Abstract:
This specification describes a domain-specific policy assertion for WS-ReliableMessaging [WS-RM] that can be specified within a policy alternative as defined in WS-Policy Framework [WS-Policy]. By using the XML [XML], SOAP [SOAP 1.1], [SOAP 1.2] and WSDL [WSDL 1.1] extensibility models, the WS* specifications are designed to be composed with each other to provide a rich Web services environment. This by itself does not provide a negotiation solution for Web services. This is a building block that is used in conjunction with other Web service and application-specific protocols to accommodate a wide variety of policy exchange models.
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1 Introduction
This specification defines a domain-specific policy assertion for reliable messaging for use with WS-Policy and WS-ReliableMessaging.

1.1 Goals and Requirements

1.1.1 Requirements

1.2 Notational Conventions

The keywords "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [KEYWORDS].

This specification uses the following syntax to define normative outlines for messages:

- The syntax appears as an XML instance, but values in italics indicate data types instead of values.
- Characters are appended to elements and attributes to indicate cardinality:
  - "?" (0 or 1)
  - "*" (0 or more)
  - "+" (1 or more)
- The character "|" is used to indicate a choice between alternatives.
- The characters "[" and "]" are used to indicate that contained items are to be treated as a group with respect to cardinality or choice.
- An ellipsis (i.e. "...") indicates a point of extensibility that allows other child, or attribute, content. Additional children and/or attributes MAY be added at the indicated extension points but MUST NOT contradict the semantics of the parent and/or owner, respectively. If an extension is not recognized it SHOULD be ignored.
- XML namespace prefixes (See Section 1.3) are used to indicate the namespace of the element being defined.

Elements and Attributes defined by this specification are referred to in the text of this document using XPath 1.0 [XPATH 1.0] expressions. Extensibility points are referred to using an extended version of this syntax:

- An element extensibility point is referred to using {any} in place of the element name. This indicates that any element name can be used, from any namespace other than the wsrn: namespace.
- An attribute extensibility point is referred to using @{any} in place of the attribute name. This indicates that any attribute name can be used, from any namespace other than the wsrn: namespace.
1.3 Namespace

The XML namespace [XML-ns] URI that MUST be used by implementations of this specification is:

```
http://docs.oasis-open.org/ws-rx/wsrmp/200702
```

Dereferencing the above URI will produce the Resource Directory Description Language [RDDL 2.0] document that describes this namespace.

Table 1 lists the XML namespaces that are used in this specification. The choice of any namespace prefix is arbitrary and not semantically significant.

Table 1

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Namespace</th>
<th>Specification</th>
</tr>
</thead>
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<tr>
<td>wsdl</td>
<td><a href="http://schemas.xmlsoap.org/wsdl/">http://schemas.xmlsoap.org/wsdl/</a></td>
<td>[WSDL 1.1]</td>
</tr>
<tr>
<td>wsrmp</td>
<td><a href="http://docs.oasis-open.org/ws-rx/wsrmp/200702">http://docs.oasis-open.org/ws-rx/wsrmp/200702</a></td>
<td>This specification.</td>
</tr>
</tbody>
</table>

1.4 Compliance

An implementation is not compliant with this specification if it fails to satisfy one or more of the MUST or REQUIRED level requirements defined herein. A SOAP Node MUST NOT use the XML namespace identifier for this specification (listed in Section 1.3) within SOAP Envelopes unless it is compliant with this specification.

Normative text within this specification takes precedence over normative outlines, which in turn take precedence over the XML Schema [XML-Schema Part1, XML-Schema Part2] descriptions.
2 RM Policy Assertions

WS-Policy Framework and WS-Policy Attachment [WS-PolicyAttachment] collectively define a framework, model and grammar for expressing the requirements, and general characteristics of entities in an XML Web services-based system. To enable an RM Destination and an RM Source to describe their requirements for a given Sequence, this specification defines a single RM policy assertion that leverages the WS-Policy framework.

2.1 Assertion Model

The RM policy assertion indicates that the RM Source and RM Destination MUST use WS-ReliableMessaging to ensure reliable delivery of messages. Specifically, the WS-ReliableMessaging protocol determines invariants maintained by the reliable messaging endpoints and the directives used to track and manage the delivery of a Sequence of messages.

