

# WS-Policy and WS-SecurityPolicy



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# Overview

- Introduction
- Policy assertions
- Main security bindings
- RampartConfig Assertion



# WS-Policy

- General framework for endpoints to express requirements
- Basic operators
  - wsp:All
  - wsp:ExactlyOne
- Domain assertions
  - WS-SecurityPolicy Language
  - Just XML elements



# Basic operators example

```
<wsp:Policy>  
  <wsp:ExactlyOne>  
    <wsp:All>  
      <A/>  
      <B/>  
    </wsp:All>  
    <wsp:All>  
      <A/>  
      <C/>  
    </wsp:All>  
  </wsp:ExactlyOne>  
</wsp:Policy>
```



# WS-SecurityPolicy

- Based on WS-Policy
- Various groups of policy assertions
- Can be embedded into WSDL or referenced



# WS-SecurityPolicy

- To express security requirements of a Web service according to the WS-Policy spec
  - What needs to be protected
  - What tokens to use
  - Algorithms, reference types, etc..
- Covers all WS-Sec\* specifications



# Assertion Types

- Protection assertions
- Token assertions
- Binding assertions
- Supporting token assertions
- Protocol assertions



# Protection Assertions

- Specify what needs to be protected
  - Integrity
  - Confidentiality
- Signed/EncryptedParts
- Signed/EncryptedElements
- RequiredElements





# Signed/Encrypted Parts

- Headers
  - name / namespace
  - namespace
- Body
- Protect when present



# Example

```
<sp:SignedParts xmlns:sp="http://...securitypolicy">  
  <sp:Body/>  
  <sp:Header Name="To" Namespace="http://.../ws/  
2004/08/addressing"/>  
  <sp:Header Name="From" Namespace="http://.../ws/  
2004/08/addressing"/>  
</sp:SignedParts>
```

```
<sp:EncryptedParts xmlns:sp="http://...securitypolicy">  
  <sp:Body/>  
</sp:EncryptedParts>
```



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# Signed/Encrypted elements

- arbitrary elements in the SOAP envelope
- configured using XPATH



# Example

```
<sp:EncryptedElements xmlns:sp="http://../  
securitypolicy">  
  <sp:XPath  
    xmlns:ns1="http://InteropBaseAddress/interop"  
    xmlns:ns2="http://xmlsoap.org/Ping">  
      /soapenv:Envelope/soapenv:Body/  
        ns1:PingResponse/ns2:scenario  
    </sp:XPath>  
  </sp:EncryptedElements>
```



# Required Elements

- arbitrary elements in the SOAP envelope
- configured using XPATH



# Example

```
<sp:RequiredElements xmlns:sp="http://../  
securitypolicy">
```

```
<sp:XPath
```

```
xmlns:a="http://xmlsoap.org/Ping">
```

```
    /soapenv:Envelope/soapenv:Body/  
    ns1:PingResponse/ns2:scenario/a:scenario
```

```
</sp:XPath>
```

```
</sp:RequiredElements>
```



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# Token Assertions

- Specifying token types to use
  - UsernameToken
  - X. 509
  - IssuedToken
  - SecureConversation
  - Kerberos
- Token Inclusion
  - Never
  - Always
  - AlwaysToRecipient
  - Once



# Token Assertion Examples

```
<sp:X509Token sp:IncludeToken="http://.../IncludeToken/  
Never">
```

```
  <wsp:Policy>
```

```
    <sp:WssX509V3Token10/>
```

```
  </wsp:Policy>
```

```
</sp:X509Token>
```

```
<sp:UsernameToken sp:IncludeToken="http://.../  
AlwaysToRecipient" />
```



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# Bindings

- Collections of security properties (values populated by assertions)
  - Tokens
  - Algorithms
  - Processing order
  - Inclusion of timestamp



# Bindings

- Three main types:
  - TransportBinding
  - AsymmetricBinding
  - SymmetricBinding
- Security Binding properties



# Algorithm Suite

- Defines values algorithms to be used
  - [Sym Sig] Symmetric Key Signature
  - [Asym Sig] Signature with an asymmetric key
  - [Dig] Digest
  - [Enc] Encryption
  - [Sym KW] Symmetric Key Wrap
  - [Asym KW] Asymmetric Key Wrap
  - [Comp Key] Computed key
  - [Enc KD] Encryption key derivation
  - [Sig KD] Signature key derivation
  - [Min SKL] Minimum symmetric key length
  - [Max SKL] Maximum symmetric key length
  - [Min AKL] Minimum asymmetric key length
  - [Max AKL] Maximum asymmetric key length
- Pre defined set of a algorithm suites
  - eg. Basic256, Basic192

