TIBCO ActiveMatrix® Adapter for Database

Concepts

Software Release 7.0
July 2013

Two-Second Advantage®

Important Information

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Preface

TIBCO ActiveMatrix Adapter for Database is used as a bi-directional gateway between database applications and applications configured for the TIBCO environment.

The adapter can remotely connect and operate with database applications running on OS platforms not supported by the adapter.

This document explains the basic concepts and supported features of TIBCO ActiveMatrix Adapter for Database.

Topics

Related Documentation

This section lists documentation resources you may find useful.

TIBCO ActiveMatrix Adapter for Database Documentation

The following documents form the TIBCO ActiveMatrix Adapter for Database documentation set:

- *TIBCO ActiveMatrix Adapter for Database Concepts* Read this manual for terminology and concepts of the product. Before reading other manuals in this documentation set, you need to be familiar with the information in this manual.
- *TIBCO ActiveMatrix Adapter for Database Installation* Read this manual for instructions on site preparation and installation.
- *TIBCO ActiveMatrix Adapter for Database Configuration and Deployment* Read this manual for instructions on how to create, configure, and deploy adapter projects.
- *TIBCO ActiveMatrix Adapter for Database Examples* Read this manual to work through the examples provided with the adapter.
- *TIBCO ActiveMatrix Adapter for Database Release Notes* Read the release notes for a list of new and changed features. This document also contains lists of known issues and closed issues for this release.

Other TIBCO Product Documentation

You may find it useful to read the documentation for the following TIBCO products:

Table 1 TIBCO Products (Sheet 1 of 3)

TIBCO Product	Description
TIBCO ActiveMatrix® Binding Type for Adapters	This product is a TIBCO ActiveMatrix binding that integrates TIBCO Adapters with the TIBCO ActiveMatrix environment.
TIBCO ActiveMatrix BusinessWorks™	This product provides an integration platform that enables companies to rapidly integrate systems and automate business processes.

Table 1 TIBCO Products (Sheet 2 of 3)

TIBCO Product	Description
TIBCO ActiveMatrix® Implementation Type for TIBCO® Adapters	This product provides capabilities to upload and deploy adapter configurations (packaged as EAR files) using TIBCO ActiveMatrix Administrator GUI.
TIBCO ActiveMatrix® Service Bus	This product is a lightweight enterprise service bus (ESB) that mediates the communication between applications and services by routing and transforming disparate data formats and transport protocols.
TIBCO ActiveMatrix® Service Grid	This product is a scalable and extensible platform for developing, deploying, and managing applications that conform to a service-oriented architecture.
TIBCO® Adapter SDK	This product provides a class library that helps developers to implement an adapter with minimal effort.
TIBCO Administrator™	This product provides capabilities for managing users, monitoring machines, and deploying and managing applications that use TIBCO products.
TIBCO Business Studio™	This product provides capabilities that help business analysts document business processes, solution engineers implement business processes, and SOA developers create composite applications.
TIBCO® Database Drivers Supplement	This product provides the licensed DataDirect database drivers that can be used with certain TIBCO products.
TIBCO Designer™	This product provides a graphical user interface to create TIBCO ActiveMatrix BusinessWorks process definitions, or create or modify TIBCO Adapter configurations.
TIBCO Enterprise Message Service™	This product sends messages from your applications in a format that conforms to the Java Messaging Service (JMS) specification.
TIBCO Hawk®	This product is for monitoring and managing distributed applications and systems throughout the enterprise.
TIBCO Rendezvous®	This product uses messages to enable distributed application programs to communicate across a wide variety of hardware platforms and programming languages.

Table 1 TIBCO Products (Sheet 3 of 3)

TIBCO Product	Description
TIBCO Runtime Agent™	This product is a bundle of TIBCO software and third-party software that is required to run many TIBCO applications such as TIBCO ActiveMatrix BusinessWorks, TIBCO Adapters, and so on.

Typographical Conventions

The following typographical conventions are used in this manual.

Table 2 General Typographical Conventions

Convention	Use
ENV_NAME *TIBCO_HOME*	TIBCO products are installed into an installation environment. A product installed into an installation environment does not access components in other installation environments. Incompatible products and multiple instances of the same product must be installed into different installation environments. An installation environment consists of the following properties: • **Name** Identifies the installation environment. This name is referenced in documentation as *ENV_NAME*. The default value is `TIBCO_HOME`. • **Directory** The folder into which the product is installed. This folder is referenced in documentation as *TIBCO_HOME*.
TIB_ADADB_HOME	TIBCO ActiveMatrix Adapter for Database is installed into a directory within a *TIBCO_HOME* directory. This directory is referenced in documentation as *TIB_ADADB_HOME*. The default value of *TIB_ADADB_HOME* depends on the operating system. For example, on Windows systems, the default value is `C:\tibco\adapter\adr3\`*ReleaseNumber*.
`code font`	Code font identifies commands, code examples, filenames, pathnames, and output displayed in a command window. For example: Use `MyCommand` to start the foo process.
`bold code font`	Bold code font is used in the following ways: • In procedures, to indicate what a user types. For example: Type **`admin`**. • In large code samples, to indicate the parts of the sample that are of particular interest. • In command syntax, to indicate the default parameter for a command. For example, if no parameter is specified, `MyCommand` is enabled: `MyCommand [`**`enable`**` | disable]`.

Table 2 General Typographical Conventions (Cont'd)

Convention	Use
italic font	Italic font is used in the following ways: • To indicate a document title. For example: See *TIBCO ActiveMatrix Adapter for Database Concepts*. • To introduce new terms. For example: A portal page may contain several portlets. *Portlets* are mini-applications that run in a portal. • To indicate a variable in a command or code syntax that you must replace. For example: `MyCommand` *PathName.*
Key combinations	Key name separated by a plus sign indicate keys pressed simultaneously. For example: Ctrl+C. Key names separated by a comma and space indicate keys pressed one after the other. For example: Esc, Ctrl+Q.
	The note icon indicates information that is of special interest or importance, for example, an additional action required only in certain circumstances.
	The tip icon indicates an idea that could be useful, for example, a way to apply the information provided in the current section to achieve a specific result.
	The warning icon indicates the potential for a damaging situation, for example, data loss or corruption if certain steps are taken or not taken.

Table 3 Syntax Typographical Conventions

Convention	Use
`[ ]`	An optional item in a command or code syntax. For example: `MyCommand [optional_parameter] required_parameter`
`|`	A logical `OR` that separates multiple items of which only one may be chosen. For example, you can select only one of the following parameters: `MyCommand param1 | param2 | param3`

`{ }`	A logical group of items in a command. Other syntax notations may appear within each logical group.
	For example, the following command requires two parameters, which can be either the pair `param1` and `param2`, or the pair `param3` and `param4`.
	`MyCommand {param1 param2} | {param3 param4}`
	In the next example, the command requires two parameters. The first parameter can be either `param1` or `param2` and the second can be either `param3` or `param4`:
	`MyCommand {param1 | param2} {param3 | param4}`
	In the next example, the command can accept either two or three parameters. The first parameter must be `param1`. You can optionally include `param2` as the second parameter. And the last parameter is either `param3` or `param4`.
	`MyCommand param1 [param2] {param3 | param4}`

Connecting with TIBCO Resources

How to Join TIBCOmmunity

TIBCOmmunity is an online destination for TIBCO customers, partners, and resident experts. It is a place to share and access the collective experience of the TIBCO community. TIBCOmmunity offers forums, blogs, and access to a variety of resources. To register, go to http://www.tibcommunity.com.

How to Access TIBCO Documentation

You can access TIBCO documentation here:

http://docs.tibco.com

How to Contact TIBCO Support

For comments or problems with this manual or the software it addresses, contact TIBCO Support as follows:

- For an overview of TIBCO Support, and information about getting started with TIBCO Support, visit this site:

  http://www.tibco.com/services/support

- If you already have a valid maintenance or support contract, visit this site:

  https://support.tibco.com

  Entry to this site requires a user name and password. If you do not have a user name, you can request one.

Chapter 1 Introduction to TIBCO Adapters

This chapter introduces basic concepts of TIBCO Adapters.

Topics

Overview of TIBCO Adapters

Many businesses rely on a complex mix of custom applications, databases, and technologies to implement their business processes and manage information. Optimizing the reuse and coordination of these assets and information sources helps organizations simultaneously reduce time-to-market and costs, but this data is not always easy to access or to integrate. Vendors typically have their own ways to format and expose data. Therefore, integrating the various applications across an enterprise poses significant challenges.

TIBCO Adapters bridge custom applications, databases, and other technologies in the enterprise information flow, regardless of their data formats or communication protocols. An adapter isolates an application from complex interaction and makes it part of TIBCO infrastructure without requiring any changes to the application. Integration of new applications does not require programming and also not interfere with existing infrastructure.

TIBCO Adapter encapsulate the complex interaction patterns into a set of standard services. This makes it easy to administer the adapters.

TIBCO Adapters exchange information through TIBCO messaging platform, which provides flexible and scalable information bus infrastructure. When the information is published to the TIBCO infrastructure, it is transformed and delivered with extreme low-latency and you can implement business process automation across applications.

TIBCO Adapters provide integration for a variety of technologies:

- **Packaged Applications** SAP, Siebel, PeopleSoft, Lotus Notes, SWIFT, Oracle BRM, J.D. Edwards EnterpriseOne, BMC Remedy, and others.
- **Databases** Oracle, SQL Server, Sybase, MySQL, PostGres, DB2 UDB for Unix, DB2 for z/OS, and DB2 for i5/OS.
- **Mainframe and i5/OS Technologies** CICS, IMS, DB2, VSAM, dataset files for z/OS and RPG program objects, Data Queues, and SPOOL files for i5/OS.
- **Other Standards and Technologies** EJB, Files, LDAP, MQSeries, Tuxedo, and OSISoft PI.
- **Custom integration** Java and C++.

Adapter Interaction Modes and Adapter Services

At the most basic level, a TIBCO Adapter receives data available from a source application or sends data to a target application. This is based on a service architecture. Services are abstractions that describe how adapters work together with other applications.

An adapter generally supports publish/subscribe and request/response interaction modes. Table 4 summarizes the adapter interaction modes and adapter services introduced in this section.

Table 4 Summary of Adapter Interaction Modes and Services

Interaction Mode	Service	Initiator	Target
Publish/Subscribe Interactions	Publication Service (sends to target)	Vendor application	TIBCO infrastructure
Publish/Subscribe Interactions	Subscription Service (gets from initiator)	TIBCO infrastructure	Vendor application
Request/Response Interactions	Request-Response Invocation Service (sends to target, waits for response, then sends response to initiator)	Vendor application	TIBCO infrastructure
Request/Response Interactions	Request-Response Service (gets from initiator, waits for response then sends response to target)	TIBCO infrastructure	Vendor application

Not all adapters provide all these services and some adapters may provide services not listed here. See Adapter Services on page 53 for information about services available on TIBCO ActiveMatrix Adapter for Database.

Choosing an Adapter Service on page 9 introduces how to choose an adapter service based on a business integration scenario.

Publish/Subscribe Interactions

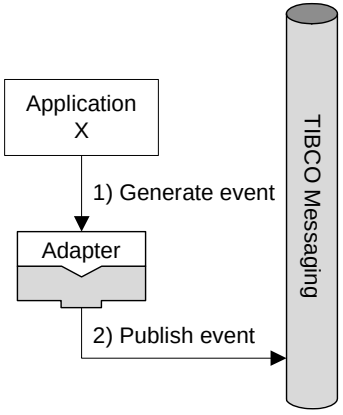
Publish/subscribe interactions are driven by events, such as the arrival of data or a timer signaling that a specified interval has expired. The following services are available for publish/subscribe interactions.

Publication Service

An adapter *Publication Service* recognizes when business events happen in a vendor application, and asynchronously publishes the event data in real time to interested systems in the TIBCO environment.

For example, an adapter Publication Service can publish an event each time a new customer account is added to application X, as shown in Figure 1. Other applications that receive the event can then update their records just as the original application did.

