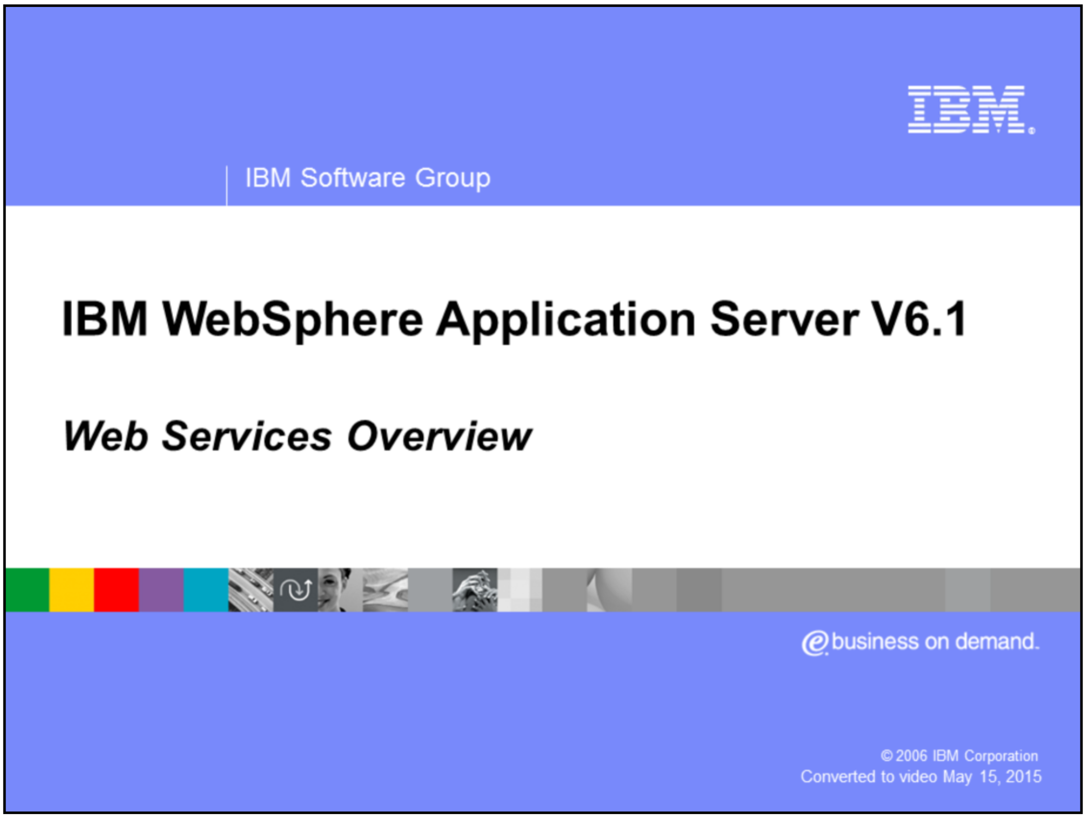

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IBM WebSphere Application Server V6.1

Web Services Overview

business on demand.

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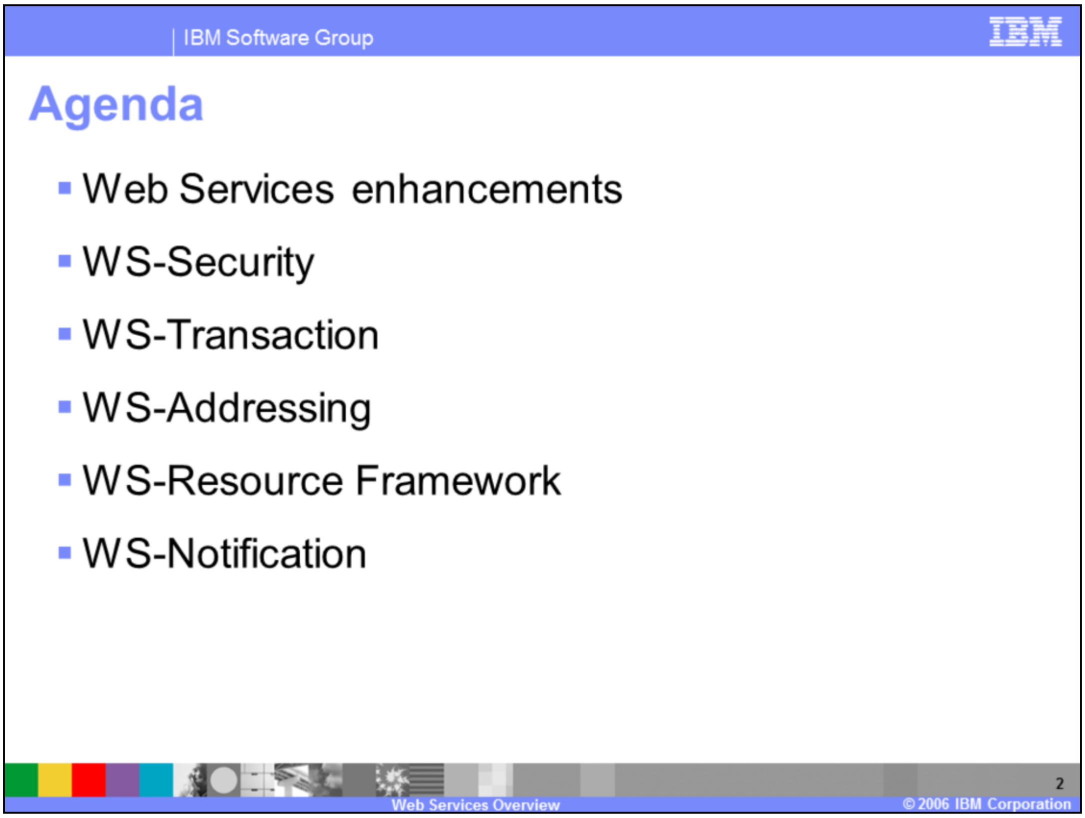
Converted to video May 15, 2015

This presentation will briefly discuss new features related to Web Services that are available with WebSphere® Application Server Version 6.1.



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Agenda

- Web Services enhancements
- WS-Security
- WS-Transaction
- WS-Addressing
- WS-Resource Framework
- WS-Notification

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Web Services Overview

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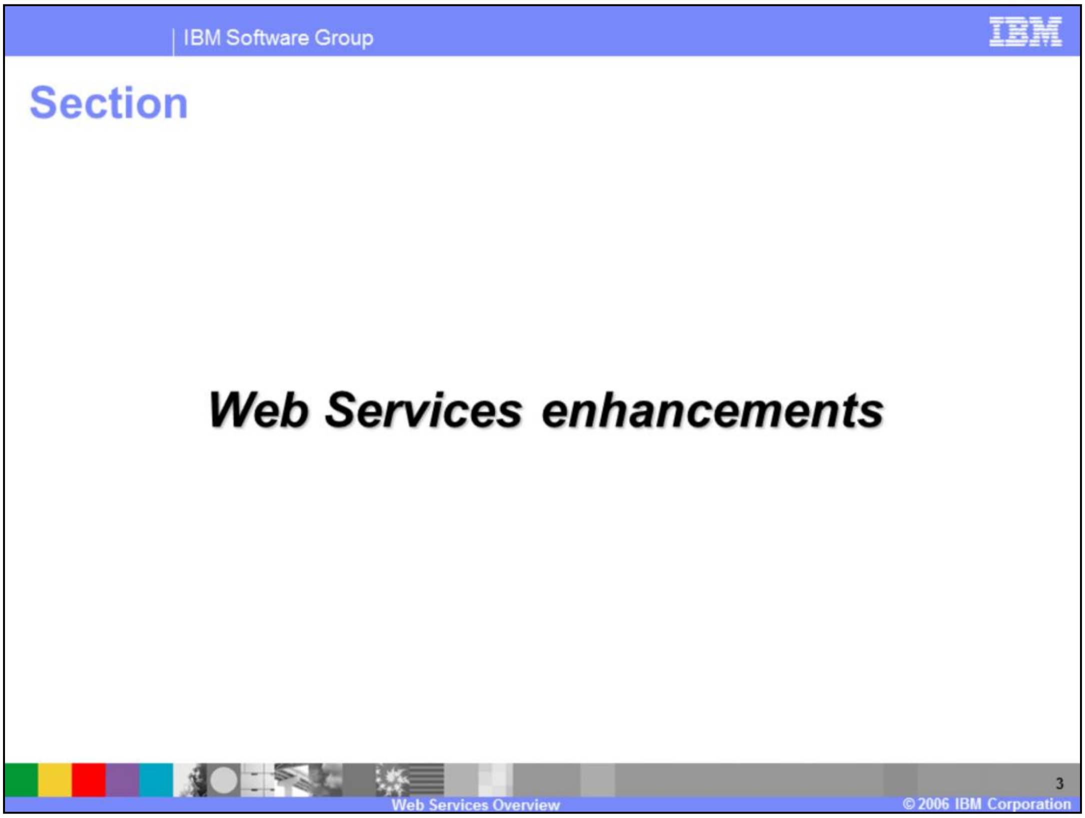
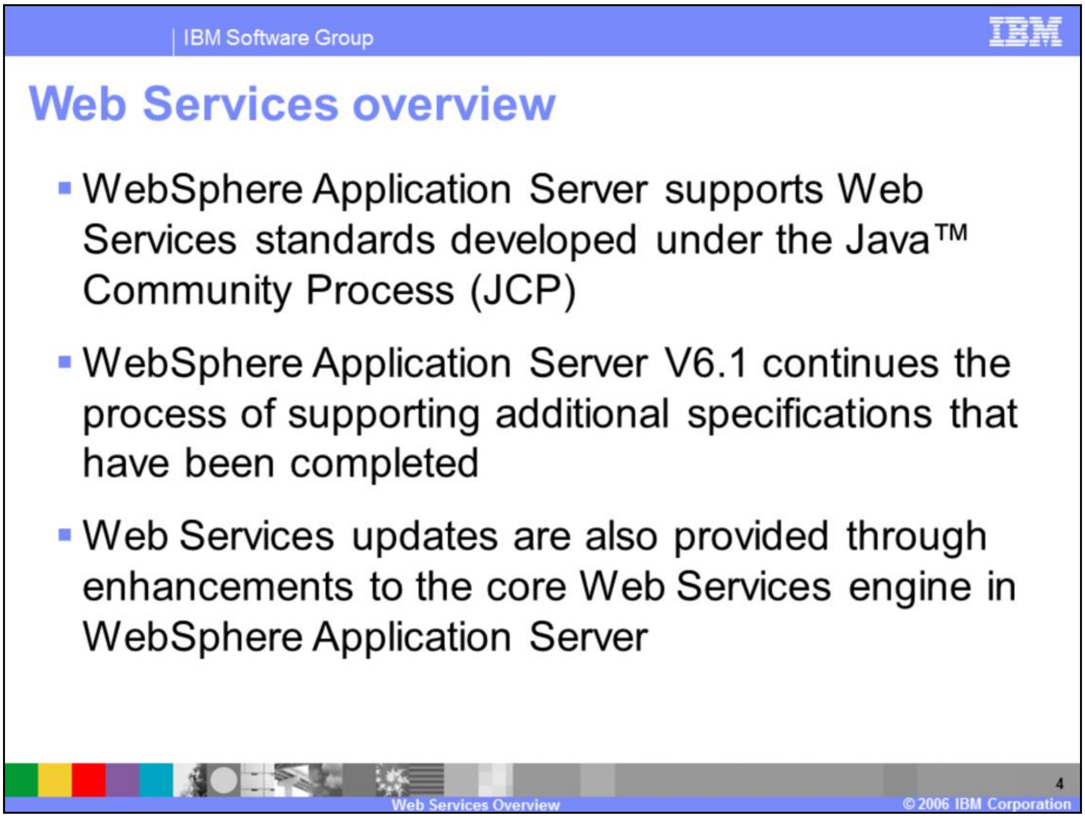
This presentation will quickly cover a number of topics related to Web Services. It will start by explaining a number of general changes made to Web Services. Next, it will discuss specific Web Services specifications that have either been updated or are now supported in the new release. Specifically this presentation will discuss the Web Service Security specification, the Web Services Transaction Specification, the Web Services Addressing Specification, and finally the Web Services Notification specification.



