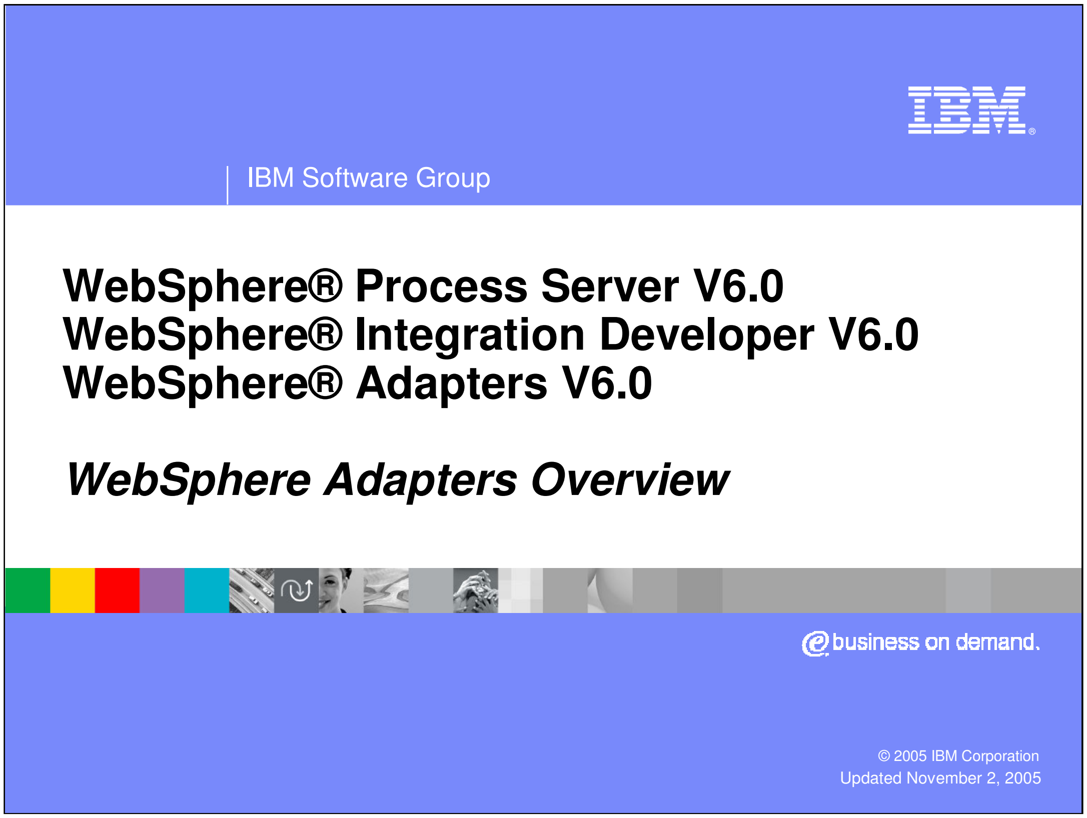

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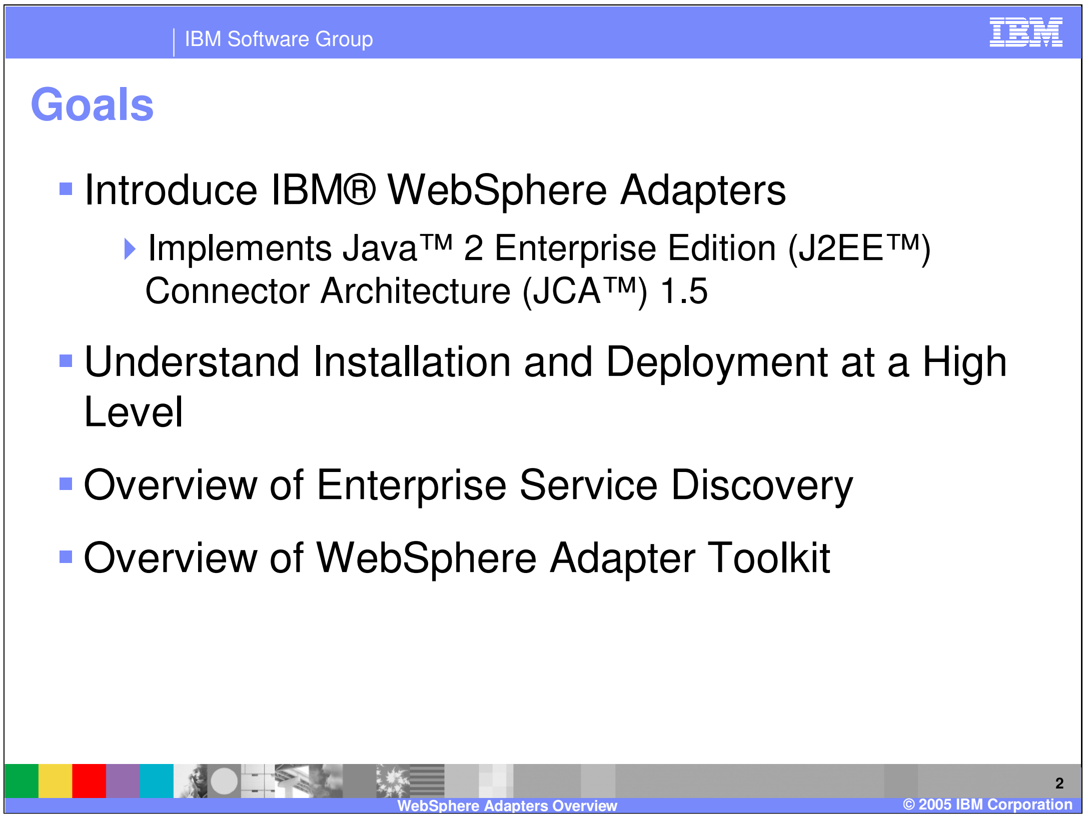
WebSphere® Process Server V6.0
WebSphere® Integration Developer V6.0
WebSphere® Adapters V6.0

WebSphere Adapters Overview

business on demand.

Updated November 2, 2005

This presentation will provide a high level overview of the WebSphere Adapters V6.0.



Goals

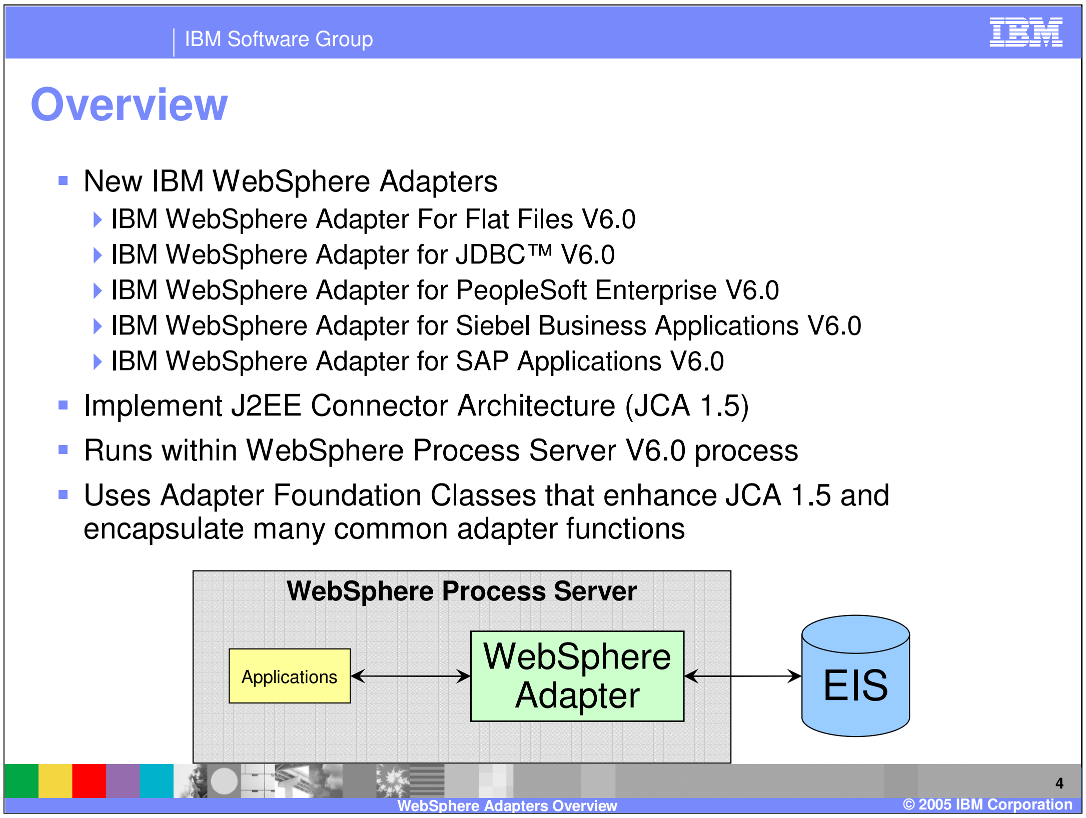
- Introduce IBM® WebSphere Adapters
  - Implements Java™ 2 Enterprise Edition (J2EE™) Connector Architecture (JCA™) 1.5
- Understand Installation and Deployment at a High Level
- Overview of Enterprise Service Discovery
- Overview of WebSphere Adapter Toolkit

The goals of this presentation are to introduce the new IBM WebSphere Adapters V6.0 that implement the JCA 1.5 specification, help you to understand installation and deployment at a high level, and take a look at enterprise service discovery and the WebSphere Adapter Toolkit.

Agenda

- **Overview**
- Architecture / Big-Picture
- WebSphere Integration Developer / Enterprise Service Discovery
- WebSphere Adapter Toolkit
- Summary and References

This section will present an overview of Adapters.



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Overview

- New IBM WebSphere Adapters
  - IBM WebSphere Adapter For Flat Files V6.0
  - IBM WebSphere Adapter for JDBC™ V6.0
  - IBM WebSphere Adapter for PeopleSoft Enterprise V6.0
  - IBM WebSphere Adapter for Siebel Business Applications V6.0
  - IBM WebSphere Adapter for SAP Applications V6.0
- Implement J2EE Connector Architecture (JCA 1.5)
- Runs within WebSphere Process Server V6.0 process
- Uses Adapter Foundation Classes that enhance JCA 1.5 and encapsulate many common adapter functions

