A Profile of Reliable Web Services Messaging for Information Appliances Services [WS-Reliability]

Version 1.0

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Reliable Web Services Messaging SIG

**Forum on Service Platform for Information Appliances**

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Introduction

SPIA Forum : The goal of Reliable Web Services Messaging SIG

- To control the information appliances in home via Internet remotely, a back-end system to connect multiple services should be developed.
- Each service will be developed by different service provider with different development infrastructure. <u>It is necessary to adopt standard reliable messaging technology for communication among services and realize interoperability</u> to develop reliable systems with the above multiple services.
- Open standard specification should be used.
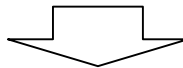
The reliable messaging protocol exists already. The following activities are required to develop skills and technologies for validating conformance and interoperability of the reliable messaging protocol.
- **<u>Implementation Profile</u>**
- Conformance Tool
- Proof-of-Concept

The position of this document

This document is a profile of WS-Reliability for information appliances.

1 Overview

1.1 The goal of this document

This document is a profile of reliable Web Services messaging for information appliances. To create this document, it was considered how we should use reliable Web Services Messaging as messaging infrastructure for Web services that will communicate with information appliances. Especially the following points were considered.

➢ What functions of Reliable Web Services Messaging should be used?
➢ How parameters for the functions should be decided?
➢ How clarify the specification, when it does not specify detail?

Figure 1.1 shows the Use case of Reliable Web Services Messaging.
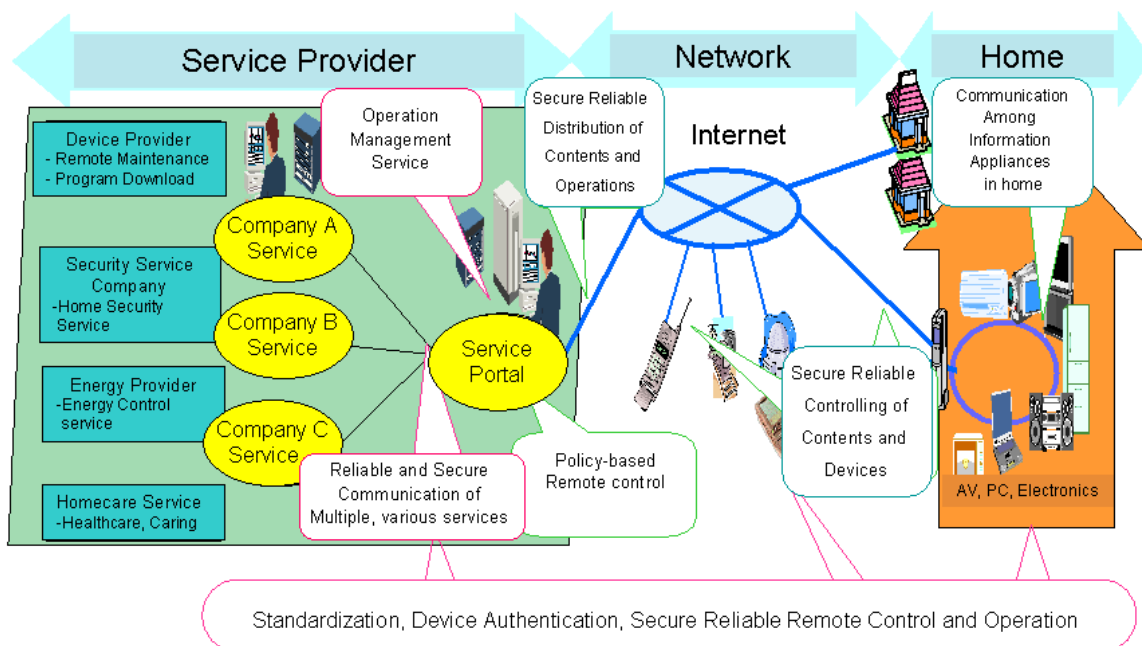
Figure 1.1   Use case of Reliable Web Services Messaging.

1.2 Requirements of Information Appliances for Reliable Web Services messaging Functions

There are following major characteristics in Reliable Web Services Messaging.
- ➢ Reliable Messaging
- ➢ Asynchronous Messaging

This section describes requirements of Information Appliances for these characteristics, in terms of interoperability.

1.2.1 Reliable Messaging

(1) Guaranteed Delivery Feature

Guaranteed Delivery of a message is considered as the most important feature for controlling home information appliances. Thus this feature will be required for many cases.

(2) Duplicate Elimination Feature

When users control home Information Appliance remotely, each control operation should be sent exactly once, to make the operation similar to the direct operation. Thus, Duplicate Elimination feature should be used with Guaranteed Delivery Feature on such cases.

It is also useful to avoid double charge for paid service, even if in the situation that the human operation is not involved.

(3) Message Ordering Feature

Message Ordering Feature is useful when you operate Information Appliances with a sequence of operations in order remotely. For synchronous messaging, it is OK when the operation request and it's response are exchanged one by one in order. However, asynchronous messaging is useful in many cases to operate Information Appliances remotely as described in 1.2.2. Thus, Message Ordering is important for users to operate Information Appliances with a sequence of operations in order remotely.

1.2.2 Asynchronous Messaging

Assuming a service provider provides centralized Web Service that controls many Information Appliances. In this case, response time will be slow down when server received overloaded access, especially when the service includes authorization or heavy analysis. Synchronous message exchange is not efficient for this case, since the user has to wait until the server process the request. In this case, asynchronous messaging is more appropriate. It is possible to control Information Appliances reliably and asynchronously, by choosing appropriate features of reliable messaging features i.e., guaranteed delivery feature, duplicate message elimination feature, or message ordering feature for the situation.

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1.3 Use cases of Reliable Web Services Messaging

This section describes use case of Reliable Web Services messaging for Information Appliance Services.

