

# **TIBCO BusinessEvents® Administration**

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# TIBCO Documentation and Support Services

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All TIBCO documentation is available on the TIBCO Documentation site, which can be found here:

<https://docs.tibco.com>

## Product-Specific Documentation

Documentation for TIBCO products is not bundled with the software. Instead, it is available on the TIBCO Documentation site. To directly access documentation for this product, double-click the following file:

`TIBCO_HOME/release_notes/TIB_businessevents-standard_version_docinfo.html` where `TIBCO_HOME` is the top-level directory in which TIBCO products are installed. On Windows, the default `TIBCO_HOME` is `C:\tibco`. On UNIX systems, the default `TIBCO_HOME` is `/opt/tibco`.

The following documents for this product can be found in the TIBCO Documentation site:

- *TIBCO BusinessEvents Installation*
- *TIBCO BusinessEvents Getting Started*
- *TIBCO BusinessEvents Architect's Guide*
- *TIBCO BusinessEvents Developer's Guide*
- *TIBCO BusinessEvents Configuration Guide*
- *TIBCO BusinessEvents WebStudio User's Guide*
- *TIBCO BusinessEvents Administration*
- Online References:
  - *TIBCO BusinessEvents Java API Reference*
  - *TIBCO BusinessEvents Functions Reference*
- *TIBCO BusinessEvents Release Notes*

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# Administration Overview

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The *TIBCO BusinessEvents Administration* guide explains how to prepare for deployment. It also explains how to deploy, monitor, and manage the runtime application.

Before you begin to use *TIBCO BusinessEvents Administration*, gain a basic familiarity with the product by completing the tutorials in *TIBCO BusinessEvents Getting Started*, and read *TIBCO BusinessEvents Architect's Guide*.

## Building EAR Files for Deployment

Deployment requires project EAR files, which are considered as an input for administrative tasks. EAR files is explained in [Enterprise Archive \(EAR\) Files](#).

You can build EAR files as follows:

- Using TIBCO BusinessEvents Studio. See [Building an EAR File in TIBCO BusinessEvents Studio](#).
- At the command line. See [Building an EAR File at the Command Line](#).

## Deploy-Time Configuration

System level configuration is generally needed. Edit the engine TRA file to add and set values for settings that are read before the engine starts.

- See [JVM-Level TRA File Configuration](#)

If you use TIBCO BusinessEvents Monitoring and Management (MM) component, you must first configure it to work with your cluster. Two kinds of configuration are documented:

- Basic configuration is about connecting with the cluster to be monitored, including defining the site topology file for cluster to be monitored. The Site Topology file configures the processing units and agents for deployment in Deployment Units (DUs) to hosts. See [Basic MM Configuration](#).
- Operational configuration is performed to suit your needs, for example to set up health level metric thresholds, alerts, and actions. See [MM Metrics and Features Configuration](#).

## Custom Functions and Third-Party Jars at Deploy-time

With all methods of deployment, you must ensure that certain files are available at runtime. If your project has JAR files for custom functions or third-party software, you must manually copy them to the runtime location. Copy them to a location on the classpath of the deployed application. The recommended location is the `BE_HOME/lib/ext/tpcl` directory. If you choose a location that is not in the classpath, then update the classpath in the TRA file to include the location.

At runtime the software uses the classpath set in the `be-engine.tra` file to locate the libraries (third-party libraries and custom function libraries) needed to execute the code. Ensure that you have added all the classpaths needed before you deploy. For example, you must update the classpath to specify the locations of libraries for TIBCO Enterprise Message Service, TIBCO Rendezvous, third party software, and custom functions.

## Business Rules Deployment Directory Property

Before deploying a business rule and starting the engine, you must set the property `be.cluster.ruletemplateinstances.deploy.dir` in the Cluster Deployment Descriptor (CDD), `be-engine.tra`, or in a `.properties` file. The property specifies the directory from which the engine loads business rules for the specific project. During startup, the engine reads the business rules from the specified directory and loads them into all the rule sessions. Ensure that the directory is local to the machine on which the engine is running. To avoid conflicts, the deployment directory specified should not contain business rules for other projects.

## Deployment

The output of a design-time project is one or more Enterprise Archive (EAR) files and one or more CDD files.

For details on configuring and building these files, see [Enterprise Archive \(EAR\) Files](#).

An EAR file deploys as one TIBCO BusinessEvents processing unit (engine). A processing unit can either contain one cache agent, or it can contain one or more agents of other types. Processing units and agents are defined in the CDD file.

When you deploy an EAR, you specify the CDD file to use, and you specify which processing unit class to deploy.

You can deploy in these ways:

- Using TIBCO BusinessEvents Monitoring and Management options. This is the recommended way. See [Deployment and Management of Engines with MM](#).
- At the command-line. See [Building an EAR File at the Command Line](#).
- To a TIBCO Administrator domain. See [Deploy a Project in a TIBCO Administrator Domain](#).



For details about deploying TIBCO BusinessEvents Decision Manager classes (implemented virtual rule functions) see *TIBCO BusinessEvents Decision Manager User's Guide*.

## Overriding Global Variables at Deploy Time

All methods of deployment enable you to override global variables at deploy time. For design time procedures relating to global variables see Working with Global Variables in *TIBCO BusinessEvents Developer's Guide*.

## Hot Deployment

You can configure your TIBCO BusinessEvents engine to allow you to replace the EAR file without shutting down the engine. This is known as [Hot Deployment](#).

TIBCO BusinessEvents Monitoring and Management also allows hot deployment. See [Hot Deployment](#) for information pertinent to Monitoring and Management (MM).

## Management and Monitoring

Depending on your method of deployment, you can use either MM or TIBCO Administrator (with TIBCO Hawk) for monitoring and management:

- [Monitoring and Management Component \(MM\) for TIBCO BusinessEvents Cluster](#).
- Certain topics in [Project Deployment in a TIBCO Administrator Domain](#), and [TIBCO Hawk Microagent Methods](#).

## Authentication and Authorization

Certain components use authentication (BEMM, TIBCO BusinessEvents Views, TIBCO BusinessEvents Decision Manager). Currently only TIBCO BusinessEvents Decision Manager uses authorization (access control).

- [User Authentication](#)
- [Configuring Access Control for a Project](#)

## Cluster Startup and Shutdown

There are only two main points to keep in mind for orderly system startup and shutdown:

- **Start storage-enabled agents (cache agents) first**  
When Cache OM is used, you must start a node that has storage enabled first. In production systems that would be a dedicated cache agent engine. (In test deployments this could be another type of agent node with cache storage enabled.)
- **Stop other engines before storage-enabled agents (cache agents)**  
In unusual situations where all cache agents are stopped but engines running other types of agents are running, you must restart all engines.

## Engine Startup and Shutdown

Certain actions occur in sequence during engine startup and shutdown.

In any particular project only some of these startup or shutdown actions may be required. For example, a project may have no startup rule functions.



TIBCO BusinessEvents Express: Content relating to Cache OM and backing store does not apply to TIBCO BusinessEvents Express edition.



During startup, the TIBCO BusinessEvents engine tries to load all the business rules present in the shared folder. Any failure when loading the business rules prevents the engine from starting.

Except where noted, this section assumes cache OM and inference agent startup and shutdown. It provides the main milestones only.

## Engine Startup Sequence

Startup sequence explains the actions during engine startup.

1. System information displays (in consoles) and is recorded in the log file:
  - a. The property file and EAR file that were used to start the engine.
  - b. The version of the JAR files it is using, and the version of the JAR files that the EAR file was built with.
2. Cache OM with backing store only: Recovery stage. When the minimum number of cache agents is started (as defined by the Cache Agent Quorum CDD setting), the cluster enters the recovery state. Various caches are preloaded from the backing store, according to preload settings. When Recovery state ends, the cluster enters Ready state.
3. All inference agents build their Rete networks by evaluating conditions against all Cache Plus Memory objects (if any). For (Cache OM only) Inactive (Standby) Nodes: If all agents in an engine are inactive, then this ends the startup sequence for that engine.
4. Channels start up for outbound traffic (inbound listeners do not start yet).
5. Scorecards are created.
6. Startup functions execute (for example, they initialize values of scorecards).
7. The first RTC cycle occurs and all rule actions that are eligible to execute now execute. (Scorecards and startup rule functions can cause rules to be eligible to execute. Depending on the state of entities recovered from the backing store, the RTC will take more or less time.) See *TIBCO BusinessEvents Architect's Guide* for more details about RTC cycles.
8. The engine startup advisory event is asserted, and its RTC occurs (as needed).
9. Time events (if any) are asserted:
  - a. The clock starts for repeating time events and they are created and asserted at the specified intervals.

- b. Rule-based time events (recovered or scheduled in a startup action) are asserted after the specified delay. The delay begins when the rule or rule function action executes, so at startup, it is possible for time events to have passed their start time, and they are asserted immediately.
10. Inbound channel listeners activate and accept incoming events and the system is now fully started up.



The `be.engine.startup.parallel` is used to start inference agents concurrently, that is in parallel. By default, 5.X inference agents start serially.

## Engine Shutdown Sequence

Shutdown sequence explains the actions during engine shutdown.

1. Inbound channels and listeners shut down.
2. Shutdown rule functions execute
3. An RTC occurs (as needed).
4. Outbound channels shut down.

## Order of Precedence at Runtime

Certain order of precedence is established at runtime, from the highest priority to lowest.

1. Command-line arguments at engine startup.
2. Properties set in property files specified at the command line.
3. Properties in the deployed TRA file.
4. CDD file, processing unit level (for the current PU): properties and settings.
5. CDD file, agent class level (for agents listed in the current PU settings, prioritized in reverse order of that list): properties and settings.
6. CDD file, cluster level: properties, settings and message encoding.
7. EAR file properties (such as global variable overrides).



Global variables set in the CDD file are ignored if you deploy using TIBCO Administrator. They are overridden by variables set in TIBCO BusinessEvents Monitoring and Management.

TRA files should be used only for system-level settings that must be read before the JVM starts. All other properties should be in the CDD.

## Values Used to Establish the Engine Name

When establishing the engine name, TIBCO BusinessEvents is searching for a value, and accepts the first found value.

- For deployment using MM, the name specified in the Processing Unit Configuration Name field in the site topology file. See [Site Topology](#).
- API setting. If TIBCO BusinessEvents is started using the public API, and a non-null instance name is provided when getting the RuleServiceProvider with `RuleServiceProviderManager.newProvider(String instanceName, Properties env)` — this takes precedence over all other name settings.
- The engine name set at the command line using the `-name` option. An engine name set at the command line overrides the engine name property set in the CDD file or `be-engine.tra` or supplementary property file.
- The engine name set by the `be.engine.name` property in the TRA file. For command-line startup it can be set in a supplementary property file.

- The engine name set in the CDD file, in the Processing Unit tab Name field. See Agent and Processing Unit Configuration in *TIBCO BusinessEvents Developer's Guide*.
- The name of the TIBCO Hawk microagent instance. This name exists if TIBCO Hawk is enabled at runtime. The microagent name can also be set in the `be-engine.tra` file using the property `Hawk.AMI.DisplayName`.
- The host name.
- This string: `engine`.

## JVM-Level TRA File Configuration

The engine executable files each have an associated configuration file with the extension `.tra`. These files are updated only for JVM-level property settings.

As needed, configure the TRA file for JVM-level settings that must be set before the TIBCO BusinessEvents engine starts. Other settings go in the CDD file. JVM-level settings in the CDD file are ignored. For non-TIBCO BusinessEvents related JVM settings, see Java documentation as needed. The TRA file also contains some helpful comments for such properties.

At runtime the software uses the classpath set in the `be-engine.tra` file to locate the libraries (third-party libraries and custom function libraries) needed to execute the code. Ensure that you have added all the classpaths needed before you deploy. For example, you must update the classpath to specify the locations of libraries for TIBCO Enterprise Message Service, TIBCO Rendezvous, third party software, and custom functions.

In some cases you must also copy the JAR files. If a JAR has dependencies on native libraries, edit `BE_HOME/bin/be-engine.tra` and as needed, update `LD_LIBRARY_PATH`, `SHLIB_PATH`, and `LIBPATH` as needed, depending on the operating system. For the design-time equivalent of these tasks, see *Adding and Working with Launch (Debug or Run) Configurations and Enabling the Test Connection Feature in TIBCO BusinessEvents Developer's Guide*.

For additional information about system configuration, see the following

- For TIBCO Enterprise Message Service and TIBCO Rendezvous Channels.

If the software is installed locally, set the `EMS_HOME` variable or `RV_HOME` variable in the `BE_HOME/bin/be-engine.tra` files. The classpath already contains entries for these variables.



For JMS channels that use TIBCO Enterprise Message Service version 5, installed locally, you must change the existing setting in the `be-engine.tra` property `tibco.env.STD_EXT_CP`: Change `%EMS_HOME%/clients/java` to `%EMS_HOME%/lib`.

- Local installation is the only option for TIBCO Rendezvous, which is not a pure Java API.

If TIBCO Enterprise Message Service is not installed locally, copy the `jms-2.0.jar` and `tibjms.jar` files to `BE_HOME/lib/ext/tpcl`. This location is specified in the standard classpath in the `be-engine.tra` file as shipped.

- For WebSphere MQ Channels, copy the copy the relevant JAR files and the binding file to the directory `BE_HOME/lib/ext/tpcl`.

This location is specified in the standard classpath in the `be-engine.tra` file as shipped.

- For instructions on configuring the system to work with ActiveMatrix BusinessWorks see *ActiveMatrix BusinessWorks Integration in TIBCO BusinessEvents Developer's Guide*.

## Setting Property for Cache Based Object Management on AIX

A specific property must be added to all TRA files when TIBCO BusinessEvents is installed on AIX and uses cache-based object management.

### Procedure

1. Add the following property: `java.net.preferIPv4Stack`

2. Set the property value to `true`:

```
java.net.preferIPv4Stack=true
```

3. If you do not add the property, you see the following exception:

```
java.net.SocketException: The socket name is not available on this systemI
```



Remember to set this property on all internal TIBCO BusinessEvents engines' TRA files too, such as in `be-mm.tra` for the TIBCO BusinessEvents Monitoring and Management (MM) server and the MM broker properties set in the MM CDD file. Add-on products also have engine TRA files you must update.

## Setting JMX Properties

JMX properties are set for various purposes.

### Procedure

1. Set JMX properties for the MM component to monitor the cluster.

Configure various JMX settings as described in [JMX Properties and To-Be-Monitored Engine TRA Files](#).

2. Set JMX properties for other purposes.

Using a JMX-compliant monitoring tool such as JConsole can be useful for other purposes. For example, MBeans enable you to see cache details if you are using Coherence as the cache provider.

3. To enable a JMX-compliant monitoring tool to view the exposed MBeans, set these properties in the `BE_HOME/bin/be-engine.tra` files:

```
java.property.com.sun.management.jmxremote=true
java.property.com.sun.management.jmxremote.ssl=false
java.property.com.sun.management.jmxremote.port=5558
```

4. You can also set the JMX connector port for deployment with TIBCO Administrator using this CDD property:

```
be.engine.jmx.connector.port
```

## Basic MM Configuration

TIBCO BusinessEvents Monitoring and Management (MM) component has to be configured for use with a deployed TIBCO BusinessEvents cluster.

The tasks are arranged in a reasonable order, but the specified order is not required for many of them:

- The MM server cluster uses Cache based object management, but MM can monitor TIBCO BusinessEvents engines running in In-Memory mode too.
- TIBCO BusinessEvents MM allows you to monitor multiple clusters. Each cluster is configured using its own site topology file. The cluster names must be unique.
- For monitoring machine-level metrics TIBCO Hawk® is required. Other metrics are available without use of TIBCO Hawk. The version of TIBCO Hawk provided with TIBCO Runtime Agent is sufficient.
- TIBCO BusinessEvents Express edition can monitor and manage only engines running in In-Memory mode.

Before you begin, the following monitored cluster project files must be correctly configured and available on the MM server machine.

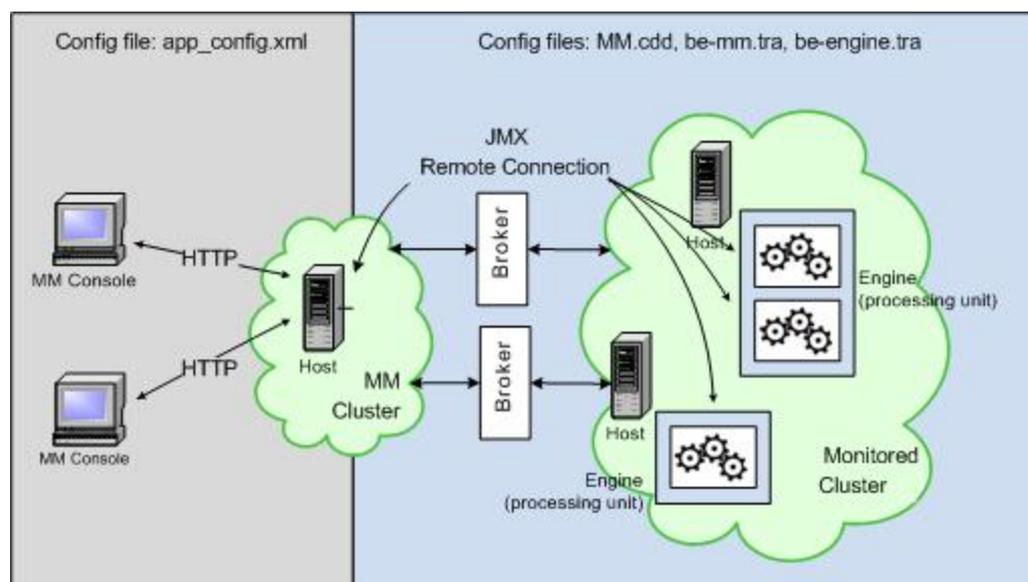
- The CDD files: Cache OM and In-Memory are supported. However, monitoring In-Memory and Cache OM simultaneously is not supported.
- The EAR files: The EAR files containing the compiled TIBCO BusinessEvents Studio projects. See *TIBCO BusinessEvents Developer's Guide* for details on maintaining these resources.

## MM Runtime Architecture

TIBCO BusinessEvents Monitoring and Management (MM) consists of MM consoles and a MM cluster.

The conceptual diagram shows the MM cluster in the center, the web-based MM Console on the left, and one instance of the monitored cluster on the right. The monitored cluster is connected to the MM cluster through JMX, and through a Java process that uses RMI to connect the two clusters. This process is known as a broker. Note that the broker is used only with the Coherence cache provider and is not required for the TIBCO BusinessEvents DataGrid cache provider.

### MM Runtime Architecture



Remote JMX connections enable MM to connect to the MBeans exposed in the monitored cluster's engines. These MBeans allow the user to invoke remote operations from MM Console to gather

performance metrics. Additionally, software utilities are used for remote start and deployment, and TIBCO Hawk is used for machine level metrics.

Files used to configure the console and the connection to the monitored cluster are shown along the top of the diagram.

## Software for Remote Start and Deployment

Several software utilities are available to perform remote operations.

For more details, refer to the software utility's documentation.

### *Software Options for Deployment, Remote Start, and Remote Method Invocation*

Software	Deployment	Remote Start, Stop	Remote Method Invocation
SSH	Yes	Yes	
PsTools (Windows)		Yes	
TIBCO Hawk		Yes	Yes
JMX (required)			Yes

### **Deployment using MM requires SSH**

Although it is possible to use more than one utility for the machines in the cluster, it is recommended that you use only one across all the machines. Ensure that the software is installed and running on all relevant machines.



The software you use on each machine in the monitored cluster is specified in the cluster's site topology file. See [Start PU Method Setting](#).

## SSH

Only SSH software enables MM to deploy TIBCO BusinessEvents software to the predefined hosts, that is, those configured in the monitored cluster's site topology file. SSH can also be used to start remote engines.

The SSH utility is available on UNIX machines by default and no action is required. On Windows machines, you must install an SSH server.



The username/password that you must use to stop the engine are the same username/password that you use to log into the BEMM UI. It's not the credentials of the remote machine that you used to start the engine.

These credentials are different because to start the engine you use SSH, and to stop the engine you use one of the MBeans methods, which use the MM user credentials.

Therefore, SSH certificates cannot be used with the stop operation.

### **Installing and Configuring an SSH Server**

If you want to use SSH on Windows machines, you must download the software and install it. Many SSH servers are available. For Windows, OpenSSH and Copssh are supported. See the product readme file for specific versions that are supported.

TIBCO has tested with OpenSSH software. See the product readme file for specific versions that are supported. If you use the OpenSSH server, note the following when installing OpenSSH:

- The OpenSSH package is not a part of the default Cygwin installation. During its installation, ensure that you select the OpenSSH package. Also select the option `Select required packages (RECOMMENDED)` to install all the required packages to satisfy the dependencies.
- Accept the default username suggested when configuring the OpenSSH server and provide a password for the username.
- For deployment and starting PUs, TIBCO recommends that you use the user login that was used to install and configure OpenSSH. The credentials of the user can be specified in the host settings of the site topology file, Host Settings User and Password fields.

However, if you choose to use a different user, you must ensure that the user is added to the SSH server.

## TIBCO Hawk®

To use TIBCO Hawk to start remote engines, it must be installed and running on the MM server machine and on all the client machines that use MM with TIBCO Hawk.

All machines in the same cluster must use the same TIBCO Hawk domain and use the same transport definitions (server, network, daemon port).

TIBCO Hawk is also used for machine-level monitoring. See [TIBCO Hawk Configuration for Machine Level Metrics](#).

The same properties are used for both purposes. TIBCO Hawk is used for remote start only if specified in the cluster's site topology file. See [Start PU Method Setting](#).

## PsTools

PsTools is an open Windows utility that enables execution of processes on remote machines. You can use PsTools to start remote engines only when both MM and the target host run on Windows.

### Installing and Configuring PsTools — Accepting the Certificate

To use PsTools you must download it to every target machine and save it to `BE-HOME/mm/bin/pstools`.

The first time PsTools is run on a client machine, a pop-up window appears. You must accept the certificate so that PsTools becomes fully functional. Do this once on each host machine.

## TIBCO Hawk Configuration for Machine Level Metrics

To monitor machine level statistics, you must use TIBCO Hawk software as well as TIBCO Rendezvous as the transport.

The version of TIBCO Hawk provided by TIBCO Runtime Agent is sufficient for this functionality.

Using TIBCO Hawk allows you to visualize machine-level metrics in the MM UI. These machine-level metrics are made available by TIBCO Hawk micro agents. If you do not configure the TIBCO Hawk domain, the enterprise monitor won't show the machine-level metrics, but it will show all other levels of metrics.

TIBCO Hawk can also be used for starting remote engines. See [Software for Remote Start and Deployment](#) for other options.

## Configuring TIBCO Hawk

The configuration shown here is used both for configuring machine level metrics and for remote engine startup.

### Procedure

1. Install TIBCO Hawk and TIBCO Rendezvous software on the MM server machine, and on all client machines in the TIBCO BusinessEvents cluster whose machine-level metrics you want to monitor.
2. Configure a Hawk domain. A Hawk domain specifies a group of TIBCO Hawk agents that acts as a monitoring set. Each machine has a Hawk agent and various micro agents (HMA) that provide useful machine-level metrics to the enterprise monitor.

Use the same Hawk domain name and Rendezvous transport for all the monitored engines and for the emonitor application.

3. Import the `BE_HOME/MM/project/emonitor` project into your workspace and edit the `MM.cdd`. If you copy files into the workspace, remember to copy the `MM.cdd` file to the above location. In the `mm-class` agent properties list, add the following property to specify the Hawk domain:

```
tibco.clientVar.Domain=TIBCO Hawk Domain
```

4. If you use non-default values for the Hawk transport properties, you must specify them, also in the `mm-class` agent properties list in the `MM.cdd`. The properties are as follows:

```
tibco.clientVar.TIBHawkDaemon=Rendezvous daemon used by Hawk
tibco.clientVar.TIBHawkNetWork=Rendezvous network used by Hawk
tibco.clientVar.TIBHawkService=Rendezvous service used by Hawk
```

To use the default client socket, omit the daemon argument. Default service is 7474, and daemon is `tcp:7474`. See Hawk documentation for additional information.

5. Add the same properties you added to the `MM.cdd` file to the monitored project's CDD file, in the Cluster tab properties sheet.
6. In the `BE_HOME/mm/bin/be-mm.tra` file, set the `tibco.env.HAWK_HOME` property and the `tibco.env.RV_HOME` to point to the TIBCO Hawk and TIBCO Rendezvous installation root directories.
7. In the TRA files of all monitored cluster engines, set the properties `tibco.env.HAWK_HOME` and `tibco.env.RV_HOME`.

## JMX Properties and To-Be-Monitored Engine TRA Files

After the TIBCO BusinessEvents cluster engines are started, they use JMX MBeans to expose monitoring and management information to the MM server, and to allow remote method invocation.

The JMX port number must be specified before the engine's JVM starts. A variable for the port number is provided in the TRA file so that the actual value can be specified before the engine starts.

Note that in the current release, JMX with SSL is not supported.

### JMX Properties Configuration

JMX properties are provided in the shipped `BE_HOME/bin/be-engine.tra` file.

Following properties have to be commented:

- `#java.property.be.engine.jmx.connector.port=%jmx_port%`
- `#java.property.be.engine.jmx.connector.authenticate=false`

These properties have to be commented for all TRA files for all monitored TIBCO BusinessEvents engines as needed.

## Enabling Monitoring and Management

JMX for monitoring and management has to be exposed without authentication.

### Procedure

1. Uncomment the following property:  
`java.property.be.engine.jmx.connector.port=%jmx_port%`
2. Ensure that the value of the port property is set to this literal value: `%jmx_port%`.  
 The actual value is substituted at runtime.
3. See [JMX Remote Port Number Setup at Runtime](#).



When more than one PU (engine) is deployed on the same host, ensure that a different JMX port is used for each of the PUs, in the site topology file.

## Enabling JMX MBeans Authentication

To enable authentication:

### Procedure

1. Set the following property:  
`java.property.be.engine.jmx.connector.authenticate=true`
2. Configure the authentication technology you want to use in the emonitor project as explained in [User Authentication](#).

## JMX Remote Port Number Setup at Runtime

When you use the MM UI to start TIBCO BusinessEvents engines remotely, MM reads the port number from the PU configuration setting in the site topology file.

MM passes this value to the TRA file's `jmx_port` variable, in the command line it composes when starting a TIBCO BusinessEvents engine:

```
-propVar jmx_port=portnum
```



If you start an engine manually from the command line, provide the port number in the same way, that is, using the option `-propVar jmx_port= portnum`. If the port number is not specified, the default port 5555 is used.

Use the same JMX port number as specified in the PUC so that MM treats the engine as a predefined engine. If you use a different number, the engine starts as an un-predefined engine.

## User Authorization for Administrator and User Roles

MM authorization uses two preconfigured roles.