WebSphere Process Server

Applications

WebSphere Adapter

EIS

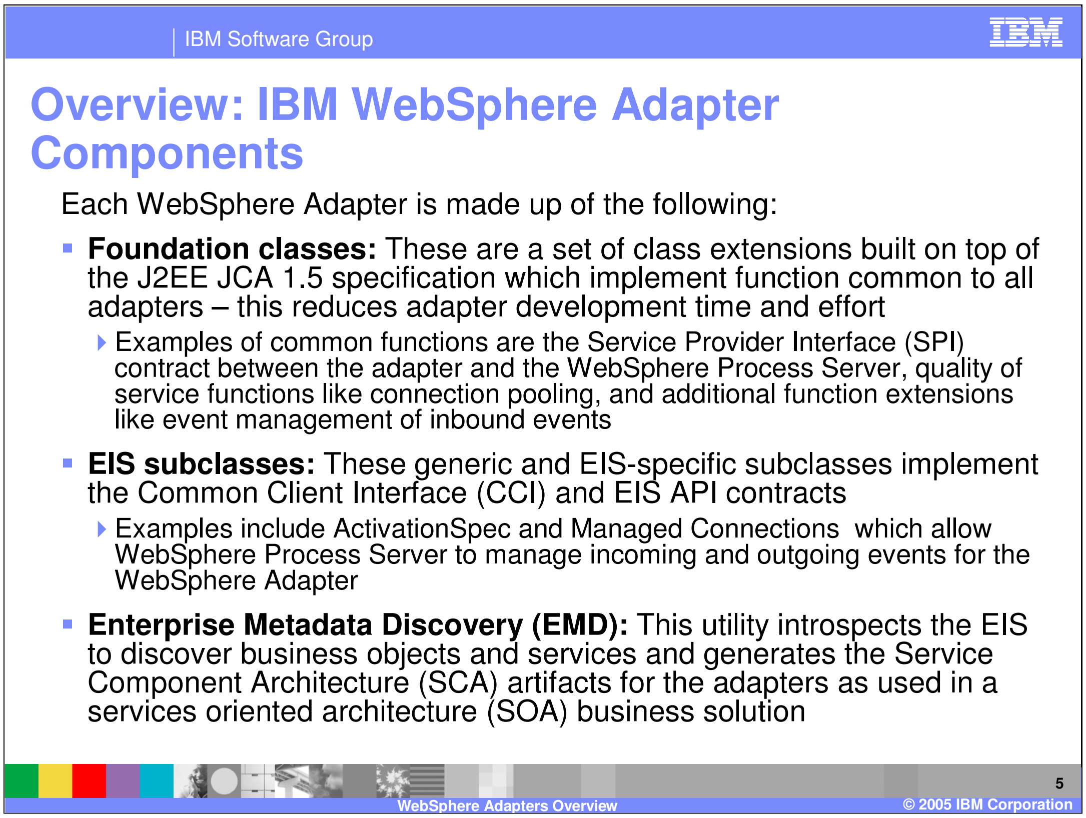
4

WebSphere Adapters Overview

There are five new IBM WebSphere Adapters available in V6.0 that implement the JCA 1.5 specification and are enhanced to run on WebSphere Process Server V6.0. These adapters are IBM WebSphere Adapter for Flat Files V6, IBM WebSphere Adapter for JDBC V6, IBM WebSphere Adapter for PeopleSoft Enterprise V6, IBM WebSphere Adapter for Siebel Business Applications V6, and IBM WebSphere Adapter for SAP Applications V6. These new adapters are enhanced to make development, deployment, and integration of adapters simple within as services oriented application. Enhancements include the ability to send and receive business objects to and from Service Component Architecture (SCA) applications, use enterprise service discovery to discover EIS objects and services, ensure inbound delivery of events using the event manager framework, and other capabilities that will be discussed in this presentation.

The adapter uses common foundation classes across each of the adapters, that enhance the JCA 1.5 functions and encapsulate many common adapter functions to simplify the adapter developer tasks.

The JCA 1.5 specification provides an open J2EE standard for EIS connectivity. It also allows for bi-directional interaction with EISs in a managed framework that provides qualities of service through the WebSphere Process Server for functions, including connection life-cycle management, connection pooling and matching, security, and transactions.

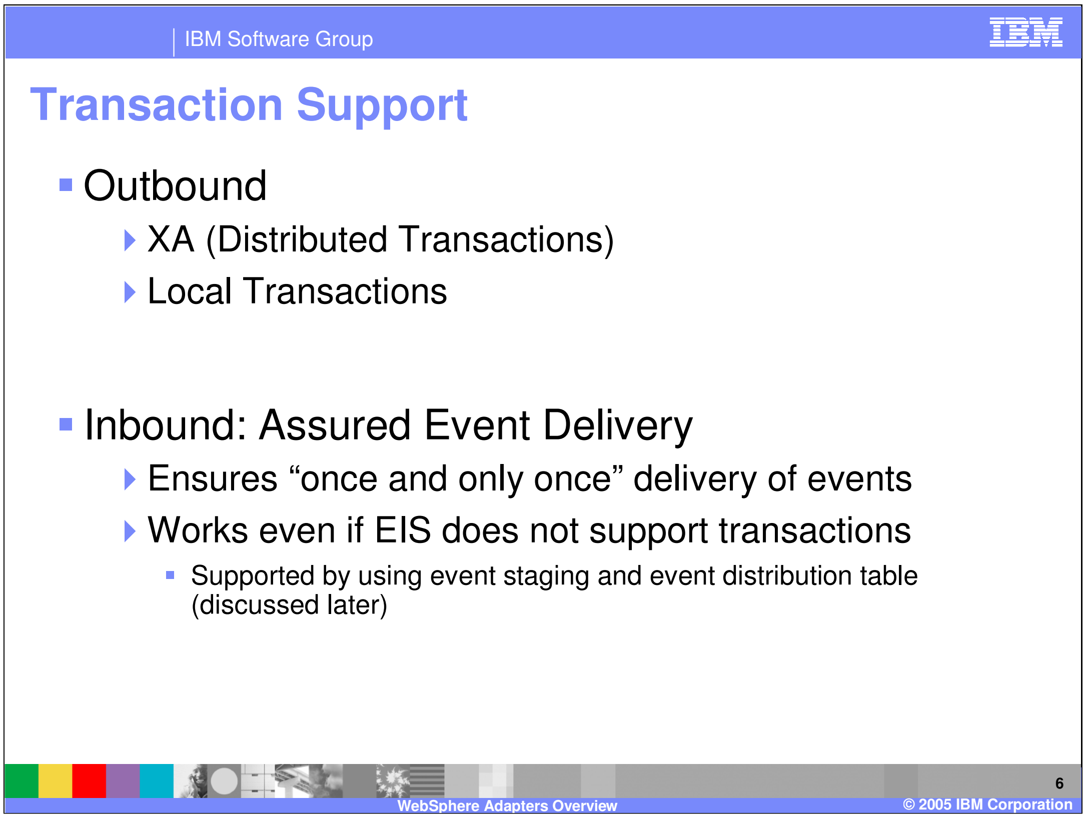


Overview: IBM WebSphere Adapter Components

Each WebSphere Adapter is made up of the following:

- **Foundation classes:** These are a set of class extensions built on top of the J2EE JCA 1.5 specification which implement function common to all adapters – this reduces adapter development time and effort
  - Examples of common functions are the Service Provider Interface (SPI) contract between the adapter and the WebSphere Process Server, quality of service functions like connection pooling, and additional function extensions like event management of inbound events
- **EIS subclasses:** These generic and EIS-specific subclasses implement the Common Client Interface (CCI) and EIS API contracts
  - Examples include ActivationSpec and Managed Connections which allow WebSphere Process Server to manage incoming and outgoing events for the WebSphere Adapter
- **Enterprise Metadata Discovery (EMD):** This utility introspects the EIS to discover business objects and services and generates the Service Component Architecture (SCA) artifacts for the adapters as used in a services oriented architecture (SOA) business solution

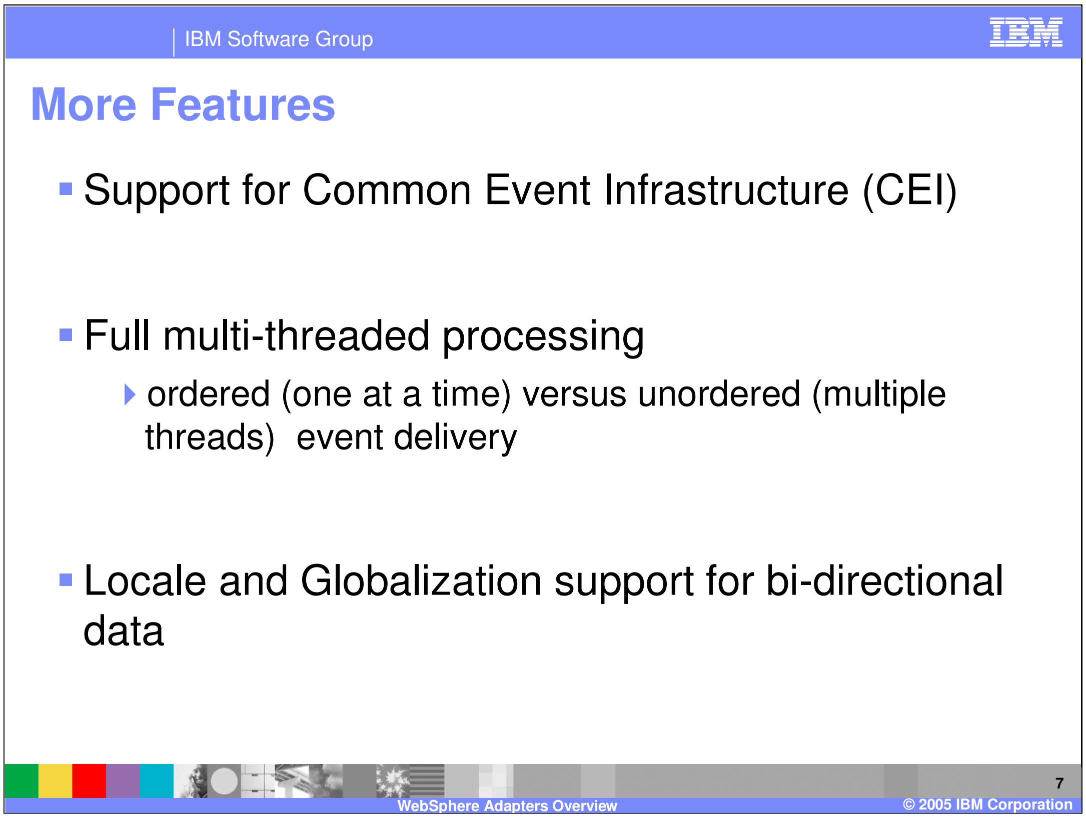
Each WebSphere Adapter consists of a set of foundation classes that are common across all adapters, and a set of EIS specific subclasses specific to each adapter. The foundation classes implement the JCA 1.5 specification and also the Enterprise MetaData Discovery specification (see references section at the end of this presentation), and enable integration with WebSphere Integration Developer, WebSphere Process Server, and the EIS application.



Transaction Support

- Outbound
  - XA (Distributed Transactions)
  - Local Transactions
- Inbound: Assured Event Delivery
  - Ensures “once and only once” delivery of events
  - Works even if EIS does not support transactions
    - Supported by using event staging and event distribution table (discussed later)

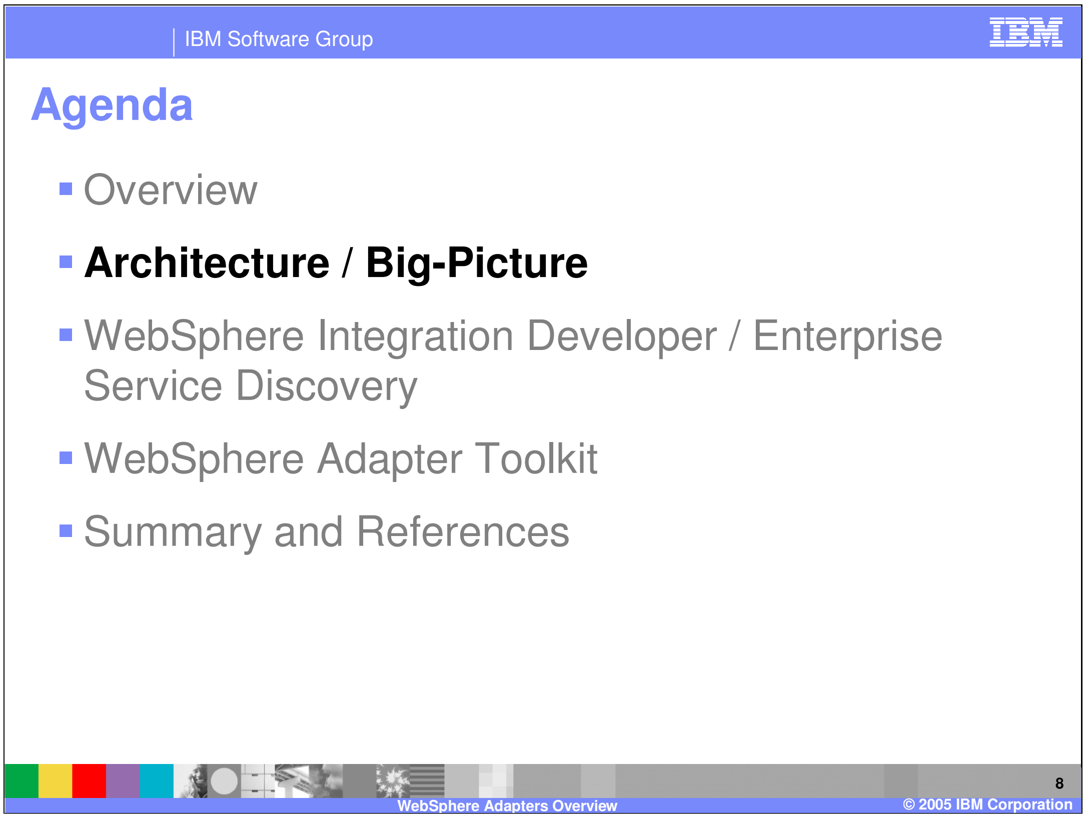
For capabilities specific to each adapter, consult the adapter product documentation. Some of the IBM WebSphere Adapters might support XA or local transactions for outbound processing. For inbound processing, assured event delivery can be guaranteed through the use of the event manager framework and a persistent event distribution table (EDT) and database. Assured event delivery is possible even if the EIS does not support transactions.