Algorithm Suite	[Dig]	[Enc]	[Sym KW]	[Asym KW]	[Enc KD]	[Sig KD]	[Min SKL]
Basic256	Sha1	Aes256	KwAes256	KwRsaOaep	PSha1L256	PSha1L192	256
Basic192	Sha1	Aes192	KwAes192	KwRsaOaep	PSha1L192	PSha1L192	192



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# Security Binding Properties

- Timestamp
  - Default : false
  - sp:IncludeTimestamp sets property to true
- Protection Order
  - Default : Sign before encryption
  - sp:EncryptBeforeSigning to change it



# Security Binding Properties

- Signature Protection
  - Default: false
  - sp:EncryptSignature sets property to true
  - signature should be encrypted
- Token Protection
  - Default: false
  - sp:ProtectTokens sets property to true
  - Token used to generate the signature must also be covered by the signature



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# Security Binding Properties

- Entire Header and Body Signatures
  - Default: false
  - `sp:OnlySignEntireHeadersAndBody` sets property to true.



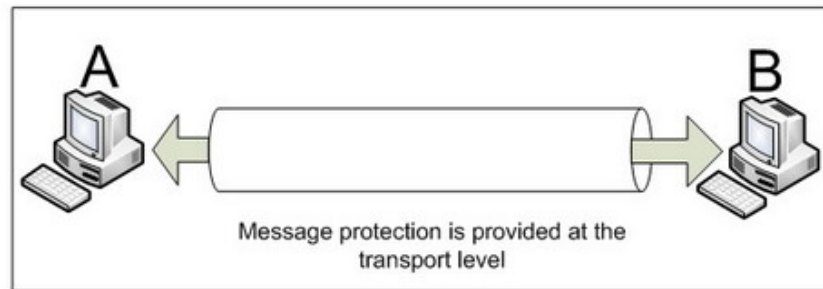
# Security Binding Properties

- Security Header Layout
  - Strict
  - Lax
  - LaxTimestampFirst
  - LaxTimestampLast
- Declare before use principle
- Default: Lax



# Transport Binding

- Indicates that the transport layer is used to satisfy the security requirements





# Transport Binding

- Allows specification of :
  - Transport tokens
  - Security header layout
  - Timestamp presence
  - Supporting tokens



# Transport Binding example

```
<sp:TransportBinding>  
  <wsp:Policy>  
    <sp:TransportToken>  
      <wsp:Policy>  
        <sp:HttpsToken />  
      </wsp:Policy>  
    </sp:TransportToken>  
    <sp:AlgorithmSuite>...</sp:AlgorithmSuite>  
    <sp:IncludeTimestamp />  
  </wsp:Policy>  
</sp:TransportBinding>
```

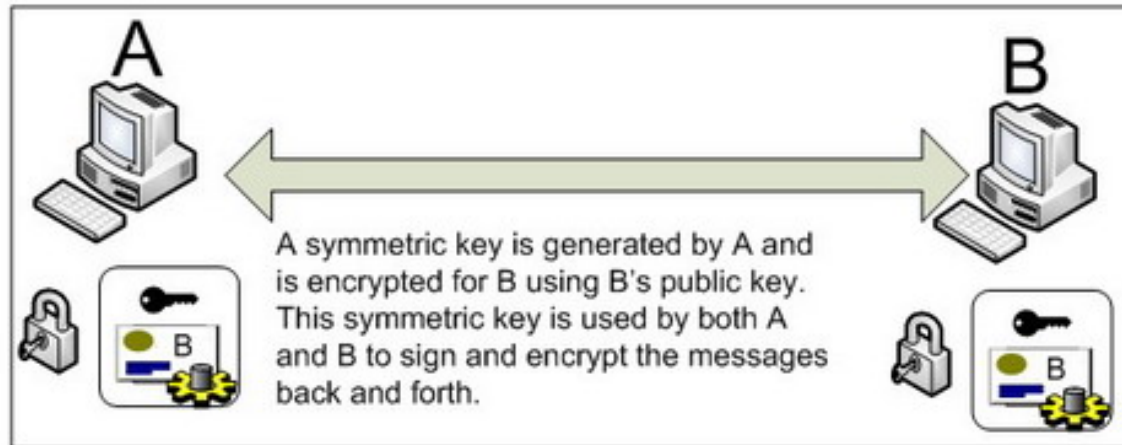


# Symmetric Binding

- Indicates that the message layer is used to satisfy the security requirements
- Defines "Encryption Token" and "Signature Token" properties
- Where multiple messages are exchanged the tokens perform the same functions for all messages



