new</b> Section 3.38.4.2 as shown</i>
---

### **3.38.4.2 Cross Gateway Query Deferred Results**

1245 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 Cross Gateway Query request.

#### **3.38.4.2.1 Trigger Events**

1250 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**

1255 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.

- 1260 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 it 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:
    - 1265 ○ Direct the message to the Deferred response endpoint of the Document Consumer that it previously retained.
    - Include the results (registry objects and errors) that were passed in the Cross Gateway Query Deferred Results message.
    - 1270 ○ Set the requestId of the AdhocQueryResponse to the id of the original [ITI-18] AdhocQueryRequest from the Document Consumer that it previously retained.
    - Consolidate the reporting of any remaining Deferred processing for this request:
      - 1275 ■ 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 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.
      - 1280 ■ 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.
    - 1285 ○ Return the results (success/failure, any errors) received from the Document Consumer in the Acknowledgement to the Responding Gateway.

Update Section 3.38.5 as shown.
---------------------------------

### 3.38.5 Protocol Requirements

...

- 1290 **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:
- The following types shall be imported (xsd:import) in the /definitions/types section:

- 1295
- namespace="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0",  
schemaLocation="query.xsd"
  - **If Deferred Response Option is supported:**
    - **namespace="urn:ihe:iti:xds-b:2007", schemaLocation="XDS.b Deferred.xsd"**
- 1300
- 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”
  - 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:CrossGatewayQueryResponse
/definitions/binding/operation/wssoap12:operation/@soapAction Required	false

1305

**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.**

1310

**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"**
    - **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”**
- 1315
- 1320

- **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**

1325

**Table 3.38.5-2: Additional Attribute Requirements**

<b><u>Attribute</u></b>	<b><u>Value</u></b>
<b><u>/definitions/portType/operation@name</u></b>	<b><u>InitiatingGateway CrossGatewayQuery DeferredResults</u></b>
<b><u>/definitions/portType/operation/input/@wsaw:Action</u></b>	<b><u>urn:ihe:iti:2019:CrossGatewayQueryDeferredResults</u></b>
<b><u>/definitions/portType/operation/output/@wsaw:Action</u></b>	<b><u>urn:ihe:iti:2019:CrossGatewayQueryDeferredResultsAcknowledgement</u></b>
<b><u>/definitions/binding/operation/wssoap12:operation/@soapActionRequired</u></b>	<b><u>false</u></b>

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.

1330 For informative WSDL for the Responding Gateway **and the Initiating Gateway**, see ITI TF-2x: Appendix W.

...

<i>Add the following <b>new</b> Sections 3.38.5.1.3 and 3.38.5.1.4 as shown</i>
---

### 1335 3.38.5.1 Sample SOAP Messages

...

#### 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.

1340 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 V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

1345

```

1350 <s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
      xmlns:a="http://www.w3.org/2005/08/addressing">
      <s:Header>
1355   <a:Action
s:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayQueryDeferredResults</a:Act
      ion>
      <a:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
1360 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"
1365   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 -->
1370   <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>
1375   </rim:ValueList>
      </rim:Slot>
      <rim:Slot name="DeferredProcessingEstimatedCompletion">
      <rim:ValueList>
      <rim:Value>201906020304</rim:Value>
1380   </rim:ValueList>
      </rim:Slot>
      </rs:ResponseSlotList>

      <!-- Errors available now -->
1385   <rim:RegistryErrorList>
      ...
      </rim:RegistryErrorList>

      <!-- Registry objects available now -->
1390   <rim:RegistryObjectList>
      ...
      </rim:RegistryObjectList>

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

```

### 3.38.5.1.3.2 Asynchronous Web Services Exchange

1395 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.

```

1400 <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
1405   s:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayQueryDeferredResults</a:Act
        ion>
        <a:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
        fbeab9e2a77e</wsa:MessageID>
        <a:ReplyTo>
1410 <a:Address>http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.svc</a:Addre
        ss>
        </a:ReplyTo>
        </s:Header>
        <s:Body>
          <query:AdhocQueryResponse
1415   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:rims="urn:oasis:names:tc:ebxml-regrep:xsd:rims:3.0"
          requestId="urn:uuid:df9b89ed-395e-40a7-8510-0b4a390434c4"
          status="urn:ihe:iti:2007:ResponseStatusType:PartialSuccess">
1420   <!-- Rest of AdhocQueryResponse message goes here -->

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