Figure 1 Adapter Publication Service

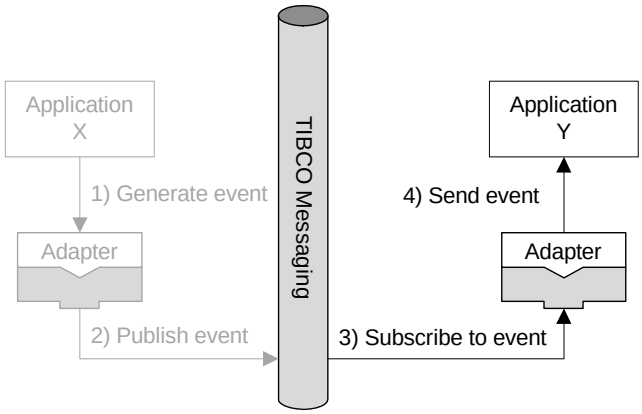


Subscription Service

An adapter *Subscription Service* gets information about business events from the TIBCO environment, and asynchronously writes the information into a target application.

Referring to the previous example, an adapter Subscription Service can subscribe to events that indicate the creation of a new customer and then enter the customer information into target application Y, as shown in Figure 2.

Figure 2 Adapter Subscription Service



Request/Response Interactions

In addition to asynchronously publishing and subscribing to events, an adapter can synchronously retrieve data from or execute transactions within a vendor application.

Demand-driven computing suits distributed applications that require point-to-point messages, that is, a request and a response. In request/response interactions, a data provider coordinates closely with a data consumer. A provider does not send data until a consumer requests it. The consumer listens until it receives the reply, and then stops listening (unless it expects further installments of information). It is useful for actions such as adding or deleting business objects.

The following services are available for request/response interactions:

- Request-Response Invocation Service, page 6
- Request-Response Service, page 8

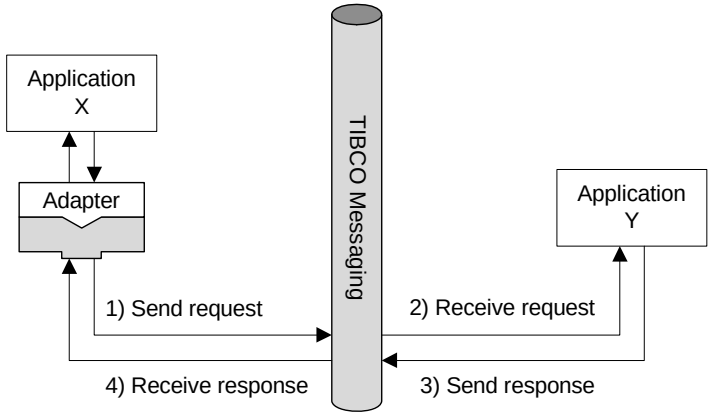
Request/response is the default invocation protocol for both Request-Response Invocation Service and Request-Response Service, but you can also use both services asynchronously where the invocation protocol is one way. Not all adapters support the one way protocol, but for those they do, the implementation of the protocol is consistent.

Request-Response Invocation Service

An adapter *Request-Response Invocation Service* acts as a proxy, giving the vendor application the ability to invoke services on the TIBCO infrastructure. The TIBCO infrastructure may perform a series of steps to complete the request, including invoking services on other applications through the TIBCO infrastructure and other adapters.

For example, an adapter Request-Response Invocation Service sends a request message from the vendor application X to another application Y through the TIBCO infrastructure. After application Y processes the message, it returns the result to the TIBCO infrastructure. Then the adapter receives the response and sends it back to application X, as shown in Figure 3.

Figure 3 Adapter Request-Response Invocation Service



Request/reply is the default invocation protocol for Request-Response Invocation service, but that it can also be used asynchronously where the invocation protocol is oneway. Not all adapters support this but for those they do it is consistent to how it is implemented.

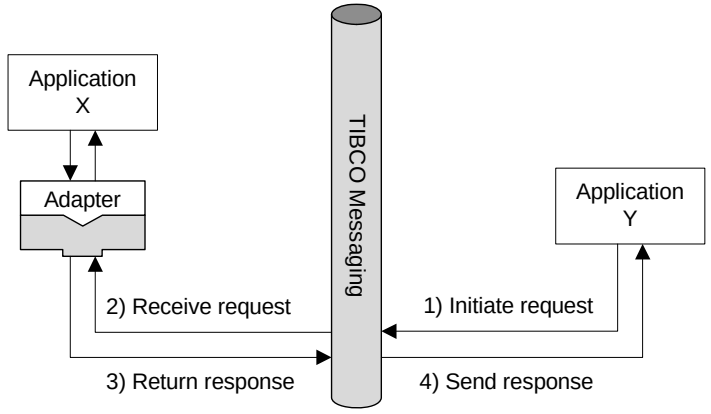
Request-Response Service

An adapter *Request-Response Service* is similar to the Request-Response Invocation Service, except that the roles are reversed. The vendor application is now the provider of the service, instead of the requester or initiator of the service.

After the action is performed in the vendor application, the adapter service sends a response back to the requester with either the results of the action or a confirmation that the action occurred.

Referring to the previous example, an adapter Request-Response Service sends a request message from the TIBCO infrastructure to application Y. The adapter gets a response from application Y and returns it to TIBCO infrastructure, which then sends the response to application X, as shown in Figure 4.

Figure 4 Adapter Request-Response Service

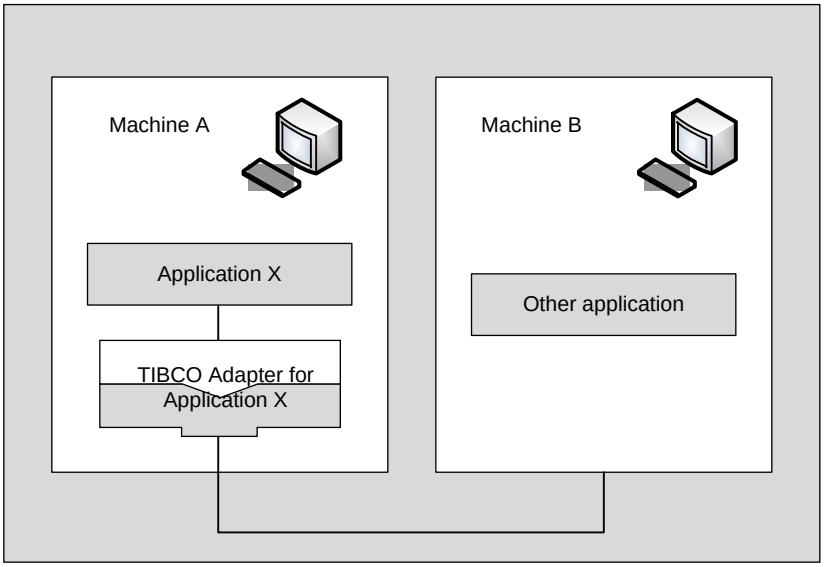


Choosing an Adapter Service

A business integration scenario drives the choice of one adapter service or another. This section provides a simple flow chart that helps you choose the service to use.

Consider the following environment that involves application X, an adapter, and another application:

Figure 5 Sample Business Integration Scenario



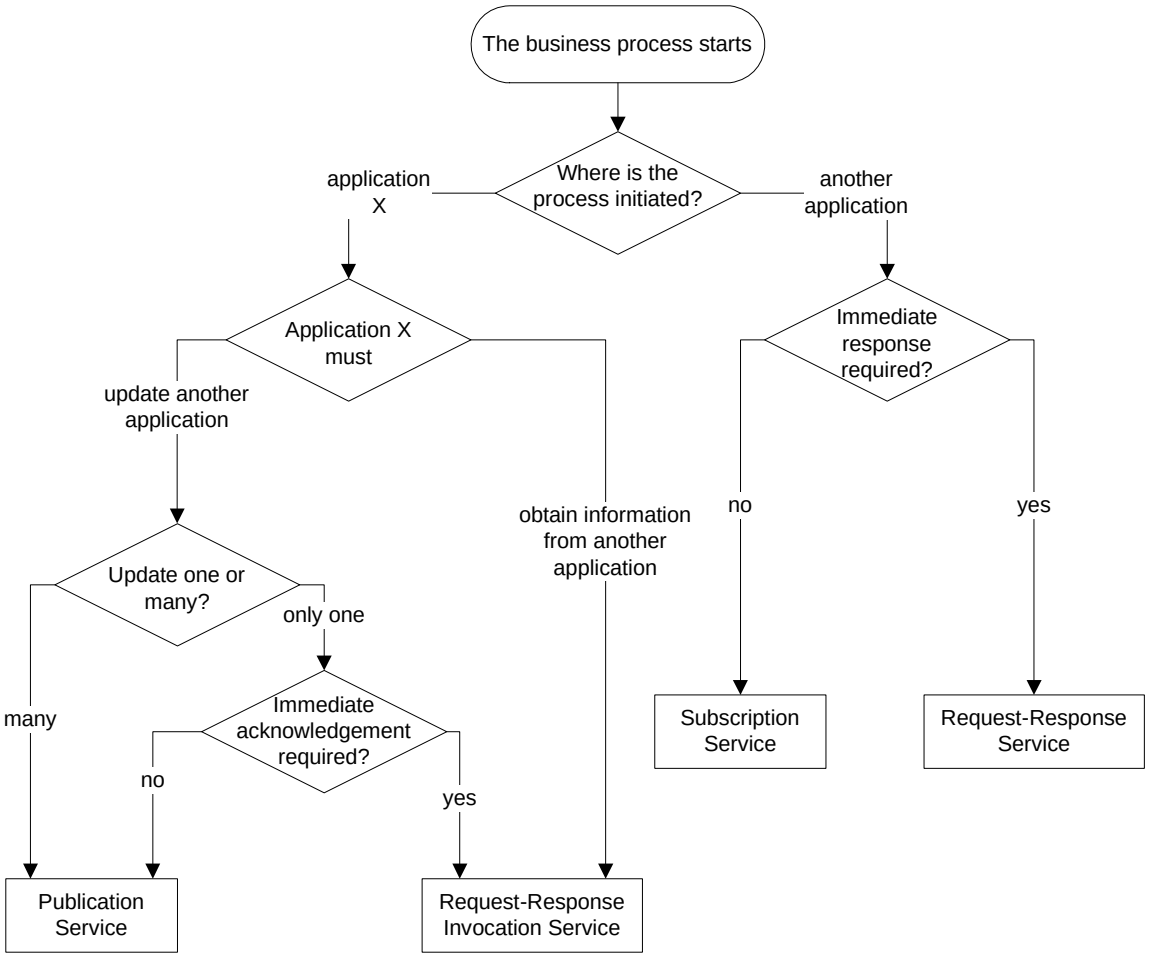
In this scenario, data is exchanged between application X and another application. The other application can be a customer management system, such as PeopleSoft, or another TIBCO application, such as TIBCO ActiveMatrix BusinessWorks.

To choose the adapter service to use, start by finding out where the scenario begins or what triggers it.

For example, when a new customer account is created in application X, must the account information be propagated through the adapter to the other application? Or does a batch business process in TIBCO ActiveMatrix BusinessWorks need information from application X to generate a report?

This question is the starting point of the decision chart provided in Figure 6.

Figure 6 Choosing an Adapter Service



Working through the decision chart, if the business process is the creation of a customer record in application X and if many other applications need to be updated when the event occurs, but no acknowledgements are required, use Publication Service.

Adapter Components

Each adapter has three main components:

- Design Component for configuring an adapter during design time.
- Runtime Component for running an adapter during production time.
- Documentation including the help resources of the adapter product.

