

Enterprise Manager for Oracle® Tuxedo

Administration Guide

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Administering Enterprise Manager for Oracle Tuxedo

This book describes configuration tasks the administrator needs to perform before using Enterprise Manager for Oracle Tuxedo for monitoring and the typical use cases.

This chapter covers the following topics:

- [Starting the tlisten Process](#)
- [Configuring the UBBCONFIG File](#)
- [Discovering and Adding Tuxedo Targets](#)
- [Configuring Security](#)
- [Use Cases](#)

Starting the tlisten Process

Before you can use Enterprise Manager for Oracle Tuxedo to monitor the Tuxedo domain targets, you must start the `tlisten` process before starting the Tuxedo domain so that Tuxedo Domain MBeans can register with the JMX agent embedded in the `tlisten` process. For MP domains in particular, you should start `tlisten` for every machine.

Note: If Enterprise Manager for Oracle Tuxedo is used in conjunction with Oracle TSAM Plus 12c, either JRE 1.6 or one of the following JDK 1.6 versions is required to start the embedded JMX agent:

- 1.6.0 to 1.6.0_38 for both SUN JRE/JDK
- SR2 to SR9 for Linux on System z

- 1.6.0.00 to 1.6.0.17 for HP platform

It is also recommended you use the JRE shipped under TSAM Plus install directory.

Before starting `tlisten`, you must set the `tlisten` environment variable

`SHLIB_PATH/LIBPATH/LD_LIBRARY_PATH` and include the `libjvm` library path. For windows platforms, you only need to set `JAVA_HOME`. For HP platforms, you need to set `LD_PRELOAD` to include the `libjvm.so` directory.

[Listing 1](#) shows examples of environment variable settings on different platforms:

Listing 1 Environment Variable Setting on Different Platforms

For Linux 64-bit platforms:

```
LD_LIBRARY_PATH=$TUXDIR/lib:$JAVA_HOME/jre/lib/amd64/server:$LD_LIBRARY_PATH;
```

```
export LD_LIBRARY_PATH;
```

For AIX 64-bit platforms:

```
LIBPATH=$TUXDIR/lib:$JAVA_HOME/jre/lib/ppc64:${JAVA_HOME}/jre/lib/ppc64/default:$LIBPATH;
```

```
export LIBPATH;
```

For HP 64-bit platforms:

```
LD_LIBRARY_PATH=$TUXDIR/lib:$JAVA_HOME/jre/lib/IA64W/server:$LD_LIBRARY_PATH;
```

```
export LD_LIBRARY_PATH;
```

```
LD_PRELOAD=$JAVA_HOME/jre/lib/IA64W/server/libjvm.so;
```

```
export LD_PRELOAD;
```

Note: `LD_PRELOAD` is only used for `tlisten` to start embedded JMX agent. It should not be set when building Tuxedo applications.

To start `tlisten`, use the following command:

```
tlisten -j rmi://<host>:<rmiport> -l //<host>:<tlistenport>
```

For example:

```
tlisten -j rmi://bej301163.cn.oracle.com:26999 -l
//bej301163.cn.oracle.com:16998
```

Note: Make sure that the host and port specified by the `-l` option are the same as the `NLSADDR` value specified in the `UBBCONFIG` file.

When the `tlisten` process is started correctly, you can view the message “**RMI connector server successfully started** and **Started the embedded JMX agent successfully**” in `ULOG`.

Additional tlisten Options for Monitoring

The following options are added to `tlisten` command line options for leveraging JMX monitoring:

- `-j jmxaddr`

Used to start the embedded JMX agent.

`jmxaddr` specifies the address of RMI connector of embedded JMX agent. If the address has been occupied by another process, an error message is printed into `ULOG` and JMX agent fails to start up. [Table 1](#) lists the `jmxaddr` address formats.

Table 1 IPv4 and IPv6 Address Formats

IPv4	IPv6
<code>rmi://IP:port</code>	<code>rmi://[IPv6 address]:port</code>
<code>rmi://hostname:port_number</code>	<code>rmi://hostname:port_number</code>
<code>rmi://#. #. #. #:port_number</code>	Hex format is not supported

Note: For the MP domain, you need to configure the `-j` option for `tlisten` on all machine nodes.