1.3.1 Certificate Authority Model

This section describes use case for registration of a home information appliances, and remote operation service with Information Appliance Certificate Authorization by reliable Web Services messaging.
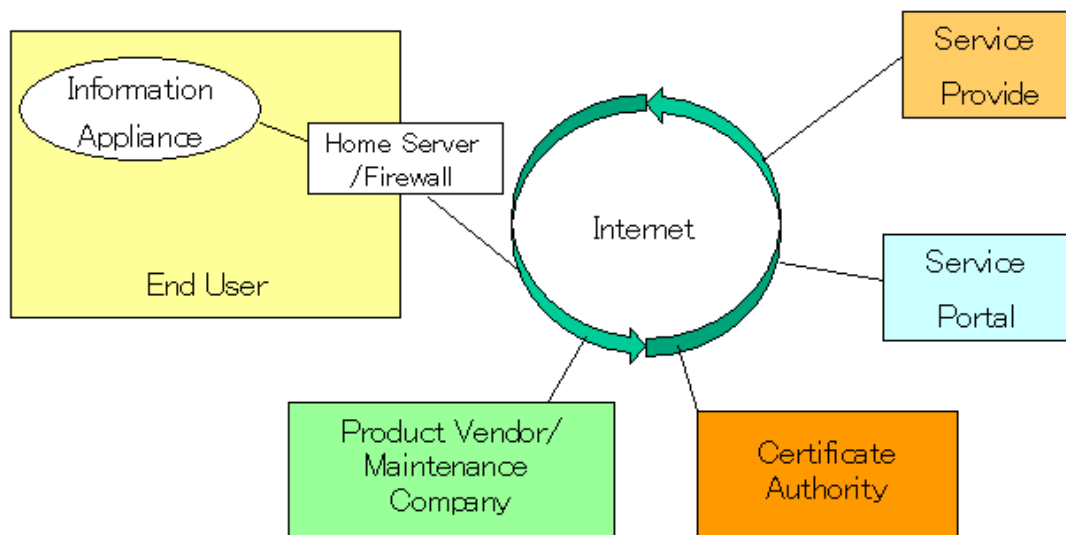
Figure 1.3.1   A model with Certificate Authority for Information Appliance

The components of this model are described below

Component	Description
Information Appliances	A device with reliable Web services messaging feature and it is connected to the Internet. Note: To simplify the model, Information Appliances in this model have capability of reliable Web Services messaging functions. However this model may be diversified to a model including a central server to control Information Appliances in home. In such cases, the central server communicates with other services with reliable Web Services messaging.
User	A user that operate Information Appliances remotely. The user uses cellular phone with reliable Web Services messaging functions to control Information Appliances remotely. Note: To simplify the model, the cellular phone in this model has reliable Web Services functions. However this model may be diversified to a model including a reliable Web Services messaging server that is operated by cellular phone carrier takes care of reliable messaging for the cellular phone. In such cases, reliable Web Services messaging server communicates with other services with reliable Web Services messaging.
Service Provider	A company that provides services for user to operate Information Appliance remotely.
Service Portal	Service Portal authenticates the Information Appliances, and requests service portal for its services. To simplify a model, service provider and Service Portal are already trusted each other. It means this model omitted a process to establish the trust between service provider and Service Portal.
Certificate Authority(CA)	Publish a digital certificate that was requested by Service Portal, and authenticate the certificate.

1.3.2 Use case   Registration and Operation of Information Appliances

Registration flow of information appliances

The following figure shows an example for registration of information appliance to the service portal.   This information appliance will be controlled remotely after this registration.
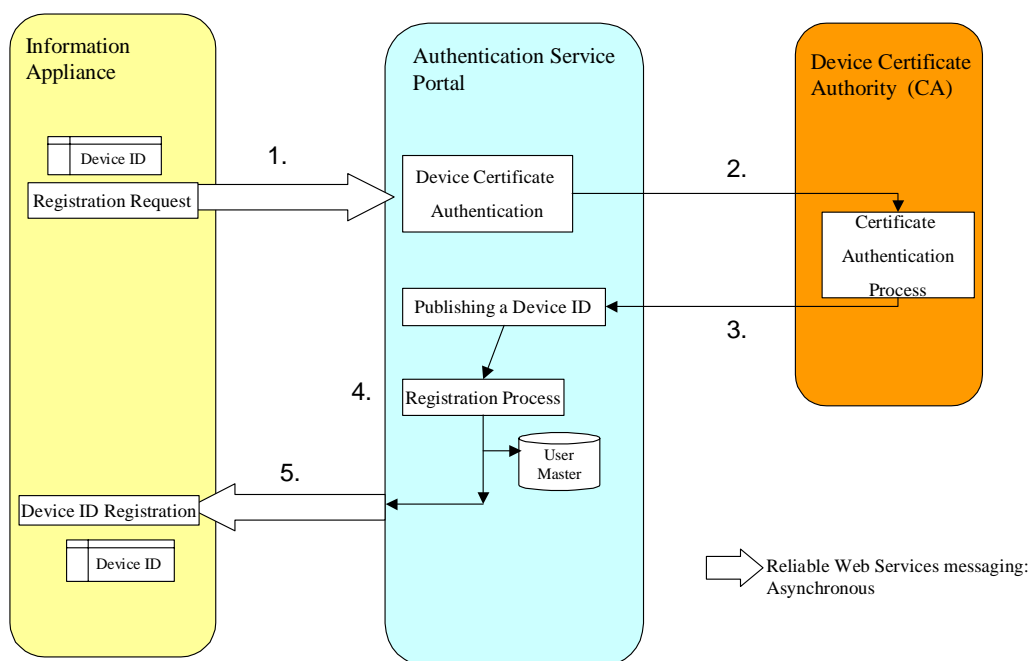
Figure 1.3.2.1   Registration Flow of Information Appliance

(*) One-WAY: One-way messaging. This message exchange doesn't require response message.
   Request-Response: This message exchange requires Response message to be returned for Request message.

	Operation	Message	Protocol
1.	A user requests registration of Information Appliance by Cellular phone.	Request for registration, Device ID (e.g., Serial Number), User information (e.g., Cellular unique ID)	Reliable Web Services Messaging One-WAY Guaranteed Delivery, Duplicate Elimination with asynchronous messaging
2.	The portal authenticates the device ID, and requests CA for Digital Certificate.	Request for Digital Certificate	(CA communication protocol)
3.	CA sends a Digital	Digital Certificate	(CA communication

	Certificate to the portal.		protocol)
4.	Portal registers a combination of user ID and device ID to the user master file.		
5.	After registration, Portal sends Digital Certificate for the cellular as its ID. The Cellular saves it.	Digital Certificate	Reliable Web Services Messaging One-WAY Guaranteed Delivery, Duplicate Elimination with asynchronous messaging