More Features

- Support for Common Event Infrastructure (CEI)
- Full multi-threaded processing
  - ordered (one at a time) versus unordered (multiple threads) event delivery
- Locale and Globalization support for bi-directional data

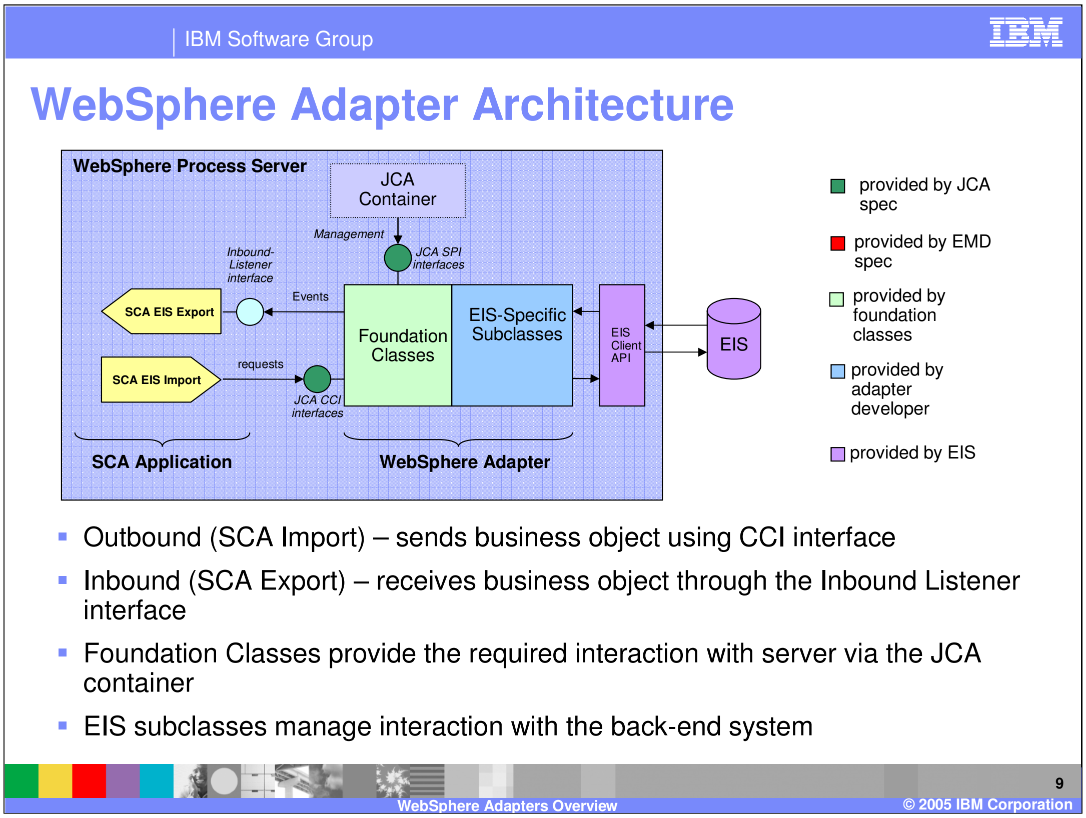
Additional features supported by the adapters include support for emitting common event infrastructure (CEI) events, multi-threaded processing of unordered events, and locale and globalization support for bi-directional data.



Agenda

- Overview
- **Architecture / Big-Picture**
- WebSphere Integration Developer / Enterprise Service Discovery
- WebSphere Adapter Toolkit
- Summary and References

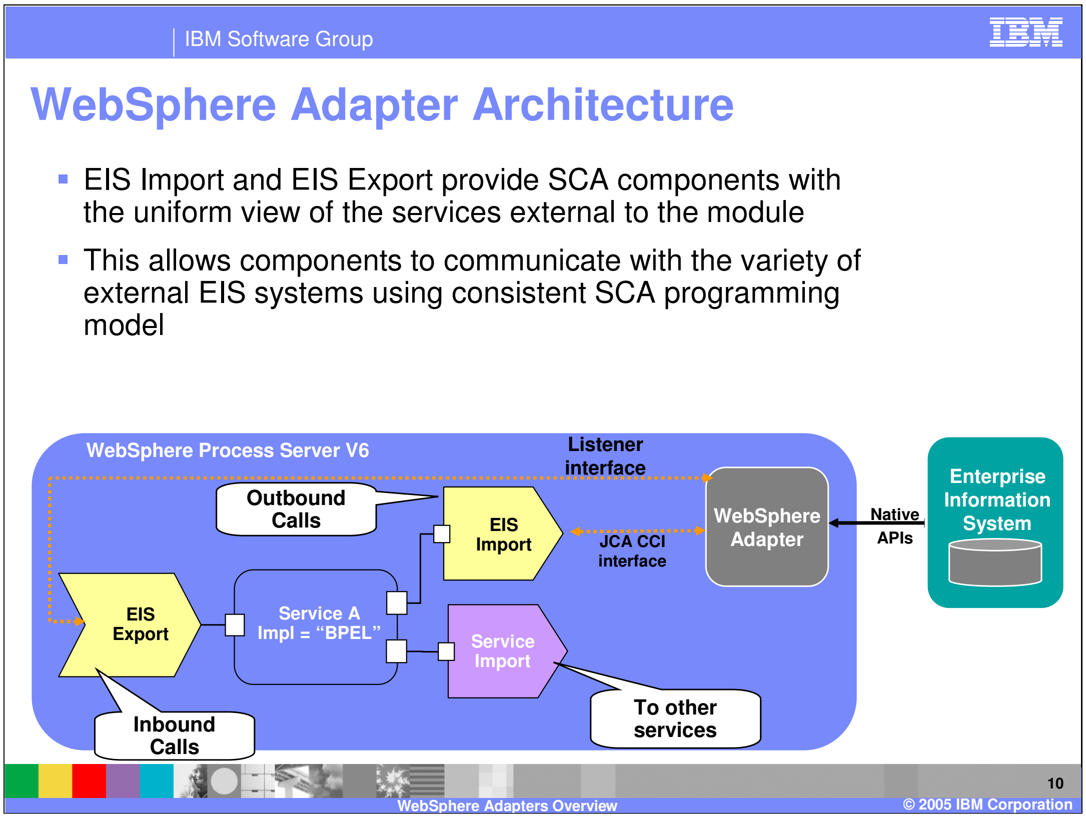
This section discusses the architecture and big picture view of the IBM WebSphere Adapters.



WebSphere Adapter Architecture

- Outbound (SCA Import) – sends business object using CCI interface
- Inbound (SCA Export) – receives business object through the Inbound Listener interface
- Foundation Classes provide the required interaction with server via the JCA container
- EIS subclasses manage interaction with the back-end system

Here you see an architecture diagram showing the lower-level application programming interfaces associated with JCA. On the next page, you will see a similar architecture diagram showing the higher-level programming model available with Service Component Architecture (SCA) and the WebSphere Integration Developer supported enterprise discovery services. The two main interfaces to a JCA 1.5 adapter are the SPI Service Provider Interface (SPI) and the Common Client Interface (CCI). The SPI is the application server view of the adapter and it contains the contracts necessary to work well with an application server and allow the server to provide qualities of service such as connection creation and matching, security, work management, and transactions. The CCI is designed to provide a common view of data and interaction with the adapter. The CCI defines the data model and provides a common mechanism to interact with the adapter. SCA applications, acting as clients, can send outbound messages to the resource adapter using the CCI APIs. The SCA components pass business objects wrapped within a CCI Record Spec object. The metadata in the business object has all the information for the adapter to determine the outbound function to call in the EIS and includes the parameters to pass to the EIS function. For inbound messages, the adapter defines a message listener interface that the endpoints or the message-driven beans should implement



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WebSphere Adapter Architecture

- EIS Import and EIS Export provide SCA components with the uniform view of the services external to the module
- This allows components to communicate with the variety of external EIS systems using consistent SCA programming model