2.2 Normative Outline

The normative outline for the RM assertion is:

```
<wsrmp:RMAssertion [wsp:Optional="true"]? ... >
  <wsp:Policy>
    [ <wsrmp:SequenceSTR/> | <wsrmp:SequenceTransportSecurity/> ] ?
    <wsrmp:DeliveryAssurance>
      <wsp:Policy>
        [ <wsrmp:ExactlyOnce/> | <wsrmp:AtLeastOnce/> | <wsrmp:AtMostOnce/> ]
        <wsrmp:InOrder/> ?
      </wsp:Policy>
    </wsrmp:DeliveryAssurance> ?
  </wsp:Policy>
</wsrmp:RMAssertion>
```

The following describes the content model of the RMAssertion element.

/wsrmp:RMAssertion

A policy assertion that specifies that WS-ReliableMessaging protocol MUST be used when sending messages.

/wsrmp:RMAssertion/@wsp:Optional="true"

Per WS-Policy, this is compact notation for two policy alternatives, one with and one without the assertion. The intuition is that the behavior indicated by the assertion is optional, or in this case, that WS-ReliableMessaging MAY be used.

/wsrmp:RMAssertion/wsp:Policy

This required element allows for the inclusion of nested policy assertions.

/wsrmp:RMAssertion/wsp:Policy/wsrmp:SequenceSTR

When present, this assertion defines the requirement that an RM Sequence MUST be bound to an explicit token that is referenced from a wsse:SecurityTokenReference in the CreateSequence message. See section 2.5.1.
When present, this assertion defines the requirement that an RM Sequence MUST be bound to
the session(s) of the underlying transport-level protocol used to carry the CreateSequence and
CreateSequenceResponse message. When present, this assertion MUST be used in
conjunction with the sp:TransportBinding assertion, see section 2.5.2.

This expression, which may be omitted, describes the message delivery quality of service
between the RM and application layer. When used by an RM Destination it expresses the delivery
assurance in effect between the RM Destination and its corresponding application destination,
and it also indicates requirements on any RM Source that transmits messages to this RM
destination. Conversely when used by an RM Source it expresses the delivery assurance in effect
between the RM Source and its corresponding application source, as well as indicating
requirements on any RM Destination that receives messages from this RM Source. In either case
the delivery assurance does not affect the messages transmitted on the wire. Absence of this
expression from a wsrmp:RMAssertion policy assertion simply means that the endpoint has
chosen not to advertise its delivery assurance characteristics.

Note that when there are multiple policy alternatives of the RM Assertion, the Delivery Assurance
on each MUST NOT conflict.

This required element identifies additional requirements for the use of the
wsrmp:DeliveryAssurance.

This expresses the ExactlyOnce Delivery Assurance defined in [].

This expresses the AtLeastOnce Delivery Assurance defined in [].

This expresses the AtMostOnce Delivery Assurance defined in [].

This expresses the InOrder Delivery Assurance defined in [].

This is an extensibility mechanism to allow different (extensible) types of information, based on a
schema, to be passed.

This is an extensibility mechanism to allow different (extensible) types of information, based on a
schema, to be passed.

2.3 Assertion Attachment

The RM policy assertion is allowed to have the following Policy Subjects [WS-PolicyAttachment]:

- Endpoint Policy Subject
- Message Policy Subject
WS-PolicyAttachment defines a set of WSDL/1.1 policy attachment points for each of the above Policy Subjects. Since an RM policy assertion specifies a concrete behavior, it MUST NOT be attached to the abstract WSDL policy attachment points.

The following is the list of WSDL/1.1 elements whose scope contains the Policy Subjects allowed for an RM policy assertion but which MUST NOT have RM policy assertions attached:

- `wsdl:message`
- `wsdl:portType/wsdl:operation/wsdl:input`
- `wsdl:portType/wsdl:operation/wsdl:output`
- `wsdl:portType/wsdl:operation/wsdl:fault`
- `wsdl:portType`

The following is the list of WSDL/1.1 elements whose scope contains the Policy Subjects allowed for an RM policy assertion and which MAY have RM policy assertions attached:

- `wsdl:port`
- `wsdl:binding`
- `wsdl:binding/wsdl:operation/wsdl:input`
- `wsdl:binding/wsdl:operation/wsdl:output`
- `wsdl:binding/wsdl:operation/wsdl:fault`

If an RM policy assertion is attached to any of:

- `wsdl:binding/wsdl:operation/wsdl:input`
- `wsdl:binding/wsdl:operation/wsdl:output`
- `wsdl:binding/wsdl:operation/wsdl:fault`

then an RM policy assertion, specifying `wsp:Optional=true` MUST be attached to the corresponding `wsdl:binding` or `wsdl:port`, indicating that the endpoint supports WS-RM. Any messages, regardless of whether they have an attached Message Policy Subject RM policy assertion, MAY be sent to that endpoint using WS-RM. Additionally, the receiving endpoint MUST NOT reject any message belonging to a Sequence, simply because there was no Message Policy Subject RM policy assertion attached to that message. There might be certain RM implementations that are incapable of applying RM Quality of Service (QoS) semantics on a per-message basis. In order to ensure the broadest interoperability, when an endpoint decorates its WSDL with RM policy assertions using Message Policy Subject, it MUST also be prepared to accept that all messages sent to that endpoint might be sent within the context of an RM Sequence, regardless of whether the corresponding `wsdl:input`, `wsdl:output` or `wsdl:fault` had an attached RM policy assertion.

Rather than turn away messages that were unnecessarily sent with RM semantics, the receiving endpoint described by the WSDL MUST accept these messages.

By attaching an RM policy assertion that specifies `wsp:Optional=true` to the corresponding endpoint that has attached RM policy assertions at the Message Policy Subject level, the endpoint is describing the above constraint in policy.

In the case where an optional RM Assertion applies to an output message, there is no requirement on the client to support an RM Destination implementation
2.4 Assertion Example

Table 2 lists an example use of the RM policy assertion.

Table 2: Example policy with RM policy assertion

```
<wsdl:definitions
    targetNamespace="example.com"
    xmlns:tns="example.com"
    xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
    xmlns:wsrmp="http://docs.oasis-open.org/ws-rx/wsrmp/200702"
    xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
  <wsp:UsingPolicy wsdl:required="true" />
  <wsp:Policy wsu:Id="MyPolicy">
    <wsrmp:RMAssertion>
      <wsp:Policy/>
    </wsrmp:RMAssertion>
  </wsp:Policy>
  <wsp:PolicyReference URI="#MyPolicy" />
  <wsdl:binding name="MyBinding" type="tns:MyPortType">
    <wsp:PolicyReference URL="#MyPolicy" />
  </wsdl:binding>
</wsdl:definitions>
```

Line (09) in Table 2 indicates that WS-Policy is in use as a required extension.

Lines (11-16) are a policy expression that includes a RM policy assertion (lines 12-14) to indicate that WS-ReliableMessaging must be used.

Lines (20-23) are a WSDL binding. Line (21) indicates that the policy in lines (11-16) applies to this binding, specifically indicating that WS-ReliableMessaging must be used over all the messages in the binding.

2.5 Sequence Security Policy

WS-SecurityPolicy [SecurityPolicy] provides a framework and grammar for expressing the security requirements and characteristics of entities in a XML web services based system. The following assertions MAY be used in conjunction with WS-SecurityPolicy to express additional security requirements particular to RM Sequences.

2.5.1 RM Assertion with Sequence STR Assertion

This version of the RM assertion includes the requirement that an RM Sequence MUST be bound to an explicit token that is referenced from a wsse:SecurityTokenReference in the CreateSequence message.

This assertion MUST apply to [Endpoint Policy Subject]. The normative outline for this form of the Sequence STR Assertion is:
The following describes the content model of the `SequenceSTR` element.

```
<wrmp:SequenceSTR/>
```

A policy assertion that specifies security requirements which MUST be used with an RM Sequence that are particular to WS-RM and beyond what can be expressed in WS-SecurityPolicy.

### 2.5.2 RM Assertion with Sequence Transport Security Assertion

This version of the RM assertion includes the requirement that an RM Sequence MUST be bound to the session(s) of the underlying transport-level security protocol (e.g. SSL/TLS) used to carry the `CreateSequence` and `CreateSequenceResponse` messages.

This assertion MUST apply to [Endpoint Policy Subject]. This assertion MUST be used in conjunction with the `sp:TransportBinding` assertion that requires the use of some transport-level security mechanism (e.g. `sp:HttpsToken`).