# Symmetric Binding



# SymmetricBinding Example

```
<sp:SymmetricBinding>  
  <wsp:Policy>  
    <sp:ProtectionToken>  
      <wsp:Policy>  
        <sp:X509Token  
          sp:IncludeToken="http://.../IncludeToken/Never"/>  
      </wsp:Policy>  
    </sp:ProtectionToken>  
    <sp:AlgorithmSuite><sp:Basic256/></sp:AlgorithmSuite>  
    <sp:EncryptBeforeSigning />  
  </wsp:Policy>  
</sp:SymmetricBinding>
```



# Asymmetric Binding

- Indicates that the message layer is used to satisfy the security requirements
- Defines “Initiator Token” and “Recipient Token” properties
- Where multiple messages are exchanged the tokens perform different functions

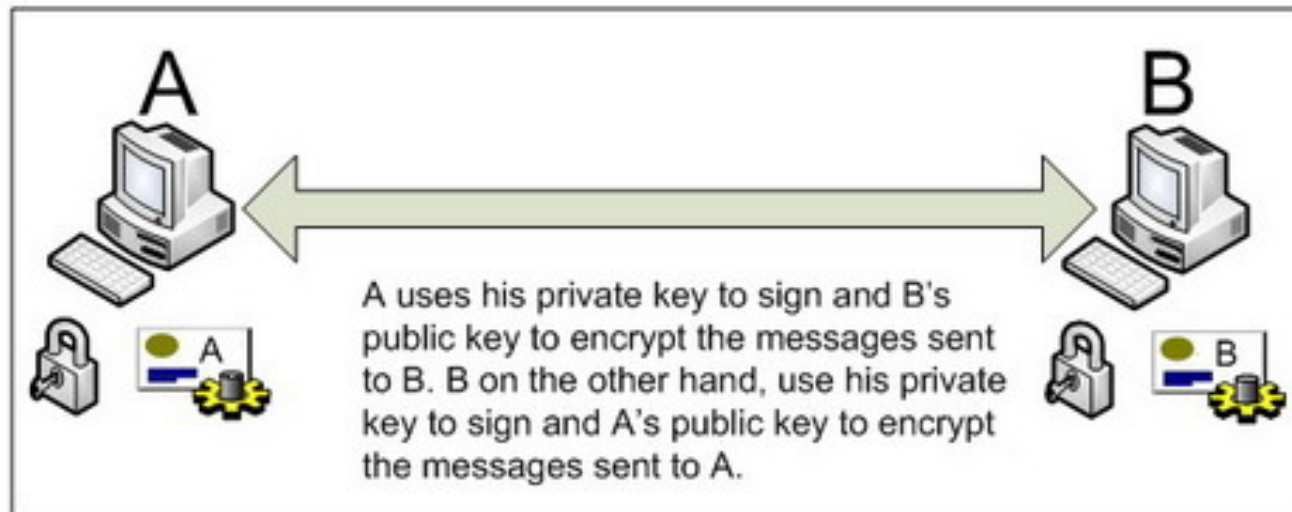


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# Asymmetric Binding



# Asymmetric Binding Example

```
<sp:AsymmetricBinding>
  <wsp:Policy>
    <sp:InitiatorToken>
      <wsp:Policy>
        <wsp:X509Token sp:IncludeToken= '.../IncludeToken/AlwaysToRecipient' />
      </wsp:Policy>
    </sp:InitiatorToken>
    <sp:RecipientToken>
      <wsp:Policy>
        <wsp:X509Token sp:IncludeToken= '.../IncludeToken/Never' />
      </wsp:Policy>
    </sp:RecipientToken>
    <sp:AlgorithmSuite><sp:Basic128/></sp:AlgorithmSuite>
    <sp:EncryptBeforeSigning />
  </wsp:Policy>
</sp:AsymmetricBinding>
```



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# Supporting Tokens

- Services may require multiple sets of claims to be presented
- Corresponds to additional tokens in a message
  - eg. Symmetric binding + Username token