These roles are specified in the provided passwords file that is used for file-based authentication:

```
BE_HOME/mm/config/users.pwd
```

The file as shipped contains the following entries:

```
jdoe:A31405D272B94E5D12E9A52A665D3BFE:MM_ADMINISTRATOR;
mm_user:11b2016b63c99ef7ab6d6d716be7b78e:MM_USER;
admin:21232f297a57a5a743894a0e4a801fc3:MM_ADMINISTRATOR;
```

If you add more users ensure that they have the appropriate role. Note that role names are case sensitive:

- *MM\_ADMINISTRATOR*: Users with this role can execute methods, for example to deploy, start, and stop engines, and invoke method operations
- *MM\_USER*: Users with this role can view MM Console, but cannot deploy, start, or stop engines, or invoke method operations



To use LDAP authentication, you must add these roles in the LDAP directory for the relevant users.

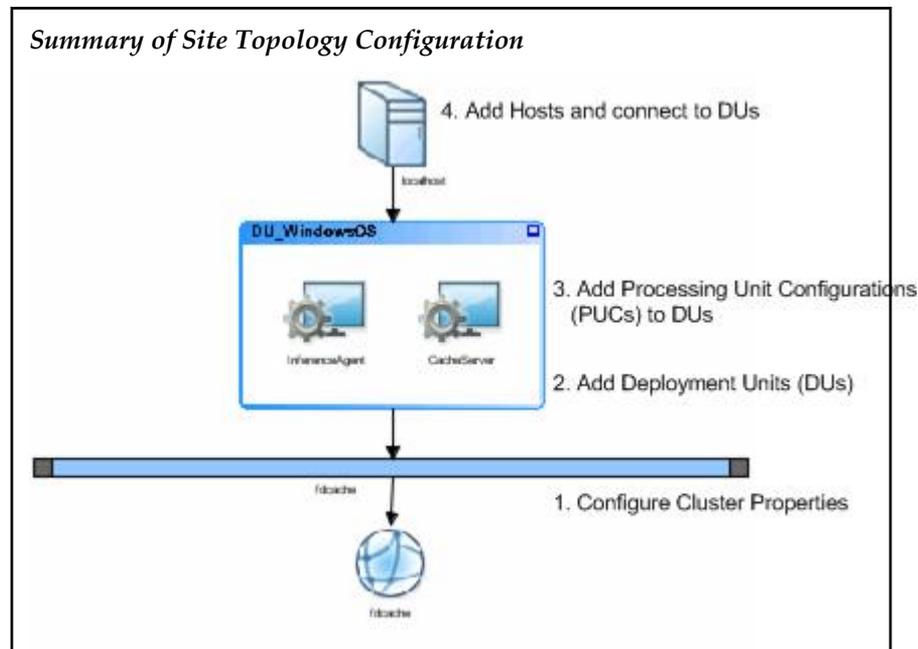
See [User Authentication](#) for more on authentication topics, and configuring the password file.

## Site Topology

The site topology file contains deploy-time information such as what processing units to deploy to specific machines in your environment.

You need to know information about the machines that will host the agents you plan to deploy, for example information about the machines' operating system and IP address.

You also need to know what remote invocation software you'll use to start remote processes on these machines: TIBCO Hawk, PSTools, or SSH.



- Changes to the EAR file do not affect the topology configuration. However if the cluster, processing unit, or agent definitions in the CDD file change, you must recreate the site topology file using the updated CDD.
- If you change the site topology, you must restart the MM server.

When possible, use the graphical site topology file editor in TIBCO BusinessEvents Studio. It provides validation and structure that are helpful.

When working on runtime installations, however, it may not be possible to use TIBCO BusinessEvents Studio. An annotated site topology file template is available, so you can edit the XML-based topology file in a text editor. It is located in:

`BE_HOME/mm/config/site_topology_template.st`

If you are editing the file directly, adapt the GUI-based instructions accordingly. The configuration requirements are the same in both cases.

Using the canvas-based editor in TIBCO BusinessEvents Studio, you create a visual representation of the desired site topology. Tabs showing the properties let you configure each item represented by the topology diagram icons: the cluster, hosts, deployment units, and processing unit configurations.

The output of this activity is an XML file used in MM. Summary steps are shown below. Detailed steps are provided in [Site Topology in TIBCO BusinessEvents Studio](#).

## Configuring the Site Topology

The site topology is best configured using the graphical site topology file editor in TIBCO BusinessEvents Studio.

### Procedure

#### 1. Configure Cluster Properties

In the Cluster Properties tab, reference the fully configured CDD and EAR files for your project. See [Project Master and Deployed Locations of CDD and EAR Files](#) for more on the use of these files.

#### 2. Add Deployment Units (DUs) to the canvas as needed.

For each DU, specify the following:

- The location of the CDD and EAR files. MM copies the files to the specified location at deploy time.



See the note in [Project Master and Deployed Locations of CDD and EAR Files](#) for an important limitation when deploying multiple DUs on one machine.

- One or more *processing unit configurations* (PUCs). You'll configure the PUCs in the next step.

#### 3. Add Processing Unit Configurations (PUCs) to DUs.

For each PUC, select one processing unit (PU) from the list of PUs defined in the CDD file. Set deploytime properties such as the JMX ports used by MM to communicate with the deployed engine.

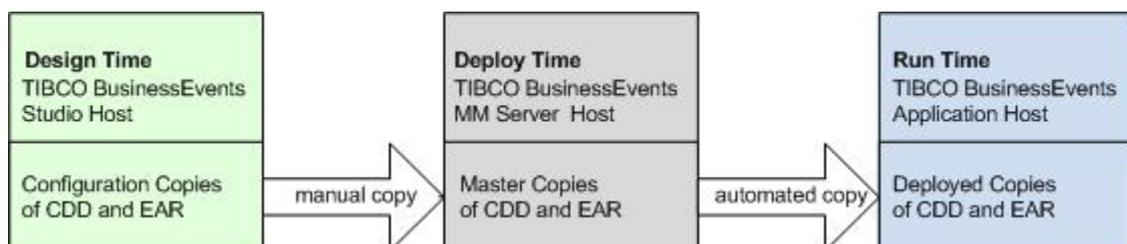
#### 4. Add Hosts.

Here you specify the machine configuration, including the software used on the remote machines to start processes remotely. To deploy a DU to a host, connect the DU to that host in the canvas editor. Multiple hosts can use the same deployment unit, if the intent is to reuse an identical configuration on more than one machine.

## Project, Master and Deployed Locations of CDD and EAR Files

In the topology file, you reference three locations for the CDD and EAR files.

### Locations for the CDD and EAR Files



The files in each location must be exact copies:

- Project CDD file:** In the cluster configuration tab, you specify a locally available copy of the project CDD, used only at design-time for configuring the topology file in TIBCO BusinessEvents Studio.
- Master CDD and EAR files:** Also in the cluster configuration tab, you specify the location of the master CDD and EAR files. These copies must be manually copied to the specified location on the MM server, for use in deployment.

- Deployed CDD and EAR files: In the Deployment Unit settings, you specify where MM will place the CDD and EAR files when it performs deployment.

The project and master CDD can be in the same location if you are using one machine to configure the topology file and to run MM server. These two sets of fields are available in case you are configuring the topology on a different machine from the MM server machine.



- All locations specified must already exist. The software does not create directories.
- Use the correct path delimiter for the operating system of the host machines.

## Deployment-Specific Processing Units and Global Variables

In general, you can reference one processing unit multiple times to create different processing unit configurations (PUCs). However processing units that have deployment-specific settings cannot be used in this flexible manner.

- Agent-Instance-Specific Properties: If a processing unit contains agent-instance-specific properties (such as agent key and priority settings), you must use it in only one PUC, which is used in only one DU, that is itself used only once in the deployment.
- Host-Specific Processing Units: Processing units can host-specific settings. If a deployment unit contains a PUC that references such a processing unit, you must link it only to the appropriate host for deployment. For example, the Coherence cache provider property `tangosol.coherence.localhost` property is a host-specific setting, and so is the TIBCO BusinessEvents DataGrid property `be.engine.cluster.as.listen.url`.
- Global Variables: Note that global variable overrides (if any) set in the master CDD are used for command-line deployment. They can be overridden by TIBCO BusinessEvents Monitoring and Management settings. If you plan to deploy using MM, override global variables using MM, instead of in the CDD file.

## Site Topology in TIBCO BusinessEvents Studio

Before you begin ensure that you have a valid CDD file. The processing units that you will deploy to the various hosts are defined in the CDD.

### Adding a Site Topology Diagram



Disable Animation to Avoid Display Issues. Animation can cause display problems. To disable animation, go to **Windows > Preferences > TIBCO BusinessEvents > Diagram**. In the Animation section, uncheck the **Allow** checkbox.

#### Procedure

1. Open the project in TIBCO BusinessEvents Studio. Select the project root, right-click and select **New > Other > TIBCO BusinessEvents > Site Topology**.
2. At the New Site Topology Wizard, enter a unique Site Topology name and optional description.
3. Select the Cluster Deployment Descriptor (CDD) that contains the PU definitions and other details you want to use. Only CDD files within the studio project you are configuring are available for selection.
4. Click **Finish**. The site topology editor is now ready to build the site topology diagram.

## Configuring the Site Topology

### Procedure

1. On the canvas, click the site icon (the globe). In the Site Properties tab you can change the site name and description as desired. Other fields are view-only.
2. Click the blue bar, which represents the cluster. In the Cluster Properties tab, specify the following:
  - The location of the Project CDD, which must be available to the TIBCO BusinessEvents Studio Explorer. The CDD you have selected with the wizard.
  - The location of the Master CDD and EAR on the MM server, which reads these files and copies them to the remote deployment locations specified in the DUs.



If the MM server is on a different machine from the machine where you are running TIBCO BusinessEvents Studio, you must copy the master files to the specified location so they are available for use by MM.

See [Project Master and Deployed Locations of CDD and EAR Files](#) for details.

3. Add one or more deployment units: In the Site Topology section of the palette to the right of the canvas, click the deployment unit icon and then click the canvas. A DU icon appears on the canvas. Click again to add more DUs. Right-click the canvas to stop adding units. (If the palette is not visible, click **Window > Show View > Palette** or **Window > Reset > Perspective** ).  
A connection arrow appears automatically, connecting each deployment unit to the cluster.
4. Click each DU in turn and configure the Deployment Unit Properties tab settings.
  - In the Deployed CDD and Deployed EAR fields, specify the directory where MM will put the files when it deploys this DU to the host machine.
  - Click **Add** and add one or more processing unit configurations (PUCs) to the deployment unit.
5. Configure processing unit configurations (PUCs): In the DU property sheet, double click one of the listed PUCs (or click the PUC icon shown in the diagram). The Processing Unit Configuration properties appear. Configure the PUC as follows (and configure the rest of the PUCs in a similar way):
  - As desired, replace the default PUC name with a name of your choice.
  - As desired, select the option to use the PUC name as the engine name.
  - Select the processing unit to use for this configuration. The list displays the PUs defined in the CDD. You can use one PU in multiple DUs, as appropriate. When you select a PU, the number of agents defined for it displays. (No agent level configuration is done in the site topology editor.)
  - Set the JMX port for MM to perform monitoring and management. When multiple PUs are running on one host, each PU must have a different JMX port. You can reuse ports on different hosts, however.
6. Add one or more hosts. In the Site Topology section of the palette, click the Host icon, and then click the canvas. A host icon appears on the canvas. Click again to add more hosts. Right-click in the canvas area to stop adding hosts.
7. Click each host icon in turn and configure the Properties tab.
  - In the General tab, configure the host name (including the domain extension), IP, and as needed, the user name and password, and operating system.
  - In the Installation tab, ensure the TIBCO BusinessEvents Home and TRA file locations are correctly specified.

- In the Start-PU-Method tab, select an option to use for MM to start a processing unit on this host.
8. Connect each host to one or more deployment units:
- In the Links section of the palette, click the Connect icon.
  - Click a host and then the title bar of the deployment unit you want to deploy on that host.
- Right-click to stop connecting.
- To remove a connection, right-click to stop connecting, then right-click a connection arrow and click the Delete option.
9. Save.



The canvas has a property sheet too: click an empty area of the canvas to see the number of deployment units and number of processing units in the site topology.

### Site Topology Files for the MM Server

The MM server parses and loads all the site topology files, except the template file `site_topology_template.st`, located at `BE_HOME\mm\config`.



For backward compatibility, MM server loads the site topology file specified using the property `be.mm.topology.file` in the `MM.cdd` file. However, this property is deprecated in the release 5.1. TIBCO recommends that you put the site topology file to the `BE_HOME\mm\config` location.

If the location `BE_HOME\mm\config` does not contain any site topology file, the MM server fails to start with an appropriate message in the log file.

If a site topology file (with the same name) is present under `BE_HOME\mm\config` and is also specified using the property `be.mm.topology.file` in the `MM.cdd` file, only the site topology file specified in the property will be parsed and loaded by the MM server.

In a multicluster configuration, all the Master CDD files defined on every site topology file (STF) loaded by the MM server must have the same Cache Object Model. You cannot load one STF pointing to a Master CDD using Coherence Cache/DataGrid and another STF pointing to a Master CDD using TIBCO Cache/DataGrid.

### Site Topology Reference

#### *Site Topology – Site Settings*

Property	Notes
Site Name	Default value is the name of the site topology file. In a multi-cluster configuration, the name must be the same for every cluster (in each site topology file).
Description	Description of the site, as desired.

Property	Notes
Number of Clusters	<p>Read-only field. Only one cluster per site is supported in this release. (Not present in the site topology XML file.)</p> <p>Note that even in a multi-cluster configuration, each cluster is configured in a different site topology file. Hence, the number of clusters in the site topology file will always be one.</p>
Number of Hosts	<p>Read-only field displaying the number of hosts in this topology. (Not present in the site topology XML file.)</p>

### Site Topology – Cluster Settings

Property	Notes
Cluster Name	<p>Read-only field displaying the cluster name specified in the CDD. This name is set in the Cluster Name field of the CDD editor.</p> <p>In a multi cluster configuration, the cluster name must be unique for each cluster.</p>
TIBCO BusinessEvents Version	<p>Read-only field displaying the version of TIBCO BusinessEvents. Must match the Host Settings field of the same name.</p> <p><b>Note</b></p> <p>If you copy a site topology from a prior release into a project and open it in the current release, this field value displays the prior release version number. The field is red and it is editable. Update the field value to the current version. It again becomes a read-only field. Also change the host-level TIBCO BusinessEvents Version field in a similar way: both must match. If you migrate the project, this issue does not occur. See the section Migration from 4.x to 5.1, in TIBCO BusinessEvents Installation.</p>
Project CDD	<p>Location and name of project CDD. This is the location used by TIBCO BusinessEvents Studio for configuration of the site topology. See <a href="#">Project Master and Deployed Locations of CDD and EAR Files</a> .</p>
Master CDD	<p>Location and name of the master CDD. This is the location used by the MM server. See <a href="#">Project Master and Deployed Locations of CDD and EAR Files</a> .</p>
Master EAR	

Property	Notes
	Location and name of the master EAR. This is the location used by the MM server. See <a href="#">Project Master and Deployed Locations of CDD and EAR Files</a> .

### Site Topology – Deployment Unit Settings

Property	Notes
Deployment Unit Name	<p>Name of the deployment unit. It can be helpful to include the operating system of the host to which you will deploy this DU in the DU name. If a DU contains any host-specific settings, it's also a good idea to put the host name in the DU name.</p> <p>In a multi cluster configuration, the deployment unit name must be unique.</p> <p><b>Note</b></p> <p>Paths in different operating systems are specified using different tokens. Even if the DUs are identical in all other settings, you must create different DUs for different operating systems.</p> <p>Default value is DU_n where n is a number that increments each time you add a DU to the diagram.</p>
Deployed CDD	<p>Absolute file path to the location where the MM server will deploy the copy of the master CDD. See <a href="#">Project Master and Deployed Locations of CDD and EAR Files</a> .</p>
Deployed EAR	<p>Absolute file path to the location where the MM server will deploy the copy of the master EAR. See <a href="#">Project Master and Deployed Locations of CDD and EAR Files</a> .</p>
Processing Unit Configurations	<p>Displays a list of processing unit configurations. Adding and configuring PUCs is explained in <a href="#">Site Topology in TIBCO BusinessEvents Studio</a> .</p>

### Site Topology – Processing Unit Settings

Property	Notes
Processing Unit Configuration Name	<p>The name that identifies this configuration of the processing unit, as specified in the Processing Unit setting (see below). The processing unit name must be unique across the deployment unit.</p> <p>The processing units settings are configured in the CDD. For more information, see <i>TIBCO Business Events Developer's Guide</i>.</p>

Property	Notes
Use As Engine Name	<p>Check this checkbox to use the value of the Processing Unit Configuration Name field as the engine name.</p> <p>It is recommended that you use the same choice across all processing units in the cluster.</p>
Processing Unit	<p>Select the processing unit that you want to use. Only processing units configured in the CDD selected as the Project CDD appear in the list. The same processing unit can be used in multiple PUCs.</p>
Number of Agents	<p>Displays the number of agents in the selected processing unit. (Not present in the site topology XML file.)</p>
JMX Port	<p>JMX port used by MM to perform monitoring and management. Required.</p> <p>When more than one PU is deployed on the same host (in one DU or multiple DUs), you must ensure the JMX port in each of these PUs is different.</p> <p>See <a href="#">JMX Remote Port Number Setup at Runtime</a> for more details.</p>

### Site Topology – Host Settings

Property	Notes
General Settings	
Host Name	<p>Name of the machine hosting the mapped DUs (including the domain extension). Used for remote access. Used to identify the host in the MM user interface. Required.</p> <p>To validate the hostname, ping the host using this name from the MM server machine.</p> <p><b>Note</b></p> <p>: Specify the exact name of the host. Errors in the host name result in the host appearing in the MM Console UI as an unpredefined machine. Do not, for example, use localhost.</p>
IP	<p>IP address of the host machine. Used for remote access. Required.</p>

Property	Notes
User Name	<p>User name to log onto the host machine.</p> <p>The user credentials are used for remote deployment and execution, including starting a process unit.</p> <p>At runtime, a dialog box pops up to authenticate the user, for example when deploying a PU. If you provide a username and password here, then the dialog is prepopulated with these values. You can enter different values as needed.</p> <p>If you do not provide the credentials here, then you must provide them at the pop-up dialog.</p> <p>You can specify a local user or a domain user.</p> <p>Enter details for the user you specified for the remote connection utility you are using. For example, if you use PsTools, you would specify <i>domain\user</i> for domain users.</p> <p><b>Note</b></p> <p>If you use a SSH server, you must specify the same user credentials here that you used to install the SSH server, or the credentials of a user who is enabled to login to the SSH server.</p>
Password	<p>Password of the user referenced in the User Name field. The password is encrypted.</p> <p>See notes in User Name section.</p>
Operating System	<p>Operating system of the host machine. See the product readme for a list of supported platforms.</p>
Installation Settings	
TIBCO BusinessEvents Version	<p>Read-only field displaying the version of TIBCO BusinessEvents. Must match the Cluster Settings field of the same name.</p> <p><b>Note</b></p> <p>If you copy a site topology from a prior release into a project and open it in the current release, this field value displays the prior release version number, the field is red and it is editable. Update the field value to the current version. It again becomes a read-only field. Also change the cluster level TIBCO BusinessEvents Version field in a similar way: both must match.</p>
TIBCO BusinessEvents Home	<p>Install location of TIBCO BusinessEvents on the host machine, for example:</p> <p><code>c:/tibco/be/5.2</code></p>

Property	Notes
TRA File	Location of the be-engine.tra file, for example: <code>c:/tibco/be/5.2/bin/be-engine.tra</code>
Start PU Method Setting	
Start-PU-Method	<p>Choose the method that MM will use to start this processing unit on remote machines:</p> <ul style="list-style-type: none"> <li>• Use Hawk</li> <li>• Use PsTools</li> <li>• Use SSH. If you choose Use SSH, and do not want to use the default port number of 22, then also enter the port. The host must accept a secure connection through this port. Using the default port is generally recommended because it is also the default port used by most Linux SSH servers.</li> </ul> <p>Note that a username and password for the remote machines are required for MM to connect (see notes for User Name and Password fields).</p> <p>See <a href="#">Software for Remote Start and Deployment</a> for details on each option.</p> <p>Default is SSH. Default SSH port number is 22.</p>

## Basic MM Settings in MM.cdd

The MM server uses the `MM.cdd` file to perform basic configuration and also to configure alerts, health metric rules, and actions.

Configurations for alerts, health metric rules, and actions are uniform across all the clusters monitored by the MM server. Note that these configurations cannot be customized for each cluster individually.

Expert users can also edit the XML file using a text editor, but using the UI protects you from editing errors. Back up the file before editing it.

To run the MM server with the installation defaults, the `MM.cdd` file must remain in the installed location.

Within the CDD file change only the settings for the `mm-class` agent. The `mm-class` agent is defined using an internal type of agent class (Monitoring & Management) used only in the `MM.cdd` file.

Whenever you change the `MM.cdd` file you must restart the BEMM server so that it uses the updated values.

## Importing the emonitor Project for CDD Editing

The emonitor file cannot be edited in TIBCO BusinessEvents Studio outside of its project context.

In order to edit the CDD in TIBCO BusinessEvents Studio, you must import the project into your workspace.



As with any procedure that changes files, make sure that the emonitor project is backed up before you edit its CDD file.

## Procedure

1. In TIBCO BusinessEvents Studio, choose **File > Import Existing Projects into Workspace** and select the following project:  
`BE_HOME/mm/project/emonitor`
2. To edit the CDD file in its original location, uncheck the Copy the projects into workspace checkbox. (If you do copy the emonitor project into your workspace, remember to copy the edited CDD file to its original location.)
3. In Studio Explorer, double-click **MM.cdd** to open it in the CDD editor.

## Configuring the Basic Settings in the MM.cdd File

In order to edit the CDD using the CDD editor, import the eMonitor project into TIBCO BusinessEvents Studio.

### Procedure

1. Import the emonitor project into your workspace and open the CDD file for editing. See [Import the emonitor Project for CDD Editing](#) for details.
2. In the CDD editor, click the Agent Classes tab and select `mm-class` agent.
3. In the properties sheet, complete the values as explained in [MM Agent Basic Configuration Reference](#).

To monitor engines running in memory mode, add the property, `be.mm.monitor.in.mem`, to the properties and set its value to true.

To monitor engines running in cluster mode, set the value of the property to false. Alternately, you can remove the property from the properties sheet.

You must also specify the host address in the `tibco.clientVar.HTTPHost` property, and specify the port as needed.



If you are running on AIX you must add an additional property to the mm-agent class CDD properties. See [Setting Property for Cache Based Object Management on AIX](#) for details.

4. The monitored cluster's topology file must be located on the MM server under `BE_HOME/mm/config`. (see [Site Topology](#)). You can copy the file from its design-time location as needed. To monitor and manage other projects, ensure that the property `be.mm.topology.file` is either deleted from the MM.cdd file, or the property is set to "" (empty string).
5. Save the CDD. If you imported it to your workspace, copy it to `BE_HOME/mm/project/emonitor` and to `BE_HOME/mm/bin`.



Whenever you change the `MM.cdd` file you must restart the BEMM server so that it uses the updated values.

## MM Agent Basic Configuration Reference

This section provides a reference to the properties to be set in the Master CDD file.

### Master CDD mm-class Agent Class Properties

Property	Notes
<code>be.mm.monitor.in.mem</code>	<p>Enables the MM server to monitor engines running in memory mode when this property is set to true.</p> <p>You can either delete this property, or set the property to false to indicate monitoring engines running in cluster mode.</p>
<code>be.mm.topology.file</code>	<p>This property is deprecated in 5.1. The MM server locates and picks up all the site topology files present under <code>BE_HOME\mm\config</code>. To monitor and manage other projects, ensure that this property is either deleted from the file, or the property is set to "" (empty string).</p> <p>Fully qualified path to the site topology file for the cluster to be monitored. As shipped, points to the example project Fraud Detection Cache in TIBCO BusinessEvents Standard Edition and to the example project Fraud Detection in TIBCO BusinessEvents Express. See <a href="#">Site Topology</a> and sections following for more details.</p> <p><b>Note</b></p> <p>The topology file must be located on the same machine as the machine where the MM server is running.</p>
<p><b>Authentication Properties (auth section)</b></p> <p>Authentication is optional. Note that to avoid conflicts between authentication for MM and for add-on products that also use authentication, MM has its own set of property names. Authentication topics are documented in <a href="#">User Authentication</a>.</p>	
<p><b>HTTP Properties</b></p> <p>Do not change unless advised by TIBCO.</p>	
<code>be.channel.http.propertiesAsXML</code>	<p>Do not change unless advised by TIBCO.</p> <p>Default is <code>true</code>.</p>
<p><b>Email Properties for Actions Feature</b></p> <p><code>actions_email</code></p> <p>Configure the properties needed to send emails in response to alerts or health levels. Required only if you will use the Actions feature. Replace default values for host, email addresses and passwords.</p>	
<code>be.mm.email.protocol</code>	

Property	Notes
	Email protocol. Supported protocols are smtp and smtps. Default value is smtp.
<code>be.mm.email.authentication</code>	
	Specifies whether the user must authenticate to the email server. Possible values are true and false. If set to true then also configure the username and password properties. Default is false.
<code>be.mm.email.host</code>	
	Specifies the email host.
<code>be.mm.email.from</code>	
	Specifies the From address.
<code>be.mm.email.username</code>	
	Specifies the username used to authenticate to the email server. Used only if <code>be.mm.email.authentication</code> is set to true.
<code>be.mm.email.password</code>	
	Specifies the password used to authenticate to the email server. Used only if <code>be.mm.email.authentication</code> is set to true.
<b>Global Variable Overrides – HTTP</b>	
<code>global_variable_overwrite &gt; http</code>	
Overrides for the project global variables.	
<code>tibco.clientVar.HTTPHost</code>	
	Used by the emonitor project HTTP channel. Set to the IP address of the machine hosting the MM server. Default value is localhost
<code>tibco.clientVar.HTTPPort</code>	
	Used by the emonitor project HTTP channel. Specify as needed to avoid port conflicts. Default is 9000.
<code>tibco.clientVar.BEMMDocRoot</code>	

Property	Notes
	<p>The directory from which static HTML content is served.</p> <p>Do not change unless advised by TIBCO.</p> <p>Default is ../web-root.</p>
<code>tibco.clientVar.BEMMDocPage</code>	
	<p>The name of the default static HTML file stored in the document root. Do not change unless advised by TIBCO.</p> <p>Default is \index.html.</p>
<p><b>Global Variable Overrides – Frequencies</b>  <code>global_variable_overwrite &gt; frequencies</code></p>	<p>These properties define how frequently certain checks and updates are done. Modify as needed to ensure best performance.</p> <p>Overrides for the project global variables.</p>
<code>tibco.clientVar.TopologyUpdateFreq</code>	
	<p>Specifies the time interval between two consecutive calls to the monitored cluster to fetch the latest (current) cluster topology (in milliseconds). The purpose of this check is to ensure that the Cluster Explorer topology matches the actual cluster topology.</p> <p>Default is 30000.</p>
<code>tibco.clientVar.JMXUpdateFreq</code>	
	<p>Specifies the time interval between two consecutive calls to get metrics of each monitored entity in the cluster (in milliseconds). The purpose of this check is to ensure that metrics at all monitored entity levels are updated regularly.</p> <p>A monitored entity in a cluster can be a cluster, a machine, a process unit or an agent.</p> <p>Adjust as needed. For example, if the requests are affecting performance, increase the time interval. If you want more immediate notifications, decrease the time interval.</p> <p>Default is 30000.</p>
<code>tibco.clientVar.HealthCheckFreq</code>	
	<p>Specifies the time interval between two consecutive two health pings to each machine and process in the monitored cluster (in milliseconds).</p> <p>This property is used to determine which monitored entities are inactive. Inactive items are indicated in Cluster Explorer. See <a href="#">Inactive Members</a> for more details.</p> <p>Default is 30000.</p>
<code>tibco.clientVar.SweepFreq</code>	

Property	Notes
	<p>This setting applies only to unpredefined cluster members. Predefined cluster members (those defined in the topology file) are never purged.</p> <p>The time interval between two sweep checks to physically delete inactive purged cluster members in the discovered topology (in milliseconds).</p> <p>The <code>SweepFreq</code> property determines how often the system checks for inactive unpredefined cluster members to be purged, and the <code>SweepThreshold</code> property determines for how long an item must remain inactive before it is eligible for purging.</p> <p>If a user is viewing an inactive cluster member that another user has purged, the cluster member remains visible until the user has finished viewing the details.</p> <p><b>Note</b> Do not change unless advised by TIBCO. Default is 300000 (that is, five minutes)</p>
<code>tibco.clientVar.SweepThreshold</code>	
	<p>The length of inactivity for a purged cluster member to be qualified for physical deletion (in milliseconds).</p> <p>Also see notes for <code>Sweepfreq</code>.</p> <p><b>Note</b> Do not change unless advised by TIBCO. Default is 600000 (that is, ten minutes)</p>
<p><b>Global Variable Overrides — Hawk</b> <code>global_variable_overwrite &gt; hawk</code></p>	<p>Overrides for the project global variables. If you use non-default values, specify them here.</p>
<code>tibco.clientVar.Domain</code>	
	Name of the TIBCO Hawk domain.
<code>tibco.clientVar.TIBHawkService</code>	
	Rendezvous service used by TIBCO Hawk.
<code>tibco.clientVar.TIBHawkDaemon</code>	
	Rendezvous daemon used by TIBCO Hawk.
<code>tibco.clientVar.TIBHawkNetWork</code>	
	Rendezvous network used by TIBCO Hawk.