Design Component

The design-time component helps you introspect the vendor application data schemas and configure the adapter, and provide context-sensitive documentation and examples. An adapter includes one or more of the following components:

- Adapter Palette, page 11
- Context-Sensitive Help, page 12
- Samples, page 12

Adapter Palette

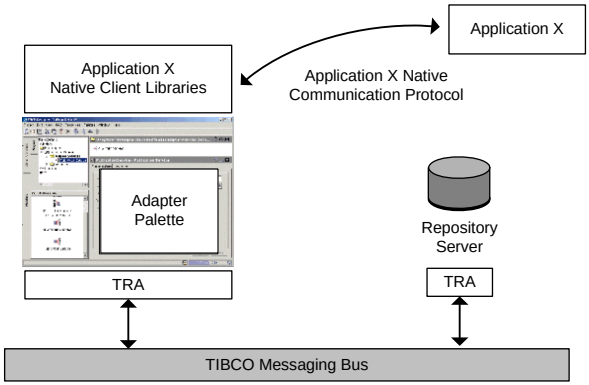
Each adapter includes a palette for you to configure adapter specific options, such as its connection to the vendor application, logging options, and adapter services. An adapter palette generally contains the following resources:

- Adapter configuration
- Adapter services
- Other adapter specific resources

An adapter at design time accesses schema from the application by using the resources provided in the adapter palette in TIBCO Designer.

Figure 7 shows components used at design time to access schema from the application.

Figure 7 Adapter Connection to Application at Design Time



After you install an adapter and start TIBCO Designer, the palette is automatically loaded into TIBCO Designer.

See TIBCO Designer on page 32 for more concept information about project, resource, palette, and adapter instance.

Context-Sensitive Help

You can access context-sensitive help for the adapter from TIBCO Designer.

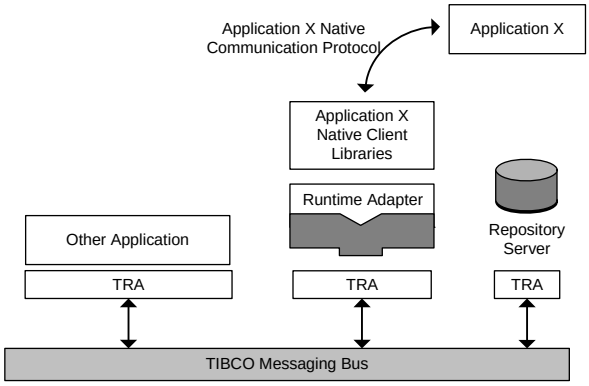
Samples

The samples available for the adapter demonstrate how the adapter interacts with vendor applications and other TIBCO products.

Runtime Component

When you complete adapter configuration, you can deploy the adapter. A deployed adapter instance is referred to as a *runtime adapter*. A runtime adapter uses the runtime component to operate in a production environment, handling communication between a vendor application and other applications that are integrated through TIBCO infrastructure, as shown in Figure 8.

Figure 8 Adapter Connection to Application at Runtime



Documentation

This component provides adapter documentation in both HTML and PDF formats.

Chapter 2 Adapter Capabilities

This chapter explains key features available for most TIBCO Adapters.

See *TIBCO ActiveMatrix Adapter for Database Configuration and Deployment* for detailed using guide for TIBCO ActiveMatrix Adapter for Database.

Topics

Easy Configuration and Deployment

The following features make it easy to configure an adapter and integrate it with the TIBCO infrastructure:

Easy-to-Use GUI

TIBCO provides a set of infrastructure software products with easy-to-use graphical user interfaces for you to develop, deploy, manage, and monitor an integration project with TIBCO Adapters. See Chapter 3, Adapter Life Cycle and TIBCO Infrastructure Tools, on page 23 for detailed introduction of each product.

Schema and Data Mapping

TIBCO Adapters manage data retrieved from and exported to a source or target application by using schema. Schemas are useful in various situations, for example:

- When several developers collaborate on an adapter application, a specification document normally defines the data model for several related adapter applications. Inside the TIBCO infrastructure, you can instead define a schema to serve as the data model and update it as needed.
- When the data model of the source or target application changes, you do not have to redesign the business process. Instead, you only need to reconfigure the adapter instance to reflect the changes.
- Using schemas in conjunction with the various mapping tools available in the TIBCO infrastructure, you can transfer data across applications with incompatible data formats.

During the configuration phase, you can use TIBCO Designer to fetch the schemas from the source or target application and apply it to an adapter service. The adapter adds that schema definition as a schema class. You can configure a schema to describe the structure of messages processed by the adapter. You can use TIBCO ActiveMatrix BusinessWorks with the adapter for data mapping and transformation. When you save the retrieved schemas into a project, you can transfer these schemas across projects by exporting from a project or importing them to a project in XML format.

Global Variables

Global variables provide an easy way to set defaults for use throughout your project. There are several ways in which they can be used:

- Predefine a variable during design time, then override the value for individual applications at deployment.
- Predefine a variable during design time, then override the value for individual services (for example, an adapter service or a process) at deployment. The values you specify are then used at runtime.
- Predefine a variable during design time, then override it from the command line.

For example, you can assign the value `tcp://localhost:7222` to the predefined `JmsProviderUrl` global variable by using TIBCO Designer. You can then use the variable in your adapter to locate the TIBCO Enterprise Message Service daemon. If you want to change the daemon for your adapter, you can specify the `JmsProviderUrl` variable in TIBCO Administrator to a different value or override it from the command line.

Robust and Reliable Data Transmission

The following features of TIBCO Adapters make an integration solution robust and provide reliable transmission of data through the network:

Multiple Message Transports

The adapter supports the following message transports at runtime:

- **Rendezvous** TIBCO Rendezvous uses subject-based addressing to provide support for both multicast or broadcast and point-to-point communications among distributed applications that exchange data across a network.
- **JMS** Java Message Service (JMS) is a Java framework specification for smooth messaging between applications. TIBCO Enterprise Message Service implements JMS and integrates support for connecting other message services.

You can configure the transport options by using the adapter palette in TIBCO Designer.

Multithreading

Most adapters maintain a dynamic pool of threads for performing tasks, which allows the adapter to respond to and process multiple events simultaneously. The adapter can track and communicate event status without affecting other processing. This multithreading ability increases the performance of the adapter. You can specify the number of threads by using the adapter palette in TIBCO Designer.

Connection Management

TIBCO Adapters support the following connection management features:

Connection Pooling Mechanism

TIBCO Adapters use an extensive connection pooling mechanism to provide an efficient way to manage connections and share them across different service requests.

The adapter maintains a pool of already-established connections to the target application. It can allocate, recycle, reuse, and release the connections. If a connection has been idle for a long time, the connection pooling mechanism closes it. The next time when the access to that connection is required, the mechanism automatically re-creates the connection.

Connection pooling saves memory used and enhances performance by reducing the number of idle connections and decreasing the amount of time a new task must wait for establishing a connection.

Reconnection Mechanism

If the adapter loses connections with a target application due to network problems or non-availability of the application, its running adapter services are suspended by the adapter. The reconnection mechanism then dynamically restores the connection to the target application. Upon reconnection, the adapter services resume automatically.

You can specify the reconnection options by using the adapter palette in TIBCO Designer.

Monitoring and Control

The TIBCO infrastructure supports several methods for monitoring adapter projects. You can select one or a combination of these methods.

- Basic logging to report trace messages

  Trace messages are the chief aids to monitor the adapter. You can specify the levels of trace messages to be reported as well as the type of message output. You can also specify that trace messages be written to a log file, to a TIBCO Rendezvous or JMS message, to a workstation display, or to TIBCO Hawk. If trace messages are written to a log file, for example, you can print them for reviewing.

- Log sinks for enhanced reporting of adapter events.

  With log sinks, you can fine-tune where and when different types of information are sent.

- TIBCO Hawk for extensive and flexible monitoring capabilities.

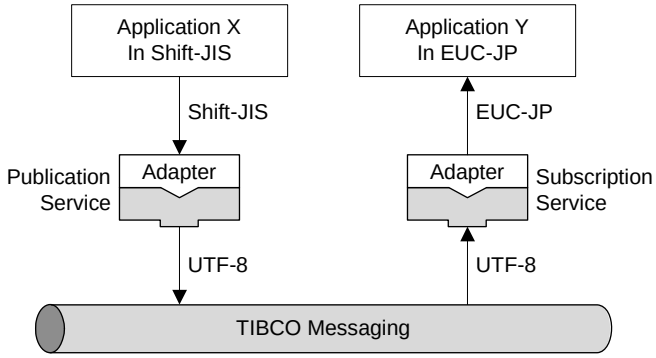
If you want to monitor and manage the state of the adapters connected with distributed applications and systems throughout the enterprise, you can use TIBCO Hawk. You can monitor application parameters, behavior, and loading activities for all nodes in a local or wide-area network and take action when predefined conditions occur. In many cases, runtime failures or slowdowns can be repaired automatically within seconds of their discovery. The monitoring mechanism reduces unscheduled outages and slowdowns of critical business systems. See TIBCO Hawk on page 44 for more introduction about its features and components.

Multilingual Support

Unicode is a way to represent characters of all known languages of the world. TIBCO Adapters support data transmission in all languages by taking advantage of Unicode. TIBCO Adapter SDK provides the Unicode support for TIBCO Adapters. Currently the internationalization support is only for data in text.

Figure 9 shows an example conversion scenario of adapters that serve two applications of different encodings in a Japanese language environment.

Figure 9 Example of Unicode Conversion by TIBCO Adapters



As illustrated in Figure 9, an adapter achieves the data conversion through two separate phases:

- Data conversion between the adapter and the TIBCO messaging bus:

  Both the Publication Service and Subscription Service communicate with the TIBCO messaging bus by using the same encoding option, that is, UTF-8.

  TIBCO messaging bus supports two encoding choices:

  — **ISO8859-1** Use this encoding for exchanging only the ASCII or Western European character set.

  — **UTF-8** Use this encoding for exchanging data other than the ASCII and Western European character set.

- Data conversion between the adapter and the target application:

  The adapter Publication Service converts data in Shift-JIS retrieved from application X to UTF-8 and sends it to the TIBCO messaging bus. When the other adapter Subscription Service receives this message, it converts the message from UTF-8 to EUC-JP and inserts the data into application Y.

Security Support

TIBCO Adapters provide the following security features:

Basic Authentication

The adapter provides a simple authentication system of username and password verification for logging into the target application. You can configure the authentication options when you set connection parameters at design time.

SSL

SSL data encryptions provide secure transmission of data. The adapter supports optional SSL configuration at both design time and runtime.

Chapter 3 Adapter Life Cycle and TIBCO Infrastructure Tools

TIBCO application integration platform includes a series of products for adapter service configuration and integration, deployment, and governance. This chapter introduces the life cycle of TIBCO Adapters and also provides an overview of TIBCO products that can help you meet the challenge of application integration with TIBCO Adapters.

Topics

Adapter Life Cycle

In general, the life cycle of an adapter includes five stages as shown in Figure 10:

Figure 10 Adapter Life Cycle

Installation

The installation stage includes installing the target application, the TIBCO software products the adapter requires, and the adapter.

For more installation information of TIBCO ActiveMatrix Adapter for Database, see *TIBCO ActiveMatrix Adapter for Database Installation*.

Configuration

The configuration stage includes configuring an adapter and testing its connection and behaviors with the target application. An adapter at runtime uses the configuration information to interact with the target application and other TIBCO infrastructure software.

For more information about how to configure TIBCO ActiveMatrix Adapter for Database by using TIBCO Designer, see *TIBCO ActiveMatrix Adapter for Database Configuration and Deployment*.

Integration

The integration stage includes developing a business process to integrate the target application connected through the adapter into the data flow in your enterprise. TIBCO integration platform smoothly connects to applications of different types, such as databases, trading partners and exchanges, and so on, and makes the data flow throughout the enterprise transparent to the end users.

For more information about how to integrate TIBCO ActiveMatrix Adapter for Database into a business process, see *TIBCO ActiveMatrix Adapter for Database Configuration and Deployment*.

Deployment

After you develop and test an integration project with adapters, you can deploy the project to your production environment.

For more information about how to deploy a project of TIBCO ActiveMatrix Adapter for Database by using TIBCO Administrator, see *TIBCO ActiveMatrix Adapter for Database Configuration and Deployment*.

Production

The production stage includes managing and monitoring adapter projects. In addition to the basic monitoring functions provided by TIBCO's administrative tools, TIBCO also supports comprehensive monitoring solutions.

For more information about how to manage an adapter project by using TIBCO Administrator, see *TIBCO ActiveMatrix Adapter for Database Configuration and Deployment*.