The normative outline for this form of the RM Assertion with the Sequence Transport Security Assertion is:

```
<wsp:Policy>
  <wsp:ExactlyOne>
    <wsp:All>
      <wrmp:RMAssertion [wsp:Optional="true"]> ...</wsp:Policy>
      <wrmp:SequenceTransportSecurity/>
    </wsp:Policy>
  </wsp:All>
  <sp:TransportBinding ...>
  ...</sp:TransportBinding>
  <wsp:All>
  <wsp:ExactlyOne>
  </wsp:All>
</wsp:Policy>
```

The following describes the content model of the `SequenceTransportSecurity` element.

```
<wrmp:SequenceTransportSecurity/>
```

A policy assertion that specifies that any Sequences targeted to the indicated endpoint MUST be bound to the underlying session(s) of the transport-level security used to carry messages related to the Sequence.

This form of the RM Assertion says that an endpoint MAY have RM as an option but always requires HTTPS to be used. All the `SequenceTransportSecurity` assertion indicates is that RM’s rules for protecting the Sequence over TLS are followed.
3 Security Considerations

It is strongly RECOMMENDED that policies and assertions be signed to prevent tampering.

It is RECOMMENDED that policies SHOULD NOT be accepted unless they are signed and have an associated security token to specify the signer has proper claims for the given policy. That is, a relying party shouldn't rely on a policy unless the policy is signed and presented with sufficient claims to pass the relying parties acceptance criteria.

It should be noted that the mechanisms described in this document could be secured as part of a SOAP message using WS-Security [WS-Security] or embedded within other objects using object-specific security mechanisms.
4 References

4.1 Normative

[KEYWORDS]

S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels," RFC 2119, Harvard University, March 1997.

http://www.ietf.org/rfc/rfc2119.txt

[SOAP 1.1]


http://www.w3.org/TR/2000/NOTE-SOAP-20000508/

[SOAP 1.2]


http://www.w3.org/TR/2003/REC-soap12-part1-20030624/

[URI]


http://ietf.org/rfc/rfc3986

[WS-RM]


[WS-Policy]

W3C Member Submission, "Web Services Policy Framework (WS-Policy)," April 2006.

http://www.w3.org/Submission/2006/SUBM-WS-Policy-20060425/

[WS-PolicyAttachment]


http://www.w3.org/Submission/2006/SUBM-WS-PolicyAttachment-20060425/

[WSDL 1.1]

W3C Note, "Web Services Description Language (WSDL 1.1)," 15 March 2001.

http://www.w3.org/TR/2001/NOTE-wsdl-20010315

[XML]


http://www.w3.org/TR/REC-xml/
4.2 Non Normative

[RDDL 2.0]
http://www.openhealth.org/RDDL/20040118/rrdl-20040118.html

[SecurityPolicy]

[WS-Security]
Appendix A. Acknowledgments

This document is based on initial contribution to OASIS WS-RX Technical Committee by the following authors:

Stefan Batres-Editor(Microsoft), Ruslan Bilorusets(BEA), Don Box(Microsoft), Luis Felipe Cabrera(Microsoft), Derek Collison(TIBCO Software), Donald Ferguson(IBM), Christopher Ferris-Editor(IBM), Tom Freund(IBM), Mary Ann Hondo(IBM), John Ibbotson(IBM), Lei Jin(BEA), Chris Kaler(Microsoft), David Langworthy(Microsoft), Amelia Lewis(TIBCO Software), Rodney Limprecht(Microsoft), Steve Lucco(Microsoft), Don Mullen(TIBCO Software), Anthony Nadalin(IBM), Mark Nottingham(BEA), David Orchard(BEA), Shivajee Samdarshi(TIBCO Software), John Shewchuk(Microsoft), Tony Storey(IBM).

The following individuals have provided invaluable input into the initial contribution:

Keith Ballinger(Microsoft), Allen Brown(Microsoft), Michael Conner(IBM), Francisco Curbera(IBM), Steve Graham(IBM), Pat Helland(Microsoft), Rick Hill(Microsoft), Scott Hinkelmann(IBM), Tim Holloway(IBM), Efim Hudis(Microsoft), Johannes Klein(Microsoft), Frank Leymann(IBM), Martin Nally(IBM), Peter Niblett(IBM), Jeffrey Schlimmer(Microsoft), Chris Sharp(IBM), James Snell(IBM), Keith Stobie(Microsoft), Satish Thatte(Microsoft), Stephen Todd(IBM), Sanjiva Weerawarana(IBM), Roger Wolter(Microsoft).