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WebSphere Adapters Overview

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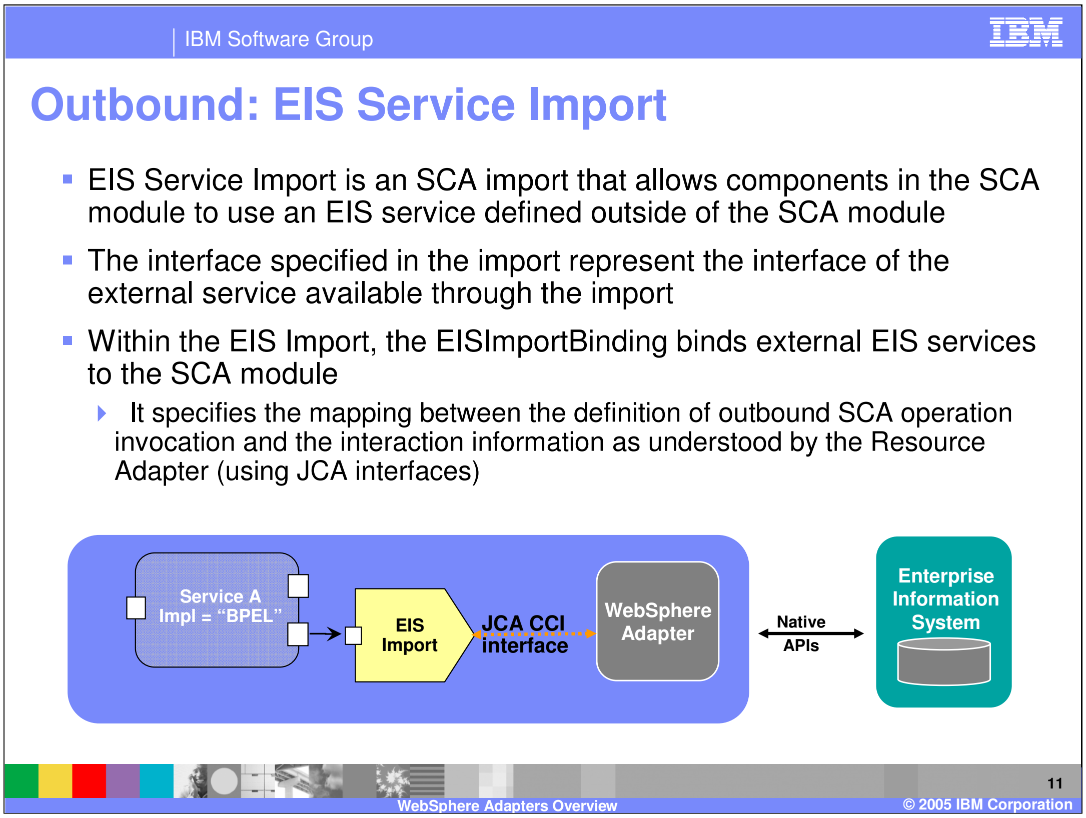
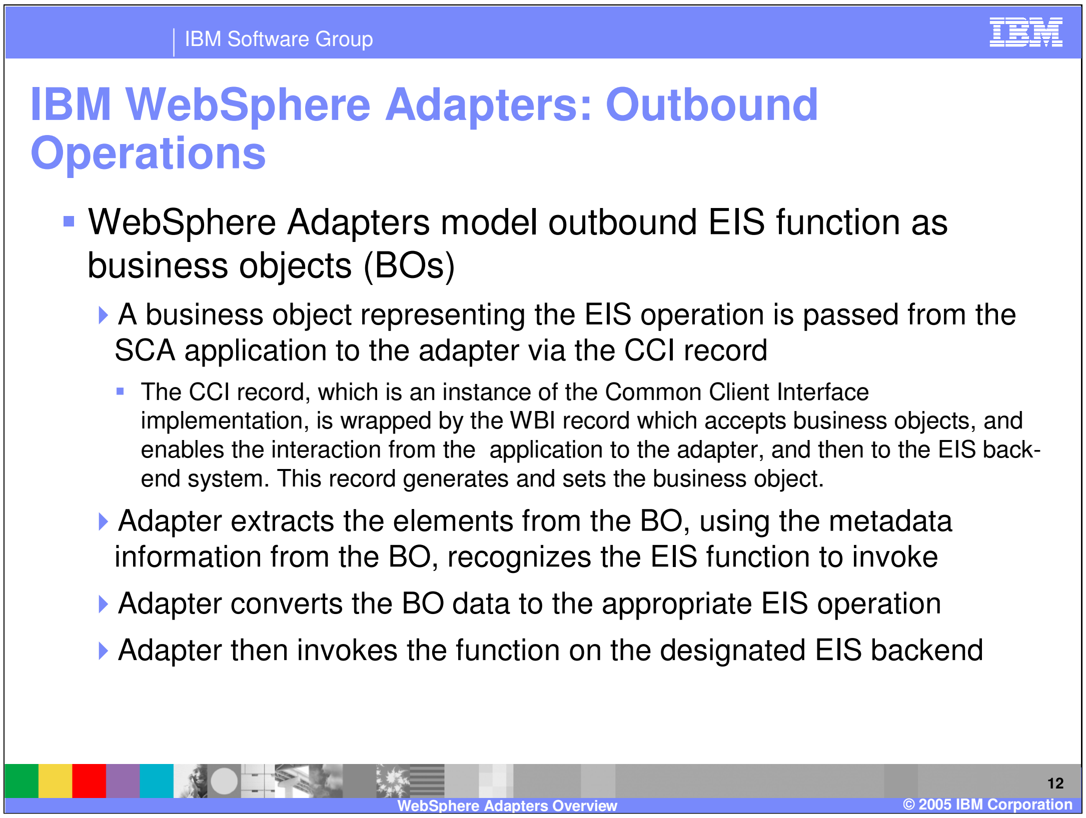
Here you see the higher-level programming model used when integrating the WebSphere Adapters into your SOA solution. You are able to work with the adapters using the same SCA programming model and components as any other component. The EIS import and export provide the uniform view of the EIS services external to the module. This allows for consistency in the use of the adapters.



Outbound: EIS Service Import

- EIS Service Import is an SCA import that allows components in the SCA module to use an EIS service defined outside of the SCA module
- The interface specified in the import represent the interface of the external service available through the import
- Within the EIS Import, the EISImportBinding binds external EIS services to the SCA module
  - It specifies the mapping between the definition of outbound SCA operation invocation and the interaction information as understood by the Resource Adapter (using JCA interfaces)

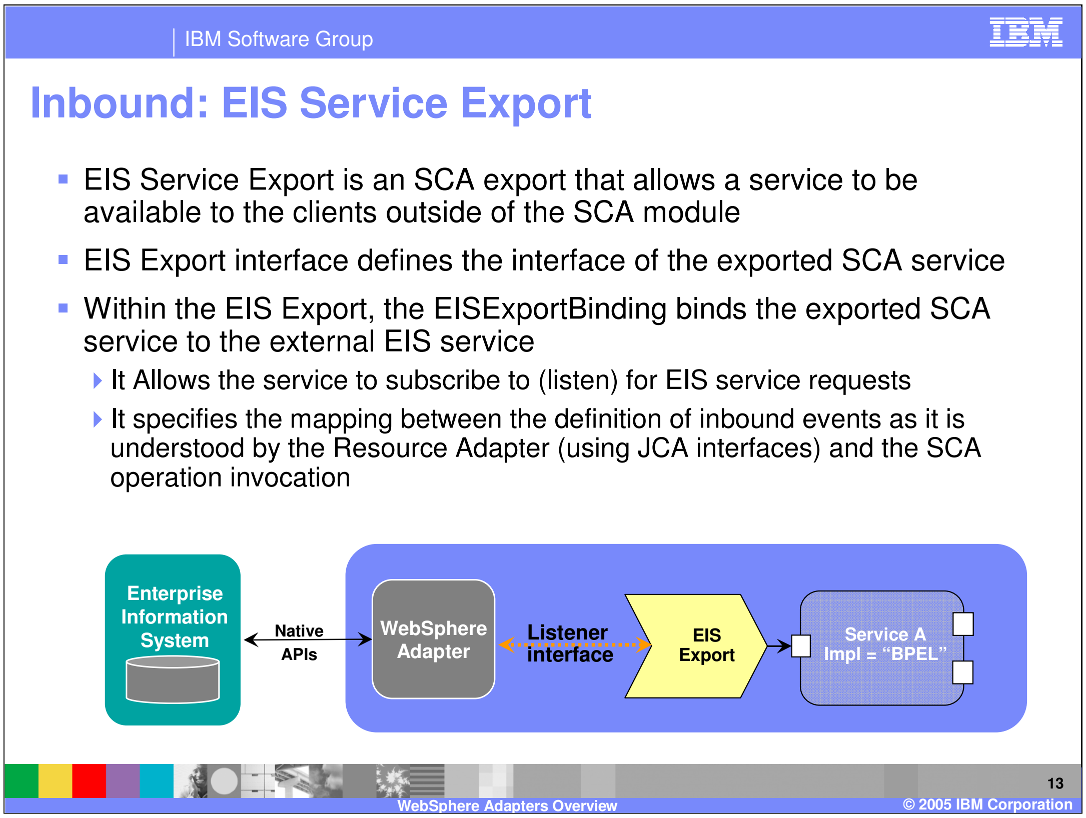
Taking a closer look at the EIS service import, you see that it allows components in the SCA module to use an EIS service defined outside of the SCA module. The interface specified in the import represents the interface of the external service available through the import. Within the EIS import, the EISImportBinding binds the external EIS services to the SCA module.



IBM WebSphere Adapters: Outbound Operations

- WebSphere Adapters model outbound EIS function as business objects (BOs)
  - A business object representing the EIS operation is passed from the SCA application to the adapter via the CCI record
    - The CCI record, which is an instance of the Common Client Interface implementation, is wrapped by the WBI record which accepts business objects, and enables the interaction from the application to the adapter, and then to the EIS back-end system. This record generates and sets the business object.
  - Adapter extracts the elements from the BO, using the metadata information from the BO, recognizes the EIS function to invoke
  - Adapter converts the BO data to the appropriate EIS operation
  - Adapter then invokes the function on the designated EIS backend

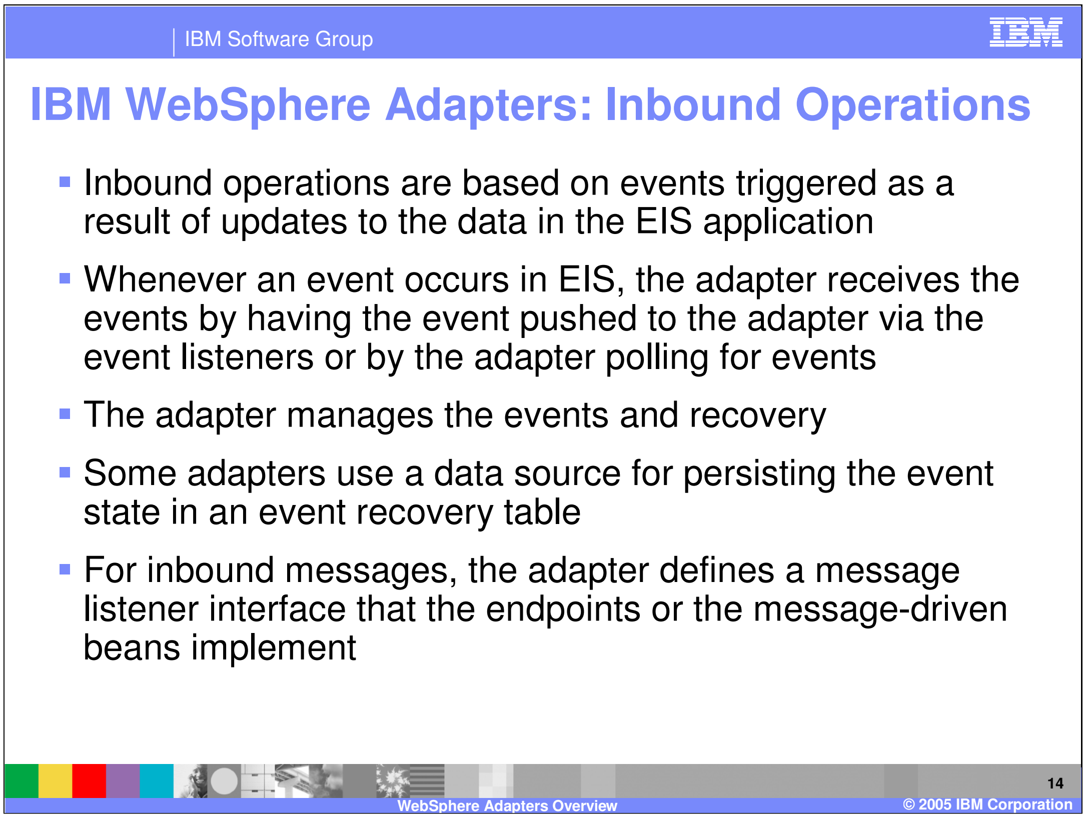
WebSphere adapters model the outbound EIS function as business graphs and business objects. The SCA application passes a business object representing the EIS operation to the adapter using the WBI Record. The WBI Record accepts business objects and wraps the CCI Record. The adapter extracts the elements from the business object, and using the metadata information from the business object, recognizes the EIS function to invoke. The adapter then converts the business object data to the appropriate EIS operation and invokes the function on the designated EIS.