Section

Web Services enhancements

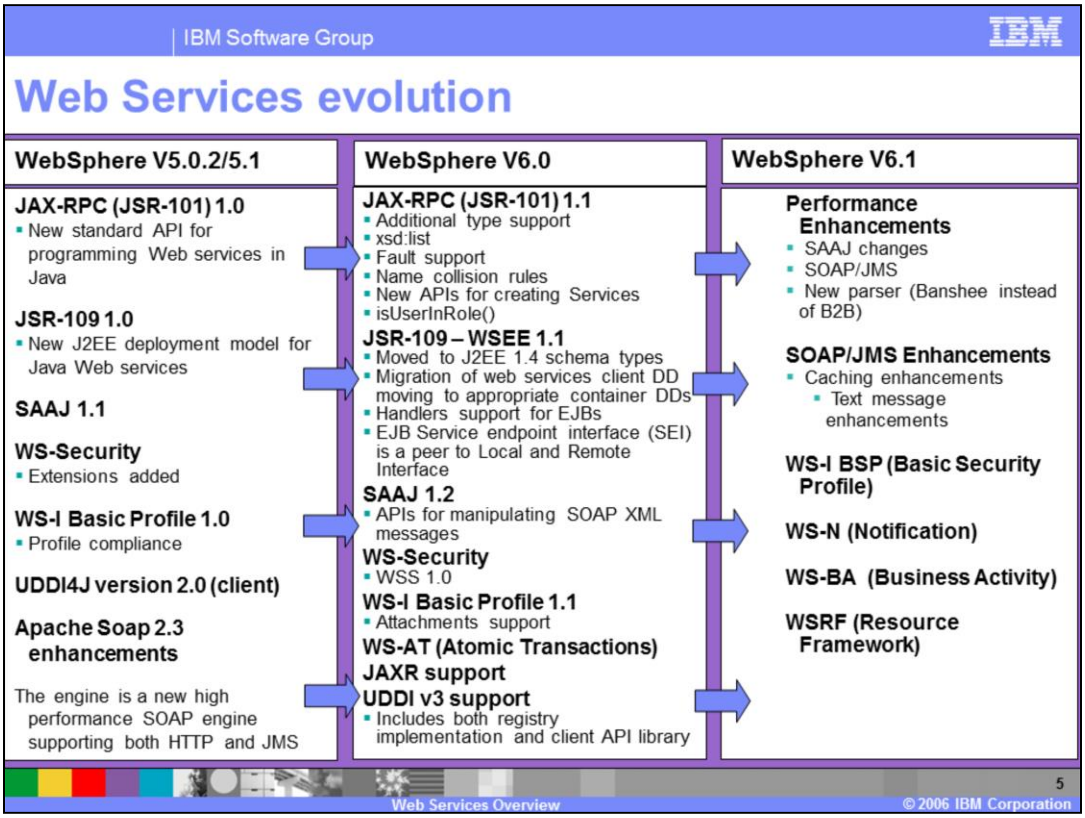
The next section discusses the general Web Services enhancements.



Web Services overview

- WebSphere Application Server supports Web Services standards developed under the Java™ Community Process (JCP)
- WebSphere Application Server V6.1 continues the process of supporting additional specifications that have been completed
- Web Services updates are also provided through enhancements to the core Web Services engine in WebSphere Application Server

WebSphere Application Server has traditionally supported Web Services and associated standards that have been created through the Java Community Process. Web Services are governed by a large number of individual J2EE specifications. Developers can then select from the available specifications based on the needs of their application. With WebSphere Application Server V6.1 this support is continued and additional support for a number of new specifications has been added. Additionally in WebSphere Application Server V6.1 other updates have been made through some changes to the Web Services functionality supported in the Web Services engine.



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Web Services evolution

WebSphere V5.0.2/5.1

JAX-RPC (JSR-101) 1.0
- New standard API for programming Web services in Java

JSR-109 1.0
- New J2EE deployment model for Java Web services

SAAJ 1.1

WS-Security
- Extensions added

WS-I Basic Profile 1.0
- Profile compliance

UDDI4J version 2.0 (client)

Apache Soap 2.3 enhancements

The engine is a new high performance SOAP engine supporting both HTTP and JMS

WebSphere V6.0

JAX-RPC (JSR-101) 1.1
- Additional type support
- xsd:list
- Fault support
- Name collision rules
- New APIs for creating Services
- isUserInRole()

JSR-109 – WSEE 1.1
- Moved to J2EE 1.4 schema types
- Migration of web services client DD moving to appropriate container DDs
- Handlers support for EJBs
- EJB Service endpoint interface (SEI) is a peer to Local and Remote Interface

SAAJ 1.2
- APIs for manipulating SOAP XML messages

WS-Security
- WSS 1.0

WS-I Basic Profile 1.1
- Attachments support

WS-AT (Atomic Transactions)

JAXR support

UDDI v3 support
- Includes both registry implementation and client API library

WebSphere V6.1

Performance Enhancements
- SAAJ changes
- SOAP/JMS
- New parser (Banshee instead of B2B)

SOAP/JMS Enhancements
- Caching enhancements
  - Text message enhancements

WS-I BSP (Basic Security Profile)

WS-N (Notification)

WS-BA (Business Activity)

WSRF (Resource Framework)

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Web Services Overview

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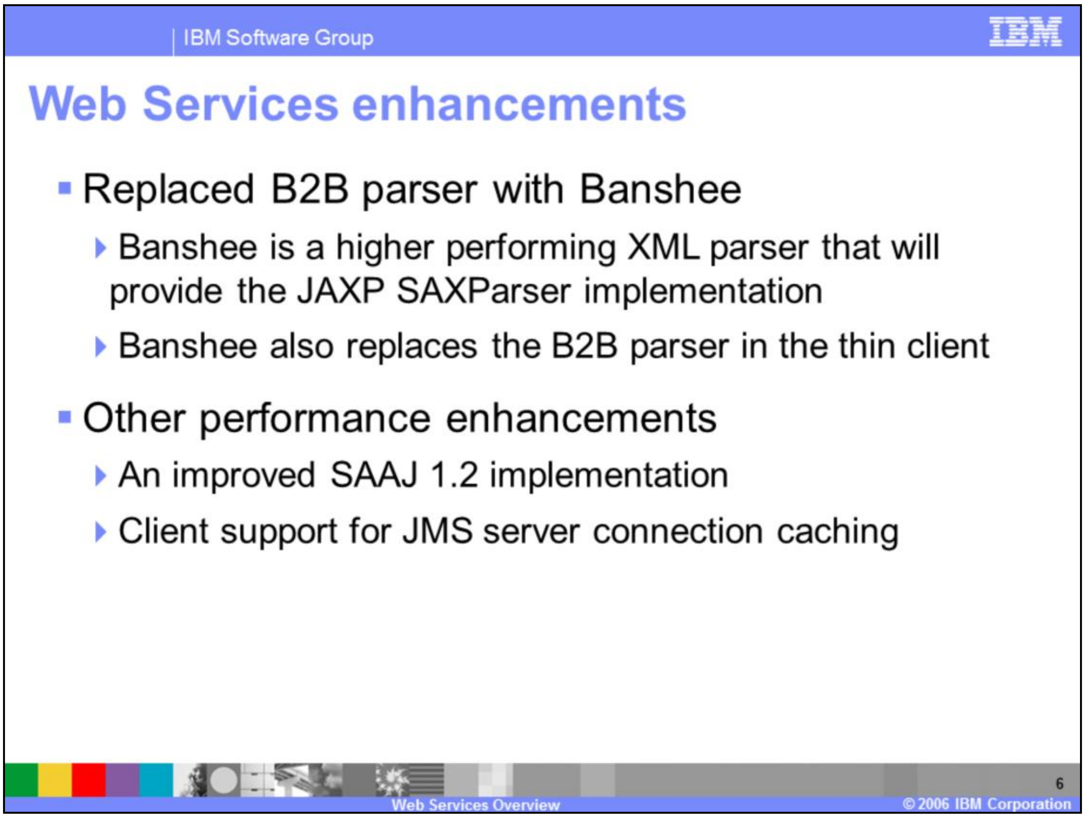
This chart illustrates the continual support for Web Services and how that now results in the offerings in WebSphere Application Server V6.1. WebSphere Application Server first began support Web Services specification in version 5.0.2. In these early release the support was focused on the original versions of the core Web Services specifications; JSR 101 (Java API for XML based Remote Procedure Calls), JSR 109 (Web Services in J2EE) and early support for Web Services Security. This support continued through the next releases, as the specifications were updated, the support for those specifications also was updated. There was also a focus on additional Web Services specifications, such as the Web Services Atomic Transactions specification, and the final version of the Web Services Security specification. With the latest release of WebSphere Application Server V6.1 there is additional support for Web Services Notification, Web Services Business Activity, Web Services Resource Framework and other additional specifications.



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Web Services enhancements

- Replaced B2B parser with Banshee
  - Banshee is a higher performing XML parser that will provide the JAXP SAXParser implementation
  - Banshee also replaces the B2B parser in the thin client
- Other performance enhancements
  - An improved SAAJ 1.2 implementation
  - Client support for JMS server connection caching

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Web Services Overview

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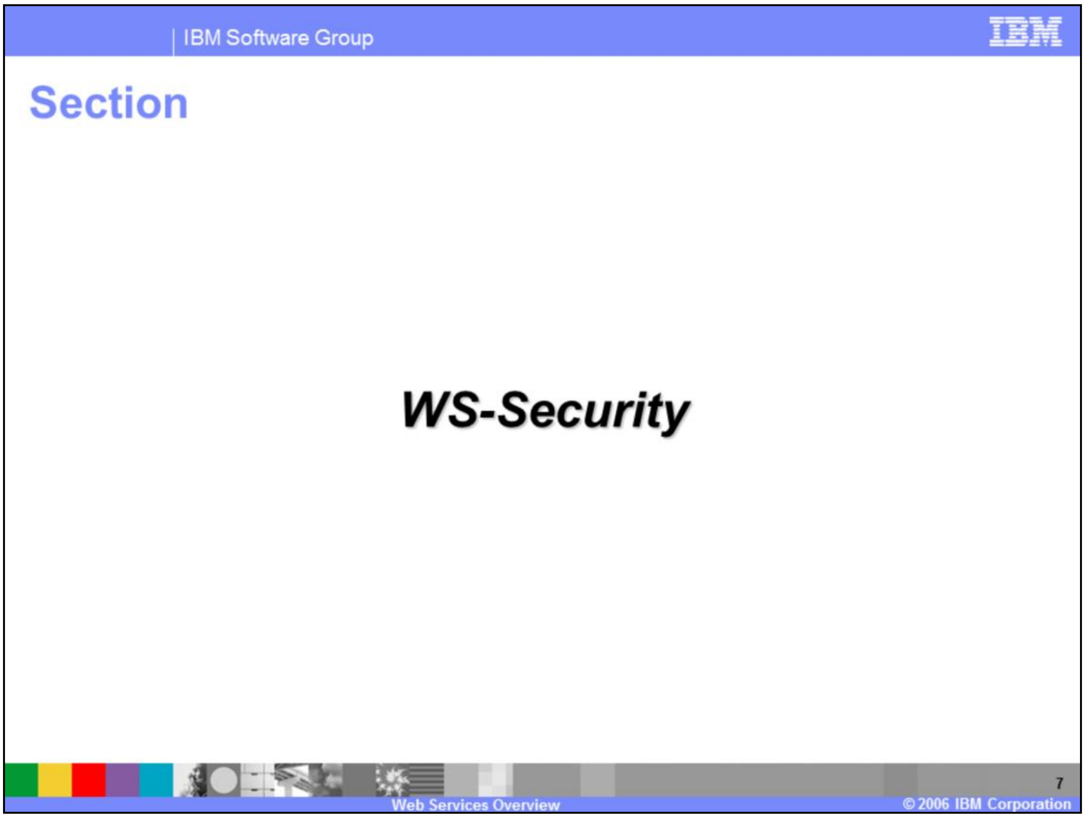
Other than additional support for Web Services specifications there are also some general enhancements to WebSphere Application Server's support for Web Services in V6.1. One important change is to the underlying XML parsing technology used by the Web Services engine within WebSphere Application Server. A new XML parser named Banshee is replacing the previous technology of the B2B XML parser. The new Banshee parser is higher performing providing clear benefits. A number of other small performance enhancements are also included in V6.1. These include an improved implementation of the SAAJ 1.2 specification, and support for JMS connection caching for clients. Applications that can take advantage of these specific features should see performance increases.