## Broker Properties for Working with Coherence Cache Provider

A broker process enables the MM cluster to communicate and retrieve information from the target cluster.

A multi-cluster configuration must have one broker per cluster, with each broker specifying its own set of properties. Each broker must have its unique RMI port. The RMI port is specified using the property `be.mm.broker.rmi.port`. The value of this property must be an integer and the default value is 11200.



The broker properties are not required for TIBCO BusinessEvents DataGrid clusters.

The broker properties *must* be specified in the Master CDD file at the cluster level. In the Master CDD file, only the properties present at the cluster level with the prefix `tangosol.coherence` or `be.mm.broker` are passed to the broker process.

For backward compatibility, the broker properties defined in the MM.cdd file with the prefix `be.metric.cluster.property` are still loaded. However, if a property with the same name exists in the MM.cdd file and the Master CDD file, the value specified in the Master CDD file takes precedence.

### Broker Properties Reference

Broker properties reference contains properties for working with a Coherence cache provider.

#### *Master CDD: Broker Properties for Working With Coherence Cache Provider*

Property	Notes
<code>be.mm.broker.killoldbroker</code>	<p>A broker process enables the MM cluster to retrieve information from the target cluster. If MM stops, the broker terminates after about three minutes.</p> <p>By default, if MM restarts before the previous broker terminates, it uses that broker. If the previous broker has terminated, however, then MM creates a new broker process, using the target cluster properties in the master CDD that is specified in the topology file.</p> <p>When set to true, the existing broker process is never reused on startup. For example, if you want to monitor a different cluster when you restart MM (by specifying a different topology file), then you would set this property to true.</p> <p>Default is <code>false</code>.</p>
<code>be.mm.broker.log.file</code>	<p>Location of the log file for the broker relative to the working directory. The broker connects to the cluster that is to be monitored. This file relates to cluster activities.</p> <p>Default is <code>logs/mm-broker.log</code>.</p>
<code>be.mm.broker.rmi.port</code>	

Property	Notes
	<p>Port used to establish the RMI (Remote Method Invocation) communication between the MM cluster and the cluster to be monitored.</p> <p>Specify a valid port number for this property. The value must be an integer that corresponds to an open port on the machine hosting the MM server. The default value of the port is 11200 .</p> <p>Specify a unique RMI port for each Master CDD corresponding to the cluster that is to be monitored. The property must have a different value for each Master CDD file.</p>
<code>be.mm.broker.tangosol.coherence.localhost</code>	
	IP address of the server machine. Required only if you are using a non-default IP interface.
<code>be.mm.broker.tangosol.coherence.localport</code>	
	<p>Specifies the port that the socket will listen to or publish on.</p> <p>If more than one cluster is running on the same subnet, then even though they have different cluster names and cluster addresses, you may need to specify this property to avoid conflict.</p> <p>Also used for Coherence WKA configuration. See <a href="#">TIBCO BusinessEvents DataGrid WKA Discovery</a> .</p> <p>Possible values are 1 to 65535.</p> <p>Default is 9000 .</p>
<code>be.mm.broker.java.net.preferIPv4Stack</code>	
	<p>If the server is hosted on an AIX machine, set this property to True. Remember to also add a similar property to the <code>be-mm.tra</code> file. See <a href="#">Setting Property for Cache Based Object Management on AIX</a> for general details (note that the property name is different here than in the to-be-monitored engine TRA file.</p> <p>Default is <code>false</code> .</p>

## Coherence WKA Cluster Discovery

If you are using the Oracle Coherence cache provider and you have configured the monitored project to discover cluster members using well-known addresses (WKA), then you must make some additional changes to the project CDD so that MM can monitor and manage the cluster.

You must configure the `mm.cdd` to work with the cluster to be monitored, and keep in mind that the MM cluster itself does not use the WKA discovery

For more details about WKA discovery, see CDD Configuration in *TIBCO BusinessEvents Configuration Guide*.



Use unique ports — including for MM Server engine. If any of the monitored cluster engines are configured to run on the same machine as the MM server, ensure that the values for `localport` are unique across the MM server and the monitored clusters on that machine.

## Configuring the Project's CDD to Communicate with the Cluster

This section assumes that the CDD for the cluster to be monitored has already been configured for WKA cluster discovery, so that the additional configuration enables MM to communicate with the cluster.

### Procedure

1. Open the project to be monitored in TIBCO BusinessEvents Studio and open its CDD file in the CDD editor.

This CDD must be copied for use as the master CDD. See [Project Master and Deployed Locations of CDD and EAR Files](#) to understand the purpose of these copies of the CDD.

2. For each PU you will deploy to a WKA machine, add the `be.engine.hostaddress` property (in addition to the `tangosol.coherence.localhost` and `tangosol.coherence.localport` properties as needed for WKA configuration). Set it to the same value as the `localhost` property:

```
tangosol.coherence.localhost HostIP
tangosol.coherence.localport Hostport
be.engine.hostaddress HostIP
```

For better organization, you can put these properties into a property group, named as desired.

3. Add the following WKA properties to the cluster level properties:

```
tangosol.coherence.wka = IP_of_machine_hosting_MMServer
tangosol.coherence.wka.port = Unused_port_on_machine_hosting_MMserver
```



If the CDD has already been configured for WKA cluster discovery and either one or both of the properties, `tangosol.coherence.wka` and `tangosol.coherence.wka.port`, already exist in the CDD under the cluster level properties, you must rename such pair of properties to `tangosol.coherence.wkan` and `tangosol.coherence.wkan.port`, where *n* is the first unused integer in the WKA list. All the other WKA properties can remain as they are.

Cluster configuration is documented in *TIBCO BusinessEvents Configuration Guide*.

## Configuring the MM.CDD File

The `MM.cdd` file is used to perform basic configuration as well as alerts, health metric rules, and actions.

### Procedure

1. Import the `emonitor` project into your workspace and open the CDD file for editing. See [Importing the emonitor Project for CDD Editing](#) for details.
2. If the MM server runs on the same host as any monitored cluster engine, specify the following properties in the **Cluster > Properties** sheet:

```
tangosol.coherence.localhost
tangosol.coherence.localport
```

3. Set `localhost` to the IP of the host where the MM server will run and set the `localport` property to a different port than any used by any monitored cluster engines on this host machine.

## Configuring the be-engine.tra Files for Hosts with Multiple NIC Cards

When you execute the be-engine, by default it looks in the working directory for a property file `be-engine.tra`. This configuration applies to host machines with multiple network cards (NIC).

### Procedure

1. Add the following property to the `be-engine.tra` file on each host:

```
java.property.java.rmi.server.hostname
```

The default value is `localhost`.

2. Set this property to the IP address of the desired NIC.

This IP address must match the value specified in other properties where host IP is specified.

This property is required so that the engine is discovered by the MM cluster and appears as an active predefined engine. It is also required so that remote users can connect to any agents running on this host using a JMX client like JConsole.

## TIBCO BusinessEvents DataGrid WKA Discovery

If you are using the TIBCO BusinessEvents DataGrid cache provider, and you have configured the monitored project to discover cluster members using well-known addresses (WKA) then you must make some additional changes to the monitored project CDD so that MM can monitor and manage the cluster.

For more details about WKA discovery in a TIBCO BusinessEvents DataGrid cluster see the sections [Datagrid Discover URL](#) and [DataGrid Listen URL](#) in *TIBCO BusinessEvents Configuration Guide*.

## Configuring the Project's CDD for Cluster Management

If the monitored project is configured to discover cluster members using well-known addresses (WKA), you must make some additional changes to the monitored project CDD so that MM can monitor and manage the cluster.

### Procedure

1. Open the project to be monitored in TIBCO BusinessEvents Studio and open its CDD file in the CDD editor.

This CDD must be copied for use as the master CDD. See [Project Master and Deployed Locations of CDD and EAR Files](#) to understand the purpose of these copies of the CDD.

2. Add the following property to the cluster properties sheet.

```
be.mm.cluster.as.listen.url MMHostIP:Port
```

Specify the IP of the computer hosting the MM server, and an unused port.

3. Add the value of the `be.mm.cluster.as.listen.url` property to the list of addresses in the `be.engine.cluster.as.discover.url` property. The discovery property should be set at the cluster level (so the value is identical for all potential cluster members).

The discovery URL for well-known address configuration uses the following format:

```
tcp://ip:port[;ip:port]*
```

4. Save.

## MM Console Properties Reference

Values for the MM console properties are configured in the file located at `BE_HOME/MM/web-root/app_config.xml`.

### MM Console Configuration Properties

Property	Notes
<code>debugMode</code>	Set to true to enable more detailed error messages. Default is false.
<code>Demo Mode</code>	If demo mode is enabled, chart updates are faked with random values based on the most recent value. Default is false.
<code>updateInterval</code>	Defines the time interval (in seconds) between two consecutive calls from MM Console to the MM server. The UI is refreshed after each update interval: the panes and tables with statistics are populated with the newly received data, and the topology tree is updated with the last state of the cluster. Default is 5.
<code>failedPaneThreshold</code>	Maximum ratio of failed pane updates to number of displayed panes, before a system crash is assumed. If the number of failed panes exceeds the threshold an error displays in the console: Lost connection to data server. Click <b>OK</b> to log out. Default is 0.2.
<code>logoURL</code>	Path to the image file for the company logo (or other image as desired). The image file must be stored within the <code>BE_HOME/MM/web-root/</code> folder. The <code>logoURL</code> value is the relative location of the image file within the <code>web-root</code> folder. For example, if the image is in this location: <code>web-root/images/logo.jpg</code> , then the value of <code>logoURL</code> would be <code>images/logo.jpg</code> . The image displays in the upper left corner. The image size must be no more than 32 by 32 pixels.
<code>chartStyles</code>	You can configure preferences such as colors used for various chart elements. Follow the documentation in the file for each element.

## MM Metrics and Features Configuration

The MM component provides a console that enables you to monitor the status of deployed TIBCO BusinessEvents engines and perform management tasks.



TIBCO BusinessEvents Express supports only In Memory object management. Therefore it does not support use of the TIBCO BusinessEvents Monitoring and Management component.

You can configure thresholds and other settings for the various health metrics and alerts to suit your needs. You can also configure actions to take based on alerts or health level status values. These configuration tasks are done in the CDD file for MM, `MM.cdd`.

See the following sections for details:

- Configure alerts:
  - [Configuring Alerts](#)
  - [Alert Configuration Reference](#)
  - [Path to an Alert Metric Value \(and a Reference Value\)](#)
  - [Pane Types Reference for Alert Configuration](#)
- Configure health metric rules:
  - [Health Metric Rules](#)
  - [Health Metric Rules Configuration](#)
  - [Health Metric Rule Configuration Reference](#)
- Configure actions to take upon triggering of an alert of change in health level:
  - [Action Configuration](#)
  - [Action Configuration Reference](#)

Alert conditions are met by comparing a specified metric value with a reference value. The reference value can be a constant, or it can be another value in the same pane. As an example of a constant reference, you can configure an alert to trigger when the number of deadlocked threads exceeds a certain number. As an example of a reference that is another value in a pane, you could configure an alert to trigger when Used memory exceeds 95% of Max memory.

Each alert has an alert level (`critical`, `warning`, and `normal`), and a configurable message. Messages use the Java Message Format syntax. You can, as desired, set up three alerts of different severity for the same metric, using different threshold values.

Severity is defined in terms of the following three levels:

- Critical (red bulb icon)
- Warning (yellow bulb icon)
- Normal (green bulb icon)

Alerts are viewable in the System Alerts pane of the Cluster Overview. See [Cluster Overview](#) for an example.

The presence of alerts can also be used to define the health level value for any monitored entity. See [Health Metric Rules Configuration](#).

## Configuring Alerts

Alert configuration tasks are performed in the MM.cdd file.

See [Alert Configuration Reference](#) for more details on the settings referenced in this procedure.



Ensure that condition settings in different alerts do not overlap with each other, so that it is clear which alert to use in all cases.



As with any procedure that changes files, ensure the emonitor project is backed up before you edit its CDD file.

### Procedure

1. Import the emonitor project into your workspace and open the CDD file for editing.
2. Open the MM.cdd in the Cluster Deployment Descriptor editor and select the Agent Classes tab.
3. Select **mm-class (Monitoring & Management) > Alert Configurations**.
4. Click **Add** or select an existing alert configuration.
5. Configure the fields as explained in [Alert Configuration Reference](#)
6. Save.
7. If you have finished configuration, start the emonitor project using the modified CDD file. This starts the MM server.

## Alert Configuration Reference

Use this reference to configure alerts.

### *MM CDD mm-class Agent Class Alert Configuration*

Property	Notes
Alert ID	
	An ID for this alert.
<b>Condition Settings</b>	
Ensure that condition settings in different alerts do not overlap with each other, so that it is clear which alert to use in all cases.	
Path	
	Enter the cluster path that defines the scope of this alert. Scope is defined in terms of cluster levels. See <a href="#">Cluster Member Paths</a> for details on specifying this value.
Alert Value	
	A structured path which points to the metric value used for the alert. It can be a series in a chart pane, or a column in a table pane. Elements of the path are as follows:  <i>PaneType/SeriesName/CategoryValue/ValueIndex</i>  See <a href="#">Path to an Alert Metric Value (and a Reference Value)</a> for details on this setting.

Property	Notes
Reference Value	<p>A constant value, or a partial structured path which points to a metric value in the same pane as the metric value specified in the Name field.</p> <p>The partial path is specified as:</p> <p><i>SeriesName/CategoryValue/ValueIndex</i></p> <p>It is appended to <i>PaneType</i> part of the path provided in the Name field.</p> <p>For example, if Name specifies <i>/memory/used</i>, then Reference might specify <i>max</i>, which is another series name in the pane type <i>memory</i>.</p>
Threshold	<p>Expressed as a percentage. Enter a value between 0 and 100 as desired.</p> <p>When the value of <i>Name</i> meets or exceeds the <i>Threshold</i> percentage of the value of <i>Reference</i>, the alert is triggered.</p>
<b>Projection Properties</b>	
Severity	
	The severity of the alert. Possible values are: <i>critical</i> , <i>warning</i> , and <i>normal</i> .
Message	
	<p>Message to display when this alert is triggered. The message string can optionally contain variables.</p> <p>For example:</p> <p>"{0}'s garbage collection time {2} for {1} has crossed 10% of {3} up time"</p> <p>See <a href="#">Specifying the Alert Message</a> for more details.</p>

## Path to an Alert Metric Value (and a Reference Value)

When you configure an alert, you specify two values to compare and a threshold.

### The Alert Value

This field provides the path to the metric you are interested in being notified about. The path is structured as follows:

*PaneType/SeriesName/CategoryValue/ValueIndex*

### The Reference Value

This field provides a comparison value. It can be a constant (such as a threshold number) or a different metric value on the same pane. Because it is on the same pane, you do not have to provide the full path. The path for reference is structured as follows

*SeriesName/CategoryValue/ValueIndex*

## Elements Used to Specify the Path to an Alert Metric Value

Path element	Notes
Pane Type	<p><i>PaneType/...</i></p> <p>The specific pane type for the selected element type.</p>
Series Name	<p><i>PaneType/Series Name/...</i></p> <p>To set an alert on a value in one series of a multi-series chart, specify the series name that appears in the chart in the <i>SeriesName</i> position of the path.</p> <p>In a table pane or a single series chart pane, use the value <code>\$default</code>. For example: <code>gc/\$default/* /2</code></p>
Category Value	<p><i>PaneType/SeriesNameCategoryValue/...</i></p> <p>To set an alert on a specific category of information in a chart or table, specify its name in the <i>CategoryValue</i> position of the path.</p> <p><b>In a chart</b></p> <p>Each chart element, such as a bar or a line, represents a category of information. For example, in the Thread Pool Best Performers chart each thread is a category (shown as a green bar). Use the name that appears for the chart element, or in the tooltip if the full name does not display.</p> <p><b>In a table</b></p> <p>Each row represents a category of information. The value in the first (that is, left-most) column of the row is the name of the category. Use the name of the first column as the category value.</p> <p>Not used for time-based panes.</p> <p>To use all category values, you can use an asterisk (*) as a wild card character in the <i>CategoryValue</i> position. For example, <code>"gc/\$default/* /2"</code></p> <p>If the category value is not found or is defined as "all," then all the categories in the specified series are considered for condition checking.</p>
Value Index	<p><i>ElementTypePath/PaneType/SeriesName/CategoryValue/ValueIndex</i></p> <p>A specific item of information in a category.</p> <p>Only used for tables (not for charts).</p> <p>For tables, use the index of the column from which the value is taken. The first column is ignored. (It is used as the category value). Indexing begins with the second column from the left. The second column index is 0, the third column index is 1, and so on.</p>

## Specifying the Alert Message

An alert message can be a simple text string, or it can use parameters.

Below are two examples showing parameter-based messages:

```
"{0}'s garbage collection time {2} for {1} has crossed 10% of {3} up time"
```

```
"{0}'s used memory {2} has crossed 95% of {3} max memory at {1,date,short}
{1,time,short}"
```

The message supports the following substitutions (using Java Message Format syntax).

### Alert Message Parameters

Parameter	Value
{0}	The name of the cluster member that the alert is about. Specified by the <code>condition/getproperty@path</code> attribute.
{1}	The category that the alert is about. Specified by the <code>PaneType/SeriesName/CategoryValue/...</code> part of the <code>condition/getproperty@name</code> path.
{2}	The actual value that is causing the alert to be triggered, as specified in the <code>condition/getproperty@name</code> .
{3}	The reference value, used to calculate whether a metric value is of concern (and the alert is therefore triggered). Specified by the <code>condition/getproperty@reference</code> attribute.

## Pane Types Reference for Alert Configuration

This reference shows the element types.

### Pane Type Details

Element type	Pane Type Title	Table or Graph	Pane Type ID
Cluster	Cluster Overview	Table	<code>cstats</code>
	System alerts	Table	<code>sysalerts</code>
Machine	CPU Usage	Chart (time)	<code>cpustats</code>
	Memory Usage	Chart (time)	<code>memory</code>
	Swap File Usage	Chart (time)	<code>swap</code>
Process	CPU Usage	Chart (time)	<code>cpustats</code>

Element type	Pane Type Title	Table or Graph	Pane Type ID
	Memory Usage	Chart (time)	memory
	Running Threads	Chart (time)	rthreads
	Deadlocked Threads	Chart (time)	dthreads
	Garbage Collection	Table	gc
All Agents	Running Threads	Chart (time)	rthreads
	Deadlocked Threads	Chart (time)	dthreads
	Garbage Collection	Table	gc
	Thread Pool Best Performers	Chart	bestpool
	Thread Pool Worst Performers	Chart	worstpool
	Thread pool Usage	Chart (time)	tpool
	Job Queue Best Performers	Chart	bestjqueue
	Job Queue Worst Performers	Chart	worstjqueue
	Job Queue Usage	Chart (time)	jqueue
Inference Agent	Locks Held	Chart (time)	locks
	RTC Statistics	Chart (time)	rtcstats
	Worst Rule Performers	Chart	worstrules
	Best Rule Performers	Chart	bestrules
Query Agent	Entity Count	Chart (time)	entitystats

Element type	Pane Type Title	Table or Graph	Pane Type ID
	Snapshot Query Execution Query Name, Pending, Accumulated	Table	ssqestats
	Continuous Query Execution Query Name, Pending, Accumulated	Table	cqestats

## Health Metric Rules

Health metrics are available for cluster members at each level: cluster, machine, process, and agent. The Cluster Overview panel in MM provides information about the overall health of the cluster, and of each of the cluster members.

Health of the cluster is defined in terms of the following three levels:

- Critical (red bulb icon)
- Warning (yellow bulb icon)
- Normal (green bulb icon)

The colored bulb icons are currently used only in the overall cluster health metric and in alerts. The use of icons is not configurable.

Health metric thresholds are set in the `MM.cdd` file, which you edit in TIBCO BusinessEvents Studio.

Note the following main points:

- You can configure health metrics for none, some, or all types of cluster members as desired
- When configuring health level thresholds, you do not have to set thresholds for all three health levels (critical, warning, and normal). Use only the ones that are useful to you.
- When configuring rules for more than one health level for a single member, ensure that the conditions have no overlap so that it is clear which condition sets the appropriate health level.

## Cluster Member Paths

The cluster metrics scope is defined using a cluster path: `site/cluster/machine/process/inference`.

A cluster member in this context is a type of cluster node. The path is a hierarchy with specified names for types of the cluster node: `site`, `cluster`, `machine`, `process`. Below the process level, you can specify types of agents.

In the path specifying a type of cluster member, the members are specified as follows:

```
site/cluster
site/cluster/machine
site/cluster/machine/process
site/cluster/machine/process/inference
site/cluster/machine/process/query
site/cluster/machine/process/cache
site/cluster/machine/process/dashboard
site/cluster/machine/process/inference/*
```

## Child Cluster Member Paths

In addition to the above values, when you are constructing a Child Cluster Member path in the Health Metric Rule Configuration panel, you can use a wild card character (\*). Specific agent instances cannot be specified.

To reference all agents in the system, use the wildcard character after the process level: *site/cluster/machine/process/\**

To reference all agents of a particular type, add the type and then specify the wildcard character: *site/cluster/machine/process/inference/\**

## Two Types of Thresholds

You can compute health for a cluster member using either of two methods: Health of Child Cluster Members or Number of Alerts.

### Health of Child Cluster Members

One method computes the threshold as a percentage of active (or inactive) specified child cluster members. You can optionally specify that only those child cluster members that are themselves at a certain health level are used when computing the threshold. For example, you could set up a threshold such that the overall cluster health level is set to warning when fifty percent or more agents of any type are at health level "Warning."

### Number of Alerts

The other method computes the threshold as a number of alerts of a given severity for the cluster member, during a given time period.

The following guidelines are used to decide which method to implement for different cluster members:

- Use Health of Child Members to compute overall cluster health and machine level health.
- Use Number and Frequency of Alerts to compute the health of processes and agents.

### Health of Child Members

Thresholds based on the health of child members can use child member health levels or child member activity status (active or inactive), or both. You can also set a threshold value such that the health level of the parent is set only if a minimum percentage of child members satisfies the specified condition.

For example, if you are setting up thresholds for *site/cluster/machine*, you might select *site/cluster/machine/process* as the child member type. You might specify that the health level should be set to warning on the machine level if any process unit on that machine has a health level of warning. Or you might set the health level of a machine to critical if any of its process units is inactive.

You can also use different child members when configuring each health level for a parent member, depending on your need.

### Number and Frequency of Alerts

To define the threshold for a cluster member's health level using alerts, you define which alert severity level to use, and the frequency of alerts received during a specified time period.

All alerts of a specified severity defined for the cluster member are counted.

MM begins a count after it receives the first alert for the specified cluster member. After the time specified in Range has elapsed, the application counts the number of alerts of the specified severity were received during this period. If the count meets or exceeds the threshold, the health indicator is changed to the specified health level for this rule.

## Health Metric Rule Examples

Rules can be configured to display a health level indicator on a cluster member based on the health levels of its child members.

These rules could be set on any parent cluster member of the specified child members. The parent member is not shown in the examples. The scope of the rule is wider for parent members higher in the cluster member hierarchy.

To set the health level to critical if a single inference agent is inactive:

- Set Health Level to `critical`
- Set Path to `site/cluster/machine/process/inference`
- Set Threshold to `0`
- Add a property called `active` whose value is `false`

To set the health level to critical if all agents are inactive

- Set Health Level to `critical`
- Set Path to `site/cluster/machine/process/*`
- Set Threshold to `100`
- Add a property called `active` whose value is `false`

To set the health level to warning if fifty percent of agents are inactive

- Set Health Level to `warning`.
- Set Path to `site/cluster/machine/process/*`
- Set Threshold to `50`
- Add a property called `active` whose value is `false`.

To set the health level to critical if all agents are inactive

- Set Health Level to `normal`
- Set Path to `site/cluster/machine/process/*`
- Set Threshold to `100`
- Add a property called `active` whose value is `true`

To set the health level to warning if thirty percent of inference agents have a health level of warning

- Set Health Level to `warning`
- Set Path to `site/cluster/machine/process/inference`
- Set Threshold to `30`
- Add a property called `healthLevel` whose value is `warning`

## Examples Using Alerts

Rules can be configured to display a health level indicator for a cluster member based on the number of alerts received in a time window.

In these examples (unlike the child cluster member examples) the cluster member path is shown. The cluster member path is used in both types of rules but is more relevant to display here.

To set the health level to warning if one critical alert is received for a cluster

- Set Cluster Member Path to `site/cluster`
- Set Health Level to `warning`.
- Set Threshold to 1
- Do not set Range.
- Add a property called `severity` whose value is `critical`

To set the health level to `warning` if 5 or more critical alerts are received within a window of 5 minutes, for a query agent

- Set Cluster Member Path to `site/cluster/process/query`
- Set Health Level to `warning`.
- Set Threshold to 5
- Set Range to 300000
- Add a property called `severity` whose value is `critical`

## Health Metric Rules Configuration

You can configure health metrics for none, some, or all types of cluster members, as desired.