Operation Flow of registered Information Appliance

This section describes a use case that end-user that uses service provided by service provider operate information appliance remotely. In this use case, the information appliance was registered in advance, and end-user already registered himself/herself to the service provider. Note that registration process can be described in the same fashion.
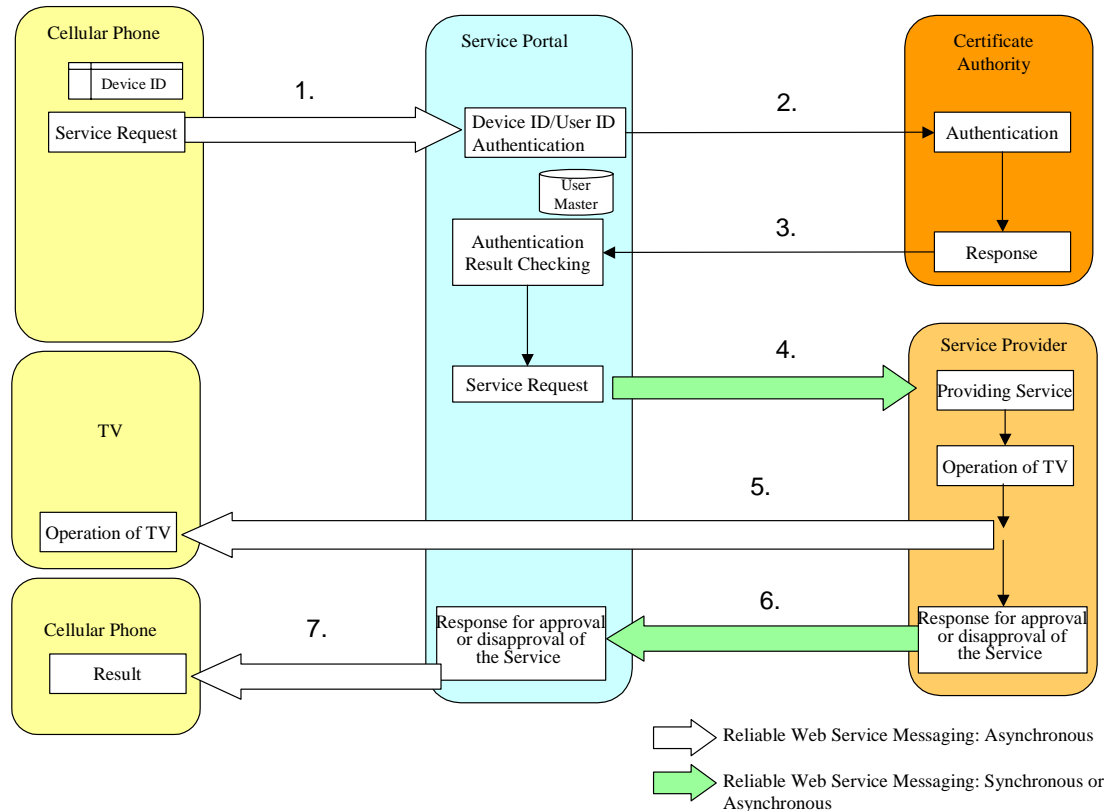
Figure 1.3.2.2   Operation Flow of Information Appliance

	Description	Message	Transport Protocol
1.	A user requests Service Portal for operation of Information Appliances by cellular phone. User information, e.g., Cellular phone serial ID, and device ID, e.g., certificate, that was received with the cellular phone registration process are also sent for authentication.	User Information, Device ID, Operation Request.	Reliable Web Services Messaging: One-WAY Guaranteed Delivery, Duplicate Elimination, Message Ordering with asynchronous Messaging.
2.	Service Portal requests Certificate Authority for the authentication of the device ID, i.e., Digital Certificate.	Digital Certification.	(CA communication protocol)
3.	Certificate Authority replies the authenticate result.	Authentication Result.	(CA communication protocol)
4.	Service Portal refers to the user master and request Service Provider with operation that was related to the user, when the authentication was OK.	Device Information (Device ID, Device URI), Operation Request.	Reliable Web Services Messaging: Request-Response Guaranteed Delivery, Duplicate Elimination, Message Ordering with Asynchronous messaging (or Guaranteed Delivery with Synchronous messaging).
5.	Service Provider process the operation that was requested for the Information Appliance.	Operation of Information Appliance.	Reliable Web Services Messaging: One-WAY Guaranteed Delivery, Duplicate Elimination, Message Ordering with asynchronous Messaging.
6.	Service Provider approve or disapprove the service request, and send the result to the portal.	Response for approval or disapproval of the Service.	Reliable Web Services Messaging: Request-Response Guaranteed Delivery, Duplicate Elimination, Message Ordering with Asynchronous messaging (or Guaranteed Delivery with Synchronous messaging).
7.	Service Portal sends back a response for approval or disapproval of the service to the user cellular phone.	Response for approval or disapproval of the Service.	Reliable Web Services Messaging: One-WAY Guaranteed Delivery, Duplicate Elimination, Message Ordering with Asynchronous messaging.

Characteristics of reliable Web Services messaging in the use case of registration and operation for Information Appliances

Asynchronous Messaging

In the following example, each user request goes to the Service Portal. And each Service Portal accesses to the Certificate Authority or Service Provider. Thus, the access peak to any particular server may cause delay when a lot of users access the server in a short time or these requests require a lot of server resources. Asynchronous reliable Web Services messaging between user and Service Portal will solve this issue, since sender don't have to wait after sending a message, and queuing mechanism helps to decrease load at the receiver.
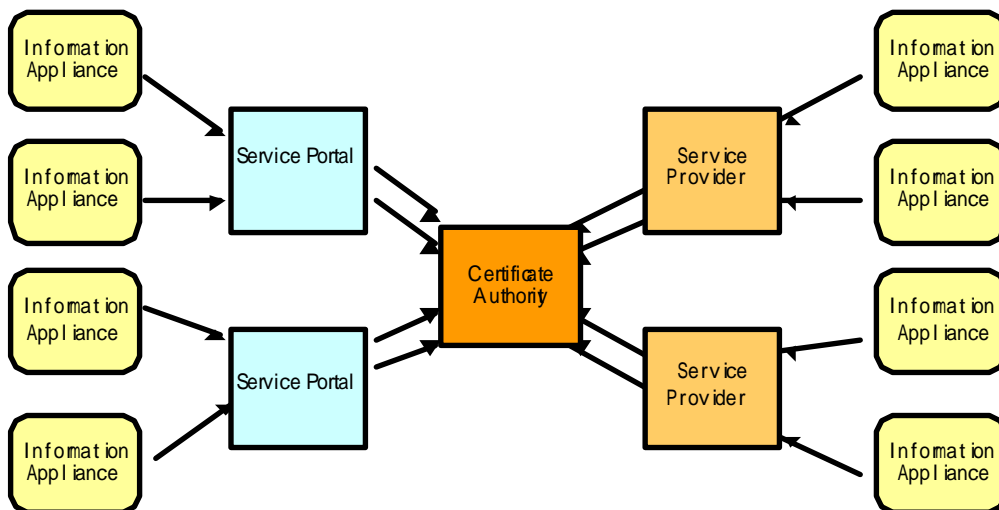
Figure1.3.2.3 Example of access concentration

Guaranteed Delivery

Guaranteed Delivery is always used to make the operation of Information Appliances reliable.

Duplicate Elimination, Message Ordering

Many operation of Information Appliance is based on a sequence of operations. There is also a case that the repeat of the same operation has special meanings. It is possible to eliminate duplicate message and to guarantee message ordering with asynchronous messaging by reliable Web Services messaging.