Inbound: EIS Service Export

- EIS Service Export is an SCA export that allows a service to be available to the clients outside of the SCA module
- EIS Export interface defines the interface of the exported SCA service
- Within the EIS Export, the EISExportBinding binds the exported SCA service to the external EIS service
  - It Allows the service to subscribe to (listen) for EIS service requests
  - It specifies the mapping between the definition of inbound events as it is understood by the Resource Adapter (using JCA interfaces) and the SCA operation invocation

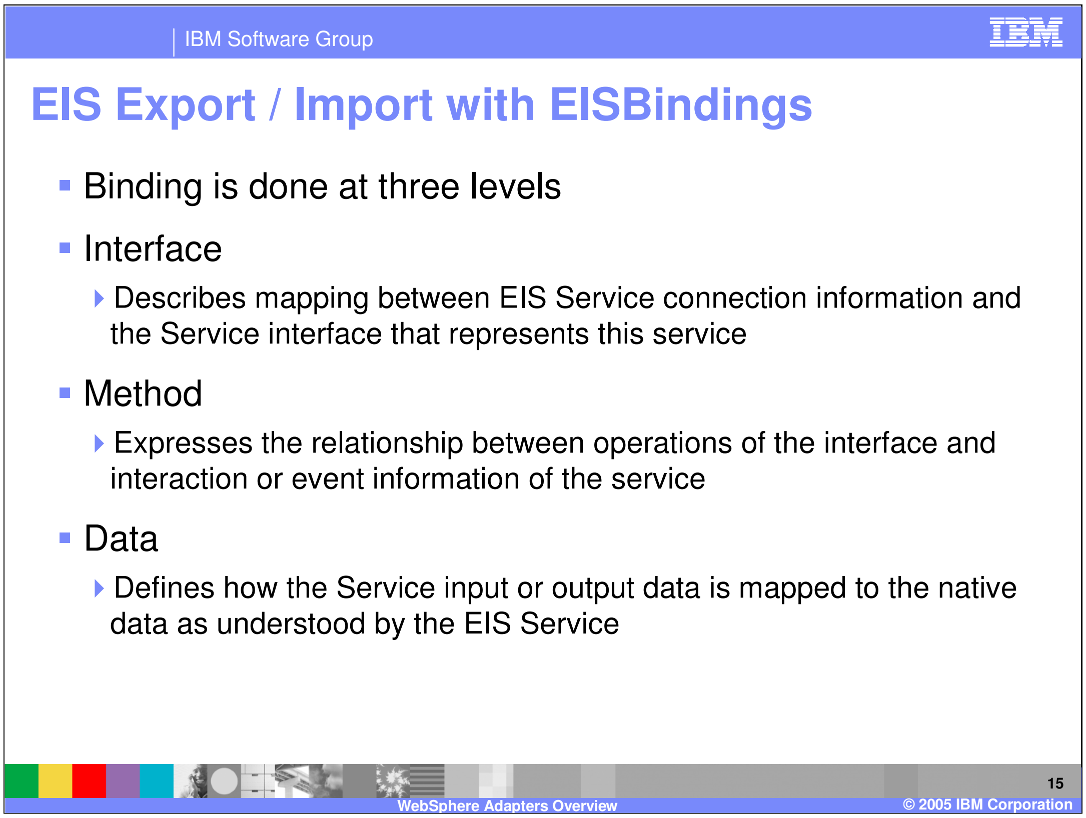
Taking a closer look at the EIS service export, you see that it allows components in the SCA module to be available to clients, such as an EIS service, defined outside the SCA module. The interface specified in the export represents the interface of the SCA component available through the export. Within the EIS export, the EISExportBinding binds the exported SCA service to the external EIS service.



IBM WebSphere Adapters: Inbound Operations

- Inbound operations are based on events triggered as a result of updates to the data in the EIS application
- Whenever an event occurs in EIS, the adapter receives the events by having the event pushed to the adapter via the event listeners or by the adapter polling for events
- The adapter manages the events and recovery
- Some adapters use a data source for persisting the event state in an event recovery table
- For inbound messages, the adapter defines a message listener interface that the endpoints or the message-driven beans implement

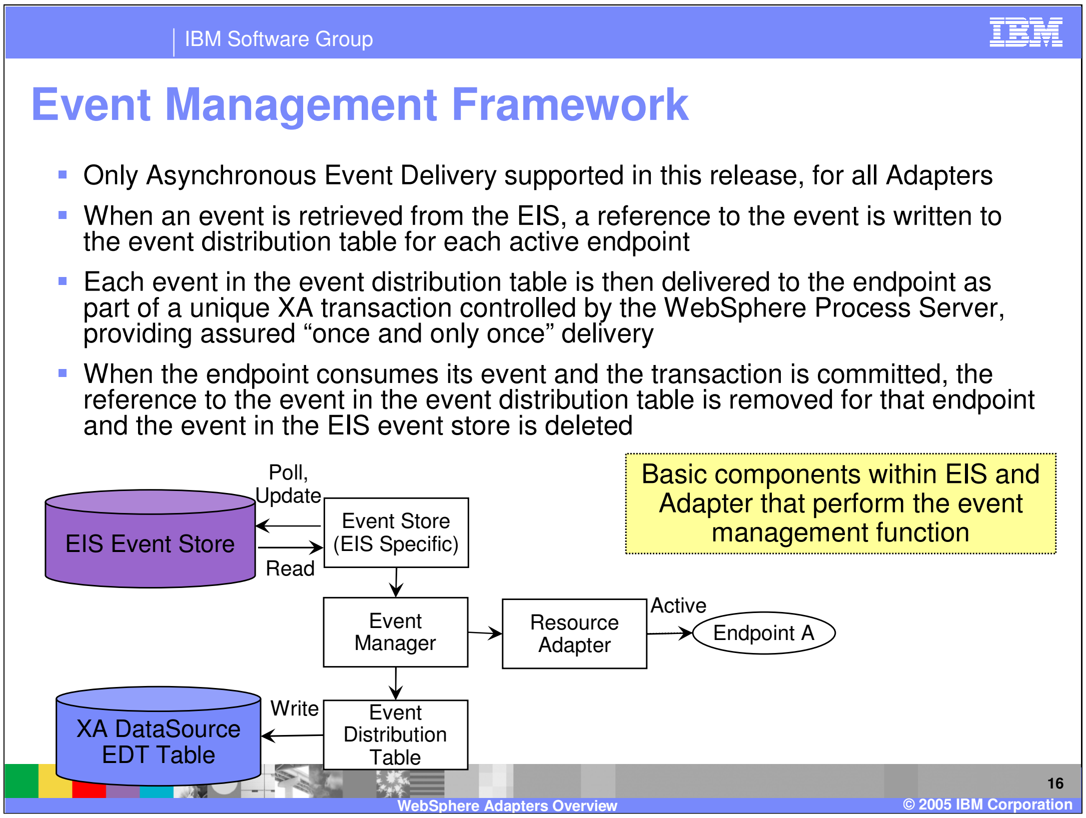
Inbound operations are based on events triggered as a result of updates to the data in the EIS application. The adapter receives the events by having the events pushed to it by way of the event listeners or by polling itself for the events. The adapter, with the assistance of the event management framework, manages the events and recovery.



EIS Export / Import with EISBindings

- Binding is done at three levels
- Interface
  - Describes mapping between EIS Service connection information and the Service interface that represents this service
- Method
  - Expresses the relationship between operations of the interface and interaction or event information of the service
- Data
  - Defines how the Service input or output data is mapped to the native data as understood by the EIS Service

Binding of an EIS service with an SCA component is done at three levels. First is the interface level, which describes the mapping between the EIS service connection information and the service interface that represents this service. Second is the method level, which expresses the relationship between operations of the interface and interaction or event information of the service. And third is the data level which defines how the service input or output data is mapped to the native data as understood by the EIS service.

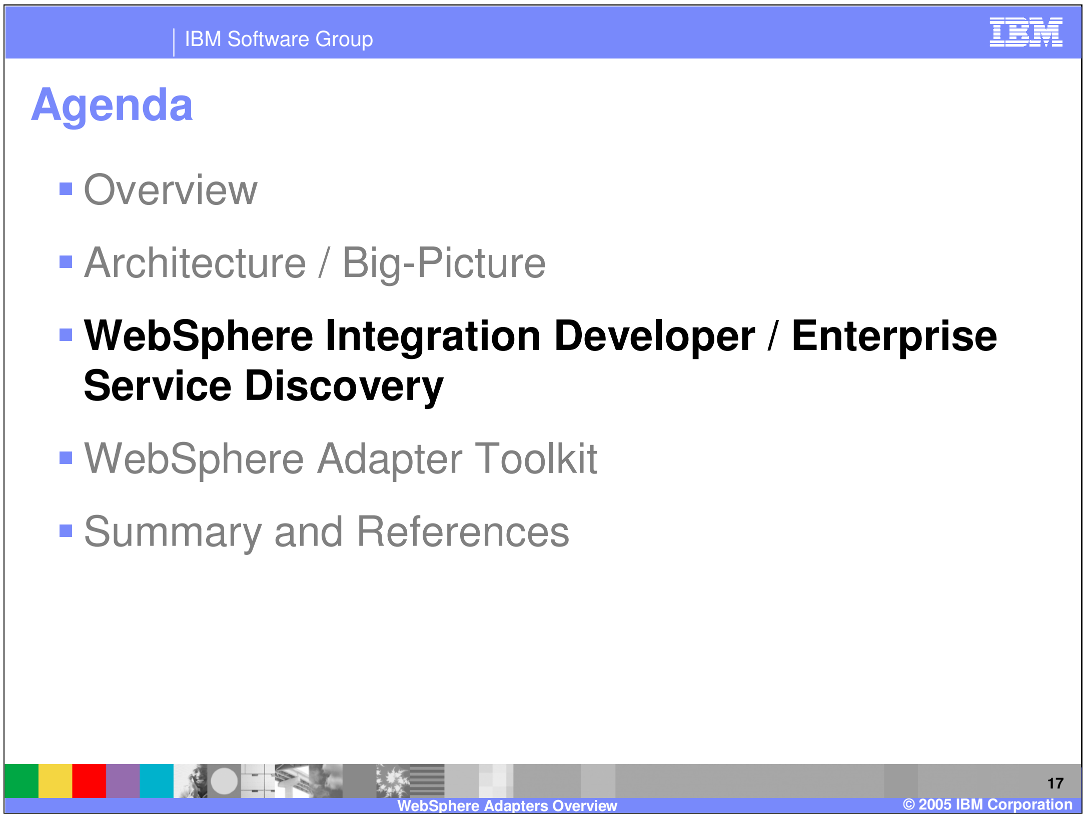


Event Management Framework

- Only Asynchronous Event Delivery supported in this release, for all Adapters
- When an event is retrieved from the EIS, a reference to the event is written to the event distribution table for each active endpoint
- Each event in the event distribution table is then delivered to the endpoint as part of a unique XA transaction controlled by the WebSphere Process Server, providing assured “once and only once” delivery
- When the endpoint consumes its event and the transaction is committed, the reference to the event in the event distribution table is removed for that endpoint and the event in the EIS event store is deleted

Basic components within EIS and Adapter that perform the event management function

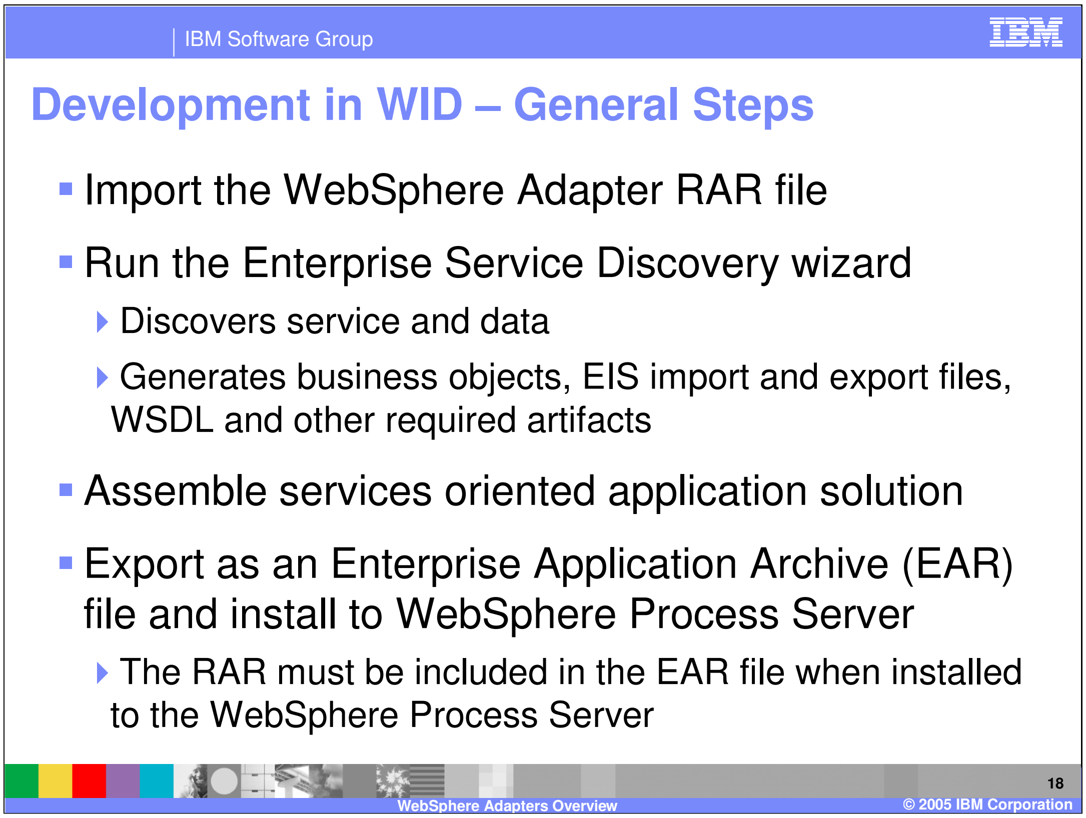
The event management framework is involved in handling incoming events. When an event is retrieved from the EIS application, a reference to the event is written to the event distribution table for each active endpoint. Each event in the event distribution table is then delivered to the endpoint as part of a unique XA transaction controlled by WebSphere Process Server. This delivery, as part of an XA transaction, is what provides the assured once and only once delivery and recovery capabilities. When the endpoint has consumed its event and the transaction is committed, the reference to the event is removed from the event distribution table and the event in the EIS event store table is deleted.