Overview of TIBCO Infrastructure

TIBCO infrastructure supports the adapter life cycle with two frameworks:

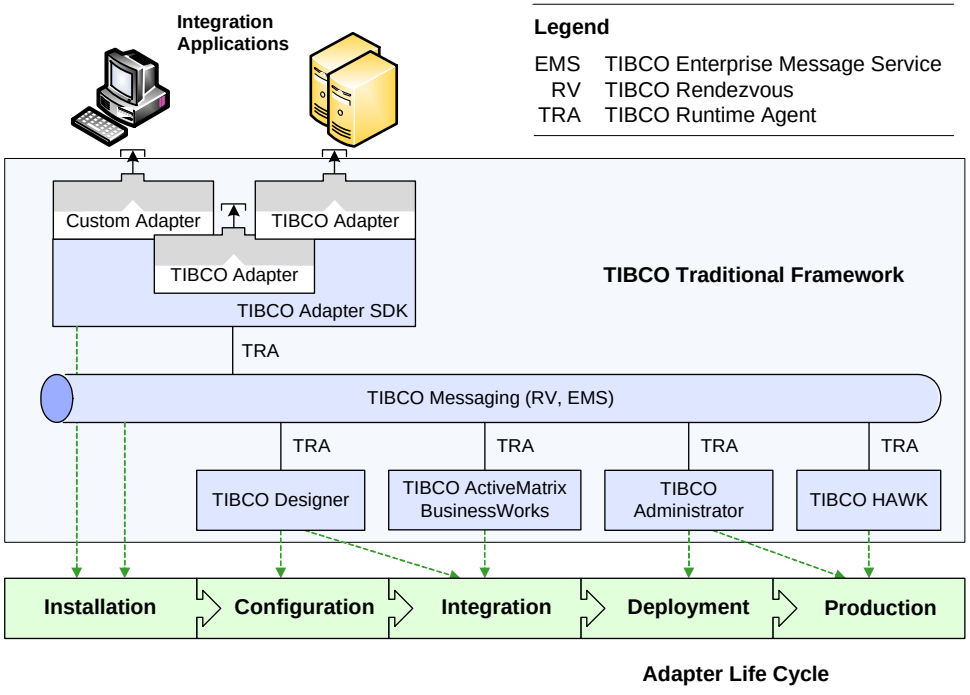
- Traditional Framework, page 26
- TIBCO ActiveMatrix Framework, page 27

Both frameworks support messaging by using TIBCO Messaging Software, business process development and integration by using TIBCO ActiveMatrix BusinessWorks, and monitoring by using TIBCO Hawk. Meantime, each framework supports a set of tools that are specific to the framework.

Traditional Framework

TIBCO supports the adapter life cycle with a series of well-established products, such as TIBCO Runtime Agent, TIBCO Designer, TIBCO Administrator, and so on. An adapter project runs as a separate standalone process in the traditional framework. Figure 11 shows the traditional tools for the adapter life cycle.

Figure 11 Adapter Life Cycle and TIBCO Traditional Framework

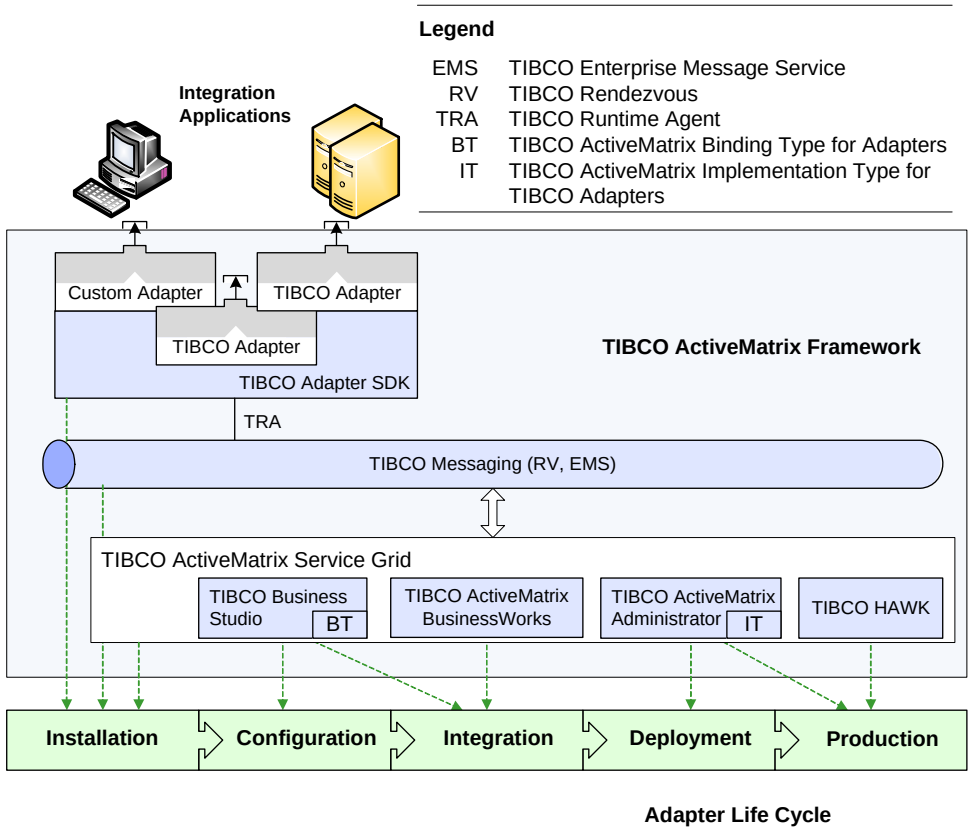


TIBCO ActiveMatrix Framework

The TIBCO ActiveMatrix framework, as shown in Figure 12, provides a technology-neutral platform for composite BPM (business process management) and SOA (service-oriented architecture) applications. The platform is based on the TIBCO ActiveMatrix Service Grid product. It provides a suite of application development and integration tools, such as TIBCO Business Studio, TIBCO ActiveMatrix Administrator, and so on, for service creation and integration, distributed service and data grids, packaged applications, and governance. See TIBCO ActiveMatrix Framework on page 48 for more of its benefits.

A traditional adapter project configured in TIBCO Designer, can communicate with TIBCO ActiveMatrix components by using TIBCO ActiveMatrix Administrator. You can also create a proxy for a traditional adapter project by using TIBCO ActiveMatrix Implementation Type for TIBCO Adapters and deploy and manage it by using TIBCO ActiveMatrix Administrator.

Figure 12 Adapter Life Cycle and TIBCO ActiveMatrix Framework



TIBCO Adapter SDK

TIBCO Adapter SDK (Software Development Kit) is the standard toolkit to build TIBCO Adapters. It provides the foundation for common adapter functionalities, such as sending and receiving information, configuration, management, and monitoring. The SDK also supports interoperability with other TIBCO products.

This section introduces the TIBCO Adapter SDK concepts and common resources that are important to the configuration and deployment of an adapter.

Adapter Instances and Services

An adapter instance contains the adapter configuration information, including name, connection, logging, monitoring, and so on. Within each adapter instance, you can add multiple *adapter services*, which contain the service configuration information. You can use the adapter service resources in the adapter palette to add adapter services to an adapter instance.

See *TIBCO ActiveMatrix Adapter for Database Configuration and Deployment* for more information about how to configure an adapter.

Common Resources

The following resources of TIBCO Adapter SDK are available to all TIBCO Adapters:

- Configuration properties that you can specify from the command line or in a properties file.
- Predefined global variables.
- Predefined TIBCO Hawk microagents and methods.

See the TIBCO Adapter SDK documentation for more details.

TIBCO Messaging Software

To support your integration project at runtime, TIBCO messaging platform reliably handles the volume of messages and provides the following benefits:

- **Guaranteed delivery and fault tolerance** The platform guarantees message delivery and is fault tolerant. If a message cannot be delivered because the recipient was unavailable, the messaging system can queue the message and continue to operate. The platform will then redeliver the queued message as appropriate.
- **Distributed architecture** The platform is based on a distributed, loosely coupled system and provides more support for fault-tolerance than a monolithic system that depends on one centralized server.
- **High throughput** The platform provides high throughput without performance degradation to meet increasing business demands.
- **Scalability** The platform is highly scalable to meet requirements of updating a business integration in a simple and cohesive way.

TIBCO Adapters supports integration with the following TIBCO messaging products:

- TIBCO Rendezvous, page 29
- TIBCO Enterprise Message Service, page 29

See also: *TIBCO ActiveMatrix Adapter for Database Configuration and Deployment* for more information on how to configure the transport for an adapter.

TIBCO Rendezvous

TIBCO Rendezvous is a low latency messaging and data distribution solution. The product supports reliable and certified message deliveries. It also supports delivering messages from one sender to many receivers.

See the TIBCO Rendezvous documentation for more information.

TIBCO Enterprise Message Service

JMS (Java Message Service) is the messaging element of the J2EE (Java Platform, Enterprise Edition) specification. It provides a standardized interface for enabling communications between J2EE-compliant applications, Enterprise Java Beans, and application servers.

TIBCO Enterprise Message Service is a high-performance implementation of JMS. The product supports both queue-based and publish/subscribe messaging, persistent or reliable delivery modes, local messaging transactions, and message selectors.

See the TIBCO Enterprise Message Service documentation for more information.

TIBCO Runtime Agent

TIBCO Runtime Agent provides basic connectivity between the adapter and other TIBCO infrastructure tools. It is required on each machine on which you install an adapter.

TIBCO Runtime Agent includes many software tools:

- An agent that runs in the background on each machine.
  - The agent is responsible for starting and stopping processes that run on a machine according to the deployment information.
  - The agent monitors the adapter and the machine. That information is then visible through TIBCO's administrative tools.
- TIBCO's and third-party libraries (including JRE (Java Runtime Environment) required by the adapter at runtime.
- TIBCO Designer
- TIBCO Domain Utility

See also: The TIBCO Runtime Agent documentation.

TIBCO Domain Utility

TIBCO Runtime Agent contains TIBCO Domain Utility for managing the components available on a TIBCO administration domain.

See TIBCO Administrator on page 40 for more concept information about TIBCO administration domain.

The utility provides the following capabilities:

- Add or remove a machine to a TIBCO administration domain.
- Change TIBCO administration domain credentials.
- Enable TIBCO administration domain and security management on a machine that hosts a TIBCO administration server.
- Add or remove a secondary TIBCO administration server.
- Add or remove the TIBCO Enterprise Message Service server plug-in to a TIBCO administration domain.
- Change TIBCO Rendezvous parameters.
- Migrate previous TIBCO Administrator installations.

TIBCO Designer

TIBCO Designer provides an easy-to-use GUI for creating adapter instances, configuring adapter services, downloading schemas from the target application, and saving the resulting configuration in a project. TIBCO Designer also supports revision control systems so that multiple developers can work on the same project together.

This section introduces the following topics that are important to adapter configuration and deployment:

- TIBCO Designer User Interface, page 33
- Projects and Resources, page 33
- Palettes, page 35
- Adapter Tester, page 35
- Accessing Help Resources, page 35

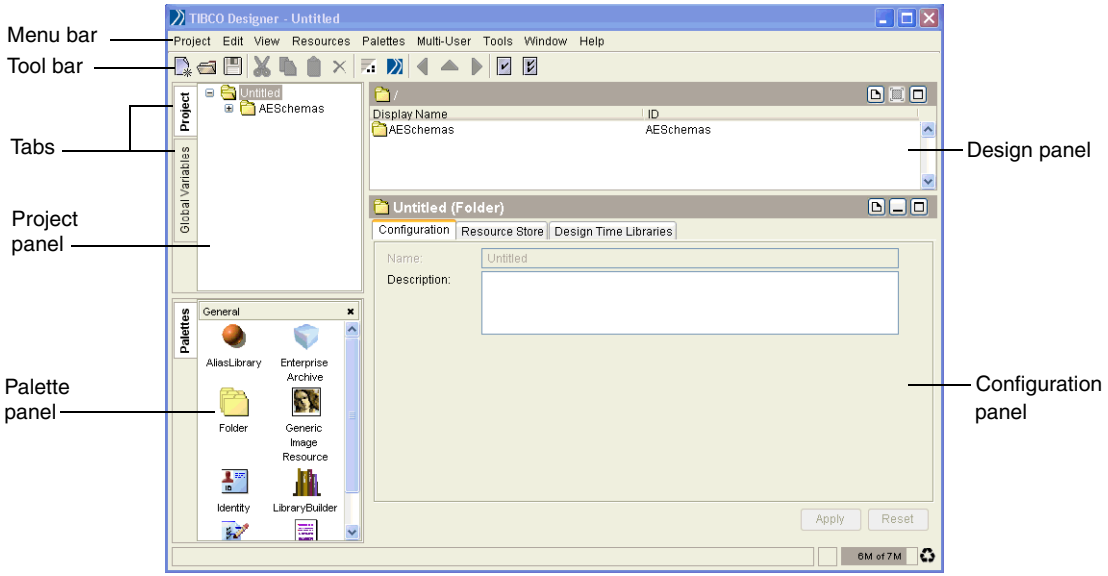
See also:

- *TIBCO ActiveMatrix Adapter for Database Configuration and Deployment* for more information on how to create and manage an adapter integration project by using TIBCO Designer.
- The TIBCO Designer documentation.