1.4 Functions of WS-Reliability

1.4.1 Three RM-Reply Patterns

WS-Reliability defines three RM-Reply patterns for Acknowledgment Indication or Fault Indication.

      Response RM-Reply Pattern
      Callback RM-Reply Pattern
      Poll RM-Reply Pattern   Synchronous   Asynchronous

With Response RM-Reply Pattern, a Request message is carried on a HTTP Request, and an RM-Reply message (e.g., Acknowledgment or fault) is carried on a HTTP Response. A pair of HTTP Request and HTTP Response will be used for this messages exchange pattern. It causes timeout at the sending side, when the receiving side takes time to send back the response message.

With Callback RM-Reply Pattern, a Request message is carried on a HTTP Request, and the HTTP Response will be returned with no RM-Reply message. The RM-Reply message is carried on a HTTP Request from the message receiver to the sender. Two pairs of HTTP Request and HTTP Response will be used for this messages exchange pattern. Sender is not affected by the processing status on the receiver side.

With Poll RM-Reply Pattern, a Request message is carried on a HTTP Request, and the HTTP Response will be returned with no RM-Reply message. Then the sender of the message sends a PollRequest message on the HTTP Request to retrieve RM-Reply from the receiver. The RM-Reply will be sent on whether HTTP Response for Synchronous messaging or HTTP Request to the sender for Asynchronous messaging. There are not many cases that Poll RM-Reply Pattern is required for Information Appliances.

1.4.2 Required Functions for Information Appliances

WS-Reliability defines reliable Web Services messaging functions that was described in section 1.2.1. The following chart shows the functions that Information Appliances requires.

Chart 1 Functions that Information Appliances will require

X...Required for most cases   ...May be required for some conditions

Feature \ ACK Message Exchange Pattern	Response RM-Reply	Callback RM-Reply	Poll RM-Reply(*3)
Guaranteed Delivery	X	X	-
Duplicate Elimination(*1)	X	X	-
Message Ordering(*2)			-

(*1)   This is especially required for charging fee to the information.

(*2)   This is required for controlling appliances with some sequence.

(*3)   This profile doesn't assume to use Poll RM-Reply. Refer section 2.2.7 for detail.

1.5 The Scope of this profile

The scope of this profile is described in Figure1.5.
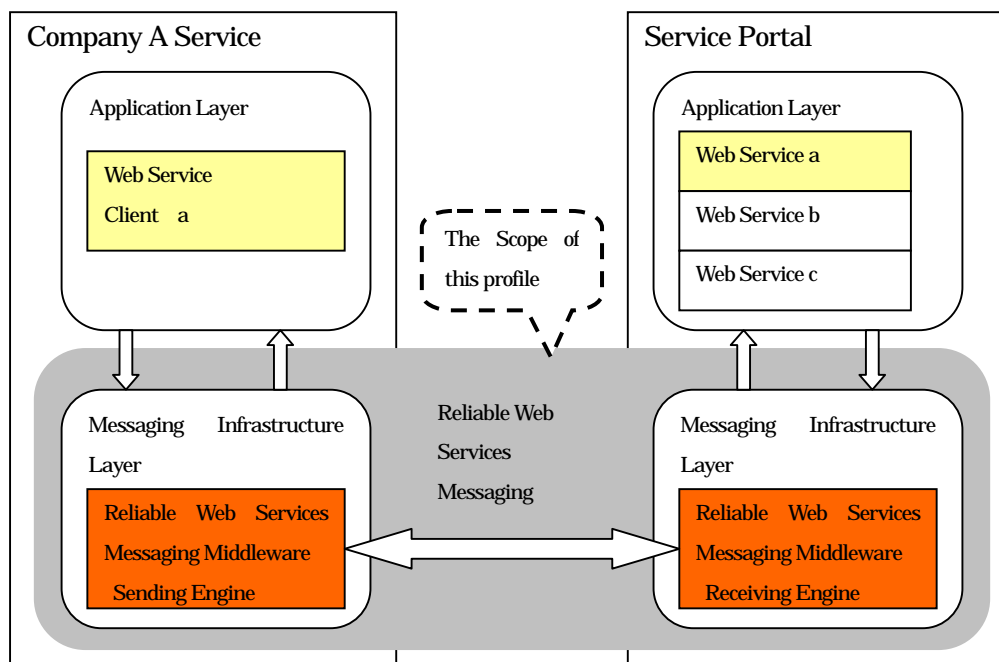
Figure 1.5   The scope of this profile

　　Messaging Infrastructure Layer
Reliable Web Services messaging standard protocol WS-Reliability specification is adopted. Interoperability of reliable Web Services messaging is realized by middleware software for reliable Web Services messaging.

　　Application Layer
It is vertical application, i.e., Web Services, to use reliable Web Services messaging.

This profile is to realize interoperability for reliable Web Services messaging, i.e., WS-Reliability, on the messaging infrastructure layer described above.

1.6 Recommendation of this profile

This profile defines three level of recommendation as described below.

[L1]

Mandatory. The element or attribute marked [L1] is required to realize interoperability for Information Appliances, even if the WS-Reliability specification defines it as optional.

[L2]

Strongly recommended. The element or attribute marked [L2] is strongly recommended to use for Information Appliances.

Others

No recommendation. This profile does not define any recommendation for some elements or attributes, if those items has no indication of [L1] or [L2] described above. These items may or may not be used in Implementation, though these items may be useful to realize interoperability.

1.7 Anticipated Readers of this document

This following audience is expected for this profile.
　　Application Developer, Systems Architecture, Systems Operator
　　Developer of Reliable Web Services Messaging Middleware　WS-Reliability

1.8 References

Web Services Reliable Messaging TC
WS-Reliability 1.1
OASIS Standard, 15 November 2004
http://docs.oasis-open.org/wsrm/ws-reliability/v1.1/wsrm-ws_reliability-1.1-spec-os.pdf

Technology Standard (ebXML) Guide Book Part I
ebXML Messaging Services Adoption Guide Book (*)
March, 2005
Electronic Commerce Promotion Council of Japan
Electronic Commerce Promotion Center, Japan Information Processing Development Corporation

*WS-Reliability1.1 Specification was standardized based on the reliable messaging function of ebXML Messaging Service 2.0.

2 WS-Reliability Function Requirements

This section describes recommendations for Information Appliances about features of WS-Reliability.

2.1 Guaranteed Delivery Function

Reference: WS-Reliability 1.1 Specification: 3.1.2 RM Agreement Items
Reference: WS-Reliability 1.1 Specification: 3.2.1 Guaranteed Delivery

Implementation or Configuration Question	Recommendation
Whether you should support Guaranteed Delivery or not?	It is recommended to use Guaranteed Delivery all the time, since this is basic feature of reliable Web Services messaging, and it is useful for controlling Information Appliance in many cases. [L1] The application layer doesn't have to implement the same feature if the infrastructure layer supports this function.