First you specify the cluster member for which a set of rules will apply. Then you configure the individual rules. You can use either of the following as the basis of the rule:

- A characteristic of the specified member's child cluster members: either the number that is active or inactive, or their health level.
- The specified cluster member's number and frequency of alerts at a certain severity.

When setting up a health metric rule, put the most severe health level first. Within each `clustermember` element, the MM server examines the `setproperty` element that is closest to the top of the file first. When a health metric threshold for a cluster member is met, the application stops and does not process additional thresholds for that member.

If you are configuring all three levels, you would put `critical` first, then `warning`, and finally `normal`.

See [Health Metric Rule Configuration Reference](#) for more details on the settings referenced in this procedure.



As with any procedure that changes files, ensure the `emonitor` project is backed up before you edit its CDD file.

## Setting Up the Health Metric Rule

When setting up a health metric rule, put the most severe health level first.

### Procedure

1. Import the `emonitor` project into your workspace and open the CDD file for editing.  
See [Importing the emonitor Project for CDD Editing](#) for details.
2. Open the `MM.cdd` in the Cluster Deployment Descriptor editor and select the Agent Classes tab.
3. Select **mm-class (Monitoring & Management) > Health Metric Rule Configurations**.
4. Click **Add**.  
You will see a configuration panel.
5. In the Cluster Member ID field enter a descriptive name to identify this cluster member.

6. In the Path field, enter a path to identify the cluster member.  
For example, `site/cluster`.
7. Click **Add**.  
You will see fields to define a health metric rule for this cluster member.
8. You can configure health metric rules in two ways. See [Two Types of Thresholds](#) for advice on which method to use. Go to one of the following procedures to continue, depending on how you want to configure this rule:
  - [Configuring a Health Metric Rule with the Child Member Health Status](#)
  - [Configuring a Health Metric Using Cluster Member Alerts](#)

### Configuring a Health Metric Rule with the Child Member Health status

Use either the number of active or inactive child members or their health level to configure a health metric rule.

#### Procedure

1. In the Health Metric Rule ID field, enter a descriptive name to identify the rule.
2. In the Health Level field, select the health level that the rule will indicate.
3. In the Condition Type field, select **Child Cluster Member**.
4. In the Path field, enter the cluster path of the child cluster member you want to use to compute this health level metric. For example, in computing cluster health you might specify `cluster/machine`, and for machine health, you might specify `cluster/machine/process`.
5. In the Threshold field enter the threshold percentage.  
If the percentage of child cluster members that match the criteria specified meets or exceeds this threshold, then the health level of the parent cluster member is set to the Health Level field value.
6. In the Properties sheet add one or both of the following properties to set the criteria for counting child members:
  - To use the number of active or inactive child members, add a property called `active`. Set the value to `false` to count only inactive members. Set the value to `true` to count only active members.
  - To use the number of child members at a certain health level, add a property called `healthLevel` and set the value to one of `critical`, `warning`, or `normal`.
7. Repeat this procedure to configure this cluster member's thresholds for remaining health levels (critical, warning, or normal), as desired.
8. Save.
9. If you have finished configuration, start the emonitor project using the modified CDD file.  
This starts the MM server.

### Configuring a Health Metric Using Cluster Member Alerts

Use cluster member's number and frequency of alerts at a certain severity to configure a health metric rule.

#### Procedure

1. In the Health Metric Rule ID field, enter a descriptive name to identify this rule.
2. In the Health Level field, select the health level that this rule will indicate.

3. In the Condition Type field, select **Notification**.
4. In the Range field enter a time period in milliseconds. Or enter 0 to specify no time period.  
If the Threshold number of alerts (of the `severity` value) is received in the Range period, the health metric is set to the Health Level value. If you specify zero (0) then the health level is changed after receiving the Threshold number without regard to any time window.
5. In the Threshold field enter the threshold number of alerts.
6. In the Properties sheet add a property called `severity`.  
As the value specify one of `critical`, `warning`, or `normal`.
7. Save
8. If you have finished configuration, start the emonitor project using the modified CDD file. .  
This starts the MM server.

## Health Metric Rule Configuration Reference

Use the health metric rule configuration reference to configure cluster member settings.

### *MM CDD mm-class Agent Class Health Metric Rule Configuration*

Property	Notes
<b>Cluster Member Settings</b>	
	A cluster member is a level in the cluster member hierarchy. It can be set to the entire cluster, a machine, or a process.
Cluster Member ID	
	Provide an ID for this cluster member.
Path	
	Path that defines the scope of this metric. Scope is defined in terms of cluster levels. See <a href="#">Cluster Member Paths</a> for details on specifying this value.  Specify a cluster member only once, then specify all the health metric rules for that member in one set.
<b>Health Metric Rule Configuration Settings</b>	
	For each cluster member you add, you define one or more health metric rules.
Health Metric Rule ID	
	ID for this health metric rule configuration.
Health Level	
	From the drop-down list, select one of the following health levels: <code>critical</code> , <code>warning</code> , or <code>normal</code> .  For each cluster member, you can define up to three rules, one for each health level.
Condition Type	

Property	Notes
	<p>Select the condition type used to compute the cluster member's health value:</p> <p><b>Child Cluster Member</b> Computes the threshold using the health level of specified child cluster members.</p> <p><b>Notification</b> Computes the threshold as a number of alerts of a specified severity for the cluster member, during a given time period.</p> <p>See <a href="#">Two Types of Thresholds</a> for more details on this choice.</p>
Path	<p>This field appears if you choose Child Cluster Member in the Condition Type field. Enter the cluster path that defines which child cluster members to use in computing this health metric. For example, in computing cluster health you might specify <code>cluster/machine</code>, and for machine health, you might specify <code>cluster/machine/process</code>.</p> <p>See <a href="#">Cluster Member Paths</a> for more on defining paths.</p> <p>You can use any child of the cluster member specified in the Cluster Member ID field of the cluster member node. It doesn't have to be an immediate child, and it doesn't have to be the same child member in rules you configure for the other health levels for this cluster member.</p> <p>In addition, you must do the following to complete configuration:</p> <ul style="list-style-type: none"> <li>• In the Properties sheet add a property called <code>active</code> and set it to true or false. This defines whether the active or inactive state of the cluster members specified in this path is used in computing the status.</li> <li>• Optionally, add a property called <code>healthLevel</code> and set it to <code>normal</code>, <code>warning</code>, or <code>critical</code>. When you do this, the Threshold percentage applies only to those specified child members whose health level matches this setting (and that are active or inactive as specified in the active property).</li> <li>• In the Threshold field specify a percentage.</li> </ul> <p>The health level rule is defined as a percentage (as defined in the Threshold field) of all child cluster members of the specified type that are active or inactive (as specified in the <code>active</code> property) and optionally: that are at the specified health level.</p>
Range	<p>This field appears if you choose Notification in the Condition Type field. Enter the number of milliseconds to be used as a range. The Threshold count is reset at the end of each range period.</p>
Threshold	

Property	Notes
	<p><b>When used for a Child Cluster Members Condition Type</b></p> <p>Defines a percentage. Enter a value between 0 and 100 as desired. When the number of child cluster members that satisfy the rule criteria meets or exceeds the percentage, the health indicator specified for the health level specified in this rule displays.</p> <p><b>When used for a Notification Condition Type</b></p> <p>Defines a number of alerts. When the number of alerts <code>notification/property@severity</code> alerts for the enclosing <code>clustermember</code> meets or exceeds this value, within the time period specified in the <code>range</code> setting, the health indicator specified for the health level specified in this rule displays. Note If either the <code>Threshold</code> or <code>Range</code> settings is not defined, then a single alert for the cluster member causes the health indicator to change.</p>
	<p><b>Health Metric Rule Configuration Properties</b></p> <p>The <code>active</code> and <code>healthLevel</code> properties are used only when computing the health level using child cluster members. You can use both <code>active</code> and <code>healthLevel</code> properties in one rule, although there may be few use cases for using both properties.</p>
<code>active</code>	
	<p>Used only when the Condition Type is set to <b>Child Cluster Members</b>.</p> <p>If set to true, then the health metric calculations use only the specified child members that are active.</p> <p>If set to false, then the health metric calculations use only the specified child members that are inactive.</p>
<code>healthLevel</code>	
	<p>Used only when the Condition Type is set to <b>Child Cluster Members</b> .</p> <p>If set, then the health metric calculations use only the specified child members whose health level is as specified in this property.</p>
<code>severity</code>	
	<p>Used only when the Condition Type is set to <b>Notification</b>.</p> <p>Set to the alert severity that you want to use for the health metric rule calculation.</p>

## Action Configuration

The MM server can perform actions when alerts are triggered or when health level indicators change. An action can be execution of a command, or sending of an email.

You must configure email settings in order to use the email feature (see [Basic MM Settings in MM.cdd](#) for details).

Commands are executed on the machine or machines where the trigger condition occurred.

## Configuring an Action

For the MM server to execute an action, it first has to be configured.



As with any procedure that changes files, ensure the emonitor project is backed up before you edit its CDD file.

See [Action Configuration Reference](#) for more details on the settings referenced in this procedure.

### Procedure

1. Import the emonitor project into your workspace and open the CDD file for editing.  
See [Importing the emonitor Project for CDD Editing](#) for details.
2. Open the MM.cdd in the Cluster Deployment Descriptor editor and select the Agent Classes tab
3. Select **mm-class (Monitoring & Management) > Action Configurations**.
4. Click **Add** or select an existing action configuration.
5. Configure the fields as explained in [Action Configuration Reference](#)
6. Save.
7. If you have finished configuration, start the emonitor project using the modified CDD file.  
This starts the MM server.

## Action Configuration Reference

The action configuration reference supplies properties to configure the mm-class (Monitoring & Management).

### *MM CDD mm-class Agent Class Action Configuration*

Property	Notes
Action ID	
	An ID for this action.
<b>Trigger Condition</b>	
Trigger Condition	
	Select the type of condition that triggers this action:  <b>Health Level</b> A specified health level of the specified cluster members.  <b>Alert</b> An alert of a specified severity raised on any of the specified cluster members.
Path	
	Enter a cluster path. This path defines the cluster members whose health level or alerts trigger this action. See <a href="#">Cluster Member Paths</a> for details on specifying this value.
Severity or Health Level	

Property	Notes
	<p>If you choose Alert as the trigger condition, in this field specify the alert severity that will trigger the action.</p> <p>If you choose Health Level as the trigger condition, in this field specify the health level that will trigger the action.</p> <p>In both cases the possible values are: <code>critical</code>, <code>warning</code>, and <code>normal</code>.</p>
<b>Action Settings</b>	
Action	
	<p>Choose a value from the drop-down list:</p> <p><b>Execute Command</b> If you choose this option, enter the command in the Command field.</p> <p><b>Send Email</b> If you choose this option configure the email message in the fields that appear.</p> <p><b>Note</b> If you choose Send Email then you must also configure the email properties in the mm-class agent properties. See <a href="#">Basic MM Settings in MM.cdd</a> .</p>
Command	
	<p>If you choose Execute Command in the Action field, enter a command that is executed when the action is triggered. You can specify a shell script or batch.</p> <p>In this release, commands are executed on the BEMM server machine.</p>
To, Cc, Subject, Message fields	
	<p>Complete the email fields to define the message that is sent when the action is triggered. See the note in the Action field.</p>

# Deployment and Management of Engines with MM

After you have configured your project for deployment and Monitoring and Management (MM) to connect to the deployment, you are ready to deploy the project and manage which engines are running in it.



TIBCO BusinessEvents Express edition supports only In Memory object management. Therefore, it does not support use of the TIBCO BusinessEvents Monitoring and Management component (including the Site Topology editor).

After you have completed all the configuration steps explained in [Basic MM Configuration](#), you are ready to use MM.

## Starting the MM Server

Start the MM server after the configuration is done.



The machine running MM must be able to access the monitored cluster through the network. It must be in the same network or have access to the network using multicast.

### Procedure

1. At a command prompt, navigate to `BE_HOME/mm/bin` and type:  
`be-mm.exe -c MM.cdd -u default -n mm MM.ear`
2. Type `be-mm.exe /help` to view usage information.

On Windows you can select the following:

**Start > All Programs > TIBCO > TIBCOEnv > TIBCO BusinessEvents 5.2 > Start Monitoring and Management Server.**

## Logging On to MM Console

After the Monitoring and Management Server has started, users can log on to MM Console.

### Procedure

1. In a web browser, enter the URL for the console.  
The hostname and port are configured in the `MM.cdd`.  
By default the URL is:  
`http://localhost:9000/index.html`
2. Log on using the user credentials that were configured in the password file or other authentication mechanism you configured for TIBCO BusinessEvents. As shipped, the default credentials are `admin/admin`.

See [User Authentication](#).

Only users with the role `ADMIN` see [User Authorization for Administrator and User Roles](#).

### Result

You see Cluster Explorer in the left panel, and the Cluster Overview on the right.

See [Cluster Explorer Nodes](#) for an introduction to the MM console user interface.



When the connection to the MM server is lost, all panel contents are dimmed and an error message displays: `ERROR Lost connection to data server`. Once the server has come back online you may login again. [OK].

See [MM Console Properties Reference](#) for details about the property `failedPaneThreshold`. It determines the maximum ratio of failed pane updates to number of displayed panes before a system failure is assumed.

## Engines with MM

You can deploy engines using MM Console or using the command-line utility, `MM-tools`.

- For details about deploying in MM Console, see [Deploying Cluster Engines in MM Console](#).
- For information about hot deployment, see [Hot Deployment](#).

Before deployment, be sure to copy custom function and third-party jars.

If your project has JAR files for custom functions or third-party software, you must manually copy them to the runtime location. Copy them to a location on the classpath of the deployed application. The recommended location is the `BE_HOME/lib/ext/tpcl` directory. If you choose a location that is not in the classpath, then update the classpath in the TRA file to include the location.

## Deploying Cluster Engines in MM Console

Deploy the engines configured to run on a predefined machine node.

### Procedure

1. Log on to MM Console. See [Logging On to MM Console](#).
2. From the Cluster Explorer, select the machine node you want to deploy.
3. If you want to override any global variables, select the Global Variables tab and do so. See [Global Variables in MM](#) for details.
4. Select the icon of the host machine where you want to deploy and click the `Deploy` button. The deployment unit that you configured to deploy on that machine in the site topology file deploys.
5. Verify the login details or provide them (see for details).
6. Click **OK**. The engine or engines configured to deploy to that machine deploy.



To see if an engine or agent is deployed, hover the pointer over its name in the explorer panel. A tooltip shows if it is deployed or undeployed.



Deployment time information is saved to a file located under `BE_HOME/mm/depoyed` and the last deployment time is displays in the UI.

## Hot Deployment for Engines with MM

You can hot deploy to a running engine deployed by MM.



See [Hot Deployment](#) for more details.

The following prerequisites have to exist in order to hot deploy a running engine deployed by MM:

- You have modified the TIBCO BusinessEvents Studio project and built the EAR file, following the limitations shown in [Modifications Allowed in Hot Deployment](#).
- The deployed processing units that you want to hot deploy to were enabled for hot deployment before they were deployed. See [Enabling Hot Deployment](#).

- The new EAR file has the same name as the existing one.

To hot deploy in MM, replace the master EAR file with the updated one, and then deploy the engines again using MM Console. There is no need to restart the engines.

## Remote Engines (PUs) and the MM-tools Utility

You can deploy engines and start and stop remote engines (PUs) at the command line using the MM command line utility named `mm-tools`.

All engines have to be predefined in the site topology file.

Before you can use the `mm-tools` utility you must configure it. Optionally, you can authenticate a user using certificates when performing `deploy` and `remote start` and `stop` operations, which requires additional configuration.

Before you can use the `mm-tools` utility, you must configure the `mm-tools.tra` file to reference the cluster's site topology file.

### Prerequisite Configuration

- For deployment, SSH must be running on the remote machine.
- For remote start, the software that MM uses to start a processing unit on remote machines must be running: TIBCO Hawk, PsTools or SSH. See [Software for Remote Start and Deployment](#) for details.
- The site topology file (and its prerequisites) must also be configured correctly. See [Site Topology](#) and sections following for details.

In addition, the `mm-tools.tra` file must be configured as explained in this section.

## Configuring the mm-tools.tra File

The `mm-tools.tra` file is used to reference the cluster's site topology file.

### Procedure

1. Open the following file for editing:  
`BE_HOME/mm/bin/mm-tools.tra`
2. In the following property, specify the path to the site topology file used for cluster deployment:  
`be.mm.topology.file <path to the site topology file>`
3. For remote start, if the `start-pu-method` in the site topology file is Hawk, and you use non-default values, uncomment and specify the following Hawk properties. Use the values that are configured for the Hawk agent running on the remote machine:

```
#be.mm.tools.Domain=TIBCO Hawk Domain
#be.mm.tools.TIBHawkService=Rendezvous daemon used by Hawk
#be.mm.tools.TIBHawkNetwork=Rendezvous network used by Hawk
#be.mm.tools.TIBHawkDaemon=Rendezvous service used by Hawk
```

If TIBCO Hawk is also used for machine level metrics, the values specified would be the same as those specified in the `MM.cdd`.

See [TIBCO Hawk Configuration for Machine Level Metrics](#).

4. Save the file.

## Using Public Private Key Authentication with mm-tools

Users are authenticated using certificates when performing `deploy` and `remote start` and `stop` operations.

### Procedure

1. On the computer hosting the MM server, use a utility to create a public/private key pair. The `ssh-keygen` utility is widely available. Two files are generated. They are referred to as follows:

`PK_FILE_NAME`: The file containing the private key

`PK_FILE_NAME.pub`: The file containing the public key

Optionally, you can specify a passphrase.

Place both generated files in the same directory on the computer hosting the MM server. For example, put them in `BE_HOME/mm/certificates`.

2. On computers hosting the to-be-monitored cluster PUs that you want to remotely deploy, start, or stop, copy the contents of the file `PK_FILE_NAME.pub` to the file containing the list of authorized keys for the user who will be logging in remotely.

For example, for SSH using certificates for authentication, the authorized keys file is called 'authorized\_keys' and it is stored in the `.ssh` directory of the user who will be logging in remotely, that is, in `~/ .ssh/authorized_keys`.

3. When executing a command with `mm-tools`, use these new options:

`-pkf` The fully qualified path to the `PK_FILE_NAME` file, that is, the file with the private key.

`-pph` The passphrase, if you specified one when creating the public/private key pair. (One example below shows the `-pph` option.)

### Example Commands for Authentication with mm-tools

These commands are used for remote deploy, start, and stop.

#### Remote Deploy:

```
mm-tools --propFile mm-tools.tra -op deploy -m 100.100.100.101 -pkf BE_HOME/mm/certificates/PK_FILE_NAME
```

#### Remote Deploy, with Passphrase:

```
mm-tools --propFile mm-tools.tra -op deploy -m 100.100.100.101 -pkf BE_HOME/mm/certificates/PK_FILE_NAME -pph passphrase
```

#### Remote Start:

```
mm-tools --propFile mm-tools.tra -op start -puc CS -m 100.100.100.101 -pkf BE_HOME/mm/certificates/PK_FILE_NAME
```

#### Remote Stop:

```
mm-tools --propFile mm-tools.tra -op stop -puc CS -m 100.100.100.101 -pkf BE_HOME/mm/certificates/PK_FILE_NAME
```

## Deploying Starting or Stopping a Remote Engine

When deployment is done through SSH, remote start is done using the method configured in the site topology file `start-pu-method` setting.

```
BE_HOME/mm/bin/mm-tools [-h] [--propFile StartupProperty File] -op [deploy | start | stop] -m MachineHostName [-puc ProcessingUnitConfig] [-user UserName] [-pwd Password>]
```

**Deployment example:**

```
mm-tools -propFile mm-tools.tra -op deploy -m Acme-PC
```

**Remote start example:**

```
mm-tools -propFile mm-tools.tra -op start -m Acme-PC -puc CacheServer
```

**Remote stop example:**

```
mm-tools -propFile mm-tools.tra -op stop -m Acme-PC -puc CacheServer
```

**mm-tools Utility Options Reference***mm-tools Utility Options*

Option	Description
-help	Displays this help.
-propFile	<p>When you execute <code>mm-tools</code>, by default it looks in the working directory (the directory where you execute the command) for a property file of the same name (<code>mm-tools.tra</code>). This property file provides startup values and other parameters to the executable.</p> <p>You can specify the path and filename of a startup property file explicitly using the <code>-propFile</code> parameter.</p> <p>For example, if you execute the command from a directory other than <code>BE_HOME/mm/bin</code>, then you would generally use <code>-propFile</code> to specify <code>BE_HOME/mm/bin/mm-tools.tra</code>.</p>
-op	<p>Specifies the operation. Two operations are available:</p> <p><code>deploy</code>: The deploy operation is done through SSH.</p> <p><code>start</code>: The start operation is done using the mechanism defined in the site topology file <code>start-pu-method</code> setting.</p> <p><code>stop</code>: The stop operation is done using the mechanism defined in the site topology file <code>start-pu-method</code> setting.</p>
-m	<p>The hostname of the machine where you want to start or deploy an engine.</p> <p>Only hostnames defined in the site topology file can be used.</p>
-puc	<p>Specify the ID of the processing unit configuration (PUC) you want to use for this engine.</p> <p>Only IDs defined in the site topology file can be used.</p>

Option	Description
<code>-user</code>	<p>Optional. If not specified, the username in the site topology file is used.</p> <p>For the <code>deploy</code> option: The username used by SSH on the remote machine.</p> <p>For the <code>start</code> option: The user name used to log on to the remote machine for remote start.</p>
<code>-pwd</code>	<p>Optional. If not specified, the password in the site topology file is used.</p> <p>For the <code>deploy</code> option: The password for the username used by SSH on the remote machine.</p> <p>For the <code>start</code> option: The password for the username used to log on to the remote machine for remote start.</p>

# Monitoring and Management Component (MM) for TIBCO BusinessEvents Cluster

You can monitor the health of a TIBCO BusinessEvents deployment using the TIBCO BusinessEvents Monitoring and Management (MM) component and manage the deployment accordingly.



The TIBCO BusinessEvents Express edition supports only In Memory object management. Therefore it does not support use of the TIBCO BusinessEvents Monitoring and Management component (including the Site Topology editor)



You can monitor TIBCO BusinessEvents Views Dashboard agents, but not otherwise manage them.

All TIBCO BusinessEvents cluster members — agents, JVMs (processing units) and machines — generate system metrics. They are made available over the network for use by the Monitoring and Management (MM) web-based user interface.

Using MM Console, you can examine all aspects of the cluster, including objects in the cache. At each level of the cluster hierarchy, various panes display metrics relating to that level graphically. You can rearrange and remove panes, and promote panes of special interest to the cluster overview to create a custom dashboard.

Before you can use the Monitoring and Management component, you must do some configuration:

- For information on configuring MM see [Basic MM Configuration](#).
- For information on configuring the metrics used by the charts and tables, see [MM Metrics and Features Configuration](#)

For each level of the cluster hierarchy, various metrics are provided using charts and tables. Later panels in this chapter provide a reference to the metrics available at each level. The charts and tables appear in different panes on the panel or panels (tabs) relating to one level of the cluster hierarchy.

The agent level can have two panels. One shows the same information for all types of agents. For inference and query agents, a second panel shows information specific to the agent type. Cache agents do not have a second panel.



All charts display data for the previous ten minutes (or less if, for example MM or a JVM has been running less than ten minutes).



Monitoring and Management polls for updates and refreshes the display periodically. The interval is configurable. See the `updateInterval` property in [Basic MM Settings in MM.cdd](#) .

## Health Indicators and Alerts

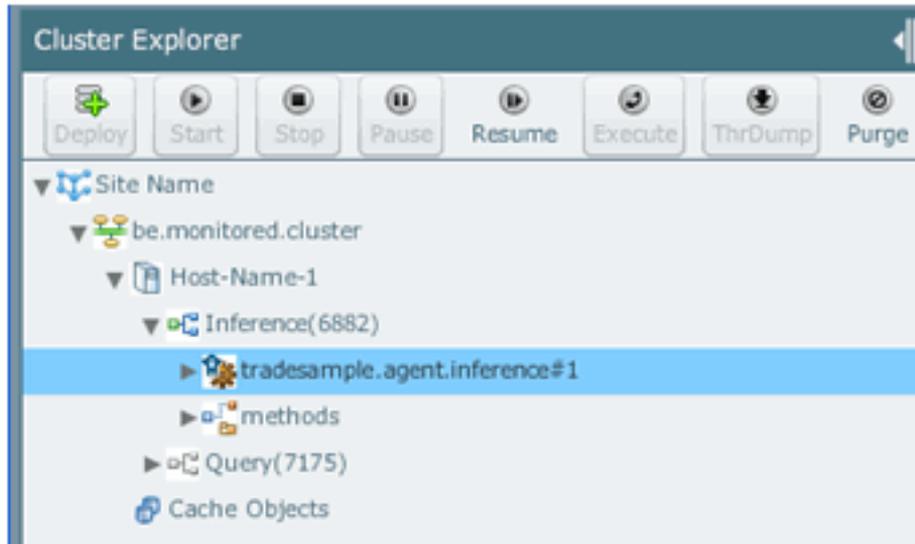
You can configure health indicator thresholds that define whether a value indicates normal functioning, a potential problem (warning), or a critical situation. You can also configure alerts to bring specific problem situations to the attention of system users. These health indicators and alerts are shown in the Cluster Overview, providing a dashboard where you can read the health of the entire cluster at a glance.

See [MM Metrics and Features Configuration](#) for configuration details.

## Cluster Explorer Nodes

Active and inactive nodes are shown in Cluster Explorer for a quick view of system health.

### Active and Inactive Nodes in Cluster Explorer



The Cluster Explorer figure shows the hierarchy of cluster members. Inactive agents (which could be standby agents or failed agents) are dimmed.

The structure of the cluster member hierarchy is as follows:

```

Site
  Cluster
    Machine (host name)
      Process (Processing Unit or Deployment Unit or JVM process ID)
        Agent (inference agent, query agent, or cache agent, dashboard agent,
              or mm agent)
      Cache Objects
  
```

Where:

- Site is the root and has no other purpose in this release.
- Cluster shows the name of the cluster being monitored.
- Machine shows one or more machines within the cluster. They run the cluster processes (process units or engines).
- Process shows each of the JVM processes (TIBCO BusinessEvents engines) running on a machine. The label for a process that was predefined in the topology file is the process unit ID assigned in the file, concatenated with the process ID enclosed in parentheses. The label for an unpredefined process is the JVM process ID.
- Agent lists all agents of each type running in the JVM process.
- The Cache Objects panel shows all the objects stored in the cache, without regard to their physical location in the TIBCO BusinessEvents cluster.

## Members of the TIBCO BusinessEvents Cluster

Machines, TIBCO BusinessEvents engines, and agents are all *members* of the TIBCO BusinessEvents cluster.

### Predefined and Unpredefined Members

Engines that are not defined in the site topology file are known as unpredefined engines. There are some differences between predefined and unpredefined engines.