```

1425

### 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 V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

1430

```

1435 <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
1440 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>
1445 <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>
1450 </s:Envelope>

```

### 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.

```

1460 <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
1465 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
1470 s:mustUnderstand="1">http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.svc</a:To>
      </s:Header>
      <s:Body>
1475 <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>

```



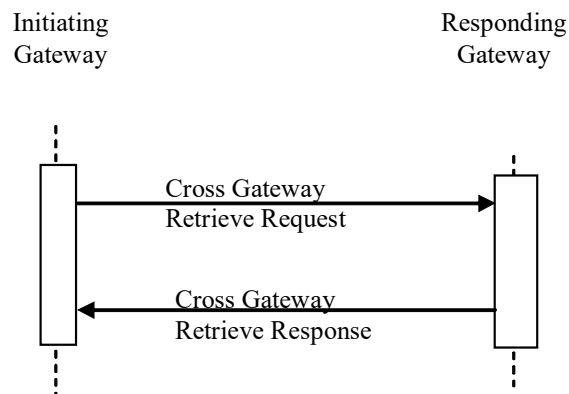
1480 **3.39 Cross Gateway Retrieve [ITI-39]**

...

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

**3.39.4 Messages**

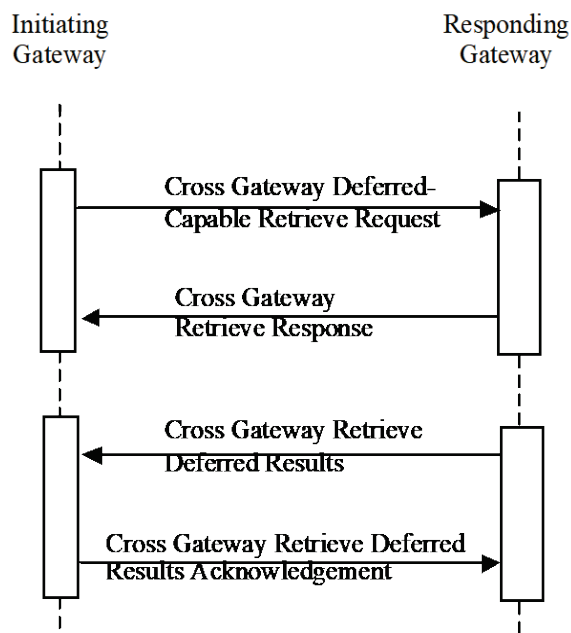
**The standard interaction is shown below.**



1485

**Figure 3.39.4-1: Interaction Diagram**

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



**Figure 3.39.4-2: Deferred Response Option Interaction Diagram**

1490 *Add the following to the end of Section 3.39.4.1.2 as shown.*

### **3.39.4.1 Cross Gateway Retrieve Request**

...

### **3.39.4.1.2 Message Semantics**

...

1495 An Initiating Gateway that supports the Deferred Response Option shall be capable of sending a Deferred-Capable Cross Gateway Retrieve Request (see Section 3.43.4.1.2.1) triggered either through internal mechanisms or, when it also supports the XDS Affinity Domain Option, through interaction with a Document Consumer that supports the Deferred Response Option.

1500 *Add the following **new** Section 3.39.4.1.3.2 as shown*

### **3.39.4.1.3 Expected Actions**

...

### **3.39.4.1.3.2 Deferred Response Option**

1505 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):

- The Responding Gateway may defer some or all of the results of the retrieve request – documents and registry errors – to one or more subsequent Cross Gateway Retrieve Deferred Results messages, in order to allow for additional processing time. See Section 3.39.4.3 for details.
- 1510     ○ How the Responding Gateway determines which results to return immediately and which to defer is not specified.
- 1515     ○ How the Responding Gateway returns subsequent results in Cross Gateway Retrieve 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.
- 1520     ○ 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. 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 community will not be Deferred.

- 1525      • 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).
  - 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`.
- 1530      ○ 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.
- 1535      ○ If the Responding Gateway includes DeferredProcessingEstimatedCompletion in the response, the value shall reflect an estimated time by which all deferred processing remaining for the request will be completed and all results/errors returned.
- 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.
  - 1540      ○ The message shall include only those results that are available at this time, and that have not already been returned.
  - The response status shall reflect only those results that are being returned in this message.
  - 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.
  - 1545      ○ If the Responding Gateway includes DeferredProcessingEstimatedCompletion in the response, the value shall reflect an estimated time by which all deferred processing remaining for the request will be completed and all results/errors returned.
- 1550      • The Responding Gateway shall attempt to return all results of the request, through the combination of initial and Deferred responses.
  - The Responding Gateway should attempt retries if an Initiating Gateway is unavailable. The details and number of attempts are not specified.
  - 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.
- 1555

1560 *Add the following **new** Section 3.39.4.2.3.1 as shown*

### **3.39.4.2 Cross Gateway Retrieve Response**

...