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Section

WS-Security

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Web Services Overview

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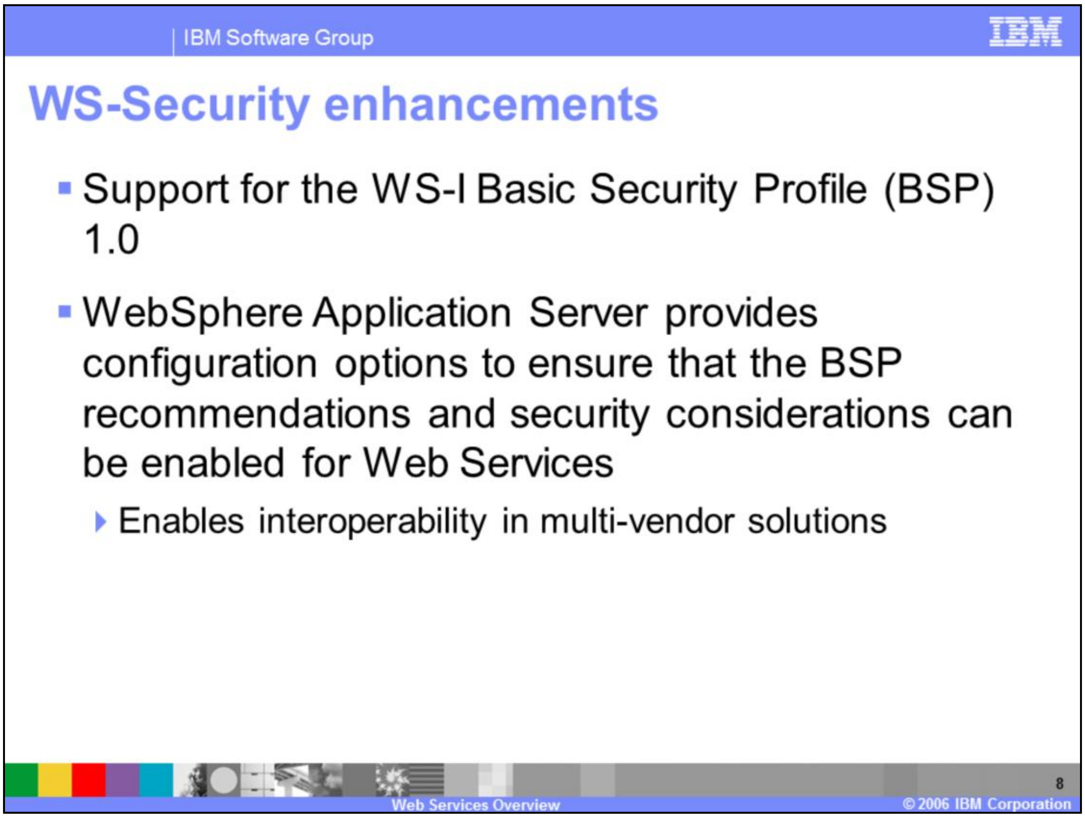
The next section discusses changes to the Web Services Security support.



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WS-Security enhancements

- Support for the WS-I Basic Security Profile (BSP) 1.0
- WebSphere Application Server provides configuration options to ensure that the BSP recommendations and security considerations can be enabled for Web Services
  - Enables interoperability in multi-vendor solutions

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Web Services Overview

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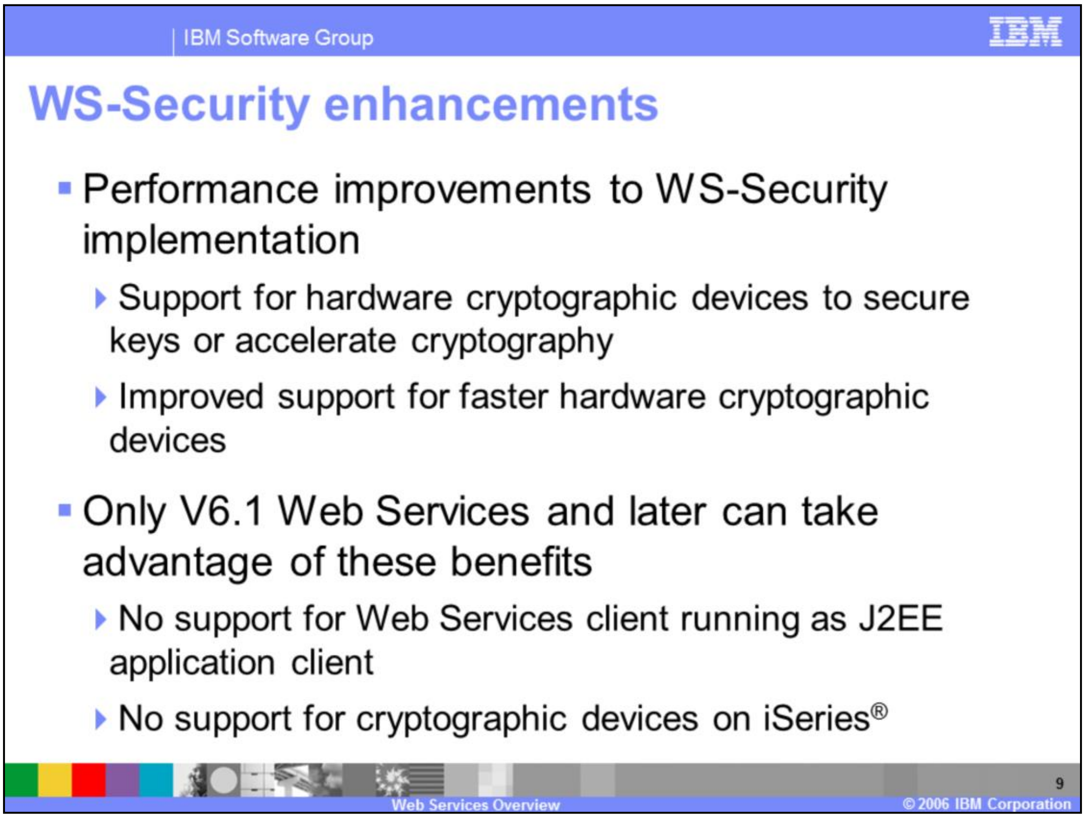
The first major change to the Web Services Security support in WebSphere Application Server V6.1 relates to interoperability. WebSphere Application Server V6.1 supports the Web Services Interoperability Basic Security Profile (BSP) 1.0. The Web Services Interoperability group provides profiles that contain guidelines for writing Web Services that can interoperate in a heterogeneous environment. WebSphere Application Server V6.1 can be configured to support the guidelines and recommendations contained within the BSP. Conforming to these guidelines enables interoperability in multi-vendor Web Services solutions. This is a change from other Web Service Interoperability profiles, which often guarantee interoperability.



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WS-Security enhancements

- Performance improvements to WS-Security implementation
  - Support for hardware cryptographic devices to secure keys or accelerate cryptography
  - Improved support for faster hardware cryptographic devices
- Only V6.1 Web Services and later can take advantage of these benefits
  - No support for Web Services client running as J2EE application client
  - No support for cryptographic devices on iSeries®

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Web Services Overview

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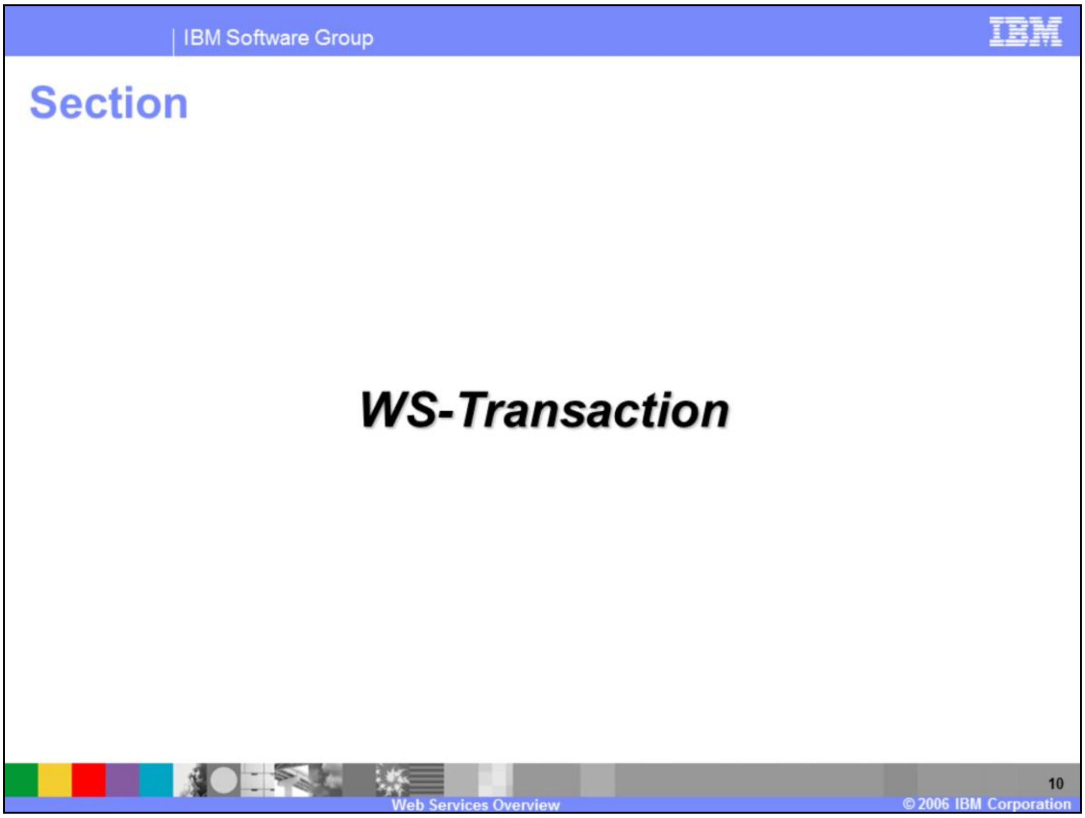
There has also been a number of changes made to improve performance of Web Services Security in this release. Support has been added to offload cryptographic operations to specialized hardware or devices, this speeds up performance by moving this work off of your main CPU. Additionally the list of cryptographic devices was updated in this release to support newer and much faster cryptographic devices. This allows WebSphere Application Server to be more competitive and provide much better performance for Web Service Security. These features are not support for Web Services clients running as J2EE application clients. This is also not support on iSeries hardware. Web Services must have been developed for V6.1 or later to take advantage of these changes.



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Section

WS-Transaction

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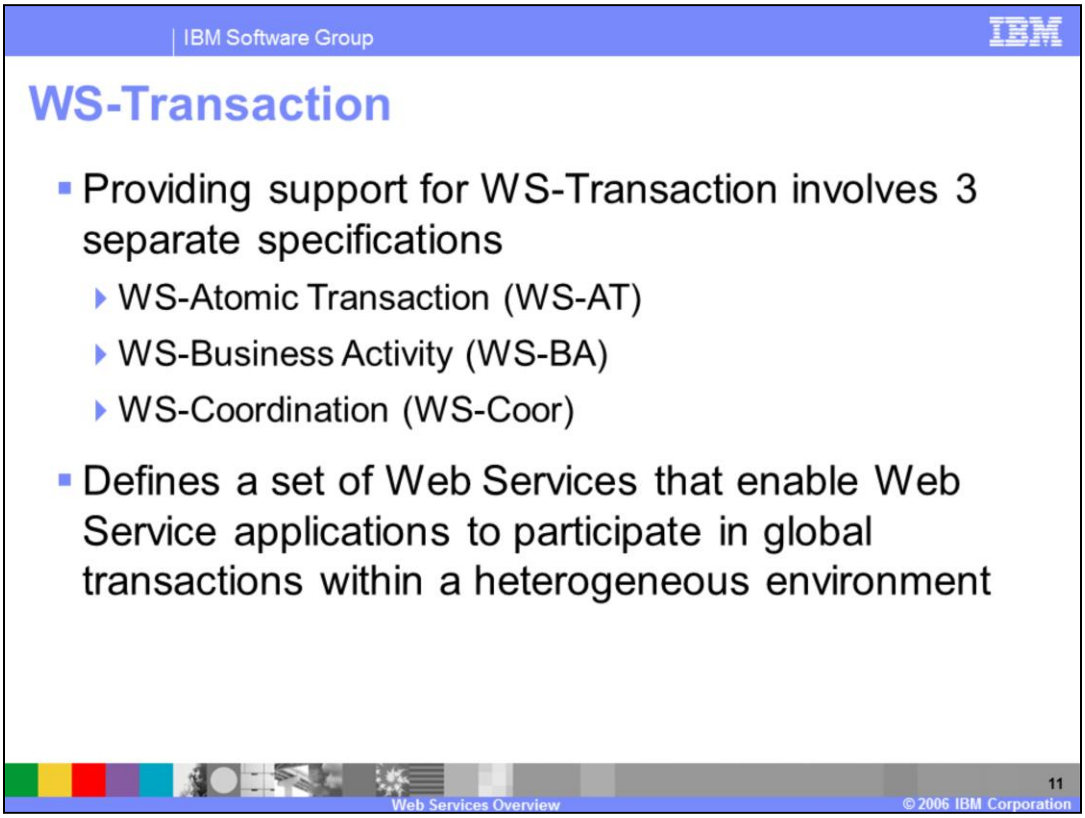
The next section is about further support for the Web Services Transaction specification.