- You cannot start or deploy an unpredefined engine using MM.
- You can “Purge Inactive” members that are unpredefined to remove them from the display. Predefined members always remain in the cluster explorer UI.
- The label for a process that was predefined in the topology file is the process unit ID assigned in the file, concatenated with the process ID enclosed in parentheses. (The label for an unpredefined process is the JVM process ID.)

Note that if you start a predefined TIBCO BusinessEvents engine at the command line (outside of MM) and you use a different JMX port from the one specified in the topology file, the engine starts as an *unpredefined* engine.

### Inactive Members

Part of cluster health is checking to see that all members are running. When a member becomes inactive, Cluster Explorer and other parts of the MM Console displays a visual indicator. Standby agents in a fault tolerant group display as inactive, as well as cluster members that have stopped operating.

### How Inactive Members Display

In Cluster Explorer, the icons for inactive members display in a dimmed state.

If a machine is inactive, processes and agents on that machine are also marked as inactive. Similarly, if a process is inactive, agents running in that process are also marked as inactive.

When a cluster member is inactive, you can still view the last available data in the panel for that member, but overlaid with a gray panel with the label `Entity Inactive`.

When a cluster member is inactive, and a pane relating to that member has been promoted to the Cluster Overview panel, the pane displays in gray with a message:

`Entity Inactive`

The difference in the display inactive member’s promoted pane alerts you to the fact that the member is inactive.

### How Inactivity is Determined

Inactivity is determined by the unsuccessful return of a health ping. Health pings are set up for machines and processes only. Process pings use JMX. Machine pings use TIBCO Hawk. If TIBCO Hawk is not available, cluster health status is determined using the health status of the processes (TIBCO BusinessEvents engines) running on each machine.

The property that controls the frequency of the health check ping is

`tibco.clientVar.healthCheckFreq`. See [MM Agent Basic Configuration Reference](#) for details.



You can also configure health thresholds and alerts at any level of the cluster hierarchy. See [MM Metrics and Features Configuration](#) for all configuration options

## Cluster Explorer

Using Cluster Explorer you can use node functionality and view information about the node level.

You can use functionality available at various nodes on the left, and you can view information about that node level on the right.

- Expand Cluster Explorer and select the member you want to work with or whose metrics you want to see. Metrics display on the right.
- Click an inactive cluster member to display the last available health metrics for that member.
- Click the minimize button in the Cluster Explorer title bar to minimize the explorer pane.

You can also use the MM-tools utility to start and stop engines at the command line.

## Managing Engines

You can start, stop, pause, or resume an engine.

### Procedure

1. From Cluster Explorer, select the engine you want to start, stop, pause, or resume. (You resume a paused engine.)  
Note that you cannot start an unpredefined engine.
2. Click the appropriate icon: **Start**, **Stop**, **Pause**, or **Resume**.
3. Verify the login details and click **OK**.

#### Stop Cache Nodes Last.



When you stop a cache node, all running inference nodes also appear as inactive in MM and cannot be stopped using MM. This is the expected behavior.

When you restart all cache nodes, the running inference nodes will appear as active again after some time. You may have to re-log on to MM Console before the display is correct.

When you stop all engines in a cluster, make sure you stop the cache nodes after stopping all other types of nodes.

## Purge Inactive Unpredefined Processes

You can purge inactive processes.

### Procedure

- Click the **Purge** icon.  
The Cluster Explorer view is cleaned.

For configuration related to the purge feature see [MM Metrics and Features Configuration](#).

## Viewing Monitored Objects

You can view the monitored object details.

### Procedure

1. Select the Monitored Objects node from the Cluster Explorer.  
The Cache Overview page is displayed in the right pane.
2. The details of various processes are displayed.  
For example, name of the entity, count, gets, puts, and so on.

## Executing a Method

You can execute mmethods from the Cluster Explorer.

### Procedure

1. Expand the **methods** node to the level at which you want to execute the method, cluster, process or agent.  
You will see the method group nodes.
2. Expand the desired method group node, select the method you want to execute on the running engine or engines, and click the **Execute** icon.

- Specify the argument or arguments according to the dialog that appears, and click **Execute**. Tooltips explain the values required for the arguments.

## Thread Analyzer Reports

Thread analyzer connects to hosts through JMX ports and collects the thread dump for each host.

Thread Analyzer analyzes the thread dump to provide information such as the following:

### Thread dump compression

Threads with same stack trace are compressed into one to provide a compressed thread dump report.

### Deadlock analysis

A resource allocation graph identifies the deadlocks in each of the thread dumps. (Thread analyzer creates a wait-for graph for a given set of stack traces and analyzes the graph to identify Circular Wait Conditions (CWC)).

### Thread Dump Summarization

Provides a detailed call flow summarization of the thread dump.

The name of the thread analyzer report uses the format: *IPAddress\_Port\_x.y.log*. The *y* element is the number of the file, 0-9. You can generate up to ten log files for each set of reports for a machine, and the default size of each file is 10MB.

The *x* element is used if you stop and start again. It is a number used to distinguish each set of reports, when multiple sets of reports are generated for the same host.

## Generating Thread Analyzer Reports

You can generate thread analyzer reports.

### Procedure

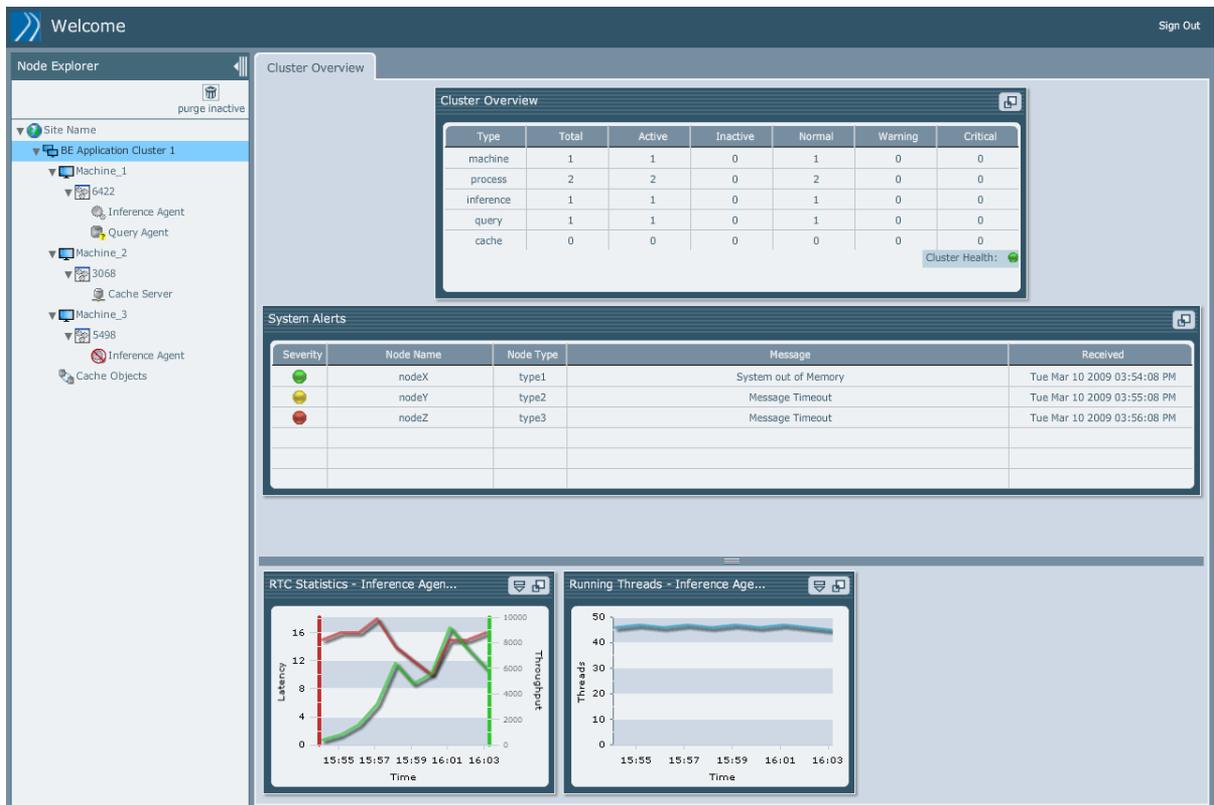
- From the Cluster Explorer, select the process whose threads you want to analyze and click the **ThrDump** icon.
- Enter the details as shown below:
  - Host name and IP**  
 Displays the name and address of the machine whose thread dump you want to get and analyze. (Thread Analyzer is always started on the server. Only a remote JMX connection is established with this host to obtain the thread dump). When not provided, it is assumed the host is `localhost`. MM connects to the JMX port configured in the site topology file.
  - Username and password**  
 Enter the credentials (if any are required) used to connect to the JMX server running on the target machine. Note that these are not the JMX credentials and not those used to log on to the machine.
  - Report Directory**  
 Specify where on the MM server to save the Thread Analyzer report. If blank or incorrect, the thread report is saved here by default: `BE_HOME/mm/logs/thread-analyzer/`.
  - Time Interval**  
 The interval in seconds between thread dumps. For example, if you enter 10, a thread dump is obtained every 10 seconds.
- Click **OK**.

## Panels and Panes

The Cluster Overview panel (also called a tab) consists of three panes promoted from a lower level display.

One of the promoted panes indicates an agent is inactive.

### Cluster Overview Panel



## MM Metric Panes

When you navigate to different levels of the cluster hierarchy using Cluster Explorer, appropriate sets of panes display.

This section explains how to use the controls in a pane's button bar. This information applies to panes in general, not just those that display in the cluster overview.

- To enlarge a pane, click the Expand  button in the title bar of the pane.
- To promote a pane to the Cluster Overview panel (tab), click the Promote  button in the title bar of the pane.

In this way you can create a custom dashboard. (The pane continues to display in its original location also.)

- To remove a promoted pane from the Cluster Overview tab, click the Demote  button.
- To remove a pane from a tab, click the Remove  button in the title bar of the pane.

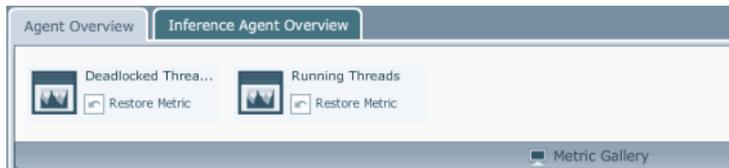
The pane is hidden in the Metric Gallery. The Metric Gallery appears as a bar you can click to open.

## Metric Gallery



- To restore a removed pane, click the Metric Gallery bar in the appropriate tab and click **Restore Metric**. (Not available on the cluster overview tab.)

## Restore Metric



## Cluster Overview

The Cluster Overview displays summary information about the health of the cluster.

### Cluster Overview Pane

Type	Total	Active	Inactive	Normal	Warning	Critical
machine	1	1	0	1	0	0
process	2	2	0	2	0	0
inference	1	1	0	1	0	0
query	1	1	0	1	0	0
cache	0	0	0	0	0	0

Cluster Health: ●

Severity	Node Name	Node Type	Message	Received
<span style="color: green;">●</span>	nodeX	type1	System out of Memory	Tue Mar 10 2009 03:54:08 PM
<span style="color: yellow;">●</span>	nodeY	type2	Message Timeout	Tue Mar 10 2009 03:55:08 PM
<span style="color: red;">●</span>	nodeZ	type3	Message Timeout	Tue Mar 10 2009 03:56:08 PM

The overall cluster health is shown in one indicator using the red, yellow, or green icon.

Various other metrics display for each type of item in the cluster: machines, processes, and each type of agent.

See [Cluster Level Metrics](#).

Thresholds for normal, warning, and critical health metrics are configurable.

See [Health Metric Rules Configuration](#).

## Cluster Level Metrics

Metrics for cluster items: machines, processes, and agent types.

### Cluster-Level Metrics

Metric	Notes
Total	Total number of cluster members of this type (machines, processes, agents).

Metric	Notes
Active	Total number of active cluster members.
Inactive	Total number of inactive cluster members.
Normal	Total number of cluster members whose health is below the threshold set for Warning.
Warning	Total number of cluster members whose health is above the threshold set for Warning and below the threshold for Critical.
Critical	Total number of cluster members whose health is above the threshold set for Critical.

## System Alerts Pane

The System Alerts pane displays only if any system alerts have been triggered. It shows (up to) the last 25 alerts generated by MM while monitoring the cluster.

The colored icons in the Severity column indicate the severity level of that particular alert.

- **Member Name** displays the name of the specific cluster hierarchy element that triggered the alert, for example, a process ID for a JVM or an agent name and ID.
- **Member Type** displays the type of element, for example, inference agent, process, machine, and so on.

You define and configure the alerts you are interested in. For each alert, you specify the metric value of interest, the threshold that triggers the alert, the severity level and a message.

See [Configuring Alerts](#).

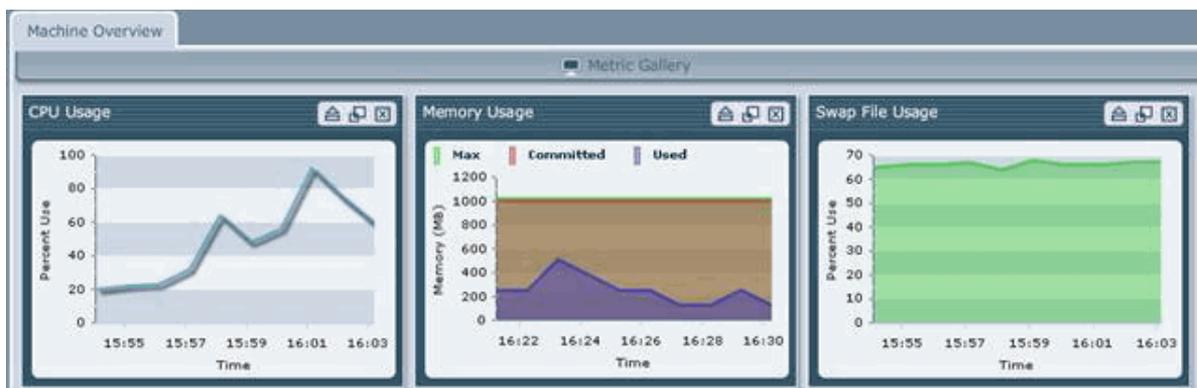
## Machine Overview

Machine level metrics are visible only if a TIBCO Hawk domain has been configured.

The Metric Gallery (shown as a gray bar above the panes) holds any panes you remove from the panel to keep your display uncluttered.

See [Panels and Panes](#) for details.

### Metric Gallery



See [Machine Level Metrics](#) for more details.

## Machine Level Metrics

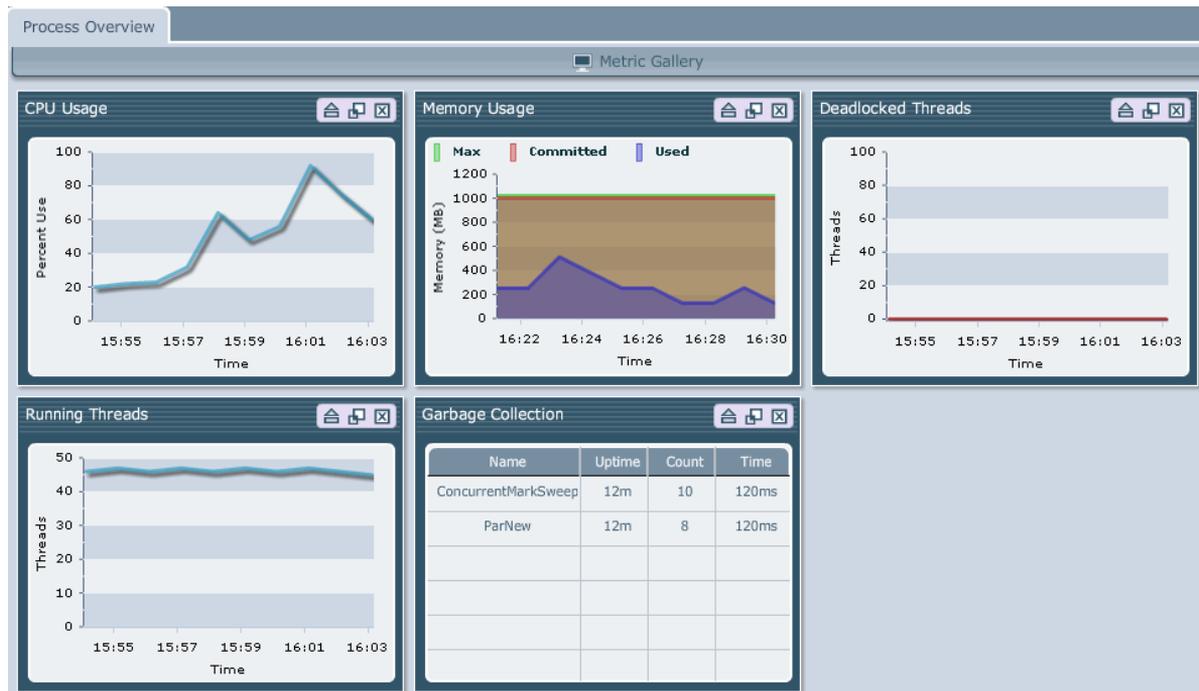
This reference supplies the metrics for a machine.

### Machine-Level Metrics

Metric	Notes
CPU Usage	CPU usage, as a percentage, over time.
Memory Usage	Available memory, in megabytes, over time.
Swap File Usage	Available swap file (page file) usage, in megabytes, over time.

## Process Overview

You can monitor TIBCO BusinessEvents processes using the TIBCO BusinessEvents Monitoring and Management (MM) component.



The IBM JRE does not provide information on process level CPU usage, resulting in the following limitations relating to the AIX operating system:

### When MM server runs on AIX

No process level CPU usage metrics display for any process (no matter what operating system is running on the host machine).

### When discovered processes run on AIX

Even when MM server is not running on AIX, no process level CPU usage metrics display for those processes.

Process-level metrics show information at the JVM level, that is at the TIBCO BusinessEvents engine level. See [Process Level Metrics](#) for more details.

## Process Level Metrics

Process-level metrics show information at the JVM level.

### *Process- Level Metrics*

Metric	Notes
CPU Usage	Percentage of CPU used by this process.
Memory Usage	Max, Committed, and Used memory, in megabytes.
Deadlocked Threads	The number of deadlocked threads in the process.
Running Threads	The number of threads in the process, including system threads.
Garbage Collection	<p>For each garbage collector running in the process, metrics shown are:</p> <ul style="list-style-type: none"> <li>• The total up time of the process</li> <li>• The number of objects garbage collected</li> <li>• The cumulative time spent in garbage collection overall.</li> </ul>

## Agent Overview

You can monitor TIBCO BusinessEvents agents using the TIBCO BusinessEvents Monitoring and Management (MM) component.



Running Threads, Deadlocked Threads, and Garbage Collection are process-level metrics.

## Agent Reference

Agent overview is common for all agent types.

### Agent Overview (Common) Metrics

Metric	Notes
Running Threads	The number of threads in the process, including system threads.
Deadlocked Threads	The number of deadlocked threads in the process.

Metric	Notes
Garbage Collection	<p>For each garbage collector running in the process, metrics shown are:</p> <ul style="list-style-type: none"> <li>• The total up time of the process</li> <li>• The number of objects garbage collected</li> <li>• The cumulative time spent in garbage collection overall.</li> </ul>
Thread Pool Best Performers	<p>The TIBCO BusinessEvents-specific thread pools in the agent, sorted by number of active threads. The fewer running threads in a pool, the better its performance.</p> <p>(If there are only a few thread pools running in an agent, the best and worst performer charts are a mirror image of each other.)</p>
Thread Pool Worst Performers	<p>The TIBCO BusinessEvents-specific thread pools in the agent, sorted by number of active threads. The more running threads in a pool, the worse its performance.</p> <p>(If there are only a few thread pools running in an agent, the best and worst performer charts are a mirror image of each other.)</p>
Thread Pool Usage	<p>Each line represents one thread pool. Usage is in terms of the number of threads in use in each pool. The pane shows a trend of the number of busy (used) threads over time. Four default threads are:</p> <p><code>\$default.be.mt\$</code>: The general thread pool controlled by the property <code>com.tibco.cep.runtime.scheduler.default.numThreads</code></p> <p><code>CacheCluster</code> handles the Agent and other Cache membership and other properties.</p> <p><code>CommonScheduledWorkManager</code>: Any Scheduler created with a single thread uses this default thread pool.</p> <p><code>CommonWorkManager</code>: Any WorkManager created with a single thread uses this default thread pool.</p>
Job Queue Best Performers	<p>The best performing TIBCO BusinessEvents-specific job queues. Job queue performance is based on how many jobs are pending in the queue. The fewer the number of pending jobs, the better the performance of the queue.</p> <p>(If there are only a few job queues, the best and worst performer charts are a mirror image of each other.)</p>
Job Queue Worst Performers	<p>The worst performing TIBCO BusinessEvents-specific job queues. Job queue performance is based on how many jobs are pending in the queue. The larger the number of pending jobs, the worse the performance of the queue.</p> <p>(If there are only a few job queues, the best and worst performer charts are a mirror image of each other.)</p>

Metric	Notes
Job Queue Usage	The count of active jobs in the TIBCO BusinessEvents-specific job queues.

## Inference Agent Overview

You can monitor Inference agents using the TIBCO BusinessEvents Monitoring and Management (MM) component.



## Inference Agent Reference

Inference agent reference is provided in the overview panel.

### *Inference Agent Metrics*

Metric	Notes
Locks Held	The number of locks held by the agent.
RTC Statistics	<p>RTC performance in terms of latency and throughput:</p> <ul style="list-style-type: none"> <li>• Latency shows the average time to complete an RTC.</li> <li>• Throughput shows the number of RTCs completed.</li> </ul>
Worst Rule Performers	Rules sorted by average execution time. The longer the execution time, the worse the rule performance.

Metric	Notes
Best Rule Performers	Rules sorted by average execution time. The shorter the execution time, the better the rule performance.

## Query Agent Overview

You can monitor Query agents using the TIBCO BusinessEvents Monitoring and Management (MM) component.



## Query Agent Reference

Query agent reference is provided in the overview panel.

### Query Agent Metrics

Metric	Notes
Entity Counts	<p>The number of entities in the query agent local cache:</p> <ul style="list-style-type: none"> <li>Local Cache Entity Count: shows the number of entities in the query agent local cache.</li> <li>Incoming Entity Count: shows the number of entities arriving into the local cache</li> </ul>
Continuous Query Execution	<p>Shows metrics for the first ten continuous queries to be registered (only the first ten are shown, for performance reasons):</p> <ul style="list-style-type: none"> <li>Pending: shows the number of cluster messages received by the query that are pending processing.</li> <li>Accumulated: shows the number of real-time cache changes that are pending while the query is still processing continuous query messages.</li> </ul>

Metric	Notes
Snapshot Query Execution	<p>Shows metrics for the first ten snapshot queries to be registered (only the first ten are shown, for performance reasons):</p> <ul style="list-style-type: none"> <li>• Pending: shows the number of cluster messages received by the query that are pending processing.</li> <li>• Accumulated: shows the number of real-time cache changes that are pending while the query is still processing continuous query messages.</li> </ul>

## Ontology (Cache Objects) Overview

The Cached Objects table displays data currently only when Coherence is the cache provider.

Ontology Overview										
Cached Objects										
Nam	Count	Gets	Puts	Get Time	Put Time	Hit Ratio	Max	Min	Expiry Delay	
be.gen.DataGene	1	0	3640	0	0	0	2147483647	1610612735	0	
be.gen.EventsAnc	0	0	0	0	0	0	2147483647	1610612735	0	
be.gen.EventsAnc	0	0	0	0	0	0	2147483647	1610612735	0	
StateTimeoutEver	0	0	0	0	0	0	2147483647	1610612735	0	
ObjectTableIDs	3554	0	3554	0	0	0	2147483647	1610612735	0	
be.monitored.clus	4	7956	6	0	0	100	2147483647	1610612735	0	
WorkList	0	0	0	0	0	0	2147483647	1610612735	0	
be.gen.ConceptM	1769	585	2354	0	0	100	2147483647	1610612735	0	
be.gen.EventsAnc	0	0	0	0	0	0	2147483647	1610612735	0	
be.gen.DataGene	0	0	0	0	0	0	2147483647	1610612735	0	
_ClusterLocks_	0	0	0	0	0	0	10000	7500	2000	
ObjectTableExtID	3554	2	3554	0	0	0	2147483647	1610612735	0	
be.gen.DataGene	0	0	0	0	0	0	2147483647	1610612735	0	
AgentTxn-1	4	0	3640	0	0	0	10000	7500	10000	
be.gen.DataGene	0	0	0	0	0	0	2147483647	1610612735	0	
be.gen.ConceptM	1769	0	1769	0	0	0	2147483647	1610612735	0	
be.gen.ConceptM	15	1768	15	0	0	100	2147483647	1610612735	0	
SequenceManage	0	0	0	0	0	0	2147483647	1610612735	0	
WorkManager	1	3	2	0	0	66.67	2147483647	1610612735	0	

The Ontology Overview panel has one large pane, the Cache Objects pane. It shows a list of all the objects currently in the cache.

Click the column headers to sort the display. You can use a multiple column sort. The primary sort column displays a number 1, and the arrow indicates the sort order. The secondary sort column displays a number 2 and so on.

## Ontology Reference

Ontology reference table shows attributes for each object.

### Cache Objects Metrics

Metric	Notes
Name	The class name of the object.
Count	The number of instances of the object in the cache.
Gets	The number of read operations done on the object.
Puts	The number of write operations done on the object.
Get Time	The average time for a read operation.
Put Time	The average time for a write operation.
Hit Ratio	The ratio of 'hits' versus 'misses,' where 'hit is defined as a 'read' for an object existing in the cache
Max	The maximum number of object instances that can be stored in the cache.
Min	The number of units to which the cache will shrink when it prunes. This is sometimes referred to as a "low water mark" of the cache.
Expiry Delay	The time-to-live in milliseconds for cached object instances.

## MM Process Methods

Process methods apply at the process level, that is the processing unit in design-time terminology.

If you use the process methods at the cluster level, they affect all processing units in the cluster.

### Process Methods

Property	Notes
Channels Group	
ReconnectChannels	Restarts all channels or a single channel.
resumeChannels	Resumes all channels or a single channel.
suspendChannels	Suspends all channels or a single channel.
ResumeDestinations	Resumes one or all of the destinations of one or all of the channels, depending on the arguments provided.