#### **3.39.4.2.3 Expected Actions**

1565 ...

##### **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:

- 1570     • If the XDS Affinity Domain Option is supported, when consolidating results from multiple Responding Gateways in the Retrieve Document Set response, the Initiating Gateway shall consolidate the reporting of any Deferred processing for this request as follows:
  - 1575         ○ If any responses indicate Deferred processing, the Initiating Gateway shall indicate Deferred processing in the Retrieve Document Set 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.
  - 1580         ○ If an 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.
- 1585     • In the initial 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 results that were received in Cross Gateway Retrieve Deferred Results messages for this request before it had returned the initial response.
- 1590     • Later Deferred results for this request, when they become available, will be sent by the 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 behaviors follow:

- 1595      ○ 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.
- 1600      ○ 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 Gateway in a synchronous Cross Gateway Retrieve response.

<i>Add the following <b>new</b> Section 3.39.4.3 as shown</i>
---

### **3.39.4.3 Cross Gateway Retrieve Deferred Results**

- 1605      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.

#### **3.39.4.3.1 Trigger Events**

- 1610      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.

- 1615      **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.

- 1620      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:
- 1625

- 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.
- Return the results (success/failure, any errors) received from the Document Consumer in the Acknowledgement to the Responding Gateway.

<p><i>Add the following <b>new</b> Section 3.39.4.4 as shown</i></p>
--

#### 1650 **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.

1655 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 when the Initiating Gateway receives a Cross Gateway Retrieve Deferred Results Message from a Responding Gateway. See Section 3.39.4.3.

##### **3.39.4.4.2 Message Semantics**

1660 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.

1665

*Update Section 3.39.5 as shown.*

### 3.39.5 Protocol Requirements

...

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**Responding Gateway:** These are the requirements for the Synchronous or Asynchronous (WS-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:**
    - **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 Response message shall be defined as “ihe:RetrieveDocumentSetResponse”
- Refer to Table 3.39.5-1 below for additional attribute requirements

1675

1680

**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/soap12:operation/@soapActionRequired	false

1685

**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 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:**
  - **namespace="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0",  
schemaLocation="rs.xsd"**
  - **namespace="urn:ihe:iti:xds-b:2007",  
schema="XDS.b DocumentRepository.xsd"**
- **The /definitions/message/part/@element attribute of the Cross Gateway Retrieve 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**

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

<b><u>Attribute</u></b>	<b><u>Value</u></b>
<b><u>/definitions/portType/operation@name</u></b>	<b><u>InitiatingGateway CrossGatewayRetrieveDeferredResults</u></b>
<b><u>/definitions/portType/operation/input/@wsaw:Action</u></b>	<b><u>urn:ihe:iti:2019:CrossGatewayRetrieveDeferredResults</u></b>
<b><u>/definitions/portType/operation/output/@wsaw:Action</u></b>	<b><u>urn:ihe:iti:2019:CrossGatewayRetrieveDeferredResultsAcknowledgement</u></b>
<b><u>/definitions/binding/operation/wsoap12:operation/@soapActionRequired</u></b>	<b><u>false</u></b>

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.

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

...



<i>Add the following <b>new</b> sections 3.39.5.1.3 and 3.39.5.1.4 as shown</i>
---

### **3.39.5.1 Sample SOAP Messages**

...

#### **1720 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.

#### **1725 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.

```

1730 <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
1735 S:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayRetrieveDeferredResults</ws
        a:Action>
        <wsa:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
        fbeab9e2a77e</wsa:MessageID>
      </S:Header>
      <S:Body>
1740 <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
1745 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">
1750 <rim:ValueList>
            <rim:Value>'This request requires more time. The
            full results will be returned on the Deferred Response endpoint.'