The following individuals were members of the committee during the development of this specification:

Abbie Barbir(Nortel), Charlton Barreto(Adobe), Stefan Batres(Microsoft), Hamid Ben Malek(Fujitsu), Andreas Bjurlestad(Ericsson), Toufic Boubez(Layer 7), Doug Bunting(Sun), Lloyd Burch(Novell), Steve Carter(Novell), Martin Chapman(Oracle), Dave Chappell(Sonic), Paul Cotton(Microsoft), Glen Daniels(Sonic), Doug Davis(IBM), Blake Dournaee(Intel), Jacques Durand(Fujitsu), Colleen Evans(Microsoft), Christopher Ferris(IBM), Paul Fremantle(WSO2), Robert Freund(Hitachi), Peter Furniss(Erebor), Marc Goodner(Microsoft), Alastair Green(Choreology), Mike Grogan(Sun), Ondrej Hrebicek(Microsoft), Kazunori Iwasa(Fujitsu), Chamikara Jayalath(WSO2), Lei Jin(BEA), Ian Jones(BT plc), Anish Karmarkar(Oracle), Paul Knight(Nortel), Dan Leshchiner(Tibco), Mark Little(JBoss), Lily Liu(webMethods), Matt Lovett(IBM), Ashok Malhotra(Oracle), Jonathan Marsh(Microsoft), Daniel Millwood(IBM), Jeff Mischkinsky(Oracle), Nilo Mitra(Ericsson), Peter Niblett(IBM), Duane Nickull(Adobe), Eisaku Nishiyama(Hitachi), Dave Orchard(BEA), Chouthri Palanisamy(NEC), Sanjay Patil(SAP), Gilbert Pilz(BEA), Martin Raeppep(SAP), Eric Rajkovic(Oracle), Stefan Rossmanith(SAP), Tom Rutt(Fujitsu), Rich Salz(IBM), Shivajee Samdarshi(Tibco), Vladimir Videlov(SAP), Claus von Riegen(SAP), Pete Wenzel(Sun), Steve Winkler(SAP), Ümit Yalçınalp(SAP), Nobuyuki Yamamoto(Hitachi).
Appendix B. XML Schema

A normative copy of the XML Schema [XML-Schema Part1, XML-Schema Part2] description for this specification may be retrieved from the following address:

http://docs.oasis-open.org/ws-rx/wsrmp/200702/wsrmp-1.1-schema-200702.xsd

The following copy is provided for reference.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!--
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MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
-->
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xmlns:xsi="http://www.w3.org/2001/XMLSchema"
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</xs:element>