Property	Notes
SuspendDestinations	Suspends one or all of the destinations of one or all of the channels, depending on the arguments provided.
GetChannels	Retrieves channel information.
GetDestinations	Retrieves destination information.
GetSessionInputDestinations	Retrieves the destinations enabled for input in the specified agent.
Engine Group	
StopEngine	Shuts down the processing unit (engine).
GetHostInformation	Retrieves the value of the specified host information property, or of all properties if none specified.
GetNumberOfEvents	Retrieves the total number of events existing in the specified agent or in every agent.
GetNumberOfInstances	Retrieves the total number of instances existing in the specified agent or in every agent.
GetMemoryUsage	Retrieves the engine's memory usage information.
SetLogLevel	Sets the log level to one of the following: FATAL, ERROR, WARN, INFO, DEBUG, ALL, or OFF
Object Management Group	
GetEvent	Retrieves an event with the specified Id from the specified agent or from every agent.
GetInstance	Retrieves an instance with the specified ID from the specified agent or from every agent.
GetScorecards	<p>If URI is not provided: Returns a table with of all of the scorecards in the specified agent or in every agent.</p> <p>If URI is provided: retrieves scorecard information in the specified agent or in every agent.</p>
Profiler Group	

Property	Notes
StartFileBasedProfiler	Turns on the profiler and starts collecting data for the specified duration. When the time is complete or the Profiler is turned off, profiling data will be saved to a file in comma separated format.
StopFileBasedProfiler	Turns off the profiler and stops collecting data.
Rule Service Provider Group	
ResumeRuleServiceProvider	Resumes the agents in the processing unit.
SuspendRuleServiceProvider	Suspends the agents in the processing unit.
Working Memory Group Applies only to inference agents. Other agent types are ignored.	
ActivateRule	Activates a rule in the specified inference agent or in every inference agent.
DeactivateRule	Deactivates a rule in the specified inference agent or in every inference agent.
ResetTotalNumberRulesFired	Resets the total number of rules fired to zero for the specified inference agent or for every inference agent.
GetWorkingMemoryDump	Gets the working memory dump for the specified inference agent or for every inference agent.
GetRule	Gets info about the rule with the specified URI for the specified inference agent or for every inference agent.
GetRules	Gets a table listing the rules deployed for the specified inference agent or for every inference agent.
GetTotalNumberRulesFired	Gets a table listing the total number of rules fired for the specified inference agent or for every inference agent.
GetRuleSession	Gets a table listing every active inference agent.

## MM Inference Agent Methods

MM Inference Agent group of methods you can use to manage a deployed cluster.

### *Inference Agent Methods*

Property	Notes
Agent Group	
GetNumberOfEvents	Retrieves the total number of events currently in the agent's Rete network. Note that events with time to live zero (ttl=0) do not persist in the Rete network.
GetNumberOfInstances	Retrieves the total number of concept instances existing in this agent's Rete network.
Resume	Resumes the execution of this agent.
Suspend	Suspends the execution of this agent.
Channels Group	
GetSessionInputDestinations	Retrieves the destinations enabled for input in this agent.
Object Management Group	
GetEvent	Retrieves the event with the specified ID from this agent.
GetInstance	Retrieves the concept instance with the specified ID from this agent.
GetScorecards	If URI is not provided: Returns a table with of all of the scorecards in this agent.  If URI is provided: Retrieves the agent's scorecard information.
Profiler Group	
The performance profiler is primarily used towards the end of the development phase, to check for bottlenecks and refine the project design. For full details about using profiler as well as a detailed reference, see Performance Profiler in <i>TIBCO BusinessEvents Developer's Guide</i> .	
StartFileBasedProfiler	Turns on the profiler and starts collecting data for the specified duration. When time is complete or the profiler is turned off, profiling data is saved to a file in a comma-separated format.
StopFileBasedProfiler	Turns off the profiler and stops collecting data.
Working Memory Group	

Property	Notes
ActivateRule	Activates the specified rule in this agent.
DeactivateRule	Deactivates the specified rule in this agent.
ResetTotalNumberRulesFired	Resets to zero the total number of rules fired in this agent, resetting the statistics.
GetWorkingMemoryDump	Retrieves the working memory dump of this agent.
GetRule	Retrieves information about the rule with the specified URI in this agent.
GetRules	Retrieves a table listing the rules deployed in this agent.
GetTotalNumberRulesFired	Retrieves a table listing the total number of rules fired in this agent since startup or since statistics were last reset.
GetRuleSession	Retrieves a table with the name of this agent.

## MM Query Agent Methods

MM Query Agent group of methods you can use to manage a deployed cluster.

### *Query Agent Methods*

Property	Notes
Agent Group	
Resume	Resumes the execution of this agent.
Suspend	Suspends the execution of this agent.
Channels Group	
GetSessionInputDestinations	Retrieves the destinations enabled for input in this agent.

## Enterprise Archive (EAR) Files

You can build an enterprise archive file using a TIBCO BusinessEvents Studio dialog, and also using a command-line utility.

For deployment using TIBCO Administrator, the configuration Name field value must match the project name. The project does not deploy if they are different. The actual EAR file name, however, can differ from the configuration name.

Certain files (and folder names) are excluded from the EAR. To maintain the list of exclusions, in TIBCO BusinessEvents Studio, select **Window > Preferences > TIBCO BusinessEvents > Code Generation > Ignored Resources**.



Do not store the EAR file in a project folder, since this will include the prior EAR file when you build the EAR file again, needlessly increasing the size.

### EAR File Encoding

- The default encoding of the EAR files generated by TIBCO BusinessEvents Studio is ISO8859-1. This is also the default encoding of TIBCO Administrator. To upload an EAR file to TIBCO Administrator, the EAR file encoding must match the TIBCO Administrator encoding.
- To change the default EAR file encoding, define a global variable named *MessageEncoding* and set its value to the desired encoding. For example, *UTF-8*.

### EAR Files and the Studio Tools Utility

You can build an EAR file with the Studio Tools command-line utility. The `buildear` operation within the `studio-tools` utility is useful for automation purposes, for example, in testing environments.

By default, the EAR files are built in memory. The compiler does not use the file system during code generation. Instead, the Studio JVM is used to load all the Java classes and resources into memory until the build process is completed. You can choose to use the file-system based compiler to build EAR files by setting the appropriate options.

Before you build an EAR file during hot deployment of the new concept and concept properties, make sure to add the following property in the `studio-tools.tra` file:

```
java.property.com.tibco.be.hotdeploy.concept=true
```

## Building an EAR File in TIBCO BusinessEvents Studio

EAR files are built in memory by default. The compiler does not use the file system during code generation, but Instead the Studio JVM is used to load all Java classes and resources into memory until the build process is completed. However, you can choose to use the file-system based compiler to build EAR files.

### Procedure

1. In TIBCO BusinessEvents Studio, select the menu **Window > Preferences** to open the Preferences dialog.
2. Select **TIBCO BusinessEvents > Code Generation** on the left panel and then set the **Compilation Mode** to **File System**.

When using the Studio Tools utility to build an EAR file, set the option `-lc` to use the file-system based legacy compiler.



When building an EAR file in memory for a large project, the JVM may run out of PermGenSpace and/or heap space. In such cases, edit the `BE-HOME/studio/eclipse/studio.ini` and `BE-HOME/studio/bin/studio-tools.tra` file to set appropriate values for the JVM settings. By default the heap size is set to `-XX:MaxPermSize=256m`.

3. In BusinessEvents Studio Explorer, highlight the project name, then from the top menus select **Project > Build Enterprise Archive** .  
If you see a message asking you to save all project resources, click **Yes**. It means an unsaved resource editor is open.
4. At the Build Enterprise Archive dialog, complete values according to guidelines provided in [Enterprise Archive Reference](#).
5. Click **Apply** to save the configuration details.  
To revert to the version already saved, click **Revert**.
6. Click **OK** to build the archive.

## Enterprise Archive Reference

This reference is used to build the Enterprise Archive (EAR) file.

### *Enterprise Archive Reference*

Field	Description
Name	<p>Name of this EAR configuration. (Not the EAR filename.)</p> <p>Default value is the project name.</p> <div style="border-left: 1px solid black; padding-left: 10px; margin-top: 10px;">  <p>For deployment using TIBCO Administrator, the configuration Name field value must match the project name. The project does not deploy if they are different. The actual EAR file name, however, can differ from the configuration name.</p> </div>
Author	<p>Person responsible for the EAR file.</p> <p>Default value is the currently logged-on user name.</p>
Description	Optional description.
Archive Version	Increments on each build of the EAR. You can also manually enter a version identifier.
Generate Debug Info	<p>Check this checkbox if you want to use the debugger.</p> <p>Default setting is checked.</p>
Include all service level global variables	Check to include service level global variables.
File Location	Browse to the directory in which you want to store the EAR file and enter an EAR filename.

Field	Description
Delete Temporary Files	<p>Before TIBCO BusinessEvents packages an EAR file, it generates the Java code in a temporary directory. After the files are packaged in the EAR file, then the temporary files and directory are deleted.</p> <p>You can choose to keep the generated Java files, for example to troubleshoot some problem with an EAR file. To do so, uncheck the Delete Temporary Files checkbox, and specify where to store the Java files in the Compilation Directory field.</p> <p>Default setting is checked, meaning that temporary files are not saved.</p>
Compilation Directory	If you uncheck the Delete Temporary Files checkbox, specify the directory where you want to save the Java files generated during the process of building the EAR file.

## Building an EAR File at the Command Line

You can build an EAR file using the command line interface.

### Procedure

1. Navigate to `BE_HOME/studio/bin/` and open a command prompt.
2. Execute a command with the following format (all on one line) at a command prompt:

```
studio-tools -core buildEar [-h] [-x] [-lc] [-o outputEarFile>] -p
studioProjectDir [-pl projectLibrariesFilePath] [-cp extendedClasspath]
```

For example:

```
studio-tools -core buildEar -o c:\FD.ear -p D:\Workspace\FraudDetection
```

See [Options for Building an EAR File](#)



When building an EAR file in memory for a large project, the JVM may run out of PermGenSpace and/or heap space. In such cases, edit the `BE_HOME/studio/eclipse/studio.ini` and `BE_HOME/studio/bin/studio-tools.tra` file to set appropriate values for the JVM settings. By default the heap size is set to `-XX:MaxPermSize=256m`.

3. When testing a project, run it at the command line using the following format:

```
BE_HOME/be-engine [-h] [--propFile startup property file] [--propVar
varName=value][-p custom property file] [-n engine name] [-d] [-c CDD file] [-u
processing unit ID] [EAR file]
```

## Options for Building an EAR File

These options are used to build an EAR file on the command line.

### TIBCO BusinessEvents Studio Tools Options for Building an EAR File

Option	Description
<code>-core buildEar</code>	Within the <code>core</code> category of operations, specifies the <code>buildear</code> operation for building EAR files.
<code>-h</code>	Optional. Displays help.

Option	Description
-x	Optional. Overwrites the specified output file if it exists.
-lc	Optional. Specifies that the file-based legacy compiler must be used to build the EAR file. By default, the EAR files are built in memory.
-o	Optional. Specifies the filename for the output EAR file. If not specified the EAR file is the same as the final (leaf) directory name in the <i>projectDir</i> path.
-p	Absolute path to the TIBCO BusinessEvents Studio project directory. The EAR file is built using this project.
-pl	Optional. Specifies list of project library file path to be used, separated by a path separator.
-cp	Optional. Specifies the extended classpath to be used.

# Engine Management at the Command Line

When testing a project, run it at the command line.

To run the TIBCO BusinessEvents engine at the command line, use this command:

```
BE_HOME/be-engine [-h] [--propFile startup property file] [--propVar varName=value]
[-p custom property file] [-n engine name] [-d] [-c CDD file] [-u processing unit
ID] [EAR file]
```

For options to use, see [Command Line Startup Option Reference](#).

## Command Line Startup Option Reference

Engine startup options used for testing.

### Command Line Startup Options

Option	Description
-h	Displays this help.
--propFile	<p>When you execute <b>be-engine</b>, by default it looks in the working directory (the directory where you execute the command) for a property file of the same name (<code>be-engine.tra</code>). This property file provides startup values and other parameters to the executable. You can specify the path and filename of a startup property file explicitly using the <code>--propFile</code> parameter.</p> <p>For example, if you start the engine from a directory other than <code>BE_HOME/bin</code>, then you would generally use <code>--propFile</code> to specify <code>BE_HOME/bin/be-engine.tra</code>.</p>
--propVar	<p>Used to provide a value for a specified variable. This value overrides any other design-time value. The format is <code>propVar-varName=value</code>. For example to specify the value of the <code>%jmx_port%</code> variable used in TRA files to configure a JMX connection, you might use this: <code>--propVar jmx_port=4567</code>.</p>
-p	<p>Allows you to pass one or more supplementary property files to <code>be-engine</code>. Specify the path and filename.</p> <p>This is not needed very often. See <a href="#">Supplementary Property Files</a>.</p>
-n	<p>Allows you to provide a name for the TIBCO BusinessEvents engine.</p> <p>The name provided here is used in the console and in log files. If you do not provide a name, the host name of the machine is used.</p>
-d	Starts the debugger service on the engine for remote debugging.
-c	<p>Specify the path and filename for the Cluster Deployment Descriptor (CDD) file. TIBCO BusinessEvents looks first in the file system, and then in the EAR file.</p> <p>The default is <code>default.cdd</code>.</p>

Option	Description
<code>-u</code>	Specify the processing unit ID you want to use for this engine. This ID must exist in the CDD file you reference in the <code>-c</code> option.  The default is <code>default</code> .
<i>EAR filename and path</i>	Specify the path and filename for the EAR file you want to use.  If you do not specify the EAR file name then the engine will use the property <code>tibco.repourl</code> as the EAR file path and name. To use this property, add it to the <code>be-engine.tra</code> file. If you deploy using TIBCO Administrator this property is added to the generated TRA file automatically.

## Supplementary Property Files

Supplementary property files can be used in addition to `be-engine.tra` (or alternate file you specified using `--propFile`).

In TIBCO BusinessEvents 4.0 and higher, property files are less likely to be needed, because only system level configuration is done in the TRA files. configuration formerly done in TRA files is now done using the Cluster Deployment Descriptor file. Supplementary property files typically have a `.cfg` or `.tra` extension. Properties are defined as a list of name-value pairs. If a property name includes spaces, escape them using a back slash (`\`).

### Order of Precedence

Values in supplementary property files override the values in the startup property file. Values provided at the command line override values in the supplementary property files. If you specify multiple property files that include different values for the same parameters, TIBCO BusinessEvents uses the value in the left-most file in the command line.

For example, consider this command line:

```
be-engine -p first.cfg -p second.cfg -p third.cfg
```

If `second.cfg` and `third.cfg` set different values for (as an example) `tibco.clientVar.MyVar`, and `first.cfg` does not include this parameter, TIBCO BusinessEvents uses the value in `second.cfg`. However, if `first.cfg` also includes a value for `tibco.clientVar.MyVar`, TIBCO BusinessEvents uses the value in `first.cfg`.

## Setting up TIBCO BusinessEvents Engine as a Windows NT Service

You can configure the TIBCO BusinessEvents engine, or Rule Management Server (RMS), or MM, or Views to start as a Windows NT service.



TIBCO Hawk and TIBCO Rendezvous must be installed on the same machine for installing the BusinessEvents engines as a Windows NT service.

To set up the engines:

### Procedure

1. Open the required TRA file for editing:
  - `BE_HOME/bin/be-engine.tra` for the TIBCO BusinessEvents engine
  - `BE_HOME/rms/bin/be-rms.tra` for RMS

- `BE_HOME/mm/bin/br-mm.tra` for MM
  - `BE_HOME/views/bin/br-views.tra` for Views
2. Add the following environment paths under the common environment variables:
 

```
tibco.env.RV_HOME=<absolute path where TIBCO Rendezvous is installed>
tibco.env.HAWK_HOME=<absolute path where TIBCO Hawk is installed>
```
  3. Edit the arguments for the application property to provide the absolute path to the EAR file:
 

```
tibco.env.APP_ARGS=<absolute path of the EAR file>
```

The value of the `tibco.env.APP_ARGS` property depends on the type of engine:

- Absolute path of `BEprojectName.ear` file for the TIBCO BusinessEvents engine
- `BE_HOME/rms/bin/RMS.ear` for Rule Management Server (RMS)
- `BE_HOME/mm/bin/MM.ear` for MM
- Absolute path of `ViewsProjectName.ear` file for Views

Optionally you can provide name to the engine using the `-n` option of the `tibco.env.APP_ARGS` property. For example, for TIBCO BusinessEvents engine for FraudDetection project

```
tibco.env.APP_ARGS=C\:/tibco/be/5.1/examples/standard/FraudDetection/fd.ear -n fddef
```

4. Edit the TIBCO standard classpath property to include classpath for RV and HAWK. Append `%PSP% %HAWK_HOME%/lib%PSP%%RV_HOME%/lib` to the existing value of the `tibco.env.STD_EXT_CP` property.
5. Add the following properties to define the Windows NT service configurations:
 

```
ntservice.name=<short name for Windows NT service>
ntservice.displayname=<full description of the service>
ntservice.starttype=<type of start, whether automatic or manual>
ntservice.binary.path.absolute=<absolute path of engine executable>
ntservice.interactive=false
```

The `ntservice.binary.path.absolute` property identifies the absolute path of the respective executable:

- `BE_HOME/bin/be-engine.exe` for the TIBCO BusinessEvents engine
- `BE_HOME/rms/bin/be-rms.exe` for RMS
- `BE_HOME/mm/bin/be-mm.exe` for MM
- `BE_HOME/views/bin/be-views.exe` for Views

For example, for TIBCO BusinessEvents engine the Windows NT service configurations are:

```
ntservice.name=TIBBEFD
ntservice.displayname=TIBCO BusinessEvents FD Default
ntservice.starttype=automatic
ntservice.binary.path.absolute=C\:/tibco/be/5.1/bin/be-engine.exe
ntservice.interactive=false
```

6. Add the following properties to provide CDD file to the engine.
 

```
tibco.clientVar.CDD=<absolute path of the CDD file>
```

The value of the `tibco.clientVar.CDD` property depends on the type of engine:

- Absolute path of `BEprojectName.cdd` file for the TIBCO BusinessEvents engine
- `BE_HOME/rms/bin/RMS.cdd` for RMS
- `BE_HOME/mm/bin/MM.cdd` for MM
- Absolute path of `ViewsProjectName.cdd` file for Views

For example, for TIBCO BusinessEvents engine for the FraudDetection project

```
tibco.clientVar.CDD=C\:/tibco/be/5.1/examples/standard/FraudDetection/
FraudDetection/fd.cdd
```

7. Set the processing unit ID for the engine to the PUID that is setup in the CDD file.

```
tibco.clientVar.PUID=<processing unit ID mentioned in the CDD file>
```

For example, the PUID in the fd.cdd file is set as default for the BusinessEvents engine, then the value of PUID in the TRA file is also default.

```
tibco.clientVar.PUID=default
```

8. (Optional) Specify the path of the log file in the Engine.Log.Dir property. For example:

```
Engine.Log.Dir C:/temp/logs
```

9. Save and close the TRA file.
10. Open the command prompt and browse to the bin directory of the respective engine.
11. In command prompt run the commands to install or uninstall the Windows NT service.

For example, to install the TIBCO BusinessEvents engine as Windows NT service:

```
BE_HOME/bin>be-engine.exe -install
```

For example, to uninstall the TIBCO BusinessEvents engine as Windows NT service:

```
BE_HOME/bin>be-engine -uninstall
```

## Result

To verify, if the service is setup correctly, browse to the bin directory of the respective engine in the command prompt and run the engine without any argument. If the service does not start check logs for the cause.



For any change to the TRA file, run **-uninstall** and **-install** commands again for the changes to take effect.

# Deployment with TIBCO Administrator

You can use TIBCO Administrator for deploying, hot deploying, undeploying, starting and stopping TIBCO BusinessEvents engines.

Within an Enterprise Archive Resource (EAR) file, a TIBCO BusinessEvents ARchive (BAR) file contains the compiled agent files for all agents. When you upload an EAR file, The BAR file appears here in the TIBCO Administrator UI:

**Application Management > application\_name > Configuration > application\_name.bar**

The default value of *application\_name* is provided by the name field in the EAR file.



- The only supported transport option in this release is the `local` option.
- Message encoding: For deployment with TIBCO Administrator the message encoding specified in the CDD file General settings must match the TIBCO Administrator domain's message encoding. The default message encoding for TIBCO BusinessEvents and TIBCO Administrator is ISO8859-1.
- Troubleshooting: When you deploy with TIBCO Administrator, remember to check the TIBCO Administrator logs (as well as TIBCO BusinessEvents logs) when troubleshooting TIBCO BusinessEvents deployment or runtime issues.

## TIBCO Administration Domains

You can use an existing domain or create another one (using Domain Utility) for your TIBCO BusinessEvents applications and the hardware they run on.

The first time you log in to the TIBCO Administrator user interface after installing the software, you must use the username and password entered during installation. You can then create additional users and passwords as needed. If TIBCO Administrator was already installed before you installed TIBCO BusinessEvents, you may have to contact the person responsible for administering the software to get login credentials for an existing administration domain.

## Property Overrides and Precedence

Properties set in TIBCO Administrator are added to the TRA file that TIBCO Administrator generates at deploy time (based on the default `be-engine.tra` file). However, See [Order of Precedence at Runtime](#) for more details.

Global variables that are overridden at the deployment level, however are stored in a different location. See [Overriding of Global Variables in TIBCO Administrator](#) .

## Using AppManage for Scripted Deployment to a Domain

Instead of using the TIBCO Administrator user interface, you can perform scripted deployment to a TIBCO Administrator domain using the AppManage utility. Use of AppManage is explained in *TIBCO Runtime Agent Scripting Deployment User's Guide*.

## Deploying a Project in a TIBCO Administrator Domain

To deploy a project in a TIBCO Administration Domain, you must update the `be-engine.tra` files on all machines to include the TIBCO Hawk information. You must also build the EAR file and perform other tasks, as needed.

### Procedure

1. Open the `BE_HOME/bin/be-engine.tra` file for editing.

2. If it is not already present, add the following variable and set the value to the TIBCO Hawk home:

```
tibco.env.HAWK_HOME=Hawk_Home
```

3. If it is not already present, append the following to the value of the standard classpath,

```
tibco.env.STD_EXT_CP:
```

```
%PSP%HAWK_HOME%/lib%PSP%
```

4. If it is not already present, append the following to the value of the standard path,

```
tibco.env.PATH:
```

```
%PSP%HAWK_HOME%/bin%PSP%
```

5. Save the file.



You can update the engine TRA file for any specific application arguments. Use `tibco.env.APP_ARGS` for generic application specific arguments.

## Other Deployment Tasks

You may need to perform additional tasks while deploying a project with TIBCO Administrator.

### Set default or specific CDD file and processing unit names

If you want to let the target engines find the CDD at a default location, name the CDD file `default.cdd` and keep it in the root of the project folder. If you want to let the target engines choose a processing unit by default, then, in the CDD file, name one of the processing units `default`. When you deploy, the processing unit named `default` will start. Note that these names are case sensitive.

You can also specify different CDD file and processing unit values at deploy time.

### Enable hot deployment, as needed

If you want to be able to hot deploy changes to the running engine, open the CDD file in the TIBCO BusinessEvents Studio project, select the processing unit or units you will deploy, and check the Hot Deploy check box. See Agent and Processing Unit Configuration in *TIBCO BusinessEvents Developer's Guide*.

### Enable service-settable global variable overrides and build the EAR

Service settable global variables are only available if the "Include All Service Level global variables" checkbox in the Build Enterprise Archive dialog is checked. Check as needed.

Then build the EAR. See Building an Enterprise Archive (EAR File). See [Enterprise Archive \(EAR\) Files](#) for details.

### Set stack size to 264K on HP-UX Itanium

The default stack size is not sufficient to create the Java Virtual Machine and start the engine on HP-UX Itanium. Edit the `be-engine.tra` file and set the stack size to 264K:

```
java.thread.stack.size=264K
```

## Overriding of Global Variables in TIBCO Administrator

Global variables defined in a project appear in TIBCO Administrator if they are configured to do so at design time.

### Levels of Override

You can override global variable default values as follows:

- **Deployment Level**

If the Deployment Settable checkbox is checked at design time in the Global Variable editor, you can override at the deployment level. Overrides set at the deployment level are used in all deployed engines.

- **Service Level (Same Scope as DeploymentLevel in TIBCO BusinessEvents)**

If the Deployment Settable checkbox and the Service Settable checkbox are both checked at design time in the Global Variable editor, you can override at the service level or service instance level. However, overrides set at the service level are used for all engines because all services (all BARs, that is all PU definitions) are merged when deployed using TIBCO Administrator.

- **Engine Instance Level**

If the Deployment Settable checkbox and the Service Settable checkbox are both checked at design time, you can override at the service instance level. Overrides set at the service instance level are used for the specific engine (PU instance) represented by that service instance.



Caution: Overriding a global variable at the service or service instance level breaks the connection with higher level overrides for that global variable. By default, global variable overrides done at the application level are propagated to all lower level global variable settings at runtime. However, when you override a global variable at the service level, TIBCO Administrator no longer propagates application-level overrides for that variable to the service or service instance levels at runtime. Similarly, if you override a global variable at the service instance level, any subsequent overrides you make to that global variable at the service level (or application level) are ignored at runtime.

This behavior applies to overrides made using the `appmanage` utility as well as those made using the TIBCO Administrator UI.

## Specifying Global Variable Groups

If global variables are defined in the TIBCO BusinessEvents project using groups, specify the group path using forward slashes. For example, if a variable `JMSuri` is located under a group called `URIs`, specify the variable as `tibco.clientVar.URIs/JMSuri`.

## Enabling Service Settable Global Variables

Service settable global variables are only available if the `Include All Service Level global variables` checkbox in the Build Enterprise Archive dialog is checked.

## Runtime Location of Global Variable Override Settings

The runtime location of override settings depends on the level at which the override was done:

- **Deployment level overrides**

are located in the following folder

```
TRA_HOME/domain/domain_name/datafiles/application_name_root
```

- **Service and service instance level overrides**

are located in the TRA file generated by TIBCO Administrator.

## Project Deployment

After performing all required actions and building an EAR file, you are ready to configure the system for deployment and deploy it.



Do not use the fault tolerance features of TIBCO Administrator. Instead, use the tab **Agent Classes** > **AgentClassName** > **Max Active** setting. To maintain one active and one standby agent, deploy two agents of the same class and set the Max Active setting to 1. (You can also deploy more than two agents and set the property to a larger number for different use cases.)



The only supported transportation option is **local**.