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WS-Transaction

- Providing support for WS-Transaction involves 3 separate specifications
  - WS-Atomic Transaction (WS-AT)
  - WS-Business Activity (WS-BA)
  - WS-Coordination (WS-Coor)
- Defines a set of Web Services that enable Web Service applications to participate in global transactions within a heterogeneous environment

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Web Services Overview

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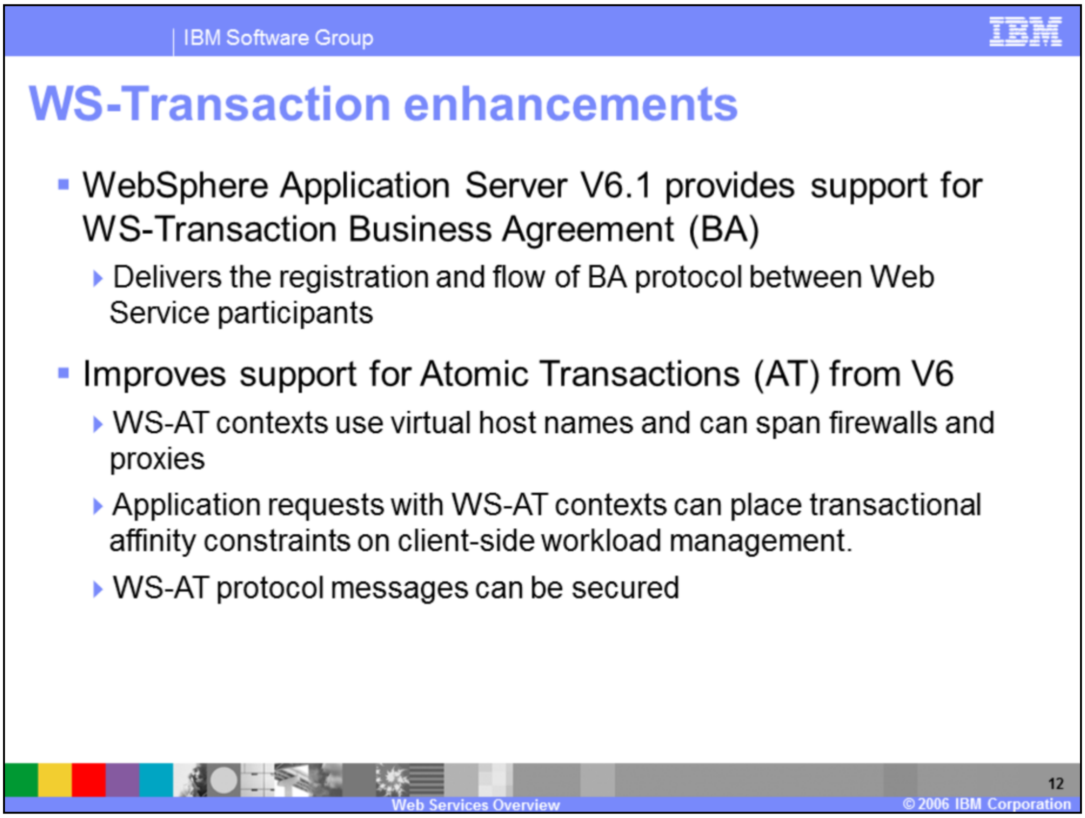
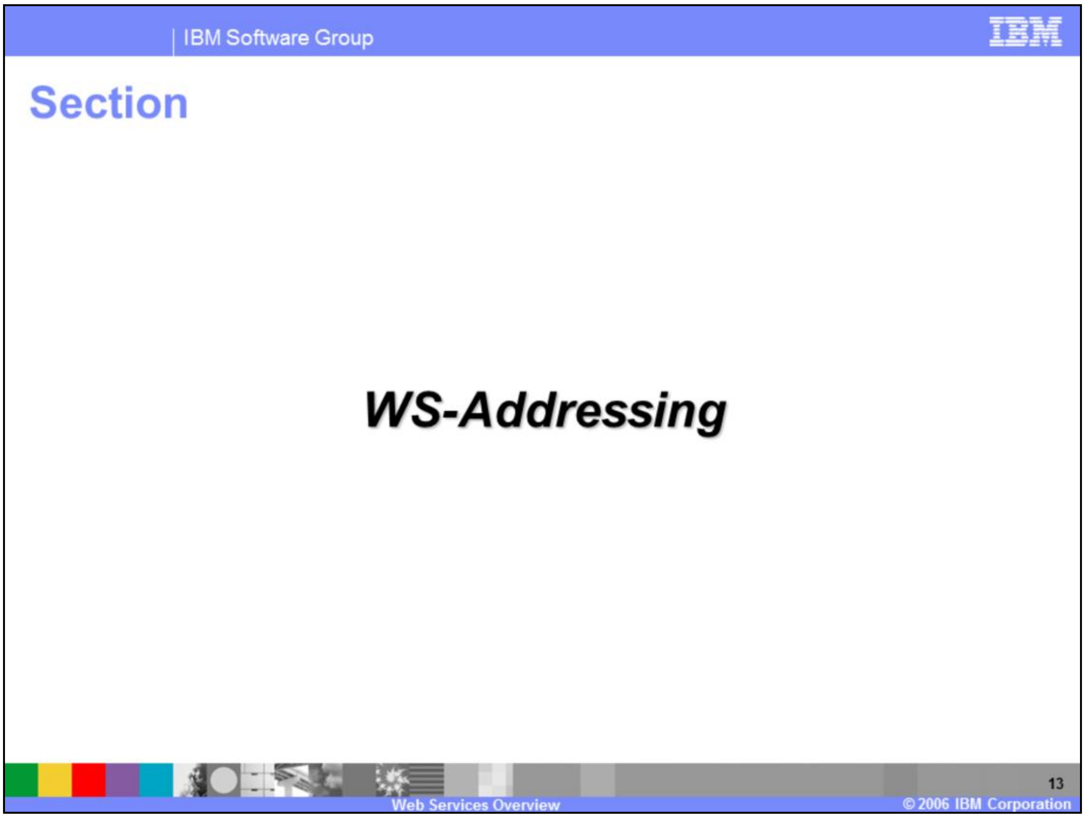
The Web Service Transaction specification is actually composed on 3 separate specification, each of which must be supported. The Web Service Atomic Transaction specification deals with Web Services that operate in smaller, discrete transactions. The Web Service Business Activity specification provides support for more complex Web Services to operate and provide mediations for more complicated transactions. The Web Service Coordination specification details how Web Services can be managed within a transaction context. Taken together these specification define how Web Services applications can work within global transactions in enterprise environments. WebSphere Application Server V6 provided limited support for the Web Services Atomic Transaction specification, but did not yet fully support the Web Services Transaction specification.



WS-Transaction enhancements

- WebSphere Application Server V6.1 provides support for WS-Transaction Business Agreement (BA)
  - Delivers the registration and flow of BA protocol between Web Service participants
- Improves support for Atomic Transactions (AT) from V6
  - WS-AT contexts use virtual host names and can span firewalls and proxies
  - Application requests with WS-AT contexts can place transactional affinity constraints on client-side workload management.
  - WS-AT protocol messages can be secured

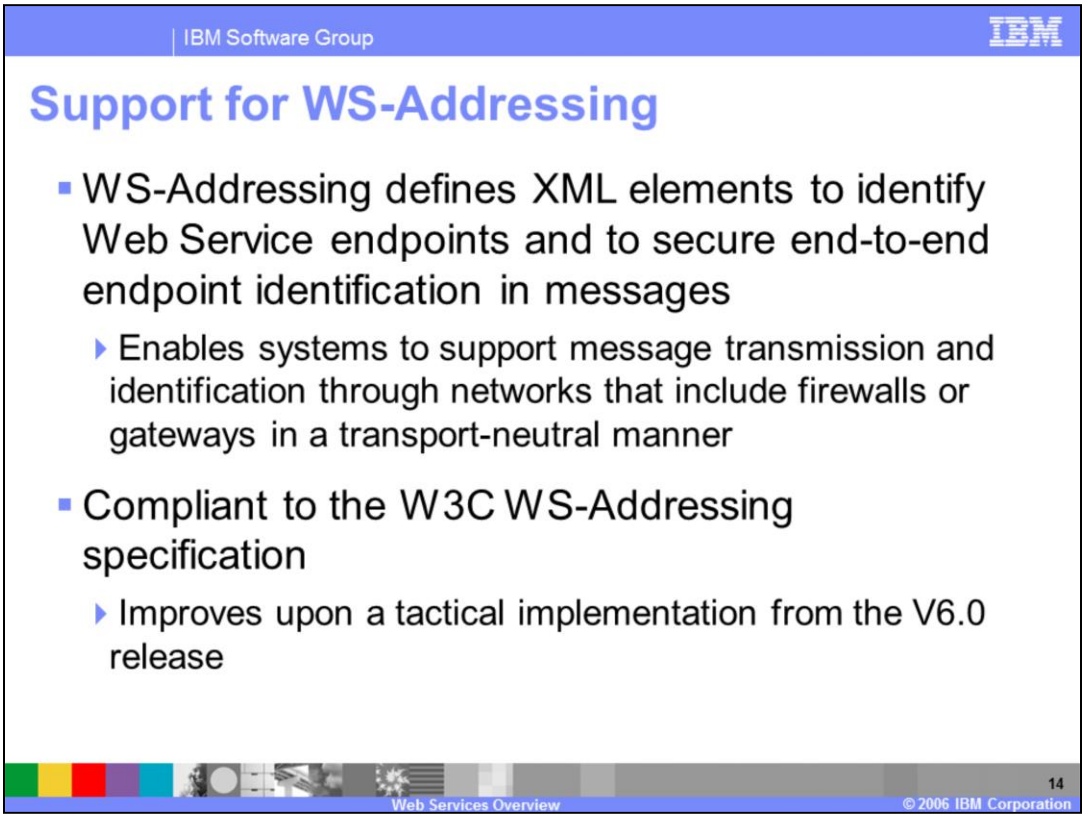
WebSphere Application Server V6.1 now supports the Web Services Business Agreement specification, this allows for the registration and flow of business agreement protocols between Web Services. This release also removes a number of limitations that existed on the tactical implementation of Web Services Atomic Transactions from the previous release. Atomic Transaction contexts can now span firewalls and use virtual host names. Atomic transaction protocol messages can also now be secured.



Section

WS-Addressing

The next section will discuss the support for the Web Services Addressing specification.