TIBCO Designer User Interface

Figure 13 illustrates the TIBCO Designer main window.

Figure 13 TIBCO Designer Window



The TIBCO Designer window consists of the following components:

- Menu bar and menus
- Tool bar and icons
- Tabs in the left most area you can select to display in the panel.
- Four panels, which are (starting in the top left corner and continuing clockwise):
  - **Project panel** for displaying the project tree and associated global variables.
  - **Design panel** for displaying the resource selected in the Project panel.
  - **Configuration panel** for specifying configuration options for each resource.
  - **Palette panel** for displaying resources you can select to design your project.

Projects and Resources

A *project* is a collection of all configured resources that implement the enterprise integration. The top-level (root) folder in the Project panel represents a project.

Resources are the components of a project. For example, an adapter Publication Service is a resource. Resources can be complex and contain other resources, much like a folder can contain other folders on your computer file system.

Project Formats

You can work with a TIBCO Designer project saved in many formats:

- Recommended Formats, page 34
- Legacy Formats, page 34
- Deployment Format, page 35

Recommended Formats

TIBCO recommends you save your project in one of the following formats:

- As a multi-file project

  The multi-file format uses one file for each top-level resource. The top-level resource may contain other resources. For example, each adapter configuration is represented by one file, which includes the services inside the file.

  Multi-file projects are well suited for development because they support file sharing and using a version control system, and because loading them at design time is usually faster.

- Under XML Canon

  XML Canon/Developer (XCD) is a comprehensive development platform with which an organization can store their XML assets, for example, XML schemas, DTDs, adjuncts, instance documents, and stylesheets, in a central repository that facilitates adaptability, collaboration, and management.

  XML Canon uses permissions to control access to the stored files. XML Canon also provides version control, protecting the development process from duplicate or conflicting efforts.

- ZIP archive

  ZIP archive is the recommended archive format for backing up a TIBCO Designer project.

Legacy Formats

TIBCO Designer also supports importing and exporting projects from and to one of the following legacy formats used in the earlier versions:

- Single-file repository project — A single DAT file exported to a local repository.
- Server-based repository project — A server-based DAT file. You can manage the project by using a TIBCO administration server.

Deployment Format

When you are ready to deploy your project, you must generate an EAR (Enterprise Archive) file, which contains the configuration for the adapter instances and processes you want to deploy. You can then use TIBCO Administrator to upload the archive and deploy the associated adapter and processes on the machine of your choice.

Palettes

Palettes organize resources in the Palette panel. Each adapter you install adds one palette during installation. You can use the installed adapter palette to create adapter instances, configure adapter services, download schemas, and save the resulting configuration in a project. To add resources to your project, you select them in the Palette panel and drag them into the Design panel.

For example, during configuration of a TIBCO ActiveMatrix Adapter for Database adapter instance, the adapter palette provides the services resources and can fetch tables in the database as you specify in the Configuration panel. You then choose the tables and fields of your interest.

Adapter Tester

Adapter Tester is a tool of TIBCO Designer for verifying adapter configuration. When you invoke the tool, all adapter instances configured in the project are displayed. After you select the adapter instance to test, you can start and stop the adapter from the tester. The tester window displays adapter output so you can easily view results.

Accessing Help Resources

Online help for TIBCO Designer is available in the following ways:

- From the Help > Designer Help menu item for viewing the TIBCO Designer documentation.
- From the Help > Help For menu item to access the product-specific documentation, for example, the documentation for the adapter product you work with.

- Right click on most resources and select the **What Is This?** menu item to view specific help for that resource. If information is displayed in the Configuration panel, you can also click the Help icon  in the panel for online help.

TIBCO ActiveMatrix BusinessWorks

TIBCO ActiveMatrix BusinessWorks is a scalable, extensible, and easy to use integration platform for developing integration projects with configured adapter services. You can define a TIBCO ActiveMatrix BusinessWorks business process in TIBCO Designer and execute the process with TIBCO ActiveMatrix BusinessWorks process engine in TIBCO Administrator.

This section introduces the following topics that are important to adapter configuration and deployment:

- Components of Process Definitions, page 37
- ActiveEnterprise Adapter Palette, page 38
- Data Mapping and Transformation Facilities, page 39
- Process Testing Facilities, page 39

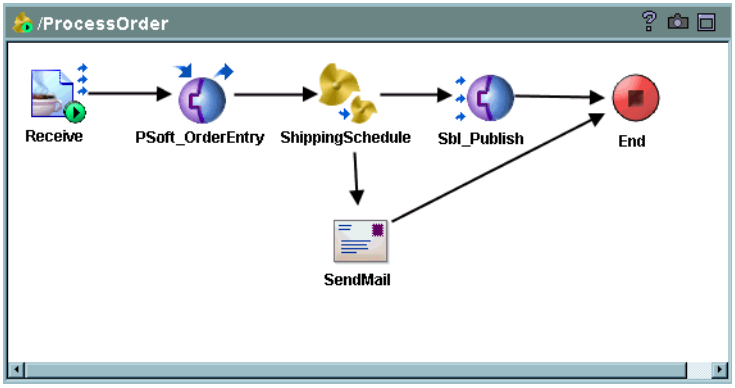
See also:

- *TIBCO ActiveMatrix Adapter for Database Configuration and Deployment* for more information on how to develop a business process with adapters by using TIBCO ActiveMatrix BusinessWorks.
- The TIBCO ActiveMatrix BusinessWorks documentation.

Components of Process Definitions

A process definition is a graphical representation of your business process model. Figure 14 illustrates a simple process definition in the Design panel, which consists of a few activities, including two ActiveEnterprise Adapter activities.

Figure 14 Example Process



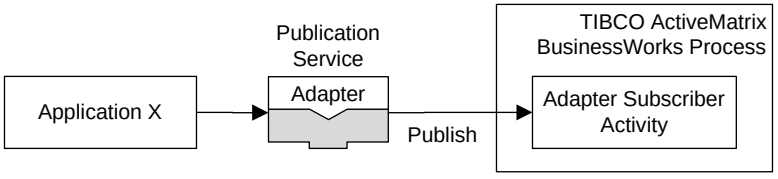
A process definition consists of one or more of the following components:

- **Activities** are the individual units of work in a process definition. Activities are generally operations that interface to external systems, as well as perform internal processing. Activities are available on the various palettes from TIBCO ActiveMatrix BusinessWorks.
- **Transitions** describe the flow of processing in a process definition. A transition is represented by an arrow between two activities. The arrows are unidirectional, and you cannot draw a transition to a previously executed activity. Control flow in a process definition must proceed sequentially beginning with the Start activity (or a process starter) and ending with the End activity.
- **Groups** specify related sets of activities.
- **Shared Configuration Resources** are specifications that are shared among activities. These are resources, such as database connections, WSDL files, schema definitions, and connections to other servers. Shared configuration resources are created outside of process definitions, but you can use them when configuring some activities.
- **Subprocesses** are child processes of a business process. Business processes are often very complex and it is difficult to diagram the complete process in one process definition. You can create several smaller process definitions known as *subprocesses*, instead of one large-scale process definition. You can then call each subprocess from another subprocess.

ActiveEnterprise Adapter Palette

The ActiveEnterprise Adapter palette contains activities for communicating with configured TIBCO Adapters, and consequently connecting with a variety of applications. For example, you can configure an Adapter Subscriber activity to receive data from an adapter Publication Service, as shown in Figure 15.

Figure 15 An Adapter Subscriber Activity Receiving a Message from an Adapter Publication Service



Data Mapping and Transformation Facilities

TIBCO Adapters must work with an application-independent transformation engine to provide full adapter functionality:

- The primary functionality of TIBCO Adapters is to retrieve data from and export data to a source or target application. An adapter changes the *format* of the data so other applications can access the data. Though the data model of a source application may be complicated, the adapter retains much of the source information and makes it easy to access the information.
- However, the adapter does not change the *content* of the data, so two applications might still be incompatible. For example, the name and address of a customer might be stored in five fields in one ERP application and in six fields in another. In this case, you must perform content conversion by using a separate tool.

To meet the needs of content conversion, TIBCO ActiveMatrix BusinessWorks provides a graphic interface for data mapping and transformation. The GUI includes a set of tools, such as XPath formula builder, XSLT statement editor, coercions dialog, and so on, with which you can drag functions and data elements to create and modify data transformation rules.

Process Testing Facilities

TIBCO ActiveMatrix BusinessWorks provides a testing environment for stepping through your process definitions and determining the sources of errors. Entering the testing environment starts a TIBCO ActiveMatrix BusinessWorks engine. The engine starts process instances based on the process definitions stored in your project.

You can select one of the running process instances to display in the Design panel, and the currently executing activity is highlighted as the process instance runs. You can also set breakpoints in the process definition to stop the running process instances at desired points.

TIBCO Administrator

TIBCO Administrator provides a central administration server for TIBCO products. You can create, deploy, and manage an adapter project in TIBCO Administrator by using a web-browser-based graphical interface.

This section introduces the following topics that are important to adapter configuration and deployment:

- Administration Domain, page 40
- Administration Server, page 41
- TIBCO Administrator User Interface, page 42
- Application, Service, and Service Instance, page 42
- Monitoring Management by TIBCO Hawk, page 43

See also:

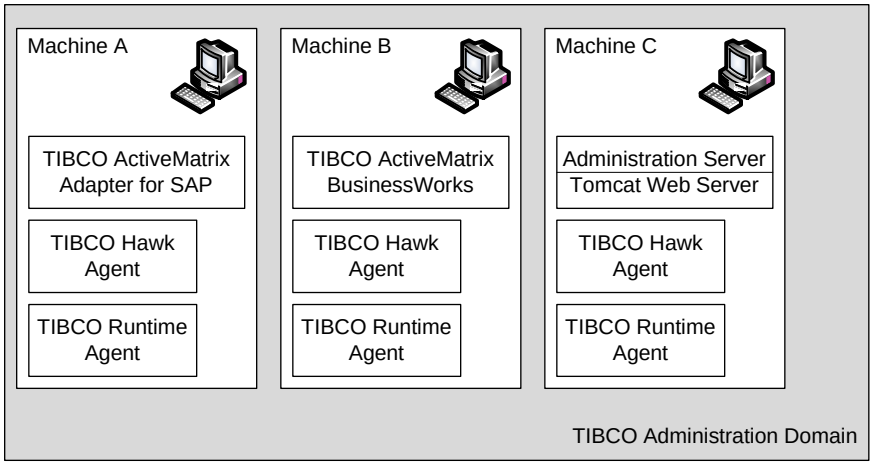
- *TIBCO ActiveMatrix Adapter for Database Configuration and Deployment* for more information on how to deploy and manage an adapter project at runtime by using TIBCO Administrator.
- The TIBCO Administrator documentation.

Administration Domain

An *administration domain* is a collection of users, machines, and services. Components within an administration domain can communicate with systems outside of the domain, but the domain is the administrative boundary of your enterprise integration project. An administration domain can contain machines in the same network subnet or across subnets.You can use TIBCO Domain Utility installed as part of the TIBCO Runtime Agent installation to create and manage administration domains.