```

```

1785 <Document>UjBsR09EbGhjZ0dTQUxNQUFBUUNBRU1tQ1p0dU1GUXhEUzhi</Document>
      </DocumentResponse>
      </RetrieveDocumentSetResponse>
    </S:Body>
  </S:Envelope>

```

### 3.39.5.1.3.2 Asynchronous Web Services Exchange

1790 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.

```

1795 <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
1800 s:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayRetrieveDeferredResults</a:
      Action>
      <a:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
      fbeab9e2a77e</wsa:MessageID>
      <a:ReplyTo>
1805 <a:Address>http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.svc</a:Address>
      </a:ReplyTo>
    </s:Header>
    <s:Body>
1810 <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">
      <!-- Rest of RetrieveDocumentSetResponse goes here -->
      </RetrieveDocumentSetResponse>
    </s:Body>
1815 </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

1820 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.

```

1825 <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
1830 s:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayRetrieveDeferredResultsAckn
        owledgeмент</a:Action>
        <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-
        821622C099DB</wsa:MessageID>
        <a:RelatesTo>urn:uuid:1795bb7a-8dc2-403a-9914-
        fbeab9e2a77e</wsa:MessageID>
1835 </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>
1840 </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 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.

```

1850 <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
1855 s:mustUnderstand="1">urn:ihe:iti:2019:CrossGatewayRetrieveDeferredResultsAckn
        owledgeмент</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
1860 s:mustUnderstand="1">http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.svc</a:To>
      </s:Header>
      <s:Body>
        <rs:RegistryResponse
1865   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>

```

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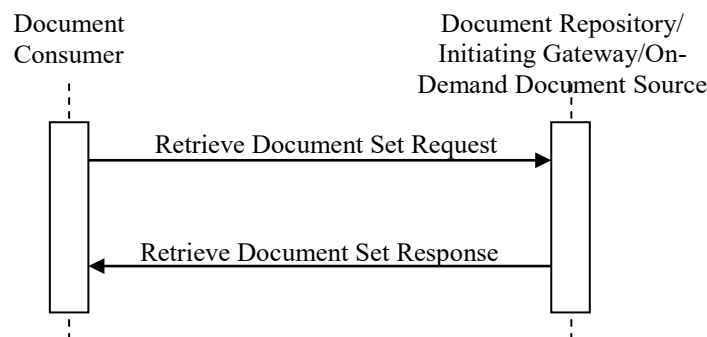
### 3.43 Retrieve Document Set [ITI-43]

...

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

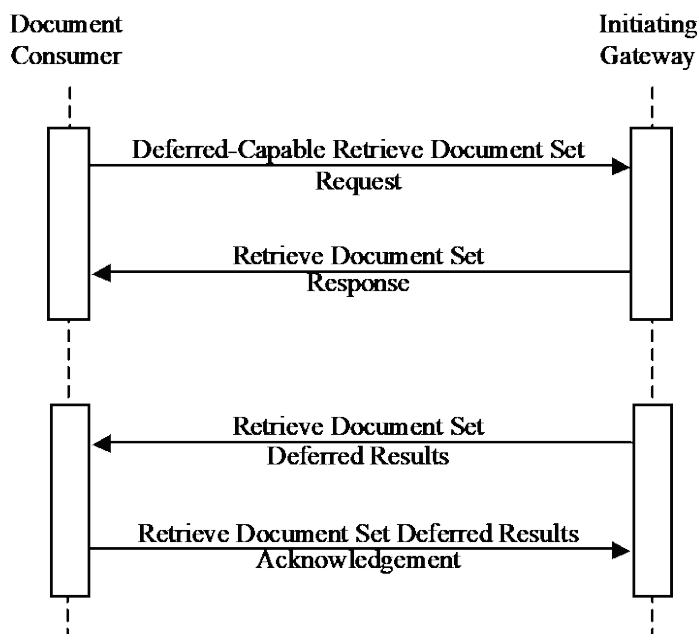
#### 3.43.4 Messages

1875 **The standard interaction is shown below.**



**Figure 3.43.4-1: Interaction Diagram**

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



**Figure 3.43.4-2: Deferred Response Option Interaction Diagram**

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

#### **3.43.4.1 Retrieve Document Set Request**

...

##### **1885 3.43.4.1.2 Message Semantics**

...