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Support for WS-Addressing

- WS-Addressing defines XML elements to identify Web Service endpoints and to secure end-to-end endpoint identification in messages
  - Enables systems to support message transmission and identification through networks that include firewalls or gateways in a transport-neutral manner
- Compliant to the W3C WS-Addressing specification
  - Improves upon a tactical implementation from the V6.0 release

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Web Services Overview

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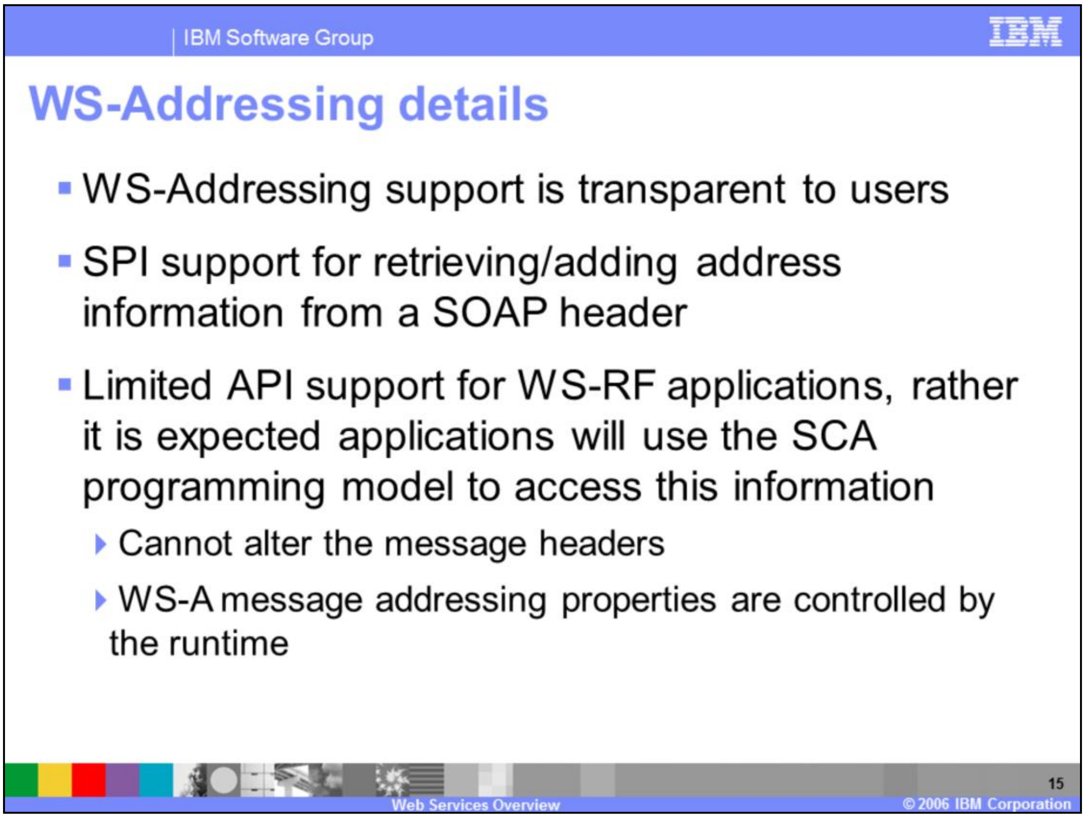
The WS-Addressing specification deals with adding information to the SOAP message about where the Web Services message originated. This is useful for when Web Services messages may span network intermediaries such as firewalls and gateways. By adding this data to the Web Services message, it will not be lost during transmission. The WS-Addressing support in WebSphere Application Server V6.1 is fully compliant to the W3C WS-Addressing specification.



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WS-Addressing details

- WS-Addressing support is transparent to users
- SPI support for retrieving/adding address information from a SOAP header
- Limited API support for WS-RF applications, rather it is expected applications will use the SCA programming model to access this information
  - Cannot alter the message headers
  - WS-A message addressing properties are controlled by the runtime

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Web Services Overview

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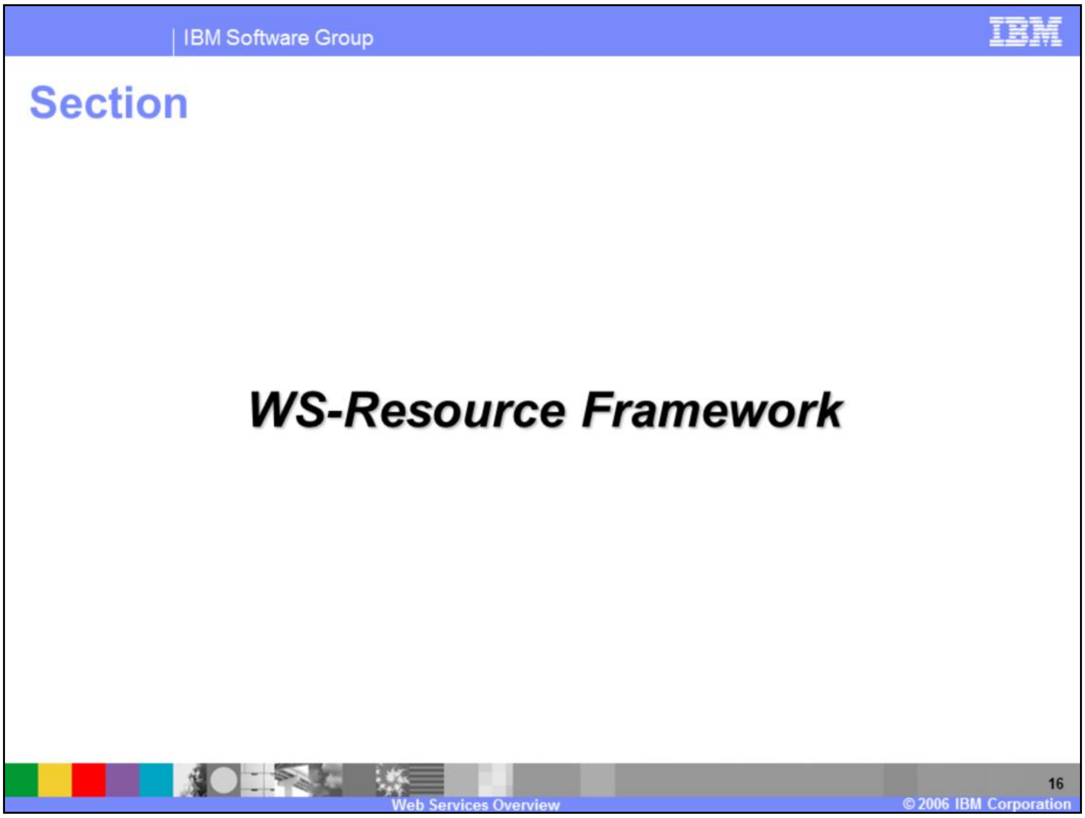
The WS-Addressing component in WebSphere Application Server Version 6.1 will expose SPI interfaces that extend the API (in terms of named JAX-RPC properties and named message context properties) in order for external service providers to drive WS-Addressing function. In particular, this will enable service providers to add/retrieve WS-Addressing header information to messages originating from a Web client or intermediary (such as WSGW). It will also enable WebSphere Application Server endpoints to extract WS-Addressing information from incoming messages.

A limited programming model will be exposed to applications by WS-Addressing in V6.1 to support Web service applications using the WS-Resource Framework Resource Access Pattern (WSRF-RAP). Applications will be able to create an instance of an EPR to represent a resource fronted by a Web service, and use that EPR as the target of client Web service requests. Endpoints will also be able to extract information regarding the resource identifier from incoming messages in order to target the appropriate resource instance. Applications will not be able to reason about the content of an EPR or to manipulate the WS-Addressing message headers. It is expected that most applications will use the SCA programming model in order to drive the underlying WS-Addressing support and therefore will not require this API.



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Section

WS-Resource Framework

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Web Services Overview

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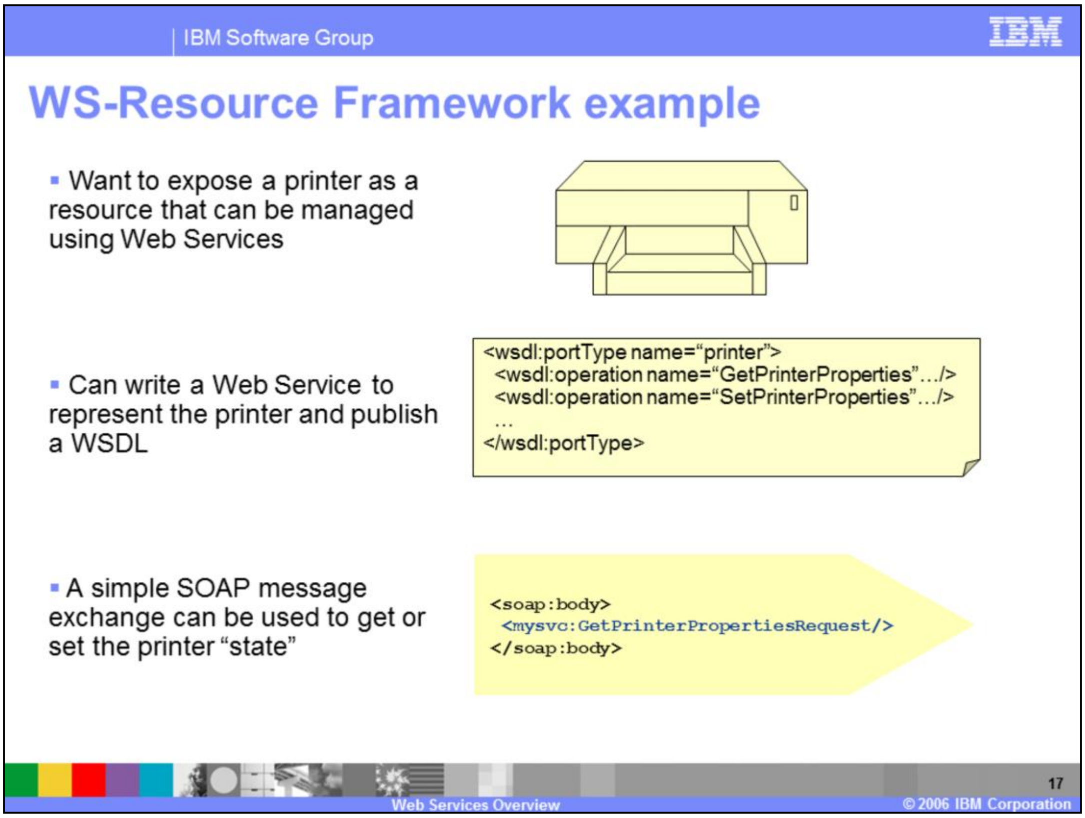
The next section explains the Web Services Resource Framework specification.



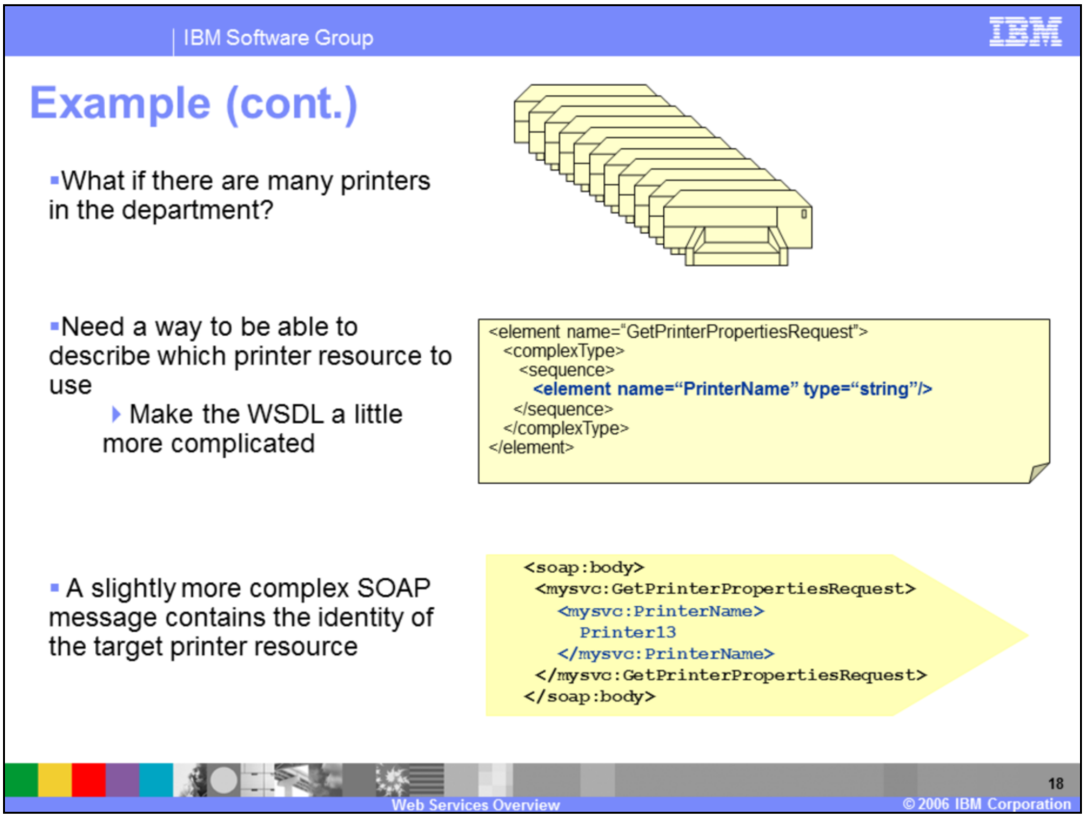
WS-Resource Framework example

- Want to expose a printer as a resource that can be managed using Web Services
- Can write a Web Service to represent the printer and publish a WSDL
- A simple SOAP message exchange can be used to get or set the printer "state"

```
<wsdl:portType name="printer">
  <wsdl:operation name="GetPrinterProperties"…/>
  <wsdl:operation name="SetPrinterProperties"…/>
  …
</wsdl:portType>
```

```
<soap:body>
  <mysvc:GetPrinterPropertiesRequest/>
</soap:body>
```

In order to explain the Web Services Resource Framework specification it is best to consider an example of using Web Services to manage stateful resources. For instance, imagine wanting to manage a printer resource using Web Services. A Web Service could be written that would represent the printer, and this could publish and make available a WSDL. Using this implementation an exchange of SOAP messages could then be used to check and set the state of the printer.