- `-m jvm_min_mem`

Specifies the minimal memory size (in MB), that should be allocated for the JVM used by JMX agent. The default value is 200MB.

- `-M jvm_max_mem`

Specifies the maximum memory size (in MB) that can be allocated for the JVM used by JMX agent. The value of `jvm_max_mem` cannot be set smaller than the value of

`jvm_min_mem`, otherwise the JVM are not created and JMX agent fails to start up. The default value is 500MB.

- `-S`
Specifies SSL connection rather than the default connection between EM OMS/Agent and JMX agent.
- `-C keyStore`
Specifies the `keyStore` absolute path.
- `-P keyStorePassword`
Specifies the environment variable in which the password for the key store is stored. This variable is only usefully when no `tty` is attached.

The following functions are added to the `tlisten` process:

- A JMX agent is embedded, and creates a JMX domain for every Tuxedo Domain (SHM mode), or Tuxedo Machine (MP mode), connecting to it. Every MBean in the JMX domain corresponds to a Tuxedo target.
- `tlisten` acts as the Tuxedo-side monitoring and management agent . It receives monitoring and management requests from Enterprise Manager and dispatches these requests to corresponding Tuxedo services.
- `tlisten` creates a Tuxedo context for each JMX connection. If a monitored Tuxedo domain enables authentication and authorization, `tlisten` provides the credentials attained from Enterprise Repository when it attaches a Tuxedo domain.
- If the JMX fetchlet in EM agent sends a metrics request to `tlisten`, `tlisten`:
 - transforms the request message to an FML32 buffer and forwards the request to the MIB service of the corresponding Tuxedo domain,
 - receives the metrics conveyed in the response buffer and then returns metrics to Enterprise Repository agent. The connection between the JMX fetchlet and the `tlisten` agent are reused across multiple metrics requests for the same Enterprise Repository user.
- `tlisten` also forwards job requests from Enterprise Repository agent to MIB service. Enterprise Repository agent creates a new JMX connection for every job request, and releases the connection after the job finishes. Accordingly, `tlisten` creates a Tuxedo context for each job request.

Configuring the UBBCONFIG File

Adding the NETWORK Section

To monitor and manage the Tuxedo domain monitoring targets, you must register the targets in the `tlisten` process by adding the `*NETWORK` section and configuring the `NLSADDR` parameters in the `UBBCONFIG` file for the Tuxedo domain in SHM mode.

Adding EXT_MON in the RESOURCES Section

Collection and calculation of certain metrics (such as Service Metrics and IPC Queue Metrics in MIB), consumes CPU time and potentially impacts Oracle Tuxedo performance. Oracle Tuxedo uses the `EXT_MON OPTIONS` parameter in the `UBBCONFIG` file `*RESOURCES` section to allow MIB performance sensitive metrics collection.

If the indicator is specified, all metrics listed in the Tuxedo Targets section are collected in MIB; otherwise, if the indicator is not specified, the following metrics are not collected by Oracle Tuxedo:

- Tuxedo Server Service metrics
- Tuxedo Server IPC Queue metrics
- Tuxedo Bridge IPC Queue metrics

The metrics collection policy changes immediately once you modify this parameter setting.

[Listing 2](#) shows an SHM mode `UBBCONFIG` file example supporting Enterprise Manager monitoring.

Listing 2 An SHM UBBCONFIG Sample Supporting Enterprise Manager Monitoring

```
*RESOURCES
IPCKEY      65831
DOMAINID    shm
MASTER      L1
MODEL       SHM
MAXACCESSERS 100
```

```
MAXSERVERS 100

OPTIONS     EXT_MON

*MACHINES

"bej301163" LMID      = L1

    APPDIR    = "/testarea/tux/test/jmx/servers"

    TUXCONFIG = "/testarea/tux/test/jmx/servers/tuxconfig"

    TUXDIR    = "/testarea/tux/oracle/tuxedo12.1.1.0"

*GROUPS

ATMIGRP1    LMID      = L1

    GRPNO     = 10

*SERVERS

SvrUpdate   SRVGRP    = ATMIGRP1

    SRVID     = 100

*SERVICES

*NETWORK

"L1"

NLSADDR="//bej301163.cn.oracle.com:16998"
```

Discovering and Adding Tuxedo Targets

In order to manage and monitor Oracle Tuxedo applications, you must first discover the Tuxedo targets using Enterprise Manager Cloud Control.