##### **3.43.4.1.2.1 Deferred Response Option: Deferred-Capable Retrieve Document Set Request**

1890 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 “Deferred-Capable”:

- 1895 • A custom SOAP Header element named DeferredResponseEndpoint in the urn:ihe:iti:xds-b:2007 namespace 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:

```
<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.

1900 Note: This same formatting is used by the Initiating Gateway to make Cross Gateway Retrieve requests Deferred-Capable.

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

- 1905 • 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.
- 1910 • 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.

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

##### **3.43.4.1.3 Expected Actions**

...

**1915 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 shall determine whether to keep the request Deferred-Capable:

- 1920
  - If the Initiating Gateway chooses to do so, the Deferred-Capable Retrieve Document Set Request shall follow the requirements of the Document Consumer in Section 3.43.4.1.2.1. In addition:
    - 1925
      - The request shall include the Deferred Response endpoint of the Initiating Gateway (not the endpoint passed by the Document Consumer). Note that the mustUnderstand value may need to change based on the Initiating Gateway's knowledge of the Responding Gateway's support for Deferred.
      - 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.
  - 1930
    - If the Initiating Gateway chooses not to do so, it shall send a regular Cross Gateway Retrieve request, removing the DeferredResponseEndpoint element.

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

**1935 3.43.4.2 Retrieve Document Set Response**

...

**3.43.4.2.2 Message Semantics**

...

**3.43.4.2.2.1 Deferred Response Option: RegistryResponse**

- 1940 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.

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An example of these slots is shown below:

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```

<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>UjBsR09EbGhjZ0dTQUxNQUFBUUNBRU1tQ1p0dU1GUXhEUzhi</Document>
  </DocumentResponse>
</RetrieveDocumentSetResponse>

```



*Add the following **new** Section 3.43.4.2.3.3 as shown*

### **3.43.4.2.3 Expected Actions**

...

#### **3.43.4.2.3.3 Deferred Response Option**

- 1995 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.

2000

*Add the following **new** Section 3.43.4.3 as shown*

### **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.

- 2005 The message is sent from an Initiating Gateway to a Document Consumer to return Deferred results – documents and registry errors – in response to a prior Deferred-Capable Retrieve Document Set Request. See Section 3.43.4.1.2.1.

#### **3.43.4.3.1 Trigger Events**

- 2010 This message will be triggered when the Initiating Gateway receives a Cross Gateway Retrieve Deferred Results message from a Responding Gateway, when that message corresponds to a prior Deferred-Capable Retrieve Document Set Request. See Section 3.39.4.3.

#### **3.43.4.3.2 Message Semantics**

- 2015 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.
- 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.
- 2020 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.

### 3.43.4.3.3 Expected Actions

2025 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:

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.
- 2030 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 generate a Retrieve Document Set Deferred Results Acknowledgement message with RegistryResponse status =  
2035 “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,
  - 2040 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 messages will match the request.
  - 2045 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”.

<i>Add the following <b>new</b> Section 3.43.4.4 as shown</i>
---

### 3.43.4.4 Retrieve Document Set Deferred Results Acknowledgement

2050 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 receipt of Deferred results – documents and registry errors – from a prior Deferred-Capable retrieve request.

#### 3.43.4.4.1 Trigger Events

2055 This message will be triggered when the Document Consumer receives a Retrieve Document Set Deferred Results Message from an Initiating Gateway. See Section 3.43.4.3.

#### 3.43.4.4.2 Message Semantics

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

#### 2060 3.43.4.4.3 Expected Actions

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

<i>Update Section 3.43.5 as shown.</i>
--

#### 2065 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.

The Retrieve Document Set transaction:

...

2070 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:

- ...
- Refer to Table 3.43.5-1 below for additional attribute requirements

2075 **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:**

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

2080       ○ **namespace="urn:ihe:iti:xds-b:2007", schemaLocation="XDS.b Deferred.xsd"**

...

2085 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:**

2090 A. **shall comply with the Synchronous Web Services Exchange protocol stack with all 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:**

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

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

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

**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:**
  - **namespace="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0", schemaLocation="rs.xsd"**
  - **namespace="urn:ihe:iti:xds-b:2007", schema="XDS.b DocumentRepository.xsd"**
- **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"**
- **Refer to Table 3.43.5-2 below for additional attribute requirements**

**Table 3.43.5-2: Synchronous Web Services Attribute Requirements**

<b><u>Attribute</u></b>	<b><u>Value</u></b>
<b><u>/definitions/portType/operation@name</u></b>	<b><u>DocumentConsumer RetrieveDocumentSet DeferredResults</u></b>
<b><u>/definitions/portType/operation/input/@wsaw:Action</u></b>	<b><u>urn:ihe:iti:2019:RetrieveDocumentSetDeferredResults</u></b>
<b><u>/definitions/portType/operation/output/@wsaw:Action</u></b>	<b><u>urn:ihe:iti:2019:RetrieveDocumentSetDeferredResultsAcknowledgement</u></b>

<u>Attribute</u>	<u>Value</u>
<u>/definitions/binding/operation/wssoap12:operation/@soapActionRequired</u>	<u>false</u>

2120

**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.**

2125

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

2130

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

2135

**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.**

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

...