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Example (cont.)

- What if there are many printers in the department?

- Need a way to be able to describe which printer resource to use
  - Make the WSDL a little more complicated

```
<element name=“GetPrinterPropertiesRequest”>
  <complexType>
    <sequence>
      <element name=“PrinterName” type=“string”/>
    </sequence>
  </complexType>
</element>
```

- A slightly more complex SOAP message contains the identity of the target printer resource

```
<soap:body>
  <mysvc:GetPrinterPropertiesRequest>
    <mysvc:PrinterName>
      Printer13
    </mysvc:PrinterName>
  </mysvc:GetPrinterPropertiesRequest>
</soap:body>
```

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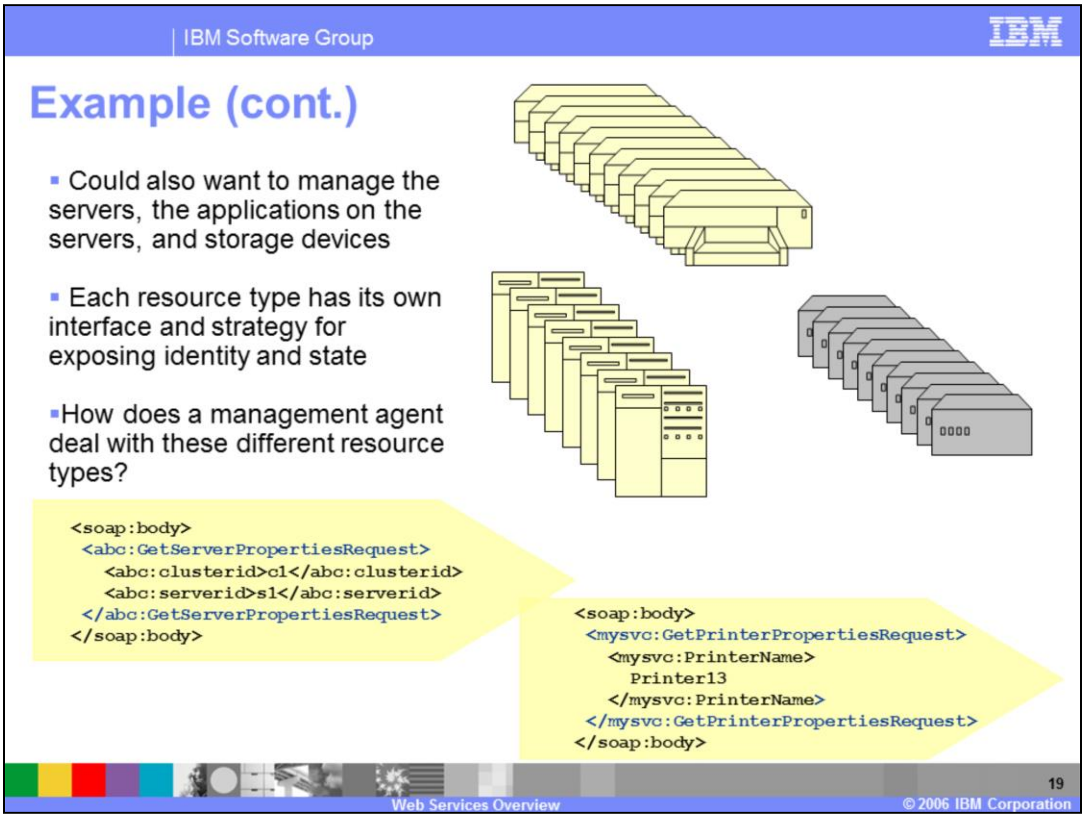
Web Services Overview

Now, expanding on the example, what if the environment contained numerous printers? The Web Service could be written with a parameter to specify a specific printer resource, this would in turn make the WSDL document slightly more complicated as is shown on the slide. The SOAP messages that are used would now need to contain a parameter for the identity of the printer that is being managed. This could be used to create a fairly robust Web Service for managing printer resources.



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Example (cont.)

- Could also want to manage the servers, the applications on the servers, and storage devices
- Each resource type has its own interface and strategy for exposing identity and state
- How does a management agent deal with these different resource types?

```
<soap:body>
 <abc:GetServerPropertiesRequest>
   <abc:clusterid>c1</abc:clusterid>
   <abc:serverid>s1</abc:serverid>
 </abc:GetServerPropertiesRequest>
</soap:body>
```

```
<soap:body>
 <mysvc:GetPrinterPropertiesRequest>
   <mysvc:PrinterName>
     Printer13
   </mysvc:PrinterName>
 </mysvc:GetPrinterPropertiesRequest>
</soap:body>
```

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Web Services Overview

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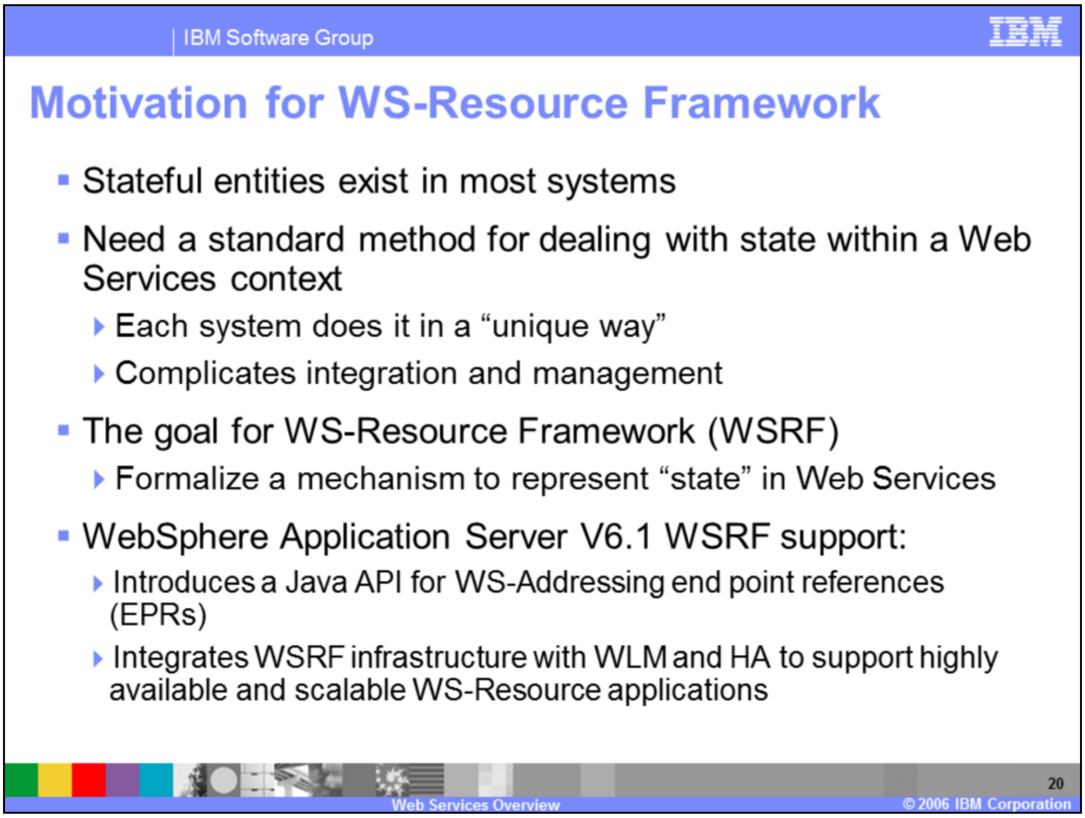
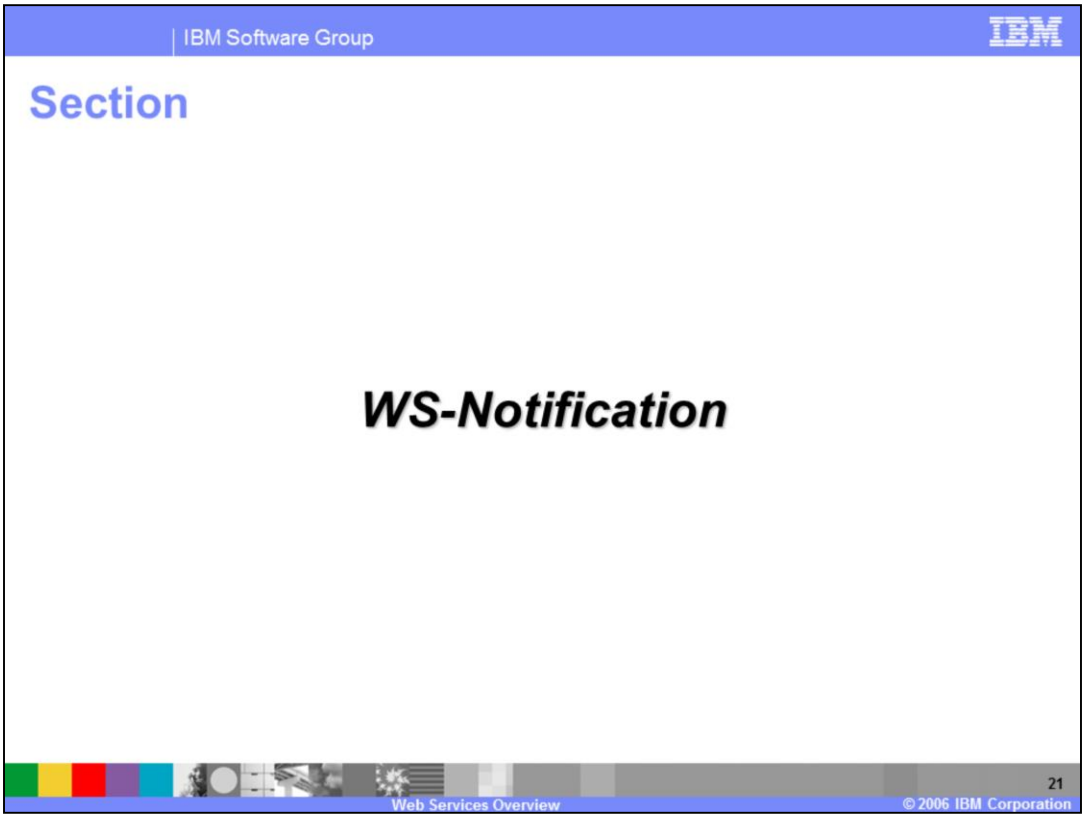
However, expanding upon the example a bit more. What if the Web Service also needed to manage other types of resources in the environment? Each other type of resource would have a different interface and methods for managing it, and the Web Service would need to be able to manage these different types of resources in a meaningful way. This adds significant complexity to the problem, and it is this type of problem that the Web Services Resource Framework specification tries to solve.