## Deploying a Project EAR in a TIBCO Administrator Domain

### Procedure

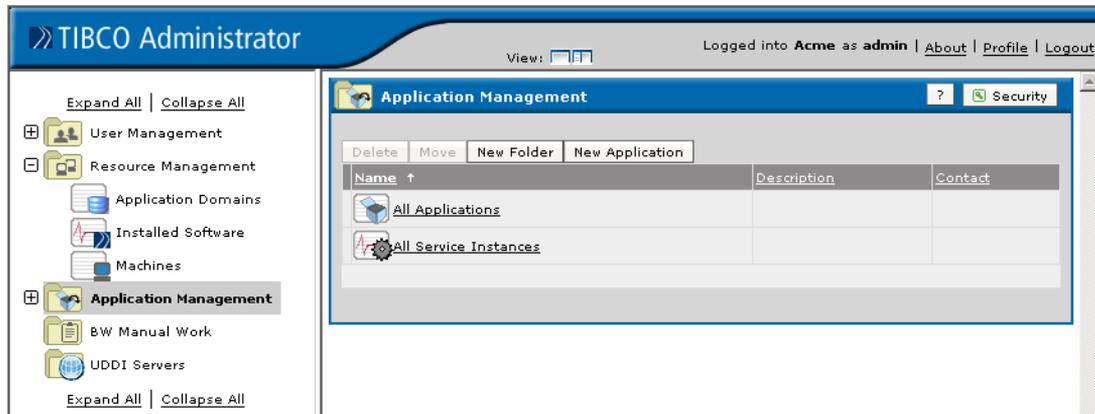
1. As needed, ensure that the following are started on the machine whose engine properties you want to change:
  - TIBCO Administrator service for the administration domain.
  - TIBCO Hawk service for the administration domain.
2. Start the TIBCO Administrator GUI:
  - Windows: **Start > Programs > TIBCO > TIBCO Administrator Enterprise Edition *version* > TIBCO Administrator**
  - Web browser: `http://host-name:port/` (where *host-name* is the machine name and *port* is the HTTP port specified at installation. It is 8080 by default.)
3. Select the administration domain for the application and provide the username and password assigned during installation, or other administrator user credentials.
4. Depending on the application you are deploying, proceed with the steps described either in [Deploying a Project EAR for the First Time](#) or in [Deploying a Project EAR for an Existing Application](#).

### Deploying a Project EAR for the First Time

If you are deploying a new application, perform these steps after selecting the administration domain and providing the username and password.

#### Procedure

1. Click **Application Management** (in the left panel).
2. Click the **New Application** button.



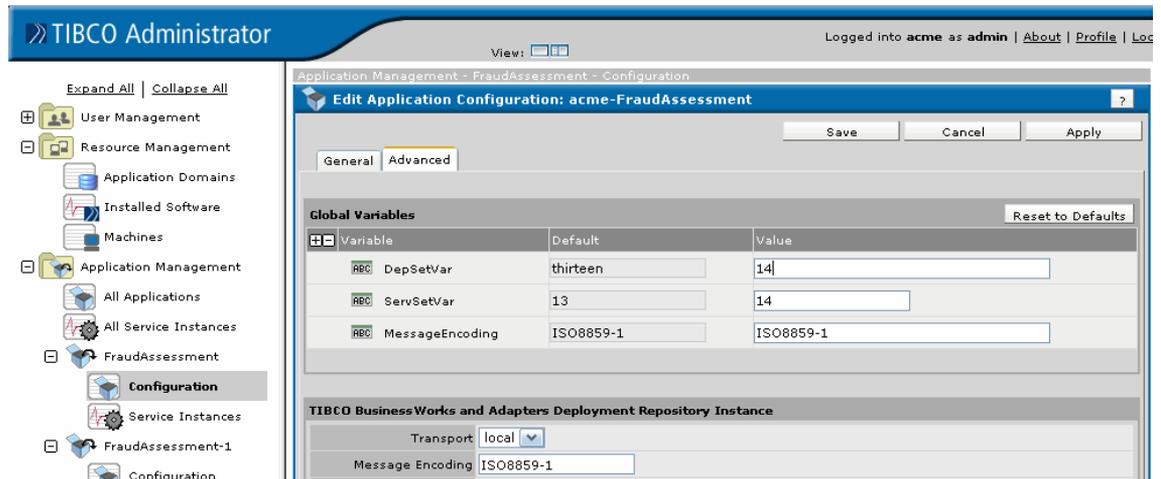
3. At the Upload EAR File dialog, click **Browse** and select the EAR file you want to deploy. Click **OK**.
4. At the New Application Configuration dialog, set the Application Parameters and Services settings as desired (click **Help** for details). You can change default names:
  - Name:** Set by default to the TIBCO BusinessEvents Studio project name
  - Deployment Name:** Set by default to the TIBCO BusinessEvents Studio project name prepended with the domain name.
5. Click **Save**.
  - If the application does not appear in the list of applications, check [Deploying a Project EAR in a TIBCO Administrator Domain](#) and ensure you have met all prerequisites.
6. Continue with the steps described in [Deploying on a Service Level](#).

## Deploying a Project EAR for an Existing Application

When deploying an existing application, you can navigate to the Configuration Builder panel by expanding the explorer nodes on the left to **Application Management > application\_name > Configuration**.

### Procedure

1. To set deployment wide settings such as deployment-wide global variable overrides, select the application (which is at the top level in the hierarchy) and select the **Advanced** tab.
  -  See [Overriding of Global Variables in TIBCO Administrator](#) for important considerations and cautions about how to override global variables.
2. Ensure that the Transport field is set to **local**. Local is the only supported transportation option. An example application level Advanced tab is shown next:



3. Click **Save** when you are done.  
The Configuration Builder panel appears again.
4. Continue with the steps described in [Deploying on a Service Level](#).

## Deploying on a Service Level

In the Configuration Builder panel, perform these steps to set project-related settings that apply to all deployed engines on all machines.

### Procedure

1. Select the *application-name.bar* entry.  
It's one level below the top level in the hierarchy.
2. Select its **Advanced** tab.



For TIBCO BusinessEvents, settings at both the application and service levels affect the entire deployment.

3. As desired, enter the name of the CDD file and processing unit (PUID) you want to use for *all* deployed engines. You can use a relative or absolute path.



The TIBCO BusinessEvents engine looks for the CDD and processing unit as follows:

- The engine looks first in the file system, under the given path. If the path is specified as a relative path, it is relative to the working directory (in this case: `...tibco/tra/domain/domainName/application/appName/`)
- If no CDD is found in the file system, the engine looks within the EAR, under the given path. If the path is specified as a relative path, it is relative to the project root.

4. You can also override any service-settable global variable values as desired. Values entered here apply to all deployed engines.



Service settable global variables are only available if the Include All Service Level Global Variables checkbox in the Build Enterprise Archive dialog is checked before generating the EAR file.



Global Variable Overrides: If you override a global variable at a lower level, subsequent changes at higher levels are ignored.

5. Click **Save** when you are done.  
The Configuration Builder panel appears again.
6. Select the machines in the administration domain to which you will deploy the application.

7. In the Configuration Builder panel, click the service (*application.bar*) name. The service name is nested under the application name. In the General tab, Target Machines panel, the current machine is available by default.
8. Select **Add to Additional Machines** and select the machines to which you will deploy the application.



You can select the same machine more than one time, if you want to deploy the application more than once on a machine. For example, you would do this when you want to deploy two different processing units to one machine.

9. Click **Save**
10. Continue with the steps described in [Deploying on an Instance Level](#).

## Deploying on an Instance Level

These steps will set project-related settings that apply to deployments on specific machines.

### Prerequisites

Make sure you have finished all the steps as described in [Deploying on a Service Level](#).

### Procedure

1. At the Configuration Builder panel, select a machine-level entry (*machineName - projectName*). These entries appear below the *application-name.bar* entry. Then select its **Advanced** tab. You see a dialog similar to the following:

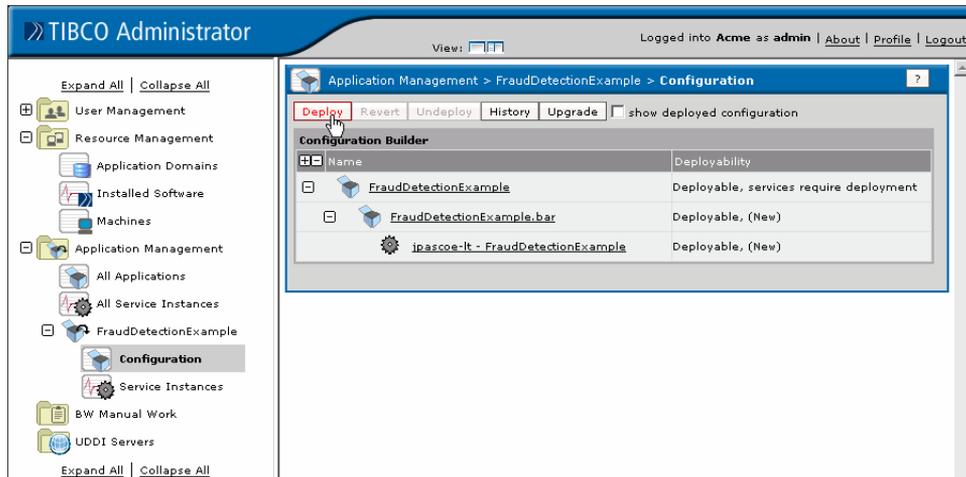
The screenshot shows a dialog box titled 'Edit Service Instance: TickerTracker' with three tabs: 'General', 'Server Settings', and 'Advanced'. The 'Advanced' tab is selected. Below the tabs is a 'Runtime Variables' section with a 'Reset to Defaults' button. The table below contains the following data:

Variable	Default	Value
CDD		
PUID		
myservicesetable1	jackie13	jackie13

Here you can also override any service-settable global variable values as desired. (See [Overriding of Global Variables in TIBCO Administrator](#) for important information.)

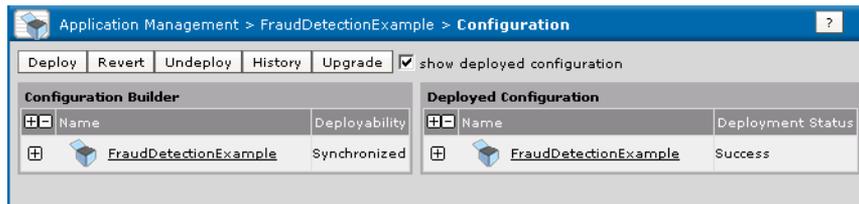
2. Click **Save** when you are done. The Configuration Builder panel appears again. The same project-related options are available here as at the *.bar* level, but here they apply only to an engine deployed to the selected machine. As desired, enter the name of the CDD file and processing unit (PUID) you want to use for this deployed engine. You can use a relative or absolute path. The same project-related options are available here as at the *.bar* level, but here they apply only to an engine deployed to the selected machine. Enter the name of the CDD file and processing unit (PUID) you want to use for this deployed engine. You can use a relative or absolute path.
3. You are now ready to deploy. By default an engine starts when you deploy it. You can also start and stop engines as separate actions.

Navigate to the application's main Configuration Builder dialog and click the **Deploy** button.



- At the Deploy Configuration dialog, configure settings if desired then click **OK**. The application deploys, and the Configuration dialog displays again.

You can check the **Show deployed configuration** checkbox to display the Deployed Configuration panel and verify success:



# Hot Deployment

You can make certain changes to a TIBCO BusinessEvents project and apply them to a running engine, without having to shut down the engine. This is known as hot deployment.

In an active agent, the hot deployment process waits for the current RTC cycle to complete and then injects the changes before the next RTC cycle starts. You can only hot deploy to an application that was enabled for hot deployment *before* it was deployed. When enabled for hot deployment, the application listens for changes in the EAR file. When you replace an EAR file, TIBCO BusinessEvents detects the change and performs hot deployment. See [Enabling Hot Deployment](#).

The permitted changes available to you depend partly on the type of object management in use. The permitted changes are listed in the section [Modifications Allowed in Hot Deployment](#). If you attempt to hot deploy an EAR file that includes unsupported modifications, TIBCO BusinessEvents rejects the EAR file.

Performing hot deployment requires changing the execution code at runtime. This is made possible using the `-javaagent` option. The `-javaagent` option is provided in the `be-engine.tra` file as shipped.

This section explains how to hot deploy with TIBCO Administrator, and also to an engine that was started at the command line.

## Modifications Allowed in Hot Deployment

You can make only certain changes during a hot deployment. Also keep in mind that supported modifications for Cache OM are more limited than those for In Memory OM.

### *Hot Deployment Supported Modifications*

Resource	New	Modify	Delete
Rules	Yes	Yes	Yes
Rule Functions	Yes	Yes	Yes
Concepts*	Yes		
Global Variables	Yes	Yes	Yes
Simple Events*	Yes		
Score Cards*	Yes		
Time Events*	Yes		
State Machines and States**	Yes		
State Machine Transitions	Yes	Yes	Yes
State Machine Timeout Expressions	Yes	Yes	Yes
State Machine Timeout Actions	Yes	Yes	Yes
State Machine Entry Actions	Yes	Yes	Yes

Resource	New	Modify	Delete
State Machine Exit Actions	Yes	Yes	Yes
State Machine Event Timeout Actions	Yes	Yes	Yes
Channels and Destinations*			
New Concept Property***	Yes		

### Explanations for Supported Modifications

#### \* Cache object management

When Cache object management is used, hot deployment is available only for rules, rule functions, global variables, event timeout actions, and the following state machine components: transitions, entry and exit actions, timeout expressions and actions.

#### \*\* For state machine hot deployment

You can only hot deploy new state machines (and state machine states) that are associated with new concepts, that is, concepts added in the same hot deployment. Adding a state machine or state machine component that is associated with an existing concept modifies that concept, and concept modification is not allowed. Also see notes for Cache object management above.

#### \*\*\* Used only when cache is enabled

This is an alternate space feature used only when cache is enabled. It allows you to add new concepts as well properties to the existing concepts and is supported only for the concept types that are cache-only.

The new concept property works in rule conditions and actions and in rule functions, which should be properly saved to cache and backing store if any. It is supported for Cache OM with shared-nothing backing store or no backing store.

With no backing store, the default `be.engine.cluster.as.tuple.explicit=true` is required in the CDD.

Adding a concept property of the type Contained Concept with the contained concept type set to an existing concept is not supported.

## Enabling Hot Deployment

As a safety measure, hot deployment is disabled by default. You must enable hot deployment for specific processing units and then deploy those processing units and start them. You can then perform hot deployment to the running engines (processing units) that are enabled for hot deployment.

### Procedure

1. In TIBCO BusinessEvents Studio Explorer, open the CDD file in the CDD editor.
2. Select the Processing Unit tab.
3. Select a processing unit and check the **Hot Deploy** check box.  
Repeat for all processing units you want to enable for hot deployment.  
See Agent and Processing Unit Configuration in *TIBCO BusinessEvents Developer's Guide* for more details.
4. Start the TIBCO BusinessEvents application Using the CDD file you updated.  
For details on performing a hot deployment, see [Hot Deployment in a TIBCO Administrator Domain](#) and [Performing Hot Deployment Outside a TIBCO Administrator Domain](#).

## Hot Deployment in a TIBCO Administrator Domain

You can perform hot deployment of the TIBCO BusinessEvents project after it has been deployed to a TIBCO Administrator domain.

This procedure assumes the following requirements are met:

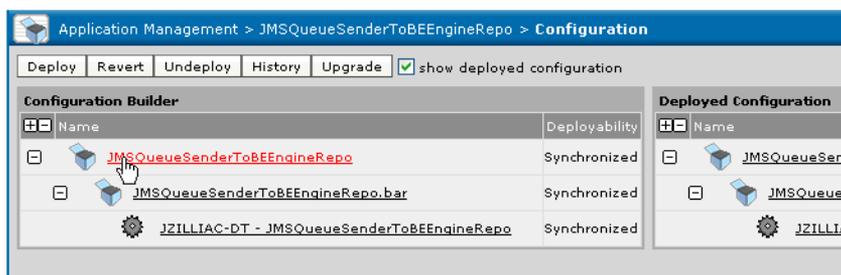
- The processing units that you want to hot deployed were already enabled for hot deployment before they were deployed (see [Enabling Hot Deployment](#)).
- Your project complies with the requirements for deploying to TIBCO Administrator.
- You have modified the TIBCO BusinessEvents Studio project and built the EAR file, following the limitations shown in [Modifications Allowed in Hot Deployment](#).
- The new EAR file has the same name as the existing one.

## Performing Hot Deployment in a TIBCO Administrator Domain

You can perform hot deployment of the TIBCO BusinessEvents project after it has been deployed to a TIBCO Administrator domain.

### Procedure

1. As needed, ensure that all the following are started on the machine running the processing unit or units you want to hot deploy to:
  - TIBCO Administrator service for the administration domain.
  - TIBCO Hawk service for the administration domain.
2. Start the TIBCO Administrator GUI:
  - Windows: **Start > Programs > TIBCO > TIBCO Administrator Enterprise Edition > version > TIBCO Administrator.**
  - Web browser: `http://host-name:port/` (where *host-name* is the machine name and *port* is the HTTP port specified during installation, 8080 by default)
3. Select the administration domain for the application and provide the username and password assigned during installation, or other administrator user credentials.
4. Expand to **Application Management > application\_name > Configuration**.
5. In the Configuration Builder panel, select the application (at the base of the tree).



6. In the Edit Application Configuration dialog, click **Upload New EAR File**.
7. At the Upload EAR File dialog, click **Browse**, select the EAR file you want to deploy, and click **OK**.
8. Confirm the upload by clicking **OK** again, then click **Save**. Verify that the Deployability column displays Deployable.
9. Click **Deploy**. You see the Deploy Configuration dialog.

10. Uncheck these checkboxes (if they are checked):

- **Stop running services before deployment.**
- **Start successfully deployed services .**
- **Force redeployment of all services.**

(When the Stop running services before deployment checkbox is checked, you see an additional setting, Kill services that haven't stopped after (seconds). It is removed when you uncheck the checkbox.)

11. Click **OK**. TIBCO Administrator performs the hot deployment of your modified TIBCO BusinessEvents project. If deployment is successful, the Deployed Configuration panel in the Configuration dialog displays **Success** in the Deployment Status column.

## Performing Hot Deployment Outside a TIBCO Administrator Domain

You can perform hot deployment when the TIBCO BusinessEvents project has not been deployed to a TIBCO Administrator domain only if the deployed application was enabled for hot deployment before it was deployed. You need to modify the project as needed and build the EAR file.

### Procedure

1. In TIBCO BusinessEvents Studio, modify the TIBCO BusinessEvents project according to your needs. See [Hot Deployment Supported Modifications](#) for a list of modifications you can make. Then rebuild the project EAR file.
2. Verify that the new EAR file have the same name as the existing one.
3. Replace the EAR File that was used to start the engine with the modified EAR file.
4. Ensure that the modified EAR file has the same name and is placed in the same directory as the EAR file that was used to start the engine.  
The engine notices the changed file and performs the hot deployment at the next RTC cycle.

# User Authentication

User authentication can be set using a file-based system and integration with an LDAP system.

To set up authentication, you add and configure the appropriate properties in the project CDD. To enable authentication for MM you must also set JMX properties in the `be-engine.tra` files.

## Pluggable JAAS Login Module

User authentication is performed using a JAAS login module. Java Authentication and Authorization Service (JAAS) is a pluggable part of the Java security framework.

With advanced configuration (not documented), you can substitute a different implementation of the JAAS login module than the one provided, or you can add the provided login module to your existing JAAS login configuration file (thus providing multi-stage authentication).



For the TIBCO BusinessEvents Monitoring and Management component, the provided JAAS login module is required.

## Authentication Options

You can choose between file based and LDAP user authentication.

### File Based Authentication

This method authenticates a user against user data stored in a file based repository. This method is not recommended for production purposes. In file-based authentication, you define a list of user names, passwords, and roles in a the file called (by default) `users.pwd` file. This file is commonly referred to as the password file.

### LDAP Authentication

This method authenticates users against a directory server using LDAP as a protocol. TIBCO BusinessEvents applications can leverage this information to authenticate users. The role information is configured through an LDAP attribute like the `nsrole` attribute in Oracle Directory Server. The LDAP attribute differs in different directory server products. The details of configuring LDAP authentication are beyond the scope of this documentation. Consult your LDAP product documentation.

## Authentication In Various Components

Authentication is used in components of various TIBCO BusinessEvents products:

### TIBCO BusinessEvents Monitoring and Management

JMX MBeans authentication is available but not enabled by default. You enable it using a JMX property in the `be-engine.tra` file. See [Authentication Configuration](#) for instructions.

File based authentication is enabled by default. LDAP authentication is also supported. To configure the MM authentication mechanism, you set the `be.mm.auth.*` properties in the `MM.cdd` file. See [Authentication Property Reference](#).

This component also uses two predefined authorization roles. See [User Authorization for Administrator and User Roles](#).

### TIBCO BusinessEvents Decision Manager RMS Component

File-based authentication is enabled by default for the TIBCO BusinessEvents Decision Manager RMS component and LDAP authentication is supported.

This component also uses authorization. Authorization details are provided in [Configuring Access Control for a Project](#).

### TIBCO BusinessEvents Views

Authentication is available but not enabled by default. The following TIBCO BusinessEvents Views example project is configured for file-based authentication: *BE\_HOME/examples/views/TickerTracker*.

## Authentication Configuration

Using the provided JAAS login module, you can select file-based authentication or LDAP-based authentication and configure each authentication option.

You can use a different authentication type and a different password file or LDAP settings for each TIBCO BusinessEvents product that uses authentication. You can actually do so for each engine (processing unit) configured for authentication, but this is not usually needed.



For MM authentication, you must also configure JMX properties. See [JMX Properties and To-Be-Monitored Engine TRA Files](#).

## Enabling Authentication and Selecting Authentication Type

You can select either file-based authentication or LDAP-based authentication and enable it for the project.

### Procedure

1. In TIBCO BusinessEvents Studio, import and open the relevant project and open its CDD file, as follows:

For TIBCO BusinessEvents Monitoring and Management:

- *BE\_HOME/mm/project/emonitor* > *MM.cdd* > *mm-class agent class* > *properties* > *mm* > *auth property group*
- *ToBeMonitored\_Project* > *project.cdd* > *Cluster properties* > *auth property group*

For TIBCO BusinessEvents Decision Manager:

- *BE\_HOME/rms/project/BRMS* > *RMS.cdd* > *Cluster properties* > *RMS property group*

For TIBCO BusinessEvents Views:

For TIBCO BusinessEvents Views:

- *Your\_Project* > *project.cdd* > *dashboard-class agent* *properties*.

2. In the CDD file add the following property if it is not present and specify the value as desired:  
`be.auth.type=[file|ldap]`

For MM authentication use the property:

`be.mm.auth.type=[file|ldap]`

3. Do one of the following:

- To configure LDAP authentication, add and configure the LDAP properties shown in [Authentication Property Reference](#). Familiarity with LDAP is required. Details are not provided in this guide.
- To configure file-based authentication, see [Configuring File-Based Authentication](#).



For Active Directory Configuration, authentication requires the domain name, for example, *abc@acme.com*, and not distinguished name (which is used with Oracle Directory Server). If you are using Active Directory for authentication, ensure that the `userPrincipalName` attribute is set on AD server.

## Configuring File-Based Authentication

Configure file-based authentication and enable it for the project.

### Procedure

1. In the CDD file, add (or configure) the property `be.auth.file.location` and set the value to the location of your password file.  
For MM authentication use the property: `be.mm.auth.file.location`.
2. Locate and open the password file. Its location is specified in the CDD file.  
See [step 1](#) for default location details.
3. Add each user on a separate line using this format:

```
Username:password:role,role,role;
```

Do not use spaces. For example here are some entries that might be used in TIBCO BusinessEvents Decision Manager:

```
Mark:A31405D272B94E5D12E9A52A665D3BFE:BUSINESS_USER,APPROVER;
James:21232f297a57a5a743894a0e4a801fc3:RULE_ADMINISTRATOR;
```

For MM authorization roles see [User Authorization for Administrator and User Roles](#)



- You must hash the password with MD5 (Message-Digest 5) hashing algorithm.
- Roles are used for access control (authorization). Access control is used only by TIBCO BusinessEvents Monitoring and Management and TIBCO BusinessEvents Decision Manager. See [Configuring Access Control for a Project](#).

## Authentication Property Reference for the TRA File

To avoid conflict with properties used by other components that use authentication, a parallel set of properties (for the TRA and CDD file) is used for MM configuration. These are authentication properties used in the TRA file.

Property	Notes
<code>java.property.be.engine.jmx.connector.port</code>	<p>Specify this property in each relevant engine TRA files to open the JMX connector port for monitoring and management.</p> <p>It is also used for hot deployment of decision tables in TIBCO BusinessEvents Decision Manager (see TIBCO BusinessEvents Decision Manager User's Guide for details).</p> <p>The JMX port is specified as <code>%jmx_port%</code>, when MM is used. See <a href="#">Authentication Configuration</a> for more details.</p> <p>For other components that use this property, you must also specify the value using the <code>%jmx_port%</code> variable, if you also use MM.</p> <p> You can also set the JMX connector port for deployment with TIBCO Administrator using this CDD property: <code>be.engine.jmx.connector.port</code></p>
<code>#java.property.be.engine.jmx.connector.authenticate</code>	<p>Set to <code>true</code> to enable authentication.</p> <p>Set to <code>false</code> (or leave commented) to disable authentication.</p> <p>The default is <code>false</code>.</p>

## Common Authentication Properties for the CDD File

To avoid conflict with properties used by other components that use authentication, a parallel set of properties (for the TRA and CDD file) is used for MM configuration. These are common authentication properties used in the CDD file.

Property	Notes
<code>java.security.auth.login.config</code>	<p>Provides the absolute location for the login module configuration used by JAAS. Only advanced users should change this value (additional configuration is also needed).</p> <p>The locations of the provided files are as follows:</p> <p>TIBCO BusinessEvents Decision Manager: <code>BE_HOME/rms/config/security/jaas-config.config</code></p> <p>TIBCO BusinessEvents Views: <code>BE_HOME/views/config/jaas-config.config</code></p> <p>TIBCO BusinessEvents Monitoring and Management: <code>BE_HOME/mm/config/jaas-config.config</code></p>
<code>be.auth.type</code> <code>be.mm.auth.type</code>	<p>Specifies the authentication mechanism. Allowable values are as follows:</p> <p><code>file</code>: File-based authentication. Uses a password file.</p> <p><code>ldap</code>: LDAP-based authentication Uses a pre-existing LDAP setup in use in your environment. Add and configure the properties shown in .</p> <p>Default is <code>file</code></p>
<code>be.auth.file.location</code> <code>be.mm.auth.file.location</code>	<p>Specifies the absolute filepath to and name of the password file. This file is used for file-based authentication. Each project can have a different file. The locations of the provided files are as follows:</p> <p>TIBCO BusinessEvents Decision Manager: <code>BE_HOME/rms/config/security/users.pwd</code>.</p> <p>TIBCO BusinessEvents Views: Create a file for each project. A sample file is provided in <code>BE_HOME/examples/views/TickerTracker/config/tickertrackerusers.pwd</code> .</p> <p>TIBCO BusinessEvents Monitoring and Management: <code>BE_HOME/mm/config/users.pwd</code>.</p>

## LDAP Authentication Properties for the CDD File

To avoid conflict with properties used by other components that use authentication, a parallel set of properties (for the TRA and CDD file) is used for MM configuration. These are LDAP authentication properties used in the CDD file.