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<td>I057 resolution</td>
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<td>What</td>
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<td>wd-3</td>
<td>2005-12-23</td>
<td>Ümit Yalçinalp</td>
<td>Changed the ref to WS-RM to the WS-RX committee draft instead of original version</td>
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<td>Fixed Dug's email address</td>
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<td>wd-3</td>
<td>2005-12-23</td>
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<td>i060 resolution</td>
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<tr>
<td>wd-03</td>
<td>2005-12-27</td>
<td>Gilbert Pilz</td>
<td>Remove schema example and put it in its own artifact (wsrmp-1.1-schema-200510.xsd). Convert source file to OpenDocument format. Make line numbers all the same style.</td>
</tr>
<tr>
<td>wd-03</td>
<td>2005-12-28</td>
<td>Anish Karmarkar</td>
<td>Included a section link to c:\temp\wsrmp-1.1-schema-200510.xsd</td>
</tr>
<tr>
<td>wd-03</td>
<td>2006-01-04</td>
<td>Gilbert Pilz</td>
<td>Fixed formatting of included section.</td>
</tr>
<tr>
<td>wd-03</td>
<td>2006-01-05</td>
<td>Gilbert Pilz</td>
<td>Fix closing tag of normative outline for RMAssertion.</td>
</tr>
<tr>
<td>wd-04</td>
<td>2006-11-11</td>
<td>Doug Davis</td>
<td>Minor tweaks/typos</td>
</tr>
<tr>
<td>wd-05</td>
<td>2006-01-23</td>
<td>Gilbert Pilz</td>
<td>Start wd-05 by accepting all changes from wd-04</td>
</tr>
<tr>
<td>wd-06</td>
<td>2006-01-23</td>
<td>Doug Davis</td>
<td>Minor typos found by Marc</td>
</tr>
<tr>
<td>wd-06</td>
<td>2006-02-14</td>
<td>Doug Davis</td>
<td>Issue 075 resolution</td>
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<td>wd-06</td>
<td>2006-02-14</td>
<td>Doug Davis</td>
<td>Issues 086, 087 resolutions</td>
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<tr>
<td>wd-06</td>
<td>2006-02-15</td>
<td>Gilbert Pilz</td>
<td>Issue 088; added link for namespace URI; added text describing link; added non-normative reference for RDDL 2.0</td>
</tr>
<tr>
<td>wd-06</td>
<td>2006-02-17</td>
<td>Anish Karmarkar</td>
<td>Removed a sentence in section 2.1 that talked about RM assertion parameters, as there aren’t any.</td>
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<tr>
<td>wd-06</td>
<td>2006-02-17</td>
<td>Anish Karmarkar</td>
<td>Change the namespace to 200602.</td>
</tr>
<tr>
<td>wd-07</td>
<td>2006-02-22</td>
<td>Doug Davis</td>
<td>Accept all changes to create new WD</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Minor typo fixed – thanks to Paul Cotton</td>
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<tr>
<td>wd-07</td>
<td>2006-02-23</td>
<td>Doug Davis</td>
<td>Added missing namespace table entries - MarcG</td>
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<tr>
<td>wd-07</td>
<td>2006-03-08</td>
<td>Doug Davis</td>
<td>Issue 097 applied</td>
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<tr>
<td>wd-08</td>
<td>2006-04-11</td>
<td>Doug Davis</td>
<td>Issue 021 applied</td>
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<td>wd-08</td>
<td>2006-04-24</td>
<td>Gilbert Pilz</td>
<td>Misc cleanups prior to publishing to TC.</td>
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<td>wd-09</td>
<td>2006-05-29</td>
<td>Gilbert Pilz</td>
<td>Issue 117 applied</td>
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<td>wd-10</td>
<td>2006-06-05</td>
<td>Gilbert Pilz</td>
<td>Accept all changes; bump WD number</td>
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<td>wd-10</td>
<td>2006-06-07</td>
<td>Doug Davis</td>
<td>Applied lots of minor edits from Marc Goodner</td>
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<td>wd-10</td>
<td>2006-06-13</td>
<td>Doug Davis</td>
<td>Applied a couple of minor edits</td>
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<td>By Whom</td>
<td>What</td>
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<td>wd-10</td>
<td>2006-07-21</td>
<td>Doug Davis</td>
<td>Issues 122-124 applied</td>
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<td>wd-10</td>
<td>2006-07-27</td>
<td>Doug Davis</td>
<td>Copied list of TC members from RM spec (i134)</td>
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<td>wd-10</td>
<td>2006-08-04</td>
<td>Doug Davis</td>
<td>Updated old namespaces – found by PaulC</td>
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<td>wd-10</td>
<td>2006-08-04</td>
<td>Doug Davis</td>
<td>Verify all [refs]</td>
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<td>wd-10</td>
<td>2006-08-04</td>
<td>Doug Davis</td>
<td>Change namespace to 2006/08</td>
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<tr>
<td>cd-04</td>
<td>2006-08-11</td>
<td>Doug Davis</td>
<td>Issue 158 applied</td>
</tr>
<tr>
<td>cd-04</td>
<td>2006-08-16</td>
<td>Gilbert Pilz</td>
<td>Fix date at 08/11/2006; formatting changes for better HTML rendering.</td>
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<tr>
<td>wd-11</td>
<td>2006-10-25</td>
<td>Doug Davis</td>
<td>Accept all changes, update to wd11</td>
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<tr>
<td>wd-11</td>
<td>2006-10-26</td>
<td>Doug Davis</td>
<td>PR004 applied</td>
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<td>wd-11</td>
<td>2007-01-26</td>
<td>Doug Davis</td>
<td>PR037 applied</td>
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<td>wd-12</td>
<td>2007-01-31</td>
<td>Doug Davis</td>
<td>Lots of typos from MarcG</td>
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<td></td>
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<td>Updated WD number and date</td>
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<tr>
<td>wd-12</td>
<td>2007-02-01</td>
<td>Doug Davis</td>
<td>PR035 (009,020 dups) applied</td>
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Appendix D. Notices

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