2140

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

### **3.43.5.1 Sample SOAP Messages**

...

#### **3.43.5.1.4 Sample Retrieve Document Set Deferred Results SOAP Request**

2145

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**

2150 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.

```

2155 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"
      xmlns:wsa="http://www.w3.org/2005/08/addressing">
      <S:Header>

2160 <wsa:Action>urn:ihe:iti:2019:RetrieveDocumentSetDeferredResults</wsa:Action>
      <wsa:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
      fbeab9e2a77e</wsa:MessageID>
      </S:Header>
      <S:Body>
2165 <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"
        status="urn:ihe:iti:2007:ResponseStatusType:PartialSuccess">

2170 <!-- Results not available now -->
      <rs:ResponseSlotList>
        <rim:Slot name="DeferredProcessingRequired">
          <rim:ValueList>
2175 <rim:Value>'This request requires more time. The
      full results will be returned on the Deferred Response endpoint.'

```

```

2200         <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>
2205 </Document>UjBsR09EbGhjZ0dTQUxNQUFBUUNBRU1tQ1p0dU1GUXhEUzhi</Document>
        </DocumentResponse>
        </RetrieveDocumentSetResponse>
2210 </S:Body>
</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/>...; these WS-Addressing headers are populated according to ITI TF-2x: Appendix V.3: Synchronous and Asynchronous (WS-Addressing based) Web Services.

```

2220 <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:RetrieveDocumentSetDeferredResults</a:A
ction>
                <a:MessageID>urn:uuid:1795bb7a-8dc2-403a-9914-
2225 fbeab9e2a77e</wsa:MessageID>
                <a:ReplyTo>
<a:Address>http://192.168.2.4:9080/XDS/InitiatingGatewayReceiver.svc</a:Adre
ss>
                </a:ReplyTo>
2230 </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">
2235
                        <!-- Rest of RetrieveDocumentSetResponse goes here -->

                </RetrieveDocumentSetResponse>
                </s:Body>
2240 </s:Envelope>

```

2245 *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**

#### **3.43.5.1.5.1 Synchronous Web Services Exchange**

2250 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.

```

2255 <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
          wledge</a:Action>
        <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-
2260 821622C099DB</wsa:MessageID>
        <a:RelatesTo>urn:uuid:1795bb7a-8dc2-403a-9914-
          fbeab9e2a77e</wsa:MessageID>
      </s:Header>
      <s:Body>
2265 <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>
  
```

2270

#### **3.43.5.1.5.2 Asynchronous Web Services Exchange**

2275 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.



2280

```
<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
wledge</a:Action>
    <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-
821622C099DB</wsa:MessageID>
    <a:RelatesTo>urn:uuid:1795bb7a-8dc2-403a-9914-
fbeb9e2a77e</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>
```

2285

2290

2295

## Volume 2x – Appendices

2300 *Add the following to Appendix Y as shown*

...

### Appendix Y – Diagram Pseudocode

...

#### Vol 1 Figure 18.3.3-3

2305 note over Doc Consumer, Initiating GW: Community A (Local)  
note over Responding GW, Staff: Community B (Remote)  
Doc Consumer->+Initiating GW: Deferred-Capable Registry\nStored Query Request  
Initiating GW->+Responding GW: Deferred-Capable Cross\nGateway Query Request  
Responding GW->Responding GW: Evaluate and store Request  
2310 note right of Responding GW: Some documents ready  
Responding GW-->Initiating GW: Initial response (partial)  
Initiating GW-->-Doc Consumer: Initial response (partial)  
Responding GW->-Staff: Notify Staff of request  
note right of Staff:  
2315 Locates documents,  
scans, registers, etc.  
end note  
Staff->+Responding GW: More documents ready  
Responding GW->Responding GW: Correlate Response to Request  
2320 Responding GW->+Initiating GW: Deferred Cross Gateway\nQuery Results  
Initiating GW->+Doc Consumer: Deferred Registry Stored\nQuery Results  
Doc Consumer-->-Initiating GW: Results Acknowledgement  
Initiating GW-->-Responding GW: Results Acknowledgement  
deactivate Responding GW  
2325 Staff->+Responding GW: More documents ready  
note right of Responding GW: Process as before...