Agenda

- Overview
- Architecture / Big-Picture
- **WebSphere Integration Developer / Enterprise Service Discovery**
- WebSphere Adapter Toolkit
- Summary and References

This section provides a discussion of WebSphere Integration Developer, the use of enterprise service discovery, and the general steps involved when working with the WebSphere Adapters.



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Development in WID – General Steps

- Import the WebSphere Adapter RAR file
- Run the Enterprise Service Discovery wizard
  - Discovers service and data
  - Generates business objects, EIS import and export files, WSDL and other required artifacts
- Assemble services oriented application solution
- Export as an Enterprise Application Archive (EAR) file and install to WebSphere Process Server
  - The RAR must be included in the EAR file when installed to the WebSphere Process Server

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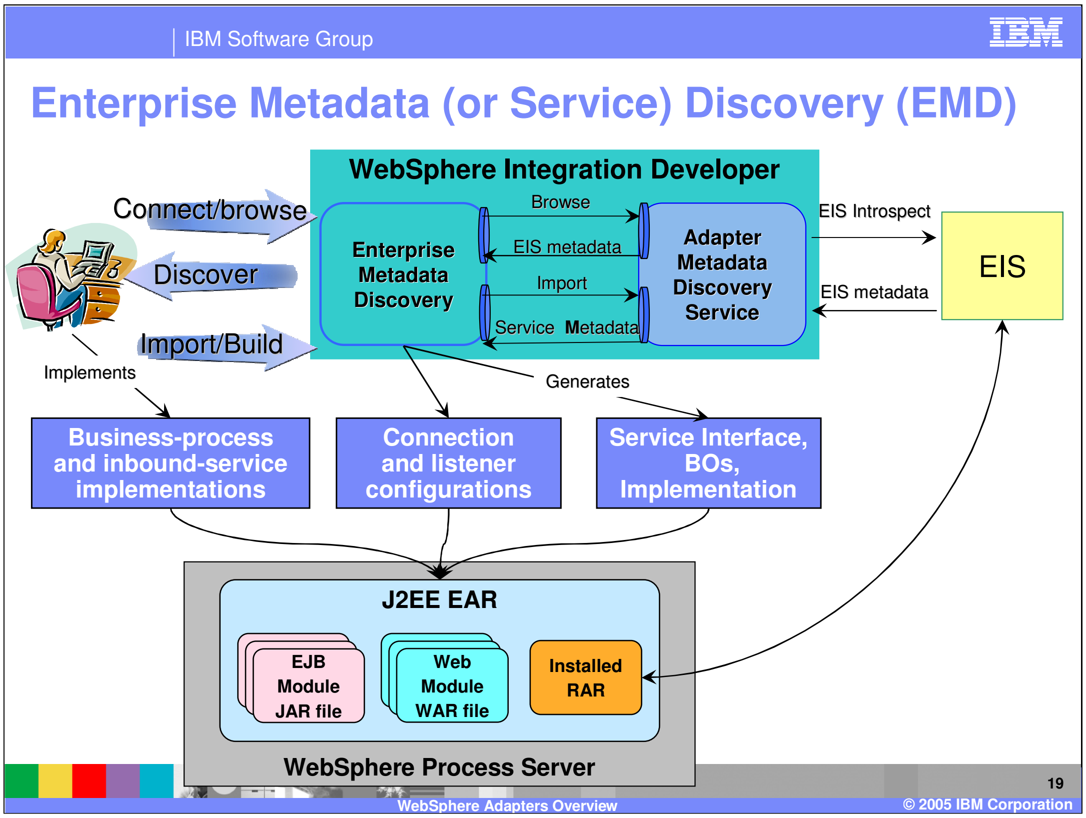
WebSphere Adapters Overview

The general steps to take in WebSphere Integration Developer when developing applications that incorporate the WebSphere Adapters are to import the WebSphere Adapter resource archive (RAR) file; run the enterprise service discovery wizard to discover services and data available from the EIS, generate the business objects, EIS import or export files, WSDL interface, and other required artifacts; assemble the adapter into the rest of your services oriented application solution; test it with the WebSphere Test Environment; and ultimately export the resulting enterprise application archive (EAR) to be deployed to the WebSphere Process Server runtime. It is important to note that the WebSphere Adapters must be installed in the EAR file and not installed as a stand-alone RAR file.



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Enterprise Metadata (or Service) Discovery (EMD)

WebSphere Integration Developer

Connect/browse

Discover

Import/Build

Implements

Enterprise Metadata Discovery

Browse

EIS metadata

Import

Service Metadata

Adapter Metadata Discovery Service

EIS Introspect

EIS metadata

EIS

Generates

Business-process and inbound-service implementations

Connection and listener configurations

Service Interface, BOs, Implementation

J2EE EAR

EJB Module JAR file

Web Module WAR file

Installed RAR

WebSphere Process Server

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WebSphere Adapters Overview

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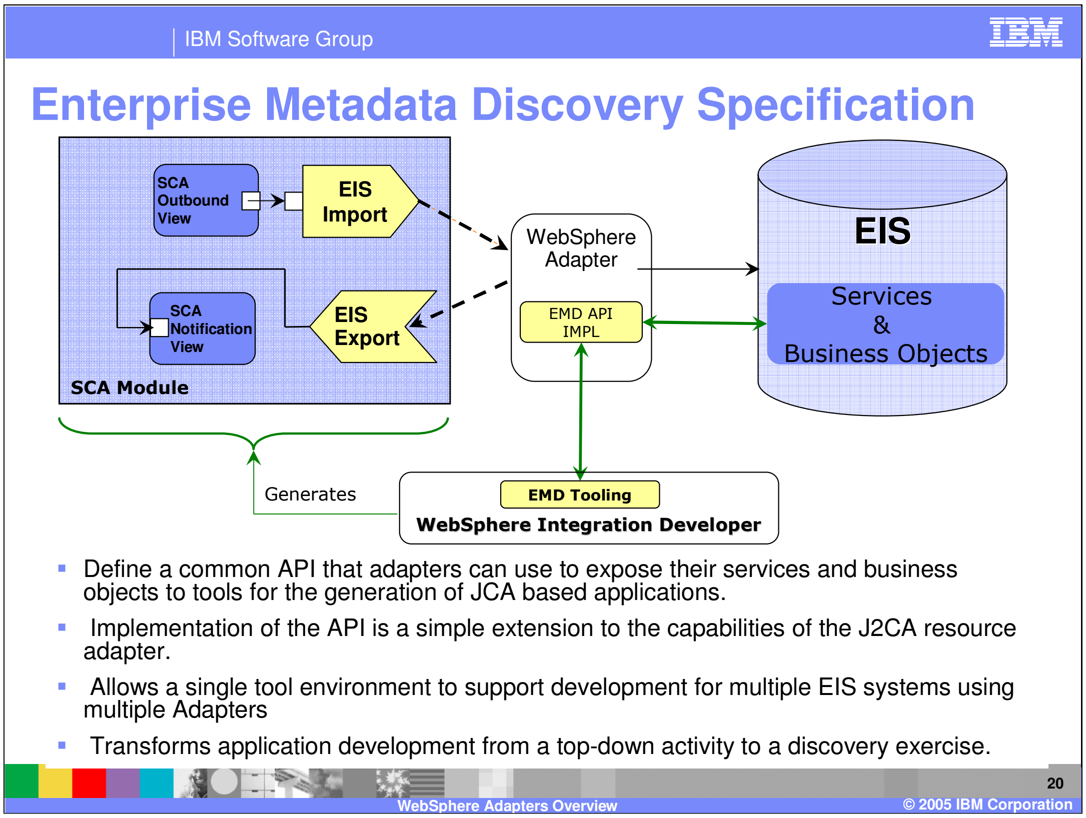
Enterprise service discovery is an implementation of the Enterprise MetaData Discovery (EMD) joint specification from IBM and BEA. More information on this specification can be found at http://www.ibm.com/developerworks/java/library/j-emd/. The enterprise service discovery wizard available in WebSphere Integration Developer is a tool that allows for discovery of business objects and services available on an EIS, using the adapter. The business objects contain the metadata corresponding to the business services. The enterprise service discovery wizard also generates the necessary SCA constructs to be used with the adapter, including the business objects or business graphs, WSDL, and imports or exports.

The EMD component is equivalent to Object Discovery Agent (ODA) from legacy adapters. It is a little more than ODA in that besides BOs, it also generates the artifacts needed by SCA such as Import/Export file and WSDL.



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Enterprise Metadata Discovery Specification

SCA Outbound View

EIS Import

SCA Notification View

EIS Export

SCA Module

WebSphere Adapter

EMD API IMPL

EIS

Services & Business Objects

Generates

EMD Tooling

WebSphere Integration Developer

- Define a common API that adapters can use to expose their services and business objects to tools for the generation of JCA based applications.
- Implementation of the API is a simple extension to the capabilities of the J2CA resource adapter.
- Allows a single tool environment to support development for multiple EIS systems using multiple Adapters
- Transforms application development from a top-down activity to a discovery exercise.