Figure 16 shows an administration domain with three machines. Each machine has TIBCO Runtime Agent installed and a TIBCO Hawk agent running. One machine has an adapter installed, another TIBCO ActiveMatrix BusinessWorks, and the other machine has the administration server installed. The browser-based TIBCO Administrator GUI can be available from any machine, including machines not in the domain.

Figure 16 TIBCO Administration Domain



Administration Server

Each administration domain is managed by an *administration server*. The administration server provides a central storage and distribution point for configuration information and schema data that an adapter requires during production stage.

The main responsibilities of an administration server are to:

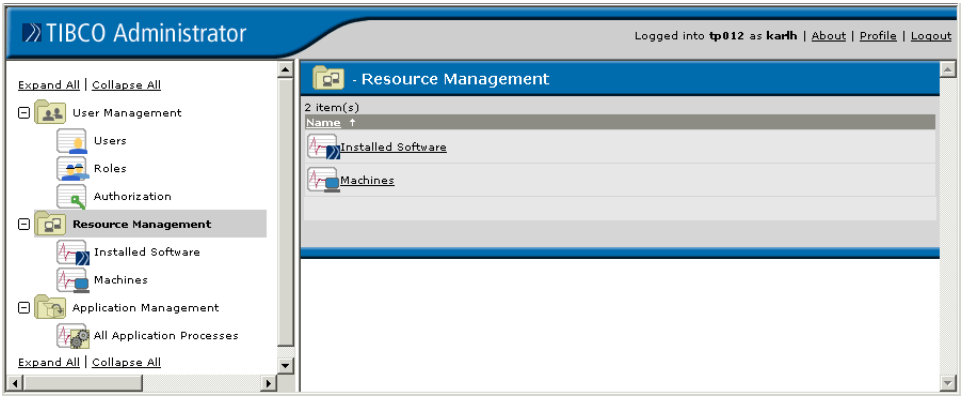
- **Manage data storage for the domain** Data about the machines, registered software, users, roles, access control lists, application configurations and deployment history are maintained for an administration domain.
- **Manage transport options for applications** An administration domain can use TIBCO Messaging Software as the transport for domain communication. The transport used affects how data is stored and how applications are deployed.
- **Enforce security for the domain** TIBCO Administrator supports centralized authentication and authorization. Different users can have different types of access for applications and resources.
- **Provide load balancing and failure recovery**(TIBCO Rendezvous administration domains only).

The TIBCO Administrator Server contains its own web server (Apache Tomcat). The web server manages basic communications and makes the TIBCO Administrator user interface available.

TIBCO Administrator User Interface

TIBCO Administrator provides an easy-to-use web interface for configuring users and applications, deploying applications, and monitoring processes and machines in an administration domain. Figure 17 shows the interface.

Figure 17 TIBCO Administrator User Interface



The TIBCO Administrator user interface includes the following modules:

- **User Management** Use this module to create users and roles, and assign them access rights to resources available in the administration domain.
- **Resource Management** Use this module to create application domains, get information about installed TIBCO software on each domain machine, view the status of each domain machine, and configure monitoring rules and events that can trigger other actions such as sending email or running a command.
- **Application Management** (mainly for adapter and process) Use this module to upload the EAR (Enterprise Archive) file of an application, change its configuration options and global variables, define monitoring rules, and then deploy and start (or stop) the application.

Application, Service, and Service Instance

A project EAR file loaded to a TIBCO administration server is represented as an *application*. An application contains the adapter instances and process definitions the project archive includes. The TIBCO administration server creates a *service* for each of these resources. A *service instance* is the instance of the service running on a particular machine.

You can set deployment options at the application level, service level, or service instance level.

Monitoring Management by TIBCO Hawk

TIBCO Administrator provides basic monitoring functions for runtime projects. If you need more monitoring and management capabilities, you can use the monitoring solution provided by TIBCO Hawk Plug-in for TIBCO Administrator. See TIBCO Hawk on page 44 for more information.

TIBCO Hawk

TIBCO Hawk provides easy-to-use interfaces to monitor adapter application parameters and behaviors for all nodes in a local or wide-area network throughout the enterprise. TIBCO Hawk can also automatically repair runtime failures or slowdowns within seconds of their discovery for some pre-defined conditions, which leads to reduced unscheduled outages and improved performance of critical business systems.

This section introduces the following concepts that are important to adapter configuration and deployment:

- TIBCO Hawk Agent, page 44
- Microagents and Methods, page 45
- Rulebases and Rules, page 45

TIBCO Hawk includes many tools for viewing and managing the monitoring information. This section gives an overview of the following tools:

- TIBCO Hawk Display, page 46
- TIBCO Hawk Plug-in for TIBCO Administrator, page 47

See also:

- *TIBCO ActiveMatrix Adapter for Database Configuration and Deployment* for more information on how to monitor and manage an adapter integration project by using TIBCO Hawk.
- The TIBCO Hawk documentation.

TIBCO Hawk Agent

A *TIBCO Hawk agent* is included in the installation of TIBCO Runtime Agent and runs on the machine that hosts the administration server and on each machine that is part of the administration domain. It performs the monitoring duties on the machine and communicates with TIBCO Hawk console applications, for example, TIBCO Hawk Display, by using TIBCO Messaging Software. Even though an agent communicates with instances of console applications, it operates independently of these applicaiton and other agents.

Microagents and Methods

A TIBCO Hawk agent interfaces the managed objects on its local machine using *microagents*. Microagents represent managed objects such as operating system subsystems, agent components, log files, or event logs. TIBCO Adapters also have microagents for monitoring adapter application metrics.

Each microagent exposes a set of *methods* to the agent that the agent uses to collect information and take action. Each agent provides information about its microagents and associated methods, including method names, arguments and return types. This permits dynamic discovery and use of microagents.

You can access the methods in different ways, from a TIBCO Hawk monitoring console or by using TIBCO Hawk Console API. Method characteristics and behavior are consistent, regardless of how the method is accessed.

Each adapter has three microagents: a standard TIBCO Hawk microagent, a class microagent, and a custom microagent. These microagents include methods that provide:

- Business level statistics that report the progress of the adapter as it interacts with the target system. For example, in TIBCO ActiveMatrix Adapter for Database, you can know from such statistics whether objects were successfully or unsuccessfully inserted, updated, or deleted in the database.
- Queries that return information about the state of the adapter. This can be an important tool for seeing the internals of an adapter and debugging it if something appears wrong. For example, methods can return information about threads, internal queues, or connections to the target system. Using these methods, you can identify certain bottlenecks or gauge how successfully an adapter is scaling in the current environment.
- Updates of the adapter runtime parameters. This includes retrieving the current runtime parameters and setting new runtime parameters without restarting the adapter. An example of this is getting and setting the polling interval. Updating a runtime parameter through the microagent only affects the setting of the instance that is running. It does not make a permanent change of the setting in either the project repository or the TRA file that stores the properties for deployed services.

Rulebases and Rules

A TIBCO Hawk agent monitors managed objects by processing *rulebases*. Each rulebase is a collection of *rules* that contain the management logic for determineing how monitoring and management will take place.

Multiple rules in the same rulebase can monitor a particular application or system function. For example, an application rulebase can include one rule for issuing a medium-level alert if disk space or CPU usage exceeds certain thresholds. Another rule can issue a high-level alert and send a pager message to the system administrator if the application process terminates.

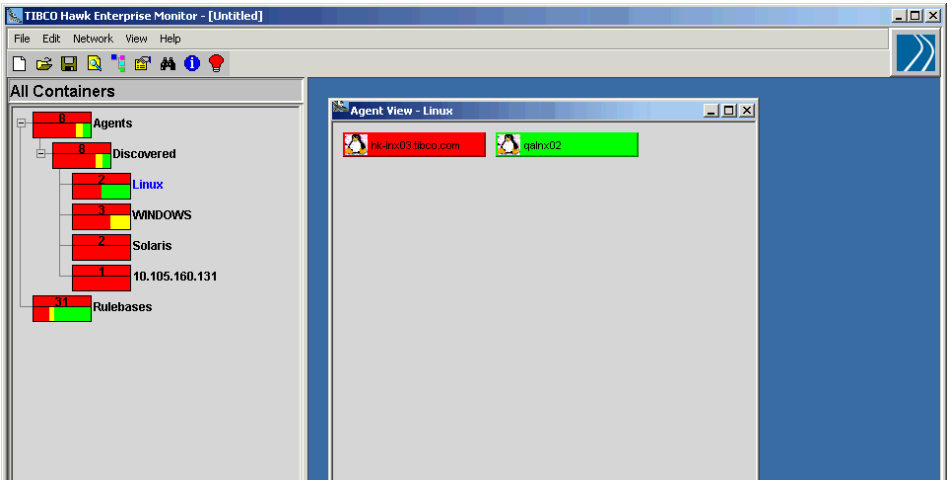
TIBCO Hawk includes pre-built rulebases that monitor basic system level parameters. You can build additional rulebases with specialized rules. You can also selectively load the rulebases to an agent or group of agents on a temporary or permanent basis.

TIBCO Hawk Display

TIBCO Hawk Display provides an easy-to-use interface for viewing and managing TIBCO Hawk agents on a network. It can discover TIBCO Hawk agents that are running and subscribe to alert messages generated by the rulebases of the agent. The alert messages it receives are presented in an organized view. Alerts are color-coded to indicate the severity of a reported problem. Clicking on a node displays the error message along with a recent history of problems on the node.

Figure 18 shows the main window of TIBCO Hawk Display, with a few discovered agents and their status displayed.

Figure 18 TIBCO Hawk Display Main Window



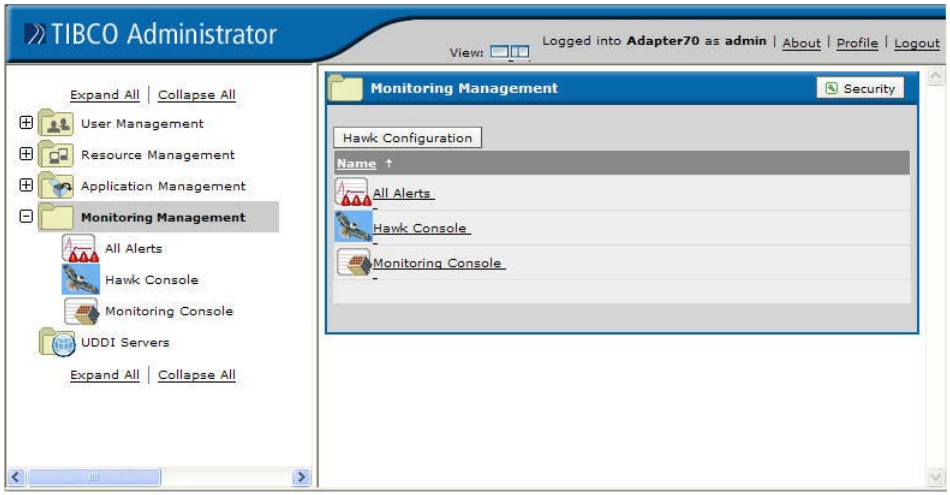
TIBCO Hawk Display is location-independent. It only offers a view of events on your distributed systems, not store the events in a centralized location. Adding more instances of the TIBCO Hawk Display application requires no additional network overhead or configuration.

TIBCO Hawk Plug-in for TIBCO Administrator

TIBCO Hawk Plug-in for TIBCO Administrator provides the Monitoring Management module for TIBCO Administrator. You can access the module by using the TIBCO Administrator web GUI. An administration server retrieves the monitoring information from each TIBCO Hawk agent, which runs as a separate process on each administration domain, and displays the information in the GUI.

Figure 19 shows the TIBCO Hawk Monitoring Management module in the TIBCO Administrator web GUI.

Figure 19 TIBCO Hawk Monitoring Management Module in TIBCO Administrator



The plug-in includes the following three parts:

- **All Alerts** provides visibility for all the alerts generated in the administration domains that you are monitoring.
- **Hawk Console** provides access to the machines in the administration domains that you are monitoring.
- **Monitoring Console** provides a mechanism for you to monitor other TIBCO applications in the administration domains that you are monitoring.