Property	Notes
<code>be.auth.ldap.type</code>	

Property	Notes
	<p>Use this property to only if you want to use OpenLDAP for LDAP authentication. The property is not required for Oracle directory server or Windows Active Directory server.</p> <p>Set his property to <code>openldap</code> to use the RMS server with OpenLDAP</p>
<code>be.auth.ldap.port</code> <code>be.mm.auth.ldap.port</code>	
	Specifies the port for LDAP authentication.
<code>be.auth.ldap.adminDN</code> <code>be.mm.auth.ldap.adminDN</code>	
	<p>Specifies the base distinguished name (DN) for admin login.</p> <p>For example:  <code>cn=Directory Administrators, dc=na, dc=tibco, dc=com.</code></p>
<code>be.auth.ldap.adminPassword</code> <code>be.mm.auth.ldap.adminPassword</code>	
	Specifies the password for the LDAP administrator DN.
<code>be.auth.ldap.baseDN</code> <code>be.mm.auth.ldap.baseDN</code>	
	Specifies the base tree in LDAP under which users can be searched. For example, <code>dc=na, dc=tibco, dc=com.</code>
<code>be.auth.ldap.roleAttr</code> <code>be.mm.auth.ldap.roleAttr</code>	
	<p>Specifies the name of the attribute used by the LDAP server for role information of a user. Set the value to <code>member</code> for RMS server with OpenLDAP</p> <p>Default value is <code>nsroleDN</code> (for Oracle Directory Server).</p>
<code>be.auth.ldap.uidattr</code> <code>be.mm.auth.ldap.uidattr</code>	
	<p>Specifies the name of the attribute used by the LDAP server for username information. Allowable values are as follows:</p> <p><code>uid</code> for Oracle Directory Server</p> <p><code>cn</code> for ActiveDirectory.</p> <p>Default value is <code>uid</code>.</p>
<code>be.auth.ldap.useRoleDN</code> <code>be.mm.auth.ldap.useRoleDN</code>	

Property	Notes
	<p>Set this property to true to use the fully qualified name of the attribute used by the LDAP server for role information of a user.</p> <p>Set this property to false to use only the name of the attribute, which is shown in the notes for the <code>be.auth.ldap.uidAttr</code> property.</p> <p>Default value is <code>true</code>.</p>
<code>be.auth.ldap.objectClass</code> <code>be.mm.auth.ldap.objectClass</code>	
	<p>Specifies the <code>ObjectClass</code> attribute value for DS.</p> <p>Many object classes can exist, for example, <code>inetOrgPerson</code> on Oracle Directory Server, and <code>user</code> on Active Directory.</p> <p>If search should span all object classes, keep this value empty or specify an asterisk ("<code>*</code>").</p>
<code>be.auth.ldap.dnAttr</code> <code>be.mm.auth.ldap.dnAttr</code>	
	<p>Specifies the name of the attribute that contains the fully qualified name.</p> <p>Default value is <code>distinguishedName</code>.</p>
<code>be.auth.ldap.ssl</code> <code>be.mm.auth.ldap.ssl</code>	
	<p>Specifies a secure connection to the LDAP host is to be established.</p> <p>Default value is <code>false</code>. Set the property to <code>true</code> to enable a secure connection.</p>

# Access Control Configuration

Access control is a core product feature used by RMS projects and available in the TIBCO BusinessEvents Decision Manager add-on and TIBCO BusinessEvents WebStudio.

TIBCO BusinessEvents Monitoring and Management also uses two roles (see [User Authorization for Administrator and User Roles](#)).

For each RMS project, you will set up an access control file where you will group the project resources as desired, giving each group (or individual resource) an ID. Use these IDs to assign permissions to each user role.

Access is defined using roles. If file-based authentication is used, roles are defined and assigned to users in the password file (by default called `users.pwa`). If LDAP-based authentication is used, roles are defined and assigned to users in the LDAP directory.



You must use only the roles defined in the password file or LDAP directory (depending on authentication type used) when configuring the access control file.



User role and username should not be same. Each username and role name should be unique.

## Guidelines for Configuring Access Control

A project's access control file is an XML file named `RMSProjectName.ac`.

The ACL file is stored in the directory specified by the `RMS.cdd` property `ws.projects.acl.location`.

In the access control file `resources` element, you create `resource` elements to define groups of resources to suit your needs. You give each resource element an ID. In the `entries` element, you add one `entry` element for each user role to define the access permissions for that role, using the resource IDs and `action` elements. This brief summary is provided so you can understand the following guidelines. For full details, see [Structure of the Access Control File](#) on page 3.



Replace the XML special character in the role names (if present) in the access control file with the following characters:

- "&" by "&#amp;"
- "'" by "&#apos;"

You can use two general approaches to setting permissions. The general aim is to simplify the setup, minimizing the number of permissions you have to set in the access control file.

### Allow everything and specify exceptions

One approach is to grant wide permissions using large resource groupings, and then selectively deny permissions within those groupings.

For example, suppose you define two resources as follows:

```
<resource name="/Concepts/*" id="AllP" type="PROPERTY"/>
<resource name="/Concepts/Person/CustID" id="CID" type="PROPERTY"/>
```

The first resource element defines a resource group consisting of all concept properties in the /Concepts project folder. The second element specifies one property in one concept. (The setup details are explained later in the chapter.)

Then you define permissions using those resources. For example, for a role named `CallCenter` you might set up permissions as follows:

```
<entry>
  <role name="CallCenter"/>
  <permissions>
    <permission resourceref="#AllP">
      <action type="read">ALLOW</action>
```

```

</permission>
<permission resourceref="#CID">
  <action type="read">DENY</action>
</permission>
</permissions>
</entry>

```

With these settings, you give users with the CallCenter role the read permission for all properties in the /Concepts directory except the custID property.



An example of an access control file (CreditCardApplication.ac) giving all permissions available for the credit card application example, is located in the following directory: *BE\_HOME\rms\config\security*

### Deny everything and specify exceptions

Another approach is to deny all permissions (which is the default setting for all permissions) and then give permissions to specific resources or groups of resources as needed.

### Mixing two approaches

You can mix these two approaches in one access control file. For example, you can give broad permissions to one project folder, and then specify exceptions within that folder. For another folder you might give permissions selectively.

## Structure of the Access Control File

The access control file for a project is an XML file.

The access control file has the following elements:

```

<resources>
  <resource id="id" type="ResourceType"/>
  <resource id="id" name="ProjectPath" type="ResourceType"/>
  .
  .
  .
</resources>
<entries>
  <entry>
    <role name="RoleName"/>
    <permissions>
      <permission resourceref="#id">
        <action type="ActionType">[ALLOW|DENY]</action>
      </permission>
      .
      .
      .
    </permissions>
  </entry>
  .
  .
  .
</entries>
</acl>

```

- The entries element contains one entry for each role. For each role, you define one set of permissions. Each permission has the following attributes
- The resourceref attribute references a resource ID defined in the resources element. It identifies a resource or set of resources.
- The name attribute specifies the project path to the resource or resources. (The name attribute is not used when you specify permissions for an entire resource type.)
- The resource type attribute specifies what types of resources in the specified name attribute project path are included in the permission.
- The action type attribute specifies an action type, for example, create. This attribute determines the kind of action a user has permission to do, for the specified resource or resources.

## Permissions—ALLOW and DENY

The value of the `action` element is one of the key words `ALLOW` or `DENY`.

The value of the key word determines whether the specified permission is given or denied.

`DENY` is the default value. You only need to set the `DENY` value explicitly when you have given `ALLOW` permissions at a higher level, and want to make individual exceptions within that broad scope.

The values `ALLOW` and `DENY` are case sensitive. Use all capitals.

## Access Control Files

XML files with the extension `.ac` are used to create access control settings .

You can create or modify an `RMSProjectName.ac` file using any XML editor. This section explains the elements used to define access control, ways you can add or edit access control files, and where to place the files so they can be used by the RMS, Decision Manager components, and TIBCO BusinessEvents WebStudio.

Examples shipped with the product contain access control files you can use as models.

### Required Location of Access Control Files

The access control file for an RMS project must be placed in the location specified by the RMS server CDD property `ws.projects.acl.location`. An RMS project's ACL file must be named using the format `RMSProjectName.ac`.

## Specification and Grouping of Project Resources

In the `resources` element, you group the project resources in whatever way supports the permissions you want to set.

You give each grouping or individual resource an ID that is used when defining the permissions.

### Grouping Resources by Resource Type

The broadest resource grouping is provided by setting permissions at the level of resource type. This method groups all resources of that type in the project. To set a resource type resource group, you associate an ID with a resource type, and you do not use the `name` attribute:

```
<resource id="ID" type="ResourceType"/>
```

For example: `<resource id="C" type="CONCEPT"/>`

### Using Resource Type as a Filter

How you specify the resource group is partly determined by the resource type attribute. The resource type can act as a filter. For example, suppose in the `name` attribute you specify a directory that includes events and concepts. If you set the `type` attribute to `"CONCEPT"` then the ID associated with this grouping is used to set permissions only on the concepts in that folder (and its subdirectories).

You could create a second grouping whose `type` specifies `"EVENT"` so that you can set permissions on events in that folder branch separately.

### Specifying an Individual Resource

To specify an individual resource, provide the *project path* to the resource in the `name` attribute. The project path is the folder path to the ontology entity, as seen in the Explorer panel. The example below shows how to specify an ID that is associated with the `FirstName` property of the `Person` concept:

```
<resource name="/Concepts/Person/FirstName" id="FN" type="PROPERTY"/>
```

## Grouping Resources Using Wildcards

You can associate groups of resources with an ID using the wildcard character in the project path. The asterisk (\*) is used as the wildcard character. For example:

```
<resource name="/someFolder/*" id="ALLP" type="PROPERTY"/>
```

## Grouping Resources by Resource Type

The broadest resource grouping is provided by setting permissions at the level of resource type. This method groups all resources of that type in the project. To set a resource type resource group, you associate an ID with a resource type, and you do not use the name attribute:

```
<resource id="ID" type="ResourceType"/>
```

For example: `<resource id="C" type="CONCEPT"/>`

See [Resource Types and Corresponding Action Types](#) for a list of resource types, and the action types that are valid for each resource type.

## Permissions Definition

Define a list of resource IDs according to the way you want to group resources and actions.

All items included under one resource ID must be of the same resource type (or type of activity, such as checking out a project).

For each user role you add a set of permissions.

```
<role name="Administrator"/>
<permissions>
  <permission resourceref="#PRJ">
    <action type="checkout">ALLOW</action>
  </permission>
  . . . . .
</permissions>
```

Each `resourceref` points to a resource ID. You create permissions using the actions available for the resource type specified for that ID, such as `create`, `read`, and `modify`.

See [Resource Types and Corresponding Action Types](#) the resource types and their available action types.

By default, all permissions are denied. If a certain permission is not explicitly given to a role, then the role does not have the permission. This approach ensures unauthorized users do not accidentally gain access to restricted resources.

Permissions are not hierarchical. That is, a `create` permission does not imply a `modify` permission or a `read` permission. All privileges are mutually exclusive. So, for example, if you want users to be able to modify some resources of a certain resource type, be sure to also give users the ability to view that resource type.

Note that for use in TIBCO BusinessEvents Decision Manager, most TIBCO BusinessEvents project resources have only a read action type.

## Resource Types and Corresponding Action Types

Permissions for a user role are defined using the action types available for each resource type.



If a resource ID specifies a set of resources, the permission applies to that set of resources only. If it specifies a resource type, then the permission applies to all resources of that resource type.

### Resource Types and Their Allowable Action Types

Resource Type	Allowable Action Types	(If action is ALLOW) Enables Users to . . .
PROJECT	checkout	Check out TIBCO BusinessEvents project resources.   Users can check out only those resources they are allowed to read.
	update	Update TIBCO BusinessEvents project resources that were checked out earlier.  Users can update only those resources they are allowed to read.
	gen_deploy	Use the Generate Deployable RMS menu option for building EAR files or class files.
	commit	Commit the modified/deleted TIBCO BusinessEvents project resources.
	approval	Review the worklist items in a project. (WebStudio only)
CATALOGFUNCTION	invoke	Invoke catalog functions in decision tables (RULEFUNCTIONIMPL resource type) that the users are allowed to modify.
CHANNEL	read	View channels.
CONCEPT	read	View concepts.
DOMAIN	read	View domain models.
	create	Create domain models.
EVENT	read	View events.
PROPERTY	read	View resource properties.  If no resources are specified, then users can view properties of all resources that they are allowed to view (read).
RULE	read	View rules (rule source code).
RULEFUNCTION	read	View rule functions (rule function source code).
	add_impl	Add decision tables (RULEFUNCTIONIMPL resource type).  If specific rule functions are not listed, then users can add decision tables to all rule functions they are allowed to view (read).  (Other permissions that apply to decision tables are set on the resources used in the decision table.)

Resource Type	Allowable Action Types	(If action is ALLOW) Enables Users to . . .
	del_impl	Delete decision tables (RULEFUNCTIONIMPL resource type).
RULEFUNCTIONIMPL	read	View decision tables (RULEFUNCTIONIMPL resource type). Add columns in the Condition area of the decision table. Add rows and modify cells in existing rows and columns.
	modify	Add columns in the Action area of decision tables.
WSDL	read	View WSDL files.
XSD	read	View XSD files.
WebStudio Only Permissions		
RULETEMPLATE	read	Checkout rule templates.
RULETEMPLATEINSTANCE	read	View business rules.
	add_inst	Create business rule for the rule template.
	del_inst	Delete business rule.
RULETEMPLATEVIEW	read	Checkout rule template views.

# TIBCO Hawk Microagent Methods

---

TIBCO BusinessEvents Monitoring and Management component is the preferred way to deploy, monitor, and manage TIBCO BusinessEvents applications.

You can also use TIBCO Administrator for deployment and many monitoring and management functions. To augment the monitoring and management functions in TIBCO Administrator, the TIBCO BusinessEvents engine is instrumented with a TIBCO Hawk microagent that can be used to perform many administrative functions.

The provided methods have the following purpose:

- To enable TIBCO Administrator to perform certain actions, for example, `GetExecInfo()`, `stopApplicationInstance()`, `getHostInformation()`
- To provide information about what is happening in the TIBCO BusinessEvents engine, for example, `getRules()`, `getDestinations()`, `getTotalNumberRulesFired()`
- To make certain changes in the TIBCO BusinessEvents engine without stopping it, for example, `activateRule()`, `reconnectChannels()`.

TIBCO BusinessEvents embeds a TIBCO Hawk microagent whose methods enable you to monitor and manage deployed TIBCO BusinessEvents applications. You can use TIBCO Hawk or the Hawk Console in TIBCO Administrator.

For more information, see:

- *TIBCO Administrator Server Configuration Guide* has more details on working with microagents and methods using TIBCO Administrator.
- *TIBCO Hawk Methods Reference* provides detailed documentation about TIBCO Hawk microagents and methods.

The provided methods are:

- [activateRule\(\)](#)
- [deactivateRule\(\)](#)
- [execute\(\)](#)
- [getChannels\(\)](#)
- [getCacheRecoveryInfo\(\)](#)
- [getDestinations\(\)](#)
- [getEvent\(\)](#)
- [GetExecInfo\(\)](#)
- [getHostInformation\(\)](#)
- [getInstance\(\)](#)
- [getJoinTable](#)
- [GetLoggerNamesWithLevels\(\)](#)
- [getMemoryUsage\(\)](#)
- [getNumberOfEvents\(\)](#)
- [getNumberOfInstances\(\)](#)
- [getOMInfo\(\)](#)
- [getRule\(\)](#)

- `getRules()`
- `getScorecard()`
- `getScorecards()`
- `getSessionInputDestinations()`
- `getSessions()`
- `getStatus()`
- `getTotalNumberRulesFired()`
- `getTraceSinks()`
- `reconnectChannels()`
- `resetTotalNumberRulesFired()`
- `resumeChannels()`
- `resumeDestinations()`
- `resumeRuleServiceProvider()`
- `setLogLevel()`
- `startFileBasedProfiler()`
- `stopFileBasedProfiler()`
- `suspendRuleServiceProvider ()`

## Enabling the TIBCO Hawk Microagent

### Procedure

1. Before using Hawk methods, enable the TIBCO Hawk microagent in the TIBCO BusinessEvents engine property file `BE_HOME/bin/be-engine.tra`.
2. Open the file for editing, add the following property and set it to true:  
`Hawk.Enabled = true`
3. If you are using non-default transport parameters for TIBCO Hawk, also add the following properties and set their value:

```
repo.hawkDaemon, repo.hawkNetwork, repo.hawkService
```



To enable TIBCO Hawk Console, set the following property to true in the `TIBCO_Admin_HOME/domain/domain_name/bin/tibcoadmin/domain_name.tra` file:  
`hawk.console.enabled=true`

## **activateRule()**

Activate a RuleSet in the Session.

### Type

ACTION

**Parameters**

Name	Description
Session	Name of the Session (optional).
URI	URI of the RuleSet.

**Returns**

Type	Description
Session	Name of the Session (optional).
URI	URI of the RuleSet.
Activated	Is the RuleSet activated?

**deactivateRule()**

Deactivate a RuleSet in the Session

**Type**

ACTION

**Parameters**

Name	Description
Session	Name of the Session
URI	URI of the RuleSet

**Returns**

Type	Description
Session	Name of the Session.
URI	URI of the RuleSet.
Deactivated	Is the RuleSet deactivated?

**execute()**

Runs a special command.

**Type**

ACTION\_INFO

**Parameters**

Name	Description
Command	The special command to execute
Parameters	Parameters (optional)

**Returns**

Type	Description
Line	Line Number.
Name	Name.
Value	Value.

**getChannels()**

Retrieves Channel Info.

**Type**

INFO

**Parameters**

Name	Description
URI	URI of the Channel (optional)

**Returns**

Type	Description
Line	Line Number
URI	URI of the Channel.
State	Current state of the Channel

**getCacheRecoveryInfo()**

Gets the Cache recovery information.

Timeout (milliseconds): 10000

**Type**

Open, Synchronous, IMPACT\_INFO

**Arguments**

Name	Description
Session	Name of the Session

**Returns**

Name	Description
Return	None

**Elements**

Name	Description
Line	Line number
Session	Name of the Session
NumberOfHandlesLoaded	Number of Handles loaded in the session
NumberOfHandlesInError	Number of Handles not loaded due to errors
NumberOfHandlesInStore	Number of Handles in the underlying CacheStore

**getDestinations()**

Retrieves Destination Info.

**Type**

INFO

**Parameters**

Name	Description
Channel URI	URI of the Channel (optional).
Destination Name	Name of the Destination (optional).

**Returns**

Type	Description
Line	Line Number.
Channel URI	URI of the Channel.
Destination URI	URI of the Destination.

Type	Description
Nb in	Number of Events in.
Rate in	Rate of Events in.
Nb out	Number of Events out.
Rate out	Rate of Events out.

## getEvent()

Retrieves an Event from a Session.

### Type

INFO

### Parameters

Name	Description
Session	Name of the Session
Id	Id of the Event
External	True if using the event's external Id, false if using the internal Id

### Returns

Type	Description
Line	Line number.
Session	Name of the Session.
Type	Attribute or Property.
Name	Name of the Attribute or Property.
Value	Value of the Attribute or Property.

## GetExecInfo()

Gets engine execution information

### Type

INFO

### Parameters

No parameters.

**Returns**

Type	Description
Status	Engine status (ACTIVE, SUSPENDED, STANDBY or STOPPING)
Uptime	Elapsed time since RuleSessionProvider was started (milliseconds)
Threads	Number of RuleSessions in engine.
Version	Engine version

**getHostInformation()**

Gets host information properties.

**Type**

INFO

**Parameters**

Name	Description
Name	Name of host information property to get (optional).

**Returns**

Type	Description
Name	Property Name
Value	Property Value

**getInstance()**

Retrieves an Instance from the Session.

**Type**

INFO

**Parameters**

Name	Description
Session	Name of the Session
Id	Id of the Instance.
External	True if using the instance's external Id, false if using the internal Id.

**Returns**

Type	Description
Line	Line number.
Session	Name of the Session.
Type	Attribute or Property.
Name	Name of the Attribute or Property.
Value	Value of the Attribute or Property.

**getJoinTable**

Retrieves a join table from the Session(s).

**GetLoggerNamesWithLevels()**

Gets the list of registered loggers with their current log level.

**Type**

INFO

**Parameters**

No parameters

**Returns**

A MAP of the registered logger names with their current log level.

**getMemoryUsage()**

Gets engine memory usage information.

**Type**

INFO

**Parameters**

No parameters.

**Returns**

Type	Description
Max	Maximum memory size of the JVM, in bytes.
Free	Estimate of the free memory available to the JVM, in bytes.
Used	Estimate of the memory used in the JVM, in bytes.

Type	Description
PercentUsed	Estimate of the percentage of max memory used.

## getNumberOfEvents()

Gets the total number of events existing in a Session.

### Type

INFO

### Parameters

Name	Description
Session	Name of the Session

### Returns

Type	Description
Line	Line number.
Session	Name of the Session.
Number	Total Number of Events

## getNumberOfInstances()

Gets the total number of instances existing in a Session.

### Type

INFO

### Parameters

Name	Description
Session	Name of the Session

### Returns

Type	Description
Line	Line number.
Session	Name of the Session.
Number	Total Number of Instances

## getOMInfo()

Retrieves Object Store information of a Session.

### Type

INFO

### Parameters

Name	Description
Session	Name of the Session

### Returns

Type	Description
Line	Line number.
Session	Name of the Session
Property	Property name.
Value	Property value.

## getRule()

Retrieves the Rules of a given RuleSet.

### Type

INFO

### Parameters

Name	Description
Session	Name of the Session
URI	URI of the RuleSet

### Returns

Type	Description
Line	Line Number.
Session	Name of the Session.
URI	URI of the RuleSet

Type	Description
Rule	Name of the Rule
Priority	Priority of the rule.

## getRules()

Retrieves Rulesets from the Session.

### Type

INFO

### Parameters

Name	Description
Session	Name of the Session

### Returns

Type	Description
Line	Line Number.
Session	Name of the Session.
URI	URI of the RuleSet.
Activated	Is the RuleSet activated.

## getScorecard()

Retrieves a Scorecard of a Session.

### Type

INFO

### Parameters

Name	Description
Session	Name of the Session
URI	URI of the Scorecard.

**Returns**

Type	Description
Line	Line number.
Session	Name of the Session.
Type	Attribute or Property.
Name	Name of the Attribute or Property.
Value	Value of the Attribute or Property.

**getScorecards()**

Retrieves all the Scorecards of a Session.

**Type**

INFO

**Parameters**

Name	Description
Session	Name of the Session

**Returns**

Type	Description
Line	Line Number.
Session	Name of the Session.
Id	Id of the Scorecard.
External Id	External Id of the Scorecard.
Type	Class of the Scorecard.

**getSessionInputDestinations()**

Retrieves destinations enabled for input.

**Type**

INFO

**Parameters**

Name	Description
Session	Name of the Session (optional).

**Returns**

Type	Description
Line	Line number.
Destination	Destination URI.
Preprocessor	Destination preprocessor URI.

**getSessions()**

Retrieves session names.

**Type**

INFO

**Parameters**

No parameters.

**Returns**

Type	Description
Line	Line number.
Session	Name of the Session.

**getStatus()**

Retrieves basic status information about the engine.

**Type**

INFO

**Parameters**

No parameters.

**Returns**

Type	Description
Instance ID	Instance ID of the application.

Type	Description
Application Name	Name of the application.
Uptime	Time elapsed since startup.
Process ID	Process ID of the application.
Host	Name of host machine on which this application is running.

## getTotalNumberRulesFired()

Retrieves the total number of rules fired.

### Type

INFO

### Parameters

Name	Description
Session	Name of the Session

### Returns

Type	Description
Line	Line Number.
Session	Name of the Session.
Number of Rules Fired	Total number of rules fired since the last reset.

## getTraceSinks()

Gets information about trace sinks.

### Type

INFO

### Parameters

Name	Description
Role Name	Name of a Role (optional)
Sink Name	Name of a Sink (optional)

**Returns**

Type	Description
Line	Line Number
Instance ID	Instance ID of the application
Application Name	Name of the application
Sink Name	Sink Name
Sink Type	Sink Type (for example, fileSink, rvSink)
Description	Sink Description (for example, filename=file)
Role	Sink Role (for example, error, warn, debug)

**reconnectChannels()**

Restarts all channels or a single channel.

**Type**

ACTION

**Parameters**

Name	Description
URI	URI of the channel to restart (all channels are restarted if this is empty).

**Returns**

Returns nothing.

**resetTotalNumberRulesFired()**

Resets the total number of rules fired to zero.

**Type**

ACTION

**Parameters**

Name	Description
Session	Name of the Session

**Returns**

Returns nothing.

## resumeChannels()

Resumes channels.

### Type

ACTION

### Parameters

Name	Description
URI	URI of the Channel to resume (optional).

### Returns

Returns nothing.

## resumeDestinations()

Resumes Destinations.

### Type

ACTION

### Parameters

Name	Description
Channel URI	URI of the Channel that contains the Destination.
Destination Name	Name of the Destination (optional).

### Returns

Returns nothing.

## resumeRuleServiceProvider()

Resumes the RuleServiceProvider.

### Type

ACTION

### Parameters

Has no parameters.

### Returns

nothing

## setLogLevel()

Sets a specific logger to a specific log level. When setting the log level, the system runs through all the log level configurations and the last match supercedes all previous log level configurations. The wildcard character '\*' can be used to select all or a pattern to match the logger names.

### Type

ACTION

### Parameters

Name	Description
Name or Pattern	Name of the logger or pattern to match the logger name.
Log Level	Sets the log level to one of the following: FATAL, ERROR, WARN, INFO, DEBUT, ALL, or OFF

### Returns

Returns nothing.

## SetLogLevel(Stringnameorpattern String Level)

This API can be used to set a specific logger to a specific level, such as `SetLogLevel("as.kit", "debug")` will set "as.kit" to debug where as `SetLogLevel("as*", "debug")` will set all loggers starting with "as" to debug.

Note that the system runs through all level configurations when setting the level and the last match superseeds previous configurations.

If you decide to invoke `SetLogLevel("as*", "debug")` and then `SetLogLevel("as.kit", "info")`, then "as.kit" will be INFO.

Similarly, if you decide to invoke `SetLogLevel("as.kit", "debug")` and then `SetLogLevel("as*", "info")`, then "as.kit" which will be INFO.

You can specify more then one family of loggers with different log levels via the cdd log configuration.

For example,

```
<roles>dashboard*:debug sql*:debug as*:info</roles>
```

The log configuration is processed left to right, and therefore

```
<roles>as*:info as.kit:debug</roles>
```

will set "as.kit" to debug and

```
<roles>as.kit:info as*:debug</roles>
```

will set "as.kit" to debug.

## startFileBasedProfiler()

Turns on BusinessEvents Profiler and starts collecting data for a specified duration.

## stopApplicationInstance()

Shuts down the engine. All checkpoint files will be preserved and the engine's operating system process will exit.

### Type

ACTION

### Parameters

No parameters.

### Returns

Returns nothing.

## stopFileBasedProfiler()

Turns off the BusinessEvents Profiler and writes the profile data into a file specified when the Profiler was turned on.

## suspendChannels()

Suspends channels.

### Type

ACTION

### Parameters

Name	Description
URI	URI of the Channel to suspend (optional).

### Returns

Returns nothing.

## suspendDestinations()

Suspends Destinations.

### Type

ACTION

### Parameters

Name	Description
Channel URI	URI of the Channel that contains the Destination.
Destination Name	Name of the Destination (optional).

**Returns**

Returns nothing.

**suspendRuleServiceProvider ()**

Suspends the RleServiceProvider.

**Type**

ACTION

**Parameters**

Has no parameters

**Returns**

nothing