Motivation for WS-Resource Framework

- Stateful entities exist in most systems
- Need a standard method for dealing with state within a Web Services context
  - Each system does it in a “unique way”
  - Complicates integration and management
- The goal for WS-Resource Framework (WSRF)
  - Formalize a mechanism to represent “state” in Web Services
- WebSphere Application Server V6.1 WSRF support:
  - Introduces a Java API for WS-Addressing end point references (EPRs)
  - Integrates WSRF infrastructure with WLM and HA to support highly available and scalable WS-Resource applications

This concept of stateful entities or resources exist in most environments, these could be a configuration for a printer or data in a purchase order. Web Services need a standard way to deal with state within the context of a Web Service application. The goal for the Web Services Resource Framework is to provide a standard way to represent state within a Web Service, thus simplifying the integration and management of resources. WebSphere Application Server V6.1 provides support for the WSRF specification, through a Java API for WS-Addressing end point references. The support is integrated within WebSphere Application Server’s workload management and high availability components, allowing for the create of highly available, scalable Web Services Resource applications.



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Section

WS-Notification

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Web Services Overview

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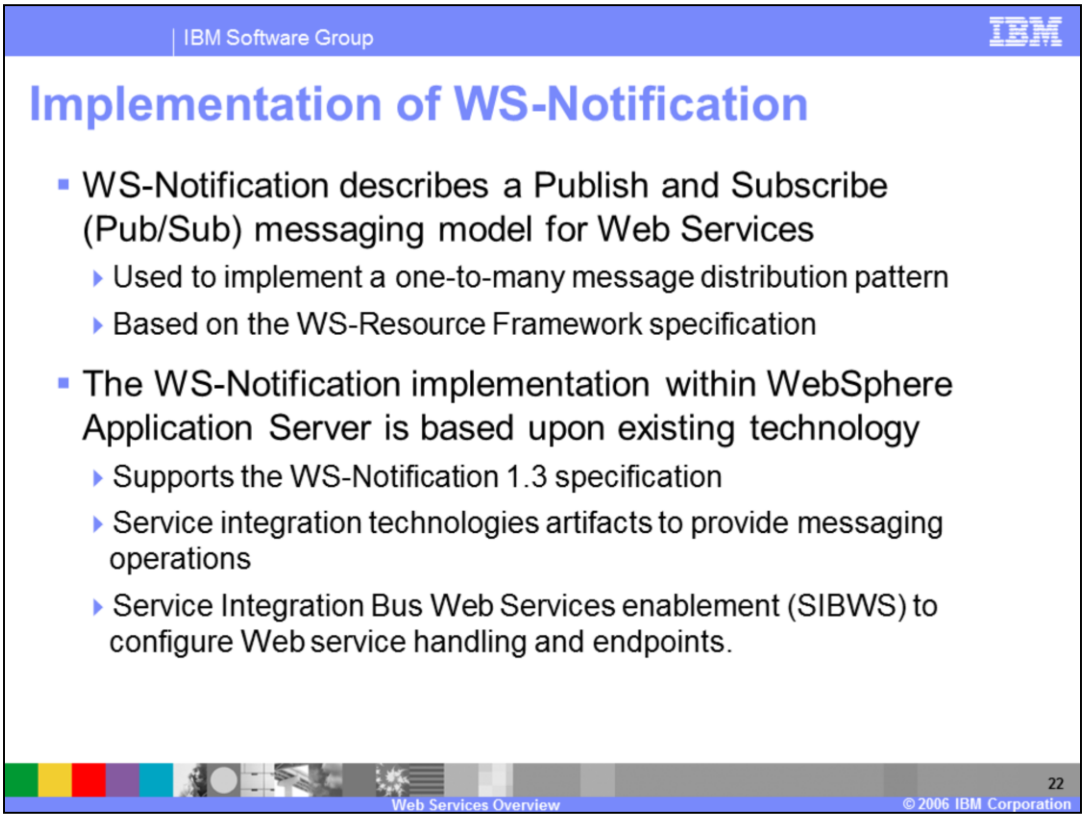
The next section covers the new support for the Web Services Notification specification.



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Implementation of WS-Notification

- WS-Notification describes a Publish and Subscribe (Pub/Sub) messaging model for Web Services
  - Used to implement a one-to-many message distribution pattern
  - Based on the WS-Resource Framework specification
- The WS-Notification implementation within WebSphere Application Server is based upon existing technology
  - Supports the WS-Notification 1.3 specification
  - Service integration technologies artifacts to provide messaging operations
  - Service Integration Bus Web Services enablement (SIBWS) to configure Web service handling and endpoints.

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Web Services Overview

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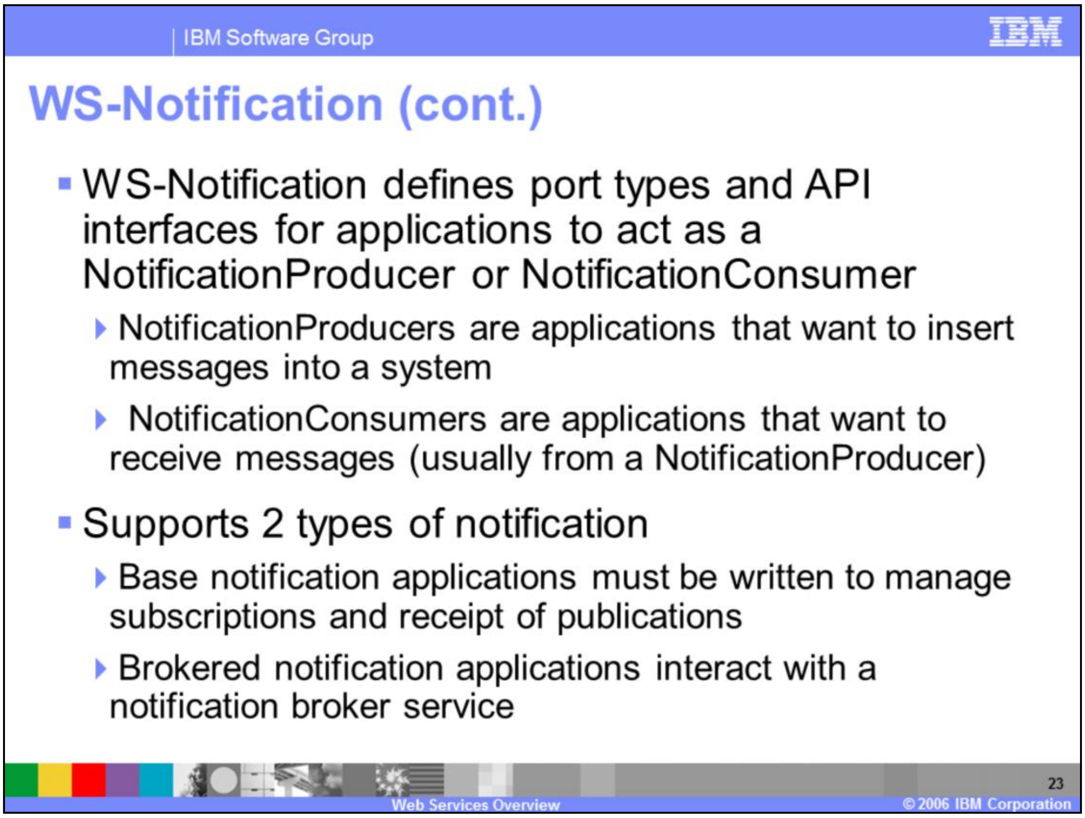
The Web Services Notification specification deals with how to implement a publish and subscription messaging model with Web Services. A publish and subscription model is most often used to implement a one to many message distribution solution. The Web Services Notification support within WebSphere Application Server V6.1 is based on a number of existing technologies. The first, is the Service Integration technologies that allow for messaging operations. The second, is the implementation for Service Integration Bus Web Services that allow for Web Services to integrate with the Java messaging technologies that were introduced with WebSphere Application Server V6. By using these existing technologies, WebSphere Application Server now supports the Web Services Notification 1.3 specification.



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WS-Notification (cont.)

- WS-Notification defines port types and API interfaces for applications to act as a NotificationProducer or NotificationConsumer
  - NotificationProducers are applications that want to insert messages into a system
  - NotificationConsumers are applications that want to receive messages (usually from a NotificationProducer)
- Supports 2 types of notification
  - Base notification applications must be written to manage subscriptions and receipt of publications
  - Brokered notification applications interact with a notification broker service

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Web Services Overview

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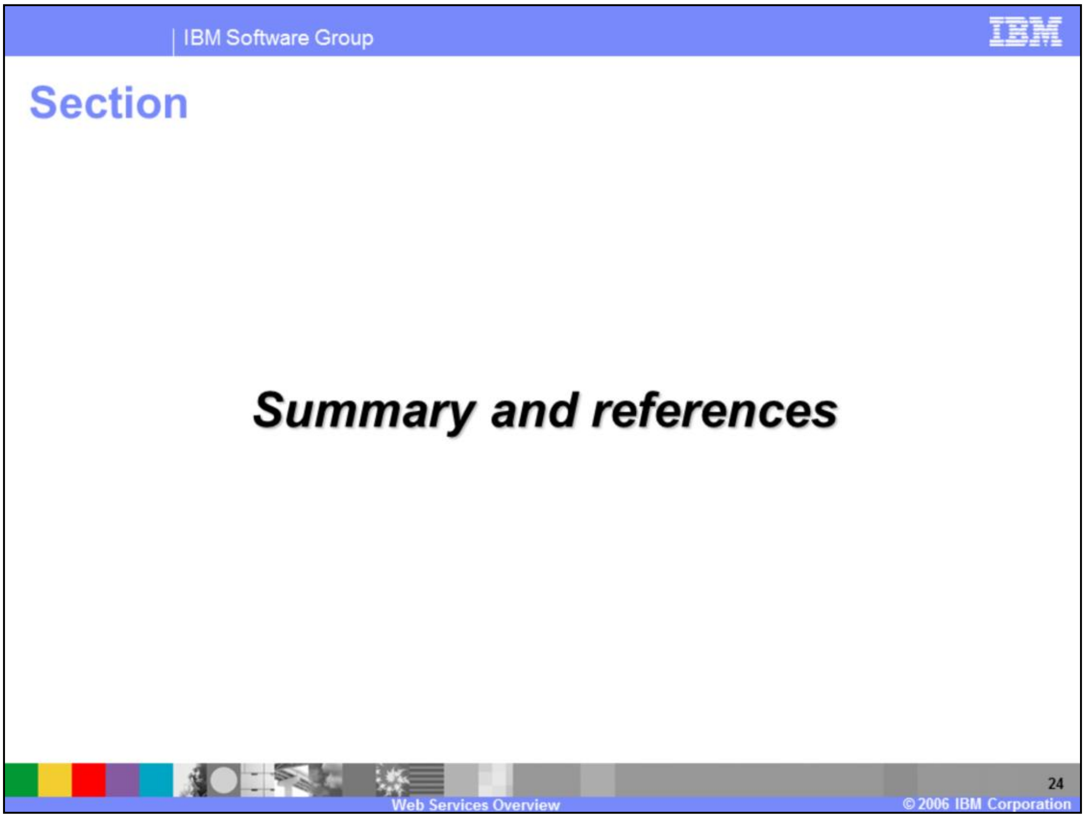
The Web Services Notification specification port types and APIs to interact with 2 specific types of Web Service applications, a NotificationProducer and a NotificationConsumer. A NotificationProducer application is a Web Service application that has the ability to create and insert messages into a messaging system. A NotificationConsumer application can than receive messages from a messaging system. Together these types of Web Services applications allow for a robust publish and subscription solution. The specification supports 2 types of notifications. Base notification applications are more complex, and must handle all aspects of working with a messaging environment. Brokered notification applications interact with a notification service provided by an application server, in order to more easily manage and interact with a messaging infrastructure.