The TIBCO Administrator GUI provides a dialog to configure rulebases, set monitoring options, and display status.

TIBCO ActiveMatrix Framework

TIBCO ActiveMatrix is an enterprise ready product for developing and deploying distributed applications. TIBCO ActiveMatrix software addresses the scalability, availability, provisioning, and security challenges for distributed applications.

Using TIBCO ActiveMatrix software, enterprises can rapidly design, implement, and test applications, deploy them to their operating environment of choice, and monitor and manage the applications end-to-end. TIBCO ActiveMatrix governance support allows enterprises to advertise access to their applications.

This section introduces:

- TIBCO ActiveMatrix Service Grid the unified design-time and runtime service framework.
- TIBCO ActiveMatrix Extensions for TIBCO Adapters the components to integrate TIBCO Adapters with TIBCO ActiveMatrix Service Grid.

See the Readme file and Release Notes to get more information about which TIBCO products are officially supported to work with the adapter.

TIBCO ActiveMatrix Service Grid

TIBCO ActiveMatrix Service Grid is the ideal SOA development platform when you have a diverse set of software assets that you want to reuse. It supports unified development and management through a series of software products, including:

- TIBCO Business Studio for project design.
- TIBCO ActiveMatrix Administrator for project deployment and management.

For more information, see the TIBCO ActiveMatrix Service Grid documentation.

TIBCO Business Studio

TIBCO Business Studio is a TIBCO ActiveMatrix tool that provides unified development, assembly, composition, and testing capabilities for an integration project in an Eclipse environment.

For more information, see the TIBCO Business Studio documentation.

TIBCO ActiveMatrix Administrator

TIBCO ActiveMatrix Administrator is a TIBCO ActiveMatrix tool that provides an easy-to-use web-based administrator console for deploying and managing integration projects developed in TIBCO Business Studio. You can take advantage of a grid-based environment for scalability and load balancing, maintain system health and performance, and troubleshoot issues with the same user interface.

For more information, see the TIBCO ActiveMatrix Administrator documentation.

TIBCO ActiveMatrix Extensions for TIBCO Adapters

TIBCO ActiveMatrix also provides the following software products to seamlessly integrate TIBCO adapter products with the platform:

- TIBCO ActiveMatrix Binding Type for Adapters, page 49
- TIBCO ActiveMatrix Implementation Type for TIBCO Adapters, page 50

TIBCO ActiveMatrix Binding Type for Adapters

TIBCO ActiveMatrix Binding Type for Adapters makes a Service Component Architecture (SCA) service accessible through the adapters and an adapter service accessible to the components in the TIBCO ActiveMatrix environment.

An adapter binding type splits service consumption and provisioning in two separate bindings, the service binding for providing TIBCO ActiveMatrix services to adapters and reference binding to allow other TIBCO ActiveMatrix components to access services provided by TIBCO adapter products.

A component of an adapter binding type does not have a one to one relationship with an adapter instance configuration. Different adapter reference bindings from a TIBCO ActiveMatrix application can reference services from the same adapter instance or from different ones. An adapter service or reference binding component can provide or consume only a single adapter service.

TIBCO ActiveMatrix Binding Type for Adapters bridges TIBCO adapter products with TIBCO ActiveMatrix components through TIBCO Messaging Software.

TIBCO ActiveMatrix Binding Type for Adapters also does not manage the deployment of adapter runtime instances. To deploy, manage, and monitor an adapter instance you need to use TIBCO ActiveMatrix Implementation Type for TIBCO Adapters.

For more information, see the TIBCO ActiveMatrix Binding Type for Adapters documentation.

TIBCO ActiveMatrix Implementation Type for TIBCO Adapters

TIBCO ActiveMatrix Implementation Type for TIBCO Adapters enables TIBCO adapter configurations designed in TIBCO Designer and packaged in an EAR (Enterprise Application Archive) file to be uploaded and deployed through TIBCO ActiveMatrix Administrator to the TIBCO ActiveMatrix runtime environment.

When deployed, you can monitor and manage an adapter application just as any other TIBCO ActiveMatrix application. The adapter implementation type manages the life cylce of a deployed Adapter.

An instance of adapter implementation type represents a configured adapter instance as a component of a business unit. The status of the adapter implementation type component instance and the runtime adapter instance are always kept synchronized. There is no distinction from the two from the logical standpoint, and basically, one represents the other. A composite application can have more than one adapter implementation type components.

TIBCO ActiveMatrix Implementation Type for TIBCO Adapters does not support the invocation of adapter services in the TIBCO ActiveMatrix environment. To offer adapter services to other TIBCO ActiveMatrix components or TIBCO ActiveMatrix services to the adapter, you need to use TIBCO ActiveMatrix Binding Type for Adapters in conjunction with TIBCO ActiveMatrix Implementation Type for TIBCO Adapters.

For more information, see the TIBCO ActiveMatrix Implementation Type for TIBCO Adapters documentation.

Chapter 4 TIBCO ActiveMatrix Adapter for Database

This chapter introduces TIBCO ActiveMatrix Adapter for Database features and services. It also explains how the adapter integrates with the database.

Topics

Overview of the Adapter

TIBCO ActiveMatrix Adapter for Database is a integration product that provides a configurable way to conduct changes within the database or publish out changes from the database without the need to do any programming. It delivers Publication, Subscription, and Request-Response services between the database and TIBCO's messaging infrastructure in a reliable, robust, and scalable way. JDBC compliant databases, such as Oracle, Sybase, Microsoft SQL Server, MySQL, PostgreSQL and Teradata databases are supported. While the adapter does not run on z/OS and iSeries systems, it can remotely connect to a DB2 database running on these systems.

Adapter Services

The adapter provides Publication, Subscription, and Request-Response services communication, database connectivity, and many other parameters can be configured for these adapter services using TIBCO Designer.

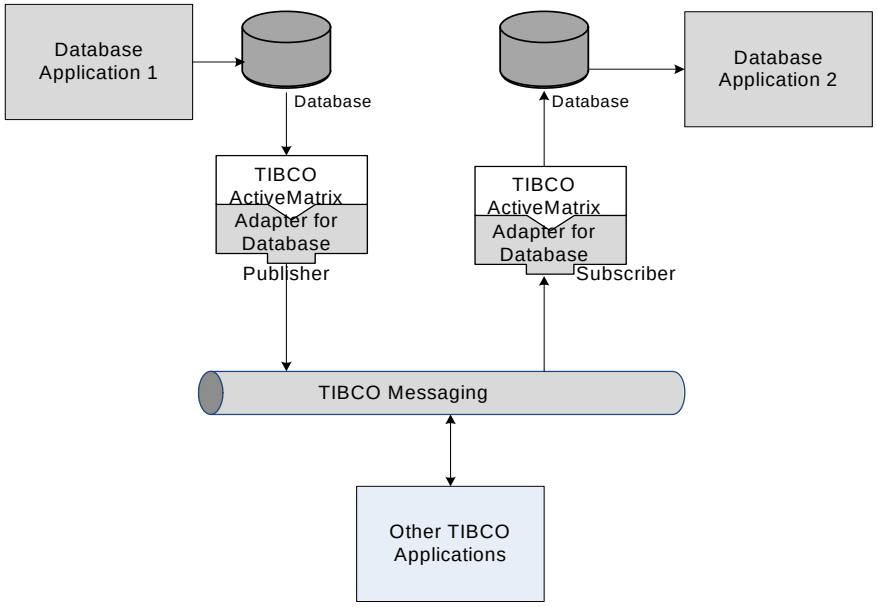
The following sections describe how these adapter services interact with the database environment to provide connectivity to TIBCO messaging products.

Publication and Subscription Services

Figure 20 illustrates a typical data flow in Publication and Subscription services when using a standalone adapter. Database Application 1 updates a table in a database monitored by a TIBCO ActiveMatrix Adapter for Database Publication Service. The adapter extracts data from the changed rows of the database tables and publishes it on the specified transport type (TIBCO Rendezvous or TIBCO Enterprise Message Service). This data is then available to other applications listening on the messaging transport.

One particular type of listening application can be another instance of a TIBCO ActiveMatrix Adapter for Database adapter, running a Subscription Service. The listening adapter can receive this message from the messaging transport layer and update te database table that the Subscription Service is configured against.

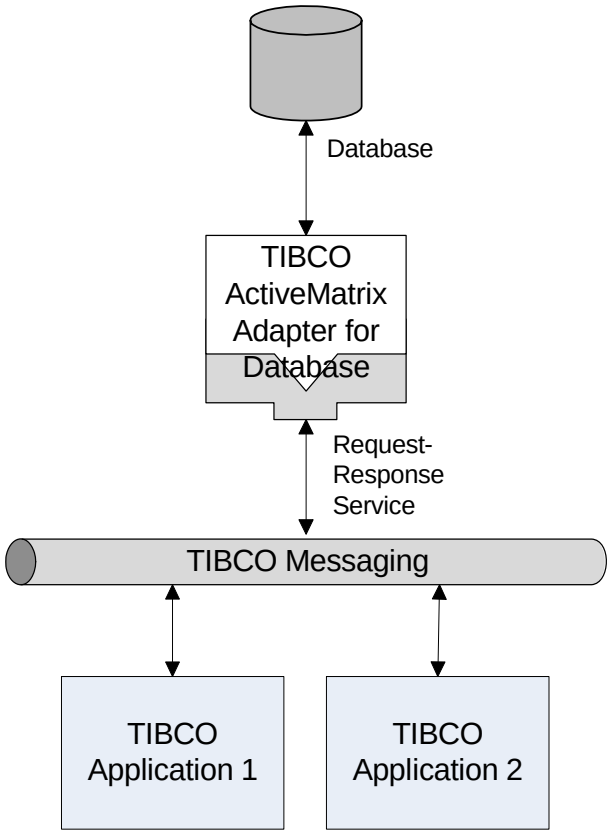
Figure 20 Typical Publication-Subscription Services Flow



Request-Response Service

The Request-Response Service in TIBCO ActiveMatrix Adapter for Database allows an application to submit one or more SQL statements, stored procedures, or both for the adapter to execute. After execution, the adapter returns one or more result sets and a result code. The requests and responses are formulated using nested self-describing messages. See Figure 21.

Figure 21 Typical Request-Response Service Flow



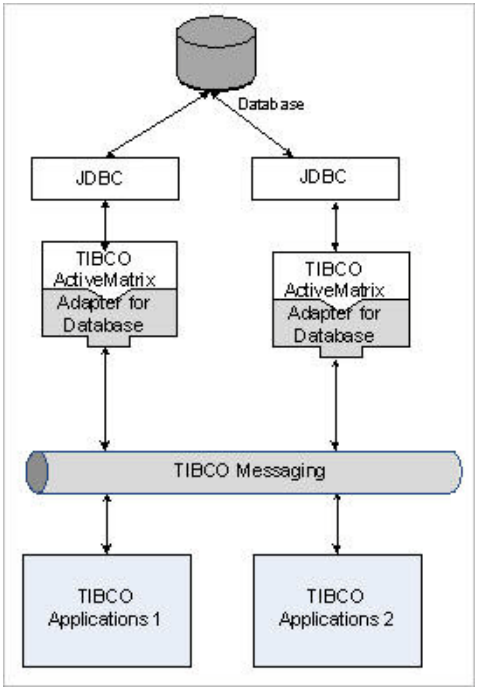
The adapter can also be configured to manage requests using load balancing among a set of adapters that participate in the same named queue. Additionally, the adapter has been designed to allow multiple threads to process application requests.

Adapter Architecture

TIBCO ActiveMatrix Adapter for Database allows data stored in a database to be exchanged with applications configured for the TIBCO environment. For Oracle and Microsoft SQL Server databases, the adapter includes an alerter component that can be used when the default method of polling for database changes is not appropriate.

Figure 22 shows the relation between the adapter and the various components it communicates with.