2.2 Duplicate Elimination Functions

Reference: WS-Reliability 1.1 Specification: 3.1.2 RM Agreement Items
Reference: WS-Reliability 1.1 Specification: 3.2.2 Duplicate Elimination

Implementation or Configuration Question	Recommendation
Whether you should support Duplicate Elimination or not?	It is preferable that one remote operation for Information Appliances causes exactly one message sending, when the remote operation simulates direct operation. In such cases, Duplicate Elimination function should be used with Guaranteed Delivery. It is recommended to use Duplicate Elimination all the time, since this is a basic function for reliable Web Services messaging in the infrastructure layer. [L1] The application layer doesn't have to implement the same feature if the infrastructure layer supports this function.
Implementation or Configuration Question	Recommendation

How long should be the monitoring time for Duplicate Elimination? Description: Receiving system stores the received message information in nonvolatile device for specified duration. The more the duration is long, the more resources required. It depends on characteristics of the devices.	The WS-Reliability specification allows to use any value with the specified type. However it is recommended to define reasonable fixed value for each Information Appliance, each system, each service, or each industry to help interoperability. [L2]

2.3 Message Ordering Function

Reference: WS-Reliability 1.1 Specification: 3.1.2 RM Agreement Items

Reference: WS-Reliability 1.1 Specification: 3.2.3 Guaranteed Message Ordering

Implementation or Configuration Question	Recommendation
Whether you should support Message Ordering or not? If this is used, both Guaranteed Delivery and Duplicate Elimination must be used also. Description: Message Ordering is a function to process messages in the order sender sent, even if the messages are received in the other order. Message Order element is used when a series of messages should be processed in the same order that the sender sent.	Synchronous messaging realizes message ordering, when the operation request and operation response for Information Appliance were processed one by one sequentially. However, synchronous messaging is not effective when a system is overloaded. Asynchronous messaging is required for such a case. And it is recommended to use Message Ordering feature with asynchronous messaging, when a series of control messages should be processed in order. [L2] The application layer doesn't have to implement the same feature if the infrastructure layer supports this function.

2.4 Recommendation for choosing of Asynchronous Messaging Synchronous Messaging between Application and Reliable Web Services Messaging Middleware

Reference: WS-Reliability 1.1 Specification:

Implementation or Configuration Question	Recommendation
Whether the communication between application and reliable Web Services messaging middleware should be asynchronous messaging, or synchronous messaging?	It depends on the application and system scale. It is recommended to choose asynchronous messaging, when it is expected to be overload with the system. Asynchronous messaging helps to decrease the system load with parallel processing or asynchronous processing. One or more feature may be chosen from Guaranteed Delivery, Duplicate Elimination, or Message Ordering appropriately. Thus, it realizes reliable controlling for Information Appliances asynchronously.

2.5 Response RM-Reply Pattern

Reference: WS-Reliability 1.1 Specification:

   6.1 Reliable Messaging with Response RM-Reply Pattern

Implementation or Configuration Question	Recommendation
In what cases, do you need to choose "Response RM-Reply Pattern"?	It is recommended to use this pattern, when a sender, i.e., user device to send operation request, or Information Appliances, and receiver, i.e., authentication services, Information Appliances controlling services, exchanges message bi-directionally. This should be used for relatively light-weight message exchange, especially for receiver side, e.g., sender sends information request, and receiver send back the requested information synchronously. [L2]

2.6 Callback RM-Reply Pattern

Reference: WS-Reliability 1.1 Specification:
  6.2 Reliable Messaging with Callback RM-Reply Pattern

Implementation or Configuration Question	Recommendation
In what cases, do you need to choose "Callback RM-Reply Pattern"?	It is recommended to use this pattern, when a sender, i.e., user device to send operation request, or Information Appliances, and receiver, i.e., authentication services, Information Appliances controlling services, exchanges message in one direction. This is valid for relatively heavy-weight message exchange, especially for receiver side, e.g., sender sends remote controlling request, and receiver send back the requested remote controlling service synchronously.

2.7 Poll RM-Reply Pattern

Reference: WS-Reliability 1.1 Specification:
  6.3 Reliable Messaging with Poll RM-Reply Pattern
Reference: WS-Reliability 1.1 Specification: 6.3.1 Synchronous Poll RM-Reply Pattern
Reference: WS-Reliability 1.1 Specification: 6.3.2 Asynchronous Poll RM-Reply Pattern

Implementation or Configuration Question	Recommendation
In what cases, do you need to choose " Poll RM-Reply Pattern"?	This is mainly for pull messaging. It will not be used much for controlling Information Appliance.

2.8 ExpiryTime

Reference: WS-Reliability 1.1 Specification: 3.1.2 RM Agreement Items
Reference: WS-Reliability 1.1 Specification:

Implementation or Configuration Question	Recommendation
What value is appropriate for ExpiryTime? Description: Message Processor keeps the message information in the persistent storage for a specified duration. Longer duration requires more resources. (It also depends on the product characteristics.)	It is recommended that each Information Appliance, each system, each service, or each industry, to define a static value to improve interoperability,, although the spec allows any value with specified type.

2.9 GroupExpiryTime, GroupMaxIdleDuration

Reference: WS-Reliability 1.1 Specification: 3.1.2 RM Agreement Items

Implementation or Configuration Question	Recommendation
What value is appropriate for GroupExpiryTime, and GroupMaxIdleDuration? Description: Message Processor keeps the message information in the persistent storage for a specified duration. Longer duration requires more resources. (It also depends on the product characteristics.)	It is recommended that each Information Appliance, each system, each service, or each industry, to define a static value to improve interoperability,, although the spec allows any value with specified type.

3 Parameters Configuration for WS-Reliability

This section describes configuration of reliable Web Services messaging - WS-Reliability.

3.1 Message Format

Reference: WS-Reliability 1.1 Specification: 4 Message Format

3.1.1 SOAP Envelope

Reference: WS-Reliability 1.1 Specification: 4.1 Structure

Implementation or Configuration Question	Recommendation
Description: - WS-Reliability message is described in the soapenv:Envelope/soapenv:Header.	No recommendation.

3.1.2 Request Element

Reference: WS-Reliability 1.1 Specification: 4.2 Request Element

Implementation or Configuration Question	Recommendation
Description: - This is a root element for Request message. - It appears zero or one time.	No recommendation.

3.1.3 Request/MessageId Element

Reference: WS-Reliability 1.1 Specification: 4.2.1 Element: Request/MessageId

Implementation or Configuration Question	Recommendation
Description:	No recommendation.