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Section

Summary and references

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Web Services Overview

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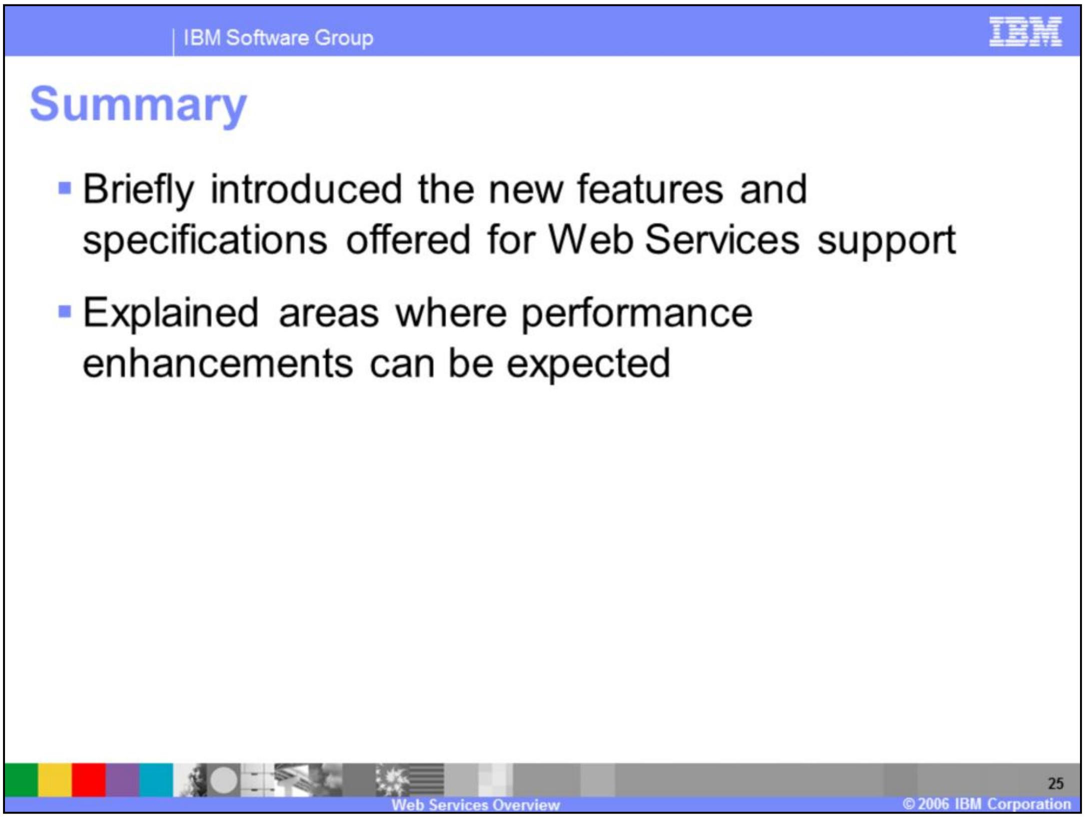
The next section discusses the summary and references.



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Summary

- Briefly introduced the new features and specifications offered for Web Services support
- Explained areas where performance enhancements can be expected

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Web Services Overview

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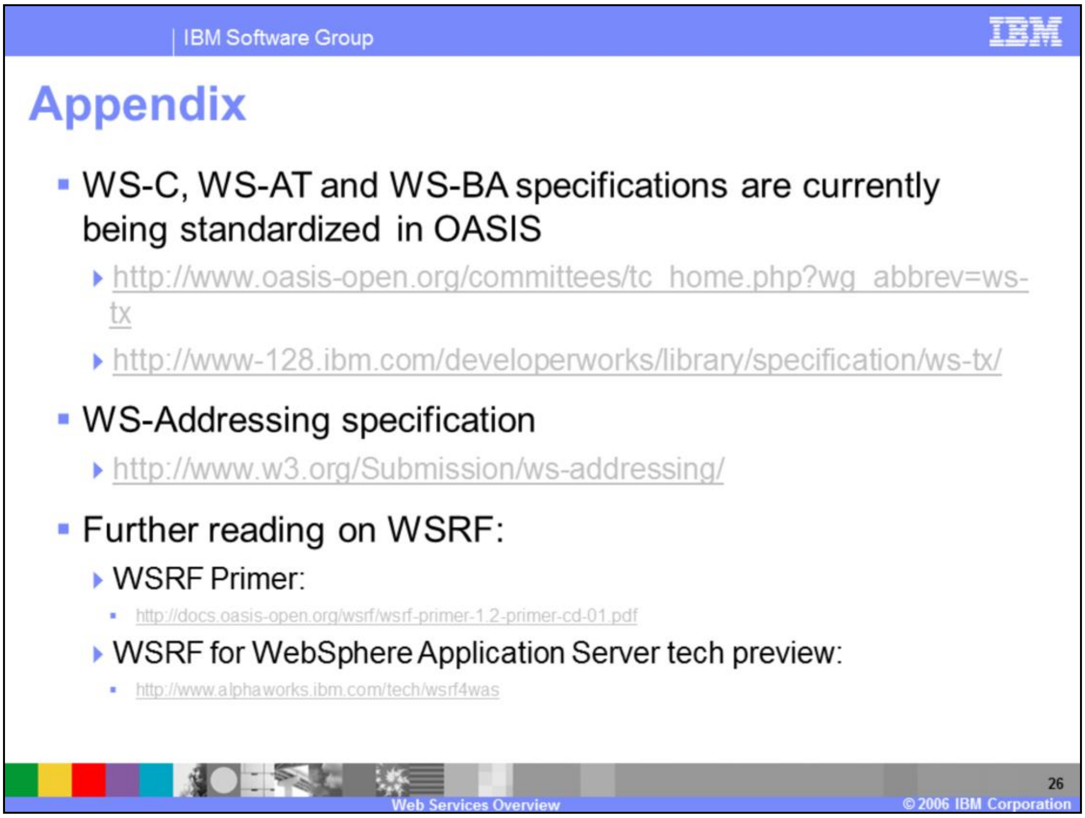
This presentation provided a brief overview of the new Web Services features in WebSphere Application Server V6.1. It explained key performance features, and the support now offered for new Web Services specifications. Other presentations go into more detail on the individual specifications.



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Appendix

- WS-C, WS-AT and WS-BA specifications are currently being standardized in OASIS
  - http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=ws-tx
  - http://www-128.ibm.com/developerworks/library/specification/ws-tx/
- WS-Addressing specification
  - http://www.w3.org/Submission/ws-addressing/
- Further reading on WSRF:
  - WSRF Primer:
    - http://docs.oasis-open.org/wsrf/wsrf-primer-1.2-primer-cd-01.pdf
  - WSRF for WebSphere Application Server tech preview:
    - http://www.alphaworks.ibm.com/tech/wsrf4was

Web Services Overview

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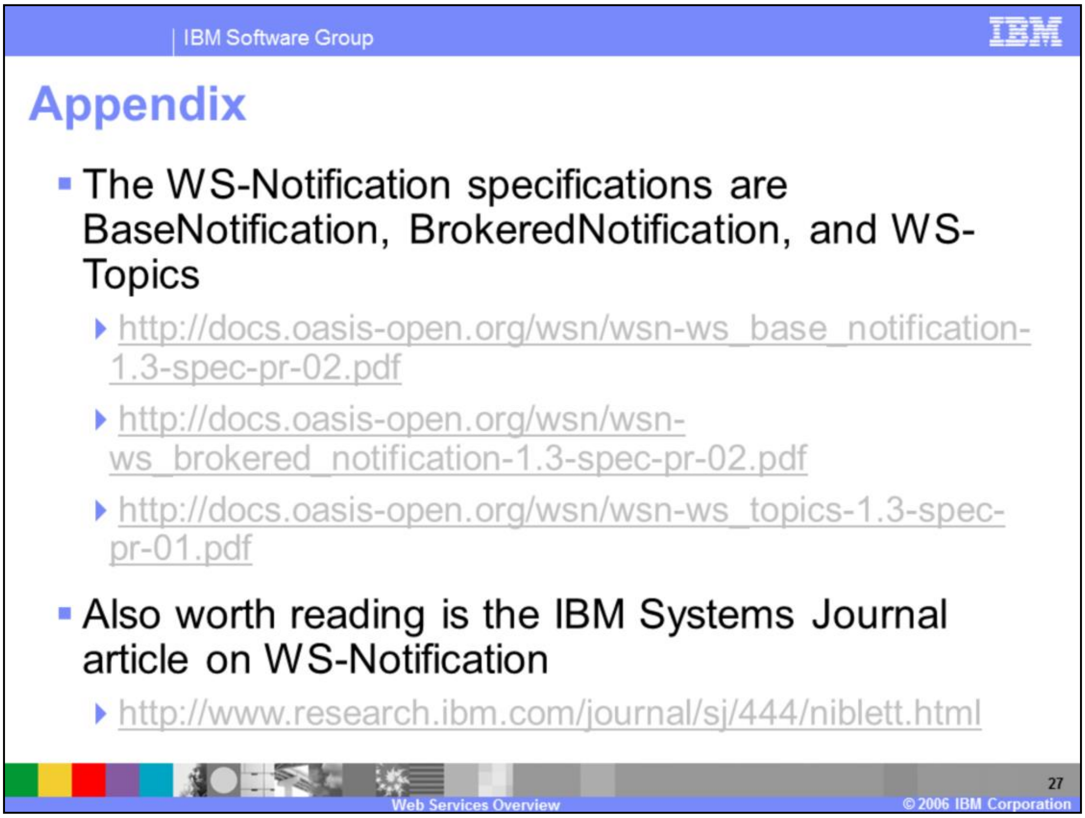
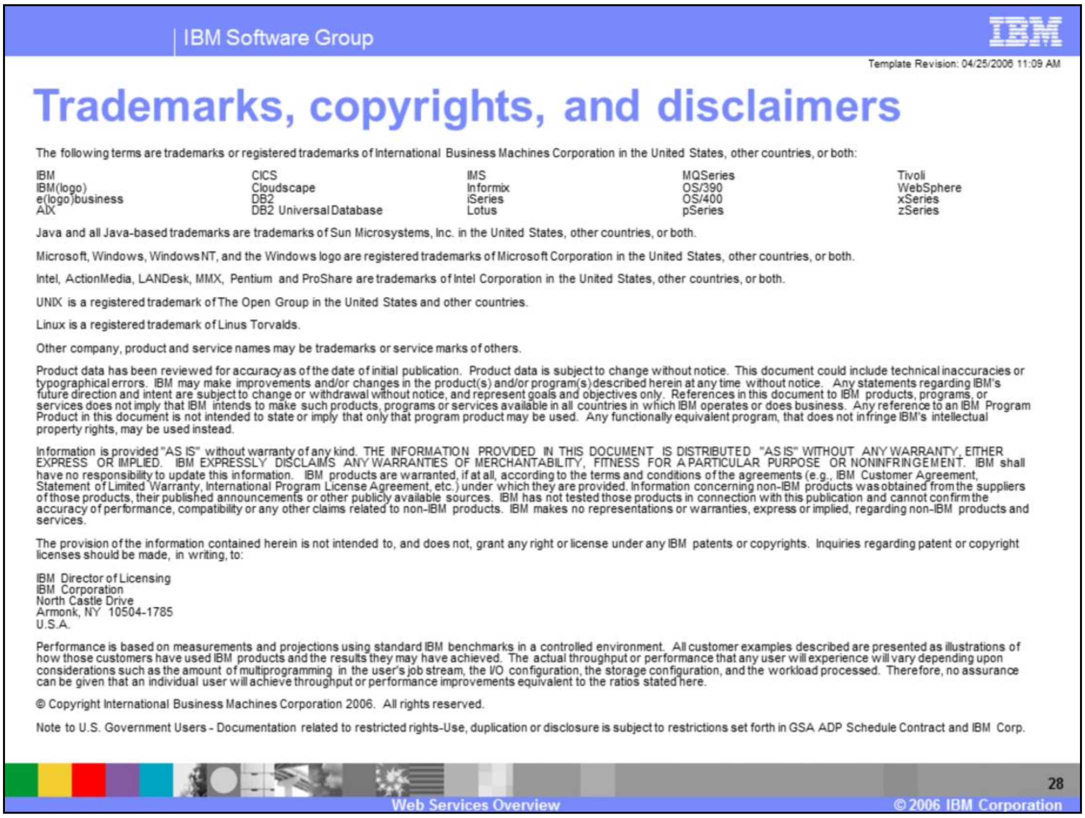


Appendix

- The WS-Notification specifications are BaseNotification, BrokeredNotification, and WS-Topics
  - http://docs.oasis-open.org/wsn/wsn-ws_base_notification-1.3-spec-pr-02.pdf
  - http://docs.oasis-open.org/wsn/wsn-ws_brokered_notification-1.3-spec-pr-02.pdf
  - http://docs.oasis-open.org/wsn/wsn-ws_topics-1.3-spec-pr-01.pdf
- Also worth reading is the IBM Systems Journal article on WS-Notification
  - http://www.research.ibm.com/journal/sj/444/niblett.html



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