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WebSphere Adapters Overview

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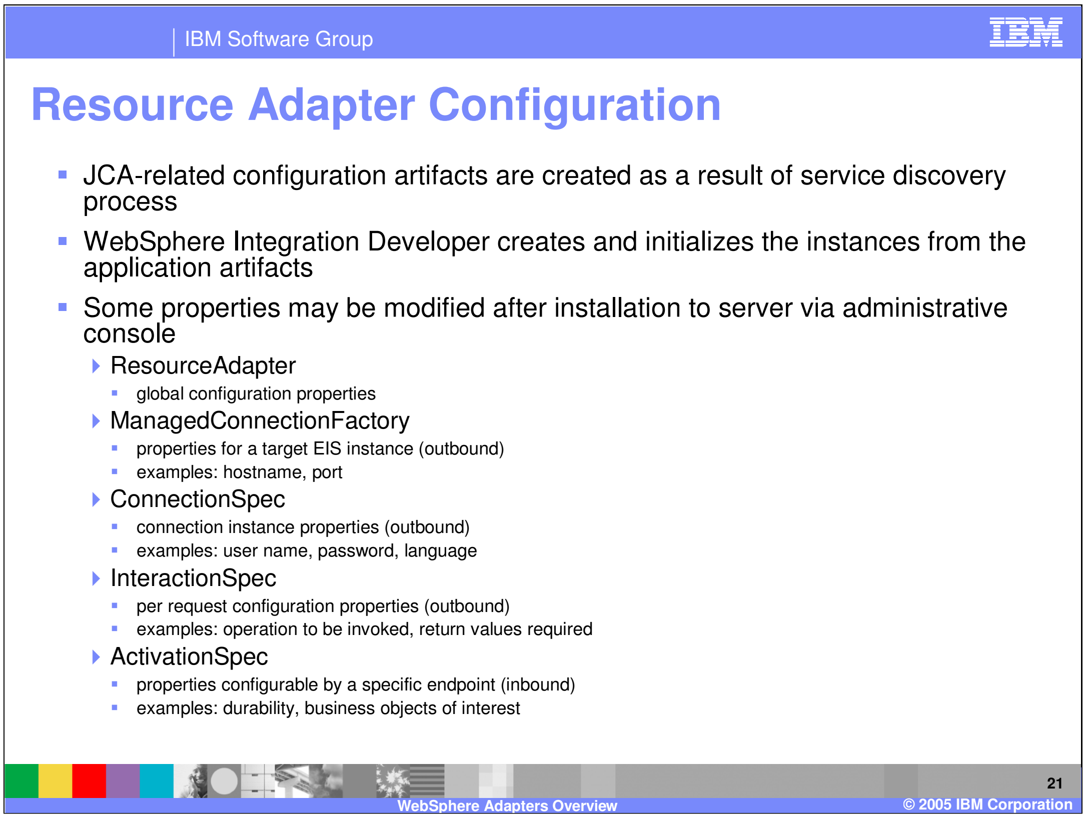
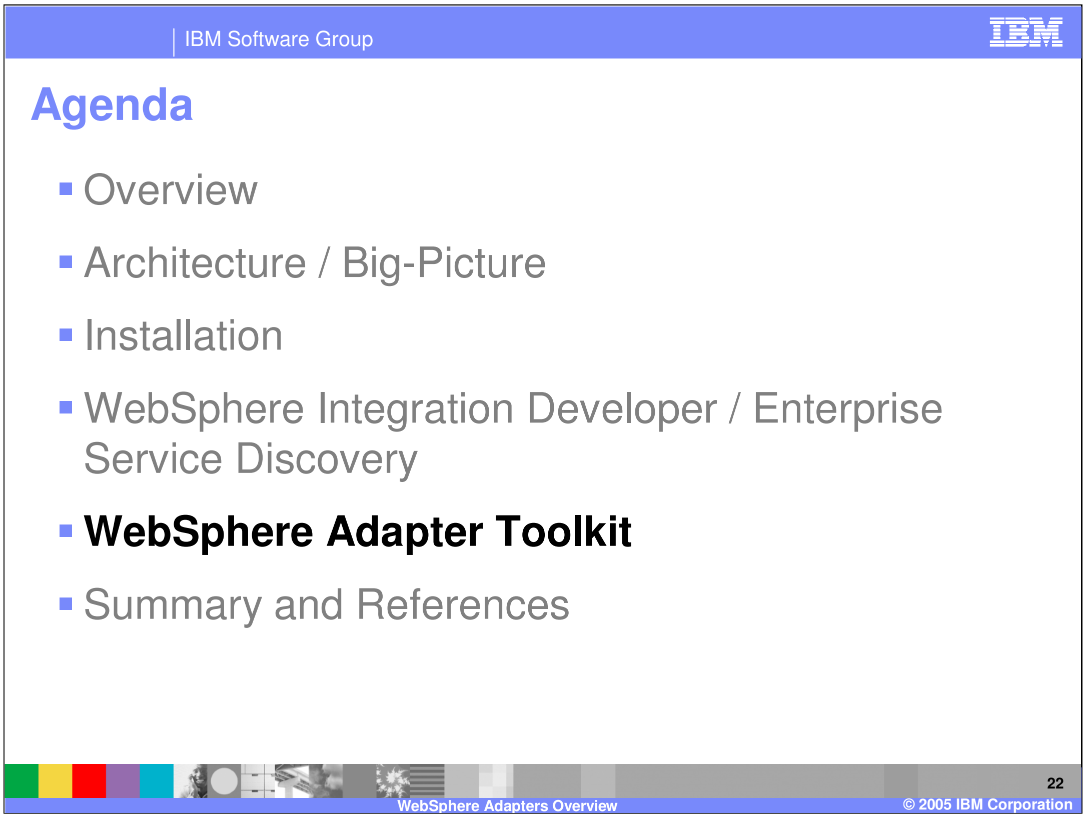
In this scenario, you have the SCA module at the left of the diagram invoking services and receiving notifications from the EIS at the right of the diagram, through the use of EIS imports and exports and the WebSphere Adapter. The Enterprise Metadata Discovery (EMD) specification defines a common API that adapters can use to expose their services and business objects to tools for the generation of JCA-based applications. WebSphere Integration Developer includes the EMD API, and along with the WebSphere Adapters EMD API implementation, you can use the enterprise service discovery wizard to generate the appropriate SCA constructs required for your application.



Resource Adapter Configuration

- JCA-related configuration artifacts are created as a result of service discovery process
- WebSphere Integration Developer creates and initializes the instances from the application artifacts
- Some properties may be modified after installation to server via administrative console
  - ResourceAdapter
    - global configuration properties
  - ManagedConnectionFactory
    - properties for a target EIS instance (outbound)
    - examples: hostname, port
  - ConnectionSpec
    - connection instance properties (outbound)
    - examples: user name, password, language
  - InteractionSpec
    - per request configuration properties (outbound)
    - examples: operation to be invoked, return values required
  - ActivationSpec
    - properties configurable by a specific endpoint (inbound)
    - examples: durability, business objects of interest

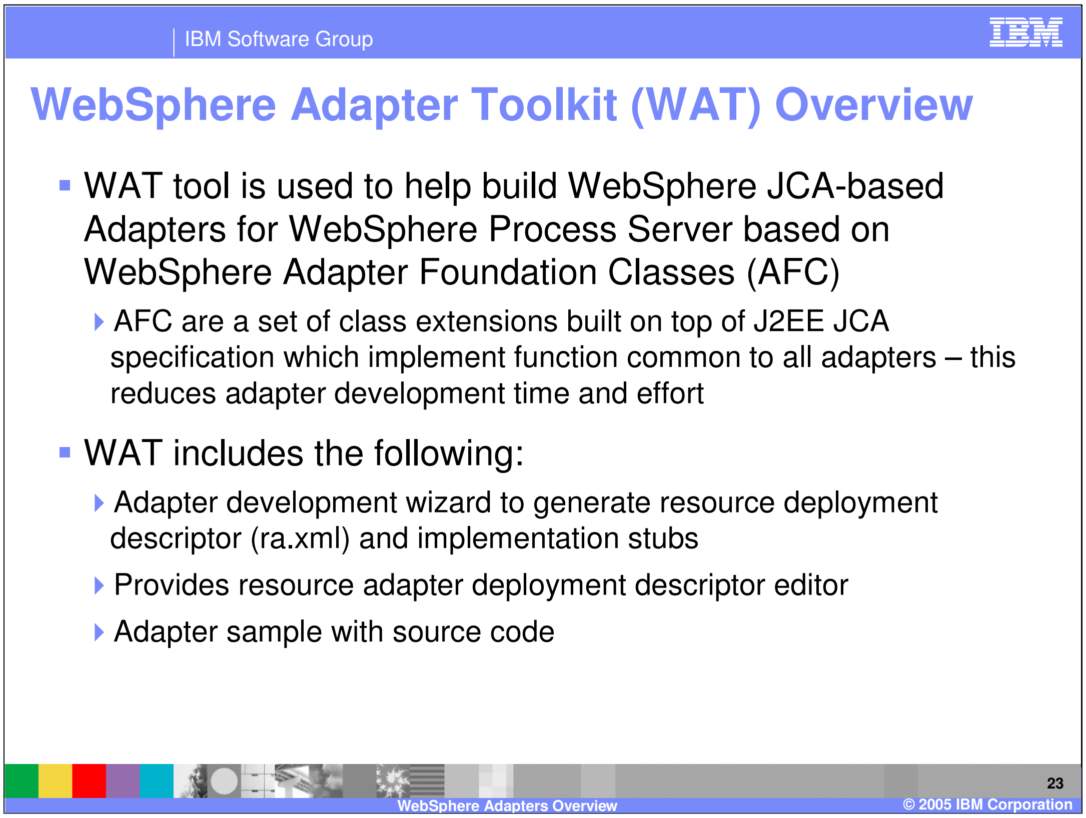
Several JCA-related artifacts are created and initialized with properties and values discovered during the enterprise service discovery phase in WebSphere Integration Developer. After the EAR containing the adapter RAR has been installed to the WebSphere Process Server runtime, some of these properties can be changed or specified.



Agenda

- Overview
- Architecture / Big-Picture
- Installation
- WebSphere Integration Developer / Enterprise Service Discovery
- **WebSphere Adapter Toolkit**
- Summary and References

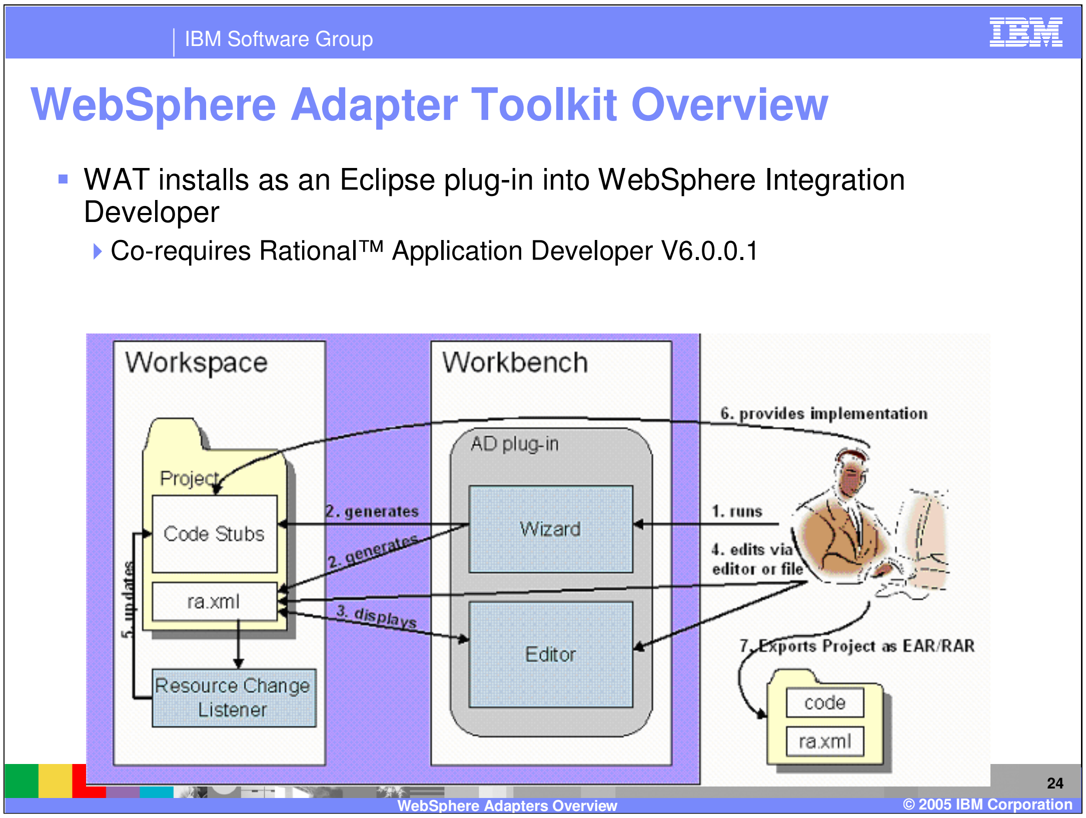
This section provides an overview of the WebSphere Adapter Toolkit used to help developers develop adapters for WebSphere Process Server.