- This element is to identify a group. - It appears one time. Mandatory.	

3.1.4 Request/MessageId/@groupId Attribute

Reference: WS-Reliability 1.1 Specification: 4.2.1.1 Attribute: Request/MessageId@groupId

Implementation or Configuration Question	Recommendation
What value should be used for groupId attribute. Description: - This element is to identify a group with ID, URI type defined by RFC2396. identify a group. - It appears one time. Mandatory.	It is recommended to create unique URI value with a combination of industry defined URI and product or service specific ID, e.g., ID diversified from a product serial ID for the device, although the spec allows any URI value. [L2]

3.1.5 Request/MessageId/SequenceNum Element

Reference: WS-Reliability 1.1 Specification:

4.2.1.2 Element: Request/MessageId/SequenceNum

Implementation or Configuration Question	Recommendation
  Description: This is an ID to specify a message in the group. - It appears one time. Mandatory.	No recommendation.

3.1.6 Request/MessageId/SequenceNum/ @groupExpiryTime Attribute

Reference: WS-Reliability 1.1 Specification:

4.2.1.2.1 Attribute: Request/MessageId/SequenceNum@groupExpiryTime

Implementation or Configuration Question	Recommendation
What value should be used for groupExpiryTime? Description: -It is for GroupExpiryTime described in the capter2.1. This is the date and time that the sender want to close the group. - This attribute may appear zero or one time. - This is exclusive with	It is recommended that each Information Appliance, each system, each service, or each industry, to define a static value to improve interoperability, although the spec allows any value with specified type. [L1] The spec defines that this is exclusive with @groupMaxIdleDuration in a group. One of these two should be chosen among service providers. [L1] However, implementation of WS-Reliability

@groupMaxIdleDuration described in chapter 3.1.7.	should be able to support both. [L1]

Implementation or Configuration Question	Recommendation
What is the appropriate value?	It is recommended to use appropriate value for each service. [L1]

3.1.7 Request/MessageId/SequenceNum/ @groupMaxIdleDuration Attribute

Reference: WS-Reliability 1.1 Specification:

4.2.1.2.2 Attribute: Request/MessageId/SequenceNum@groupMaxIdleDuration

Implementation or Configuration Question	Recommendation
What value should be used for groupMaxIdleDuration? Description: - This is for GroupMaxIdleDuration specified in chapter 2.1. It specifies max idle duration for a group. - This attribute may appear zero or one time. - This is exclusive with @groupExpiryTime described in chapter 3.1.6.	It is recommended that each Information Appliance, each system, each service, or each industry, to define a static value to improve interoperability, although the spec allows any value with specified type. [L1] The spec defines that this is exclusive with @groupExpiryTime in a group. One of these two should be chosen among service providers. [L1] However, implementation of WS-Reliability should be able to support both. [L1]

Implementation or Configuration Question	Recommendation
What value is appropriate for this attribute?	It is recommended to use appropriate value for each service. [L1]

3.1.8   Request/MessageId/SequenceNum/@number Attribute

Reference: WS-Reliability 1.1 Specification:

    4.2.1.2.3 Attribute: Request/MessageId/SequenceNum@number

Implementation or Configuration Question	Recommendation
Description: - This is a sequence number to specify a message in a group. - Sending RMP must use zero for the first message in a group. The value of the following messages increases one by one sequentially. - The value is between "0" and "18446744073709551615". - It appears one time. Mandatory attribute.	No recommendation.

3.1.9   Request/MessageId/SequenceNum/@last Attribute

Reference: WS-Reliability 1.1 Specification:

    4.2.1.2.4 Attribute: Request/MessageId/SequenceNum@last

Implementation or Configuration Question	Recommendation
Whether this attribute should be used or not? Description: - This attribute indicates whether the message including this attribute is the last message of the group or not. - This attribute may appear zero or one time.	There must not be two or more MessageId element with the value of this attribute "true " in a group. [L1] There must not be a MessageId with larger value in number attribute, than MessageId with last attribute with "true".[L1] Use of this attribute: Sender has to use this attribute when it can decide the last message of a group for the service. [L2] However, receiver should not expect this value is used always. [L1] Value of this attribute: The value should be "true", when it is the last message of a group. Otherwise the value should be "false", which is the default value. [L2]

3.1.10 Request/ExpiryTime Element

Reference: WS-Reliability 1.1 Specification: 4.2.2 Element: Request/ExpiryTime

Implementation or Configuration Question	Recommendation
What is the appropriate value for this element? Description: - It is for ExpiryTime described in chapter 2.1. This specifies the date and time that the receiving RMP must not invoke Deliver operation thereafter. - This MUST appear one time. Mandatory element.	It is recommended to use appropriate value for each service. [L1]

3.1.11 Request/ReplyPattern Element

Reference: WS-Reliability 1.1 Specification: 4.2.3 Element: Request/ReplyPattern

Implementation or Configuration Question	Recommendation
Description: - This element is to specify RM-Reply Pattern - This MUST appear one time. Mandatory element.	It is recommended to use Response RM-Reply pattern or Callback RM-Reply pattern. It is recommended not to use Poll RM-Reply pattern.

3.1.12 Request/ReplyPattern/Value Element

Reference: WS-Reliability 1.1 Specification: 4.2.3.1 Element: Request/ReplyPattern/Value

Implementation or Configuration Question	Recommendation
Description: - Select one of the following RM-Reply Patterns: Response, Callback, or Poll - This MUST appear one time. Mandatory element.	No recommendation.

3.1.13 Request/ReplyPattern/ReplyTo Element

Reference: WS-Reliability 1.1 Specification: 4.2.3.2 Element: Request/ReplyPattern/ReplyTo

Implementation or Configuration Question	Recommendation
Description: - The value of this element must be specified, when the value of Request/ReplyPattern/Value element is "Callback". The value of this element must not be specified, if the value of Request/ReplyPattern/Value element is "Response" or "Poll". - This element specifies the endpoint that the sending RMP receives Callback message with RM-Reply information. - This element appears 0 or 1 time.	No recommendation.

3.1.14 Request/ReplyPattern/ReplyTo/ @reference-scheme Attribute

Reference: WS-Reliability 1.1 Specification:

   4.2.3.2.1 Attribute : Request/ReplyPattern/ReplyTo@reference-scheme

Implementation or Configuration Question	Recommendation
The spec defines that the BareURI and this attribute are exclusive. Which of these should be used? Description: - This specifies the schema format for the child element of Request/ReplyPattern/ReplyTo. Sending RMP has to omit this attribute, if the child element of Request/ReplyPattern/ReplyTo is BareURI. -This attribute appears 0 or 1 time.	It is recommended NOT to use this attribute.