Figure 22 The TIBCO ActiveMatrix Adapter for Database Environment



Adapter in Runtime

When an adapter executes in runtime, it acts as a bidirectional bridge between your database and the TIBCO environment. A Publication Service monitors your database, extracts data from relevant database tables and sends it on an appropriate subject using the reliable or certified quality of service. A Subscription Service listens for messages sent on configured subjects and inserts, deletes or updates rows in its associated database tables with the information.

An adapter can be configured with both a Publication and Subscription Service, sending messages and writing them to more than one table. An adapter can publish and subscribe to the same table, but the provided publish destination is different from the subscribe destination.

An adapter can also be configured to use request-response semantics, acting on behalf of a TIBCO application, processing its requests and returning responses. A set of adapters can be configured to participate in a queue (TIBCO Rendezvous Distributed Queue or JMS Queue) to load balance the incoming requests, improving overall performance.

Adapter services that are using TIBCO Rendezvous transport type can use TIBCO Rendezvous certified messaging service. Message parameters are stored in the project and can be modified for your environment. Adapters using JMS transport type can use the durable messaging service.

Adapters can also be configured to use TIBCO Enterprise Messaging Service, to reduce the possibility of message loss.

Polling or Alerter

An adapter Publication Service uses periodic polling or an alerter process to monitor changes to a database table.

- The default method is polling. The adapter polls (checks) the publishing tables periodically for any new rows to be published. This method is the most efficient when the publishing tables change frequently and a limited number of database operations are preferred.
- In the case where the publishing tables change infrequently, polling may result in many unnecessary database accesses. For this situation, the alerter can be used to asynchronously alert the adapter of changes in the database. This removes the need for the adapter to poll its publishing table for existence of new rows. When the adapter receives an alert, it publishes the new data.

Referencing External Schemas

When configuring an adapter, you can specify the database tables to use for Publication and Subscription Services. The default schema for specified source and destination table names is associated with the database user account in the `create_user.sql` script. This script is normally executed as part of the post installation procedure.

You may need to access source and destination tables that are in another schema, and not in your default schema (the schema specified in `create_user.sql`). Source and destination tables in the adapter can be configured to reference tables in an external schema.

Exception Table

You can designate an exception table for a Subscription Service. If a subscriber adapter cannot write data to its destination table, it will write the data to the exception table.

To write to an exception table, an adapter must be started with the `adb.useExceptTable` option set in the supplied properties file and an exception table must have been specified when using TIBCO Designer to add a subscription. If an error occurs when inserting data into the destination table, the adapter attempts to insert the data into the exception table.

- If the insertion into the exception table is successful and the RVCM quality of service is specified for the subscription, the transaction commits and confirmation for the message is sent back. When publishing tables, the value of the delivery status column becomes `C` after processing the message. If you are using a durable JMS subscriber, a JMS confirmation will be sent back.
- If the insertion into the exception table fails, an error message displays, a rollback occurs, and a TIBCO Hawk alert is published. The adapter will then terminate, and the user is advised to fix the problem with the message or the table, then to restart the adapter. The message will be delivered again after the adapter starts. (If the adapter did not terminate, after the next message is inserted successfully, its confirmation will also implicitly confirm the failed message.)

  You can check the `ADB_OPCODE` column of the publishing table to identify the failed operation, and the `ADB_ERROR_TEXT` column of the opaque exception table for the error information.

Loop Detection

If a source table is used both as the source and destination table for the same subject, the loop detection feature will be enabled. The feature prevents the same changes from being published repeatedly.

If the loop detection feature is enabled, an additional column, `ADB_SOURCE`, is added to the source table. When an adapter receives a message, it inserts or updates the source table and enters a `T` in the `ADB_SOURCE` column to denote that this row was inserted or updated as a result of a message, rather than from user intervention.

Triggers created by the Adapter Configuration palette are defined to not copy rows with `T` in the `ADB_SOURCE` column into the publishing table, which effectively means that the row will not be published. If you must update a row that was received (that is, has a `T` in the `ADB_SOURCE` column) and want the updated row propagated, you must change the `ADB_SOURCE` column to `NULL`, then the trigger will pick up the row and send it out.

Master-Master Replication

You can use the loop detection feature to implement a simple master-master replication scheme. Master-master replication allows multiple sites, acting as peers, to copy and maintain groups of replicated objects.

When loop detection is enabled, an adapter can be configured as both a publisher and a subscriber to the same table on the same subject. When the subscriber receives a message, it compares the `adapter ID` of the message to its own `adapter ID`. If the values of the `adapter ID` match, and source and destination tables are the same table in the database, the subscriber discards the message. Other subscriber adapters listening on the subject receive the message only once.

The adapter does not resolve any replication conflicts, for example, two applications updating the same row of their corresponding source table will both publish the change. For advanced replication scenarios, use the replication tools provided by your database vendor.

Multi-file Format Projects

The multi-file format creates one ActiveEnterprise XML file for each logical object (such as an adapter instance, a set of related ActiveEnterprise classes, or a TIBCO ActiveMatrix BusinessWorks process flow) that occurs in the repository instance. This kind of project is referred to as a multi-file project.

Multi-file projects can be checked in a version control system, and a project can contain more than one adapter configuration. This allows a number of people to work on the same project at the same time, with different people working on each adapter configuration: a developer can check out a specific file corresponding to an object that needs to be changed, update the file, and check it back in. TIBCO Designer accesses the local synchronized copies of the files on the developer's hard drive.

See *TIBCO ActiveMatrix Adapter for Database Configuration and Deployment* for more information.

DAT File Format

For production and for testing with runtime adapters, developers export multi-file projects to DAT format using TIBCO Designer menu commands. A project can be exported as a local project for local testing or exported to be managed by a repository server.

Supported SQL Operations

The adapter supports the following SQL operations for publishing and subscribing:

- INSERT
- UPDATE
- DELETE
- UPDATE/INSERT (update if row exists, otherwise insert)

Whenever a supported SQL statement is executed with a table monitored by a publisher adapter, the adapter instance sends a message to its subscribers, which update their destination tables.

Appendix A Encoding Tables

This appendix lists the encoding values that can be used for TIBCO ActiveMatrix Adapter for Database.

Topics

Encoding Tables

Table 5 lists the table headings that appear in the encoding table:

Table 5 The Encoding Tables

Table Headings	Description
Encoding Value in Pick List	This column lists all of the adapters displayed names in the Encoding fields that are available from the field's pick list in design time. This column also lists potential values for all adapters. Your adapter likely displays a subset of these values.
Set 1	Your adapter may support more encoding values than given in the adapter's Encoding field pick list. The values in this column represent the underlying encoding used by the adapter in runtime. You can type an encoding value listed in this column in the adapter's Encoding field. The palette does not verify whether the value you provide is supported or not. If the value is not supported, the adapter displays an error in runtime.
IBM CCSID (character code set identifier)	The IBM CCSID column represents the CCSID given to the ISO code page in IBM publications.
Oracle NLS (National Language Support) String	Some multi-nation character sets require the `LANGUAGE_TERRITORY` prefix before the Oracle `NLS_LANG` value. Check with Oracle for details.
Description	Description of the encoding value.

The following three encoding tables introduce ISO character sets, EBCDIC character sets, and Microsoft Windows character sets. See Table 6.

Table 6 ISO Character Sets

Value in Encoding Field Pick List	Set 1	Set 2	IBM CCSID	Oracle NLS String	Description
ISO-8859-1	LATIN_1	ISO8859_1	IBM-819	language_territory. WE8ISO8859P1	ISO8859-1 (Latin-1), West European
UTF8	UTF8	UTF8	IBM-1208	AMERICAN_AMERICA.UTF8	Unicode Transformation Format-8

Glossary

A

ActiveEnterprise

One of the three product groupings within TIBCO Software Inc, focused on enterprise application integration. The other two are ActivePortal™ and ActiveExchange™ (see www.tibco.com for details).

adapter tester

A tool can be used for testing adapters.

AESchemas folder

When configuring a standard adapter, by default, TIBCO Designer creates schema resources and places them in the AESchemas folder. These resources represent schema that are recognized by TIBCO Adapter SDK. Each schema file contains a collection of classes, scalars, associations, unions, and sequences.

alert

A notification to an end-user, for example, scheduled alerts deliver portal headlines to a chosen device. See also *real-time alert*.

C

common page

A logical name-value binding to identify a portal page in page layout templates, regardless of where that portal page exists in the page tree. Provides for flexibility and ease of template maintenance.

community site

A type of portal *site* created and used by business users in support of team communications.

D

deployment descriptor

An XML file that describes the configuration of a web application. It's located in the WEB-INF directory of the application's WAR file.

DMZ

An acronym for demilitarized zone, this term is used metaphorically for that part of a network between an inner and an outer fire wall. Machines placed in the DMZ may be available to authorized users outside the firewalls, whereas machines placed behind the DMZ are protected from outside access.

domain

In TIBCO Administrator, two kinds of domains are used. See also *administration domain* and *application domain*.

E

Enterprise Archive Resource (EAR) file

An EAR file contains information about the adapter instances and TIBCO ActiveMatrix BusinessWorks processes you want to deploy. The EAR file is imported into TIBCO Administrator where you can deploy, start, and

manage the adapter instance on the machine of your choice.

G

global variable

Global variables provide an easy way to set defaults for use throughout your project. You can define a global variable either at design time in TIBCO Designer, or in the adapter properties file, or at runtime in TIBCO Administrator.

L

local repository

An exported project is saved in DAT format to a local repository, and can only be used for development and testing. The DAT format can be used where data is not shared by more than one adapter. It is possible to have a few local adapters accessing a local project in read-only mode. It is, however, not possible to have more than one local adapter accessing a local project in read and write mode. Data are loaded at startup for local projects, so a local project has higher memory requirements.

P

palette

Each adapter includes a palette that is used for configuration. The palette is automatically loaded into TIBCO Designer during adapter installation and available the next time Designer is started. The palette enables you to configure adapter specific options, such as its connection to the vendor application, logging options, and adapter services.

During the design phase, the palette connects to the vendor application and fetches information about connection options and data schemas. You can then graphically select the appropriate items.

project

A collection of configured adapter resources. It contains configuration information for one or more adapter instances.

A local project is typically used at design time for testing. For production, a project is typically managed by an administration server provided by the TIBCO Administrator for the standalone adapter and TIBCO ActiveMatrix Administrator for the adapter service engine.

Publication Service

An adapter Publication Service recognizes when business events happen in a vendor application, and asynchronously sends out the event data in realtime to interested systems in the TIBCO environment.

R

Request-Response Service

In addition to asynchronously publishing and subscribing to events, an adapter can be used for synchronously retrieving data from or executing transactions within a vendor application. After the action is performed in the vendor application, the adapter service sends a response back to the requester with either the results of the action or a confirmation that the action occurred. This entire process is called Request-Response, and it is useful for actions such as adding or deleting business objects.

Request-Response Invocation Service

An adapter Request-Response Invocation Service is similar to the Request-Response Service, except that the roles are reversed. The vendor application is now the requester or initiator of the service, instead of the provider of the service. The adapter service acts as a proxy, giving the vendor application the ability to synchronously invoke functionality on an external system.

S

schema

Schema defines the data used by an adapter. Adapters use schema to describe data received from or sent to the TIBCO environment. For example, when you define a Publication Service, you need to define the schema to describe the data that will be published. When you save the project, both the adapter configuration and the corresponding schema are saved.

server repository

A project exported to a server repository is managed by a TIBCO administration server running in a separate process, typically elsewhere on the network. One or more adapters can communicate with a project managed by an administration server. Each can support multiple projects.

SOAP (Simple Object Access Protocol)

A basic web services standard for making web services available remotely. See www.w3C.org/TR/SOAP/for details. See also *UDDI*, *WSIL*, *WSDL*, *WSRP*

standalone adapter

Standalone adapter projects are created and configured using TIBCO Designer, and deployed using TIBCO Administrator.

Subscription Service

An adapter Subscription Service asynchronously performs an action, such as updating business objects or invoking native APIs, on a vendor application. The adapter service listens to external business events, which trigger the appropriate action.

Z

ZIP archive

A project exported to a ZIP archive is written to the location you specify as a read-only ZIP file. A project exported as a ZIP archive can be imported into TIBCO Designer.