# Supporting Tokens Example

<sp:SupportingTokens>

<wsp:Policy>

<sp:UsernameToken sp:IncludeToken= '.../  
IncludeToken/Once' />

</wsp:Policy>

</sp:SupportingTokens>



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# Supporting Token types

<b>Type</b>	<b>Sign main signature?</b>	<b>Signed by main token?</b>
Supporting	No	No
Endorsing	Yes	No
Signed	No	Yes
Signed Endorsing	Yes	Yes

# WSS Assertions

- WSS10
  - <sp:MustSupportRefKeyIdentifier ... />  
<sp:MustSupportRefIssuerSerial ... />  
<sp:MustSupportRefExternalURI ... />  
<sp:MustSupportRefEmbeddedToken ... />
- WSS11
  - <sp:MustSupportRefKeyIdentifier ... />  
<sp:MustSupportRefIssuerSerial ... />  
<sp:MustSupportRefExternalURI ... />  
<sp:MustSupportRefEmbeddedToken ... />  
<sp:MustSupportRefThumbprint ... />  
<sp:MustSupportRefEncryptedKey ... />  
<sp:RequireSignatureConfirmation ... />



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# WSS Assertions

- Should be able to process any of the key referencing mechanisms

```
<sp:X509Token sp:IncludeToken="http://../  
IncludeToken/Never">  
  <wsp:Policy>  
    <sp:RequireThumbprintReference/>  
    <sp:WssX509V3Token10/>  
  </wsp:Policy>  
</sp:X509Token>
```



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# WSS Assertion Examples

```
<sp:Wss10>  
  <wsp:Policy>  
    <sp:MustSupportRefKeyIdentifier />  
    <sp:MustSupportRefExternalURI />  
  </wsp:Policy>  
</sp:Wss10>
```

```
<sp:Wss11>  
  <wsp:Policy>  
    <sp:MustSupportRefExternalURI />  
    <sp:MustSupportRefThumbprint />  
    <sp:RequireSignatureConfirmation />  
  </wsp:Policy>  
</sp:Wss11>
```



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# Trust Assertions

- Specify supported version of WS-Trust and associated properties

- sp:Trust10

- Example :

```
<sp:Trust10>
```

```
<wsp:Policy>
```

```
<sp:RequireClientEntropy />
```

```
<sp:RequireServerEntropy />
```

```
</wsp:Policy>
```

```
</sp:Trust10>
```



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# Policy Subjects

- Message Policy Subject
  - wsdl:binding/wsdl:operation/wsdl:input,
  - wsdl:binding/wsdl:operation/wsdl:output
- Operation Policy Subject
  - wsdl:binding/wsdl:operation
- Endpoint Policy Subject
  - wsdl:binding





# Policy Subjects

- MUST NOT attach to
- Message Policy Subject
  - wsdl:message
  - wsdl:portType/wsdl:operation/wsdl:input
- Operation Policy Subject
  - wsdl:portType/wsdl:operation
- Endpoint Policy Subject
  - wsdl:portType



# Applying Security Policies

services.xml

```
<service>  
  <wsp:Policy/>  
    <operation name="echo">  
      <wsp:Policy/>  
        <message label="In">  
          <wsp:Policy/>  
        </message>  
        <message label="Out">  
          <wsp:Policy/>  
        </message>  
      </operation>  
    </service>
```



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# Applying Security Policies

```
<service>  
  <wsp:PolicyAttachment  
    xmlns:wsp="http://../policy">  
    <wsp:AppliesTo>  
      <policy-subject identifier="binding:soap11" />  
      <policy-subject identifier="binding:soap12" />  
    </wsp:AppliesTo>  
    <wsp:Policy />  
  </wsp:PolicyAttachment>  
</service>
```



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# Applying Security Policies

```
<service>
  <wsp:PolicyAttachment
    xmlns:wsp="http://../policy">
    <wsp:AppliesTo>
      <policy-subject identifier="binding:soap11/
operation:echo" />
      <policy-subject identifier="binding:soap12/
operation:echo" />
    </wsp:AppliesTo>
    <wsp:Policy />
  </wsp:PolicyAttachment>
</service>
```



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# Applying Security Policies

```
<service>
  <wsp:PolicyAttachment
    xmlns:wsp="http://../policy">
    <wsp:AppliesTo>
      <policy-subject identifier="binding:soap11/
operation:echo/in" />
      <policy-subject identifier="binding:soap12/
operation:echo/in" />
    </wsp:AppliesTo>
    <wsp:Policy/>
  </wsp:PolicyAttachment>
</service>
```



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