3.1.15   Request/ReplyPattern/ReplyTo/BareURI Element

Reference: WS-Reliability 1.1 Specification:

4.2.3.2.2 Element: Request/ReplyPattern/ReplyTo/BareURI

Implementation or Configuration Question	Recommendation
Which element/attribute should be used between this element and reference-scheme attribute, which is exclusive each other. Description: -This is one of the easiest reference option. This specifies URI to receive Callback message. -This element appears 0 or 1 time.	It is recommended to use this BareURI element, rather than reference-scheme attribute. [L1]

3.1.16 Request/AckRequested Element

Reference: WS-Reliability 1.1 Specification: 4.2.4 Element: Request/AckRequested

Implementation or Configuration Question	Recommendation
Description: - Sending RMP has to include AckRequested element in the message, if the message is sent with GuaranteedDelivery, as described in chapter 2.1. -This element appears 0 or 1 time.	It is recommended to use this element always. [L1]

3.1.17 Request/DuplicateElimination Element

Reference: WS-Reliability 1.1 Specification: 4.2.5 Element: Request/DuplicateElimination

Implementation or Configuration Question	Recommendation
Description: - Sending RMP has to include DuplicateElimination element in the message, if the message is sent with NoDuplicateDelivery, as described in chapter 2.1.	This element is mandatory for asynchronous messaging. [L1]

| -This element appears 0 or 1 time. | |

3.1.18 Request/MessageOrder Element

Reference: WS-Reliability 1.1 Specification: 4.2.6 Element: Request/MessageOrder

Implementation or Configuration Question	Recommendation
Description: - Sending RMP has to include MessageOrder element in the message, if the message is sent with OrderedDelivery, as described in chapter 2.1. -This element appears 0 or 1 time.	No recommendation.

3.1.19 PollRequest Element

Reference: WS-Reliability 1.1 Specification: 4.3 PollRequest Element

Implementation or Configuration Question	Recommendation
Description: - This is a root element that requests RM-Reply for Poll RM-Reply Pattern. -This element appears 0 or 1 time.	It is considered that there are not many cases that that Poll RM-Reply is required in Information Appliances, as described in chapter2.2.7. This profile recommends an implementation not to use Poll RM-Reply. [L2] The following chapters regarding Poll RM-Reply pattern are described for the case the Poll RM-Reply is in use.

3.1.20 PollRequest/ReplyTo Element

Reference: WS-Reliability 1.1 Specification: 4.3.1 Element: PollRequest/ReplyTo

Implementation or Configuration Question	Recommendation
Description: - Receiving RMP has to send back RM-Reply information to the endpoint specified in PollRequest/ReplyTo element in a new request message. - Receiving RMP has to send back RM-Reply in the response of PollRequest, when there is not this element. - This element is used for exchanging	No recommendation.

message asynchronously. This element is not used for synchronous messaging. -This element appears 0 or 1 time.

3.1.21   PollRequest/ReplyTo/@reference-scheme Attribute

Reference: WS-Reliability 1.1 Specification:

4.3.1.1 Attribute: PollRequest/ReplyTo@reference-scheme

Implementation or Configuration Question	Recommendation
Description: - It is similar to the Request/ReplyPattern/ReplyTo@reference-scheme. - This specifies the schema format for child element of PollRequest/ReplyTo. Sending RMP has to omit this attribute, if the child element of PollRequest/ReplyTo is BareURI. - This attribute appears 0 or 1 time.	It is recommended NOT to use this attribute. [L2]

3.1.22 PollRequest/ReplyTo/BareURI Element

Reference: WS-Reliability 1.1 Specification: 4.3.1.2 Element: PollRequest/ReplyTo/BareURI

Implementation or Configuration Question	Recommendation
Description: - It is similar to Request/ReplyPattern/ReplyTo/BareURI. - This is a default type of PollRequest/ReplyTo. This specifies the endpoint URI to receive Callback message. -This element appears 0 or 1 time.	It is recommended to use this BareURI element, and not to use reference-scheme attribute. [L2]

3.1.23 PollRequest/RefToMessageIds Element

Reference: WS-Reliability 1.1 Specification: 4.3.2 Element: PollRequest/RefToMessageIds

Implementation or Configuration Question	Recommendation
Whether multiple PollRequest/RefToMessageIds element should be used as a child element of PollRequest? Description: - It includes group ID or message ID, i.e., @groupId and zero or more SequenceNumRange element that the Sending RMP wants to know the status. - When RefToMessageIds element doesn't include SequenceNumRange element, Receiving RMP MUST send back RM-Reply for received or faulted, and non-expired message for the group. - When the RefToMessageIds element include one or more SequenceNumRange element, Receiving RMP MUST send back RM-Reply for received or faulted, and non-expired message for the specified subset messages of the group. - The specified subset above includes every Reliable Message, that the value of MessageId/SequenceNum@number is included in the range specified by RefToMessageIds/SequenceNumRange element of the PollRequest. - Sending RMP may includes multiple RefToMessageIds element for each @groupId to request RM-Reply for multiple groups. - This element appears 1 or more time.	It is recommended to use single RefToMessageIds element for the child element of PollRequest. Because multiple group cause to increase complexity.

3.1.24   PollRequest/RefToMessageIds/@groupId Attribute

Reference: WS-Reliability 1.1 Specification:

    4.3.2.1 Attribute: PollRequest/RefToMessageIds@groupId

Implementation or Configuration Question	Recommendation
Description: - This specifies a groupId for the messages that the Sending RMP wants to know the status. - This MUST appear one time. Mandatory attribute.	It is recommended to create unique URI value with a combination of industry defined URI and product or service specific ID, e.g., ID diversified from a product serial ID for the device, although the spec allows any URI value. [L2]

3.1.25 PollRequest/RefToMessageIds/ SequenceNumRange Element

Reference: WS-Reliability 1.1 Specification:

    4.3.2.2 Element: PollRequest/RefToMessageIds/SequenceNumRange

Implementation or Configuration Question	Recommendation
Whether this element should be used or not? Description: - This specifies the message in a group that the Sending RMP is requesting the status. - The attribute in this element, @from and @to, indicate range of SequenceNum value. - When RefToMessageIds element doesn't include SequenceNumRange element, Receiving RMP has to send back RM-Reply for received or faulted, and non-expired message for the group. - When the RefToMessageIds element include one or more SequenceNumRange element, Receiving RMP has to send back RM-Reply for received or faulted, and non-expired message for the specified subset messages of the group. - This element appears 0 or more time.	It is recommended NOT to use this element, i.e., Receiving RMP sends back RM-Reply always for received or faulted and non-expired message for the group. [L1]

3.1.26 PollRequest/RefToMessageIds /SequenceNumRange/@from Attribute

Reference: WS-Reliability 1.1 Specification:

4.3.2.2.1 Attribute: PollRequest/RefToMessageIds/SequenceNumRange@from

Implementation or Configuration Question	Recommendation
Description: - This specifies the smallest value for SequenceNum@number in message ReplyRange. The value of @from is unsignedLong type and it should be equal or smaller than the value of @to. - This MUST appear one time. Mandatory attribute.	It is recommended NOT to use this attribute, since the parent element is not recommended to use. [L1]

3.1.27 PollRequest/RefToMessageIds /SequenceNumRange/@to Attribute

Reference: WS-Reliability 1.1 Specification:

4.3.2.2.2 Attribute: PollRequest/RefToMessageIds/SequenceNumRange@to

Implementation or Configuration Question	Recommendation
Description: - This specifies the largest value for SequenceNum@number in message ReplyRange. The value of @to is unsignedLong type and it should be equal or larger than the value of @from. - This MUST appear one time. Mandatory attribute.	It is recommended NOT to use this attribute, since the parent element is not recommended to use. [L1]

3.1.28 Response Element

Reference: WS-Reliability 1.1 Specification: 4.4 Response Element

Implementation or Configuration Question	Recommendation
Description: - Response element indicates Acknowledgements and Fault for Reliable Message. -This element appears 0 or 1 time.	No recommendation.

3.1.29 Response/NonSequenceReply Element

Reference: WS-Reliability 1.1 Specification: 4.4.1 Element: Response/NonSequenceReply

Implementation or Configuration Question	Recommendation
Description: - RM-Reply for a message with no sequence number has to include NonSequenceReply element. -This element appears 0 or more time.	No recommendation.

3.1.30   Response/NonSequenceReply/@groupId Attribute

Reference: WS-Reliability 1.1 Specification:
   4.4.1.1 Attribute: Response/NonSequenceReply@groupId

Implementation or Configuration Question	Recommendation
Description: - This specifies a group ID for a message with no sequence number. - NonSequenceReply element has to include @groupId for the message. - This MUST appear one time. Mandatory attribute.	It is recommended to create unique URI value with a combination of industry defined URI and product or service specific ID, e.g., ID diversified from a product serial ID for the device, although the spec allows any URI value. [L2]

3.1.31   Response/NonSequenceReply/@fault Attribute

Reference: WS-Reliability 1.1 Specification:

4.4.1.2 Attribute: Response/NonSequenceReply@fault

Implementation or Configuration Question	Recommendation
Description: - This specifies the Reliable Messaging Fault code that was occurred during the message processing. -This element appears 0 or 1 time.	No recommendation.

3.1.32 Response/SequenceReplies Element

Reference: WS-Reliability 1.1 Specification: 4.4.2 Element: Response/SequenceReplies

Implementation or Configuration Question	Recommendation
Description: - RM-Reply for a group or subset of a group, including a message with sequence number has to include SequenceReplies element. -This element appears 0 or more time.	No recommendation.

3.1.33   Response/SequenceReplies/@groupId Attribute

Reference: WS-Reliability 1.1 Specification:

4.4.2.1 Attribute: Response/SequenceReplies@groupId

Implementation or Configuration Question	Recommendation
Description: - SequenceReplies element specifies the status for a group specified with this attribute. - SequenceReplies element has to specify the @groupId attribute for the group.	It is recommended to create unique URI value with a combination of industry defined URI and product or service specific ID, e.g., ID diversified from a product serial ID for the device, although the spec allows any URI value. [L2]

- This MUST appear one time. Mandatory attribute.	

3.1.34　　Response/SequenceReplies/ReplyRange Element

Reference: WS-Reliability 1.1 Specification:

4.4.2.2 Element: Response/SequenceReplies/ReplyRange

Implementation or Configuration Question	Recommendation
Description: - This specifies a range of sequence number and delivery status. -This element appears 1 or more time.	No recommendation.

3.1.35　　Response/SequenceReplies/ReplyRange/ @from Attribute

Reference: WS-Reliability 1.1 Specification:

4.4.2.2.1 Attribute: Response/SequenceReplies/ReplyRange@from

Implementation or Configuration Question	Recommendation
Description: - It is same for @from attribute for PollRequest element. - This specifies the smallest value for SequenceNum@number in message ReplyRange. The value of @from is unsignedLong type, i.e., the value is between "0" and "18446744073709551615" , and it should be equal or smaller than the value of @to. - This MUST appear one time. Mandatory attribute.	No recommendation.

3.1.36   Response/SequenceReplies/ReplyRange/ @to Attribute

Reference: WS-Reliability 1.1 Specification:

4.4.2.2.2 Attribute: Response/SequenceReplies/ReplyRange@to

Implementation or Configuration Question	Recommendation
Description: - It is same for @to attribute for PollRequest element. - This specifies the largest value for SequenceNum@number in message ReplyRange. The value of @to is unsignedLong type, i.e., the value is between "0" and "18446744073709551615" , and it should be equal or larger than the value of @from. - This MUST appear one time. Mandatory attribute.	No recommendation.

3.1.37   Response/SequenceReplies/ReplyRange/ @fault Attribute

Reference: WS-Reliability 1.1 Specification:

4.4.2.2.3 Attribute: Response/SequenceReplies/ReplyRange@fault

Implementation or Configuration Question	Recommendation
Description: - This specifies all of the Reliable Messaging Fault code(s) that was (were) occurred during the message processing for the message(s) specified with ReplyRange. -This element appears 0 or 1 time.	No recommendation.

4 Clarification of WS-Reliability specification

This section describes some points to implement WS-Reliability, when it will be used to control information appliances.

4.1 Group Termination

Reference: WS-Reliability 1.1 Specification: 3.1.2 RM Agreement Items
Reference: WS-Reliability 1.1 Specification: 3.1.3 Scope of an Agreement Item
Reference: WS-Reliability 1.1 Specification: 5.1.1 Group Termination

Implementation or Configuration Question	Recommendation
What you should do when the expiration of message and the expiration of its group is different?	No recommendation.

Implementation or Configuration Question	Recommendation
Whether a sender should resend a message with Guaranteed Delivery in a group when the message was not delivered, even if the group was closed, since the specified duration was passed? Description: The specification allows to resend the message. It MAY resend the message.	No recommendation.

4.2 Attachments

Reference: WS-Reliability 1.1 Specification: 5.2 Attachments

Implementation or Configuration Question	Recommendation
Should implementation of WS-Reliability support attachments? Description: - The spec describes the message may include 0 or more additional MIME Part.	Implementation of WS-Reliability may support Attachments. Even if the implementation doesn't support attachments, it should not cause system failure when it received a message with attachments. [L1] It should be clarified in the application guideline how to deal with attachments. [L1]