WebSphere Adapter Toolkit (WAT) Overview

- WAT tool is used to help build WebSphere JCA-based Adapters for WebSphere Process Server based on WebSphere Adapter Foundation Classes (AFC)
  - AFC are a set of class extensions built on top of J2EE JCA specification which implement function common to all adapters – this reduces adapter development time and effort
- WAT includes the following:
  - Adapter development wizard to generate resource deployment descriptor (ra.xml) and implementation stubs
  - Provides resource adapter deployment descriptor editor
  - Adapter sample with source code

The WebSphere Adapter Toolkit helps the adapter developer build either enhanced WebSphere JCA 1.5 Adapters based on the common Adapter Foundation classes or adapters that are simply based on the JCA 1.5 specification alone. WebSphere JCA 1.5 Adapters are used in WebSphere Process Server, whereas the simple JCA adapter can be used in WebSphere Application Server V6. The J2EE JCA Adapter does not make use of the Adapter foundation classes. Adapter foundation classes provide common functions and quality of service extensions common to all enhanced WebSphere JCA 1.5 Adapters, thereby reducing time and effort in adapter development. WebSphere Adapter Toolkit provides several functions, including a wizard to create the adapter deployment descriptor and the stubs needed for implementing the adapter. It also provides a resource adapter deployment descriptor editor that makes it easy to modify the deployment descriptor. An adapter sample with full source code is included in the toolkit. Adapter developers will find it helpful to see the source code of the sample to understand the kind of implementations that will be needed for their generated stubs.



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WebSphere Adapter Toolkit Overview

- WAT installs as an Eclipse plug-in into WebSphere Integration Developer
  - Co-requires Rational™ Application Developer V6.0.0.1

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WebSphere Adapters Overview

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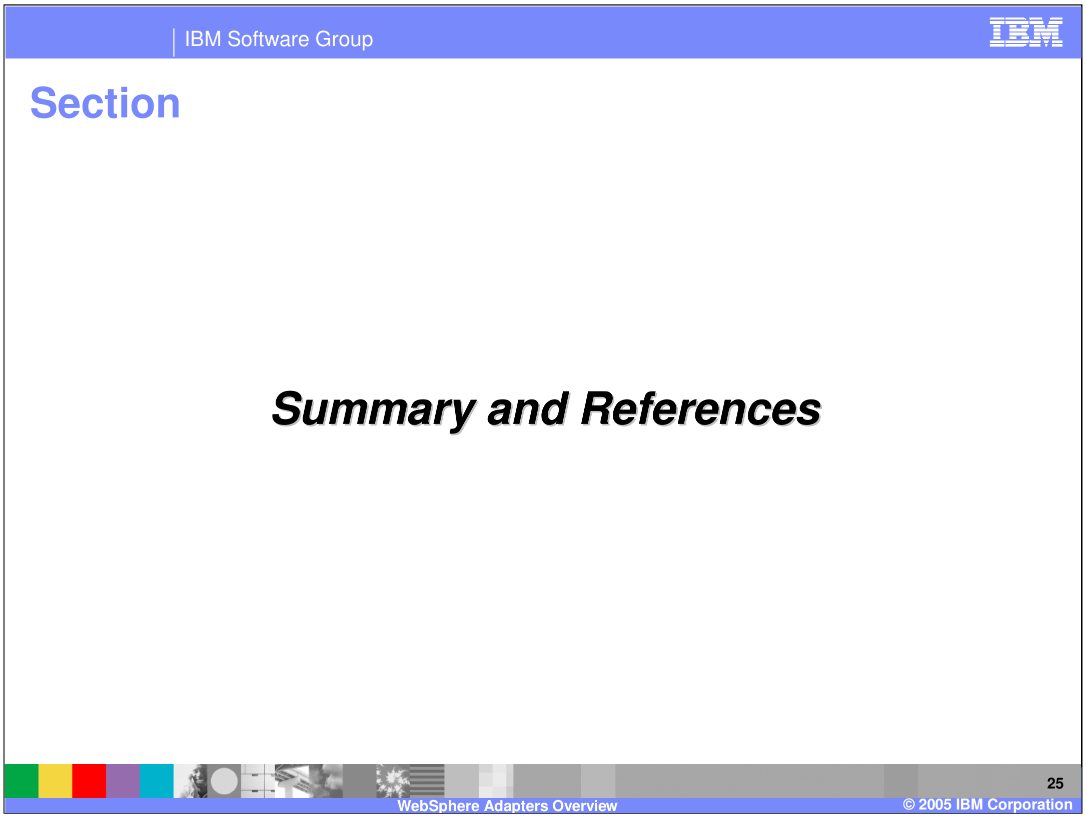
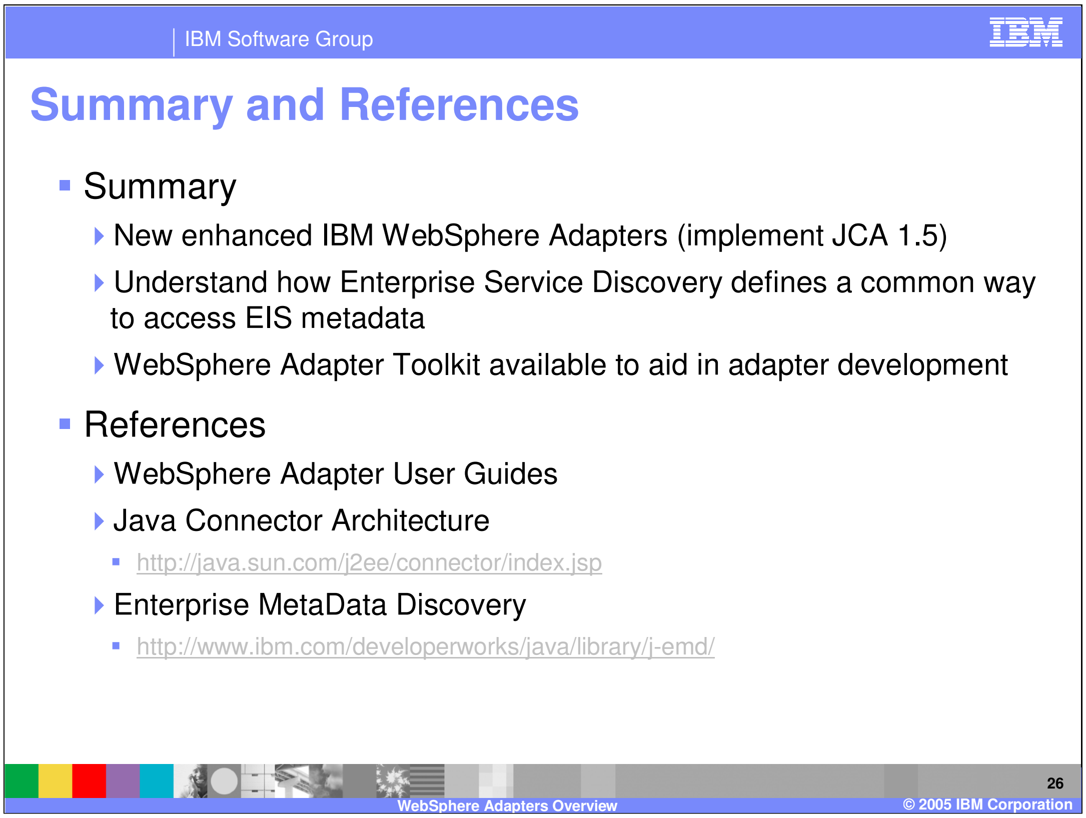
The toolkit is an Eclipse plug-in to WebSphere Integration Developer. It also requires Rational Application Developer V6.0.0.1 to be installed on the system. The graphic shows the flow of the activities for development of the adapter. In step 1, a new adapter is created using the wizard. In step 2, the wizard generates code stubs and the resource adapter deployment descriptor. The developer can then modify the deployment descriptor using the deployment descriptor editor, as shown in steps 3 and 4. The developer provides implementation for the code stubs, as shown in steps 5 and 6 and finally, in step 7, the resource adapter is packaged within the application and exported as an EAR file.



Section

Summary and References

This section provides a summary and references.



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Summary and References

- Summary
  - New enhanced IBM WebSphere Adapters (implement JCA 1.5)
  - Understand how Enterprise Service Discovery defines a common way to access EIS metadata
  - WebSphere Adapter Toolkit available to aid in adapter development
- References
  - WebSphere Adapter User Guides
  - Java Connector Architecture
    - http://java.sun.com/j2ee/connector/index.jsp
  - Enterprise MetaData Discovery
    - http://www.ibm.com/developerworks/java/library/j-emd/

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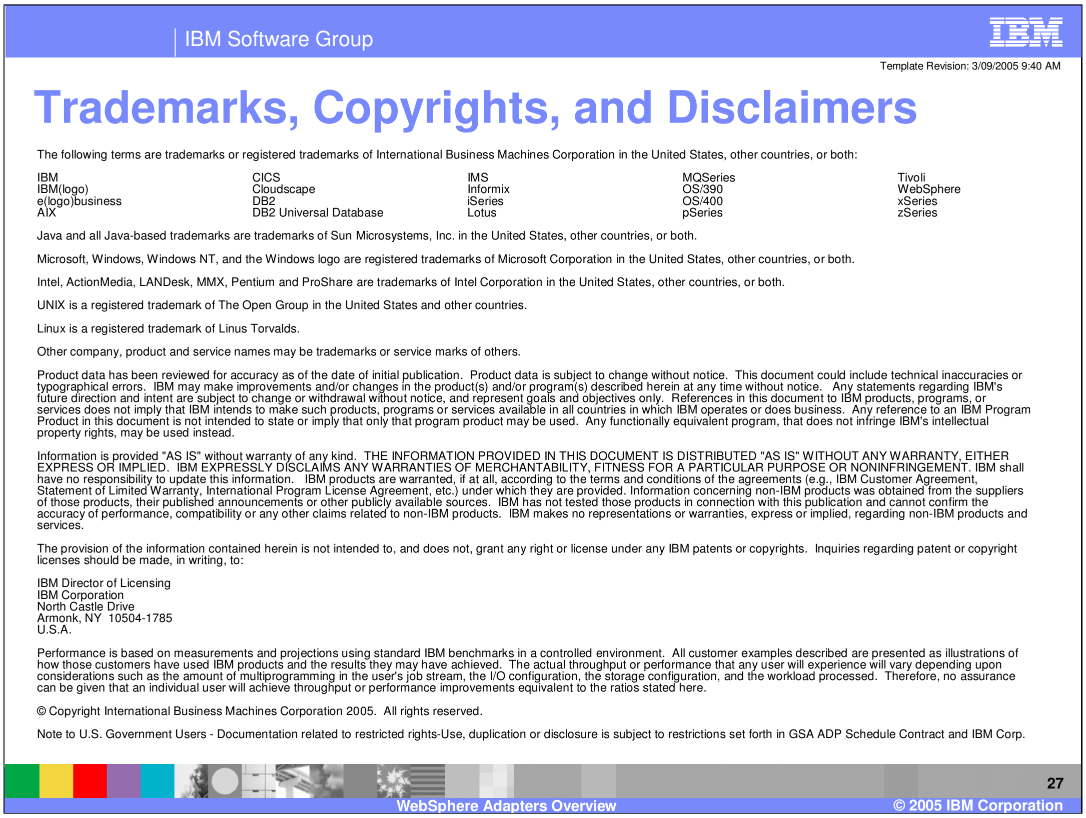
WebSphere Adapters Overview

In summary, this presentation provided an overview of the new, enhanced IBM WebSphere Adapters that implement the JCA 1.5 specification. It also provided information regarding the use of WebSphere Integration Developer and the enterprise service discovery, which implements the Enterprise MetaData Specification. The WebSphere Adapter Toolkit is available to aid the developer in adapter development.



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