Once discovered, the domain and the components within it can be promoted to "managed target" status and an automatic discovery job runs every 24-hours to update the targets. In this process, management agents are assigned to each target, enabling Enterprise Manager Cloud Control to collect the data needed to monitor the target.

This section covers the following topics:

- [Discovering Targets Manually](#)
- [Manually Adding a Standalone Target](#)

Discovering Targets Manually

To discover all Tuxedo domains on a JMX agent, do the following steps:

1. Log in to Enterprise Manager Cloud Control.
2. From the home page, go to **Targets >Middleware**.
3. Click **Middleware Features >Tuxedo Summary**.
4. In the Tuxedo Summary page, click **Add > Tuxedo Domain Discovery**.
5. If only one domain exists in the JMX agent, specify the following options on the page that appears:
 - **Hostname:** Mandatory parameter. Specifies the host where the Tuxedo domain master machine is running.
 - **Port:** Mandatory parameter. The port number specified by `tlisten -j` option.
 - **Application Password:** Optional parameter. Specifies the Tuxedo application password Enterprise Manager agent uses to connect to the Tuxedo domain. You must input this parameter if the Tuxedo domain `SECURITY` value is one of following: `APP_PW`, `USER_AUTH`, `ACL`, or `MANDATORY_ACL`; otherwise, leave the field blank.
 - **User name:** Optional parameter. Specifies the Tuxedo user name Enterprise Manager agent uses to connect to the Tuxedo domain. You must input this parameter if the Tuxedo domain `SECURITY` value is one of following: `USER_AUTH`, `ACL`, or `MANDATORY_ACL`; otherwise, leave the field blank.
 - **User Password:** Optional parameter. Specifies the Tuxedo user password Enterprise Manager agent uses to connect to the Tuxedo domain. You need to input this parameter if the Tuxedo domain `SECURITY` value is one of following: `USER_AUTH`, `ACL`, or `MANDATORY_ACL`; otherwise, leave the field blank.
 - **Use SSL:** Optional. This option refers to SSL mechanism between Enterprise Manager and JMX agent in the `tlisten` process.
 - **With Tuxedo Authentication:** If this box is unchecked, Tuxedo security related information is ignored and only `tlisten` and the Tuxedo Home targets are discovered. Leave this box checked if you want to discover the Tuxedo domains monitored by the `tlisten` process.

- **Monitoring Agent:** Mandatory option. It is recommended you select the one residing on the same physical machine with `tlisten`.

Note: The User name, Password, and Application password are used to generate Enterprise Manager Monitoring Credentials for all discovered targets. You can manage Monitoring Credentials by clicking **Setup** -> **Security** in the Enterprise Manager console.

6. Click **Discover Now**.

If only one domain is being monitored by `tlisten`, you will get a list of discovered targets; otherwise, select the domain on the page that appears and enter the parameters specific to the domain, then click **Discover Now** again.

Manually Adding a Standalone Target

To add a standalone Tuxedo target to Enterprise Manager Cloud Control, do the following steps:

1. Log in to Enterprise Manager Cloud Control as SYSMAN.
2. From the home page, navigate to **Setup > Add Targets**.
3. Click **Add Targets Manually > Add Non-Host Targets by Specifying Target Monitoring Properties**.

Enterprise Manager Cloud Control bypasses `tlisten` and directly adds the target into Enterprise Repository.

Configuring Security

Enterprise Manager for Oracle Tuxedo supports the following security mechanism:

Tuxedo Authentication and Authorization

If the `SECURITY` parameter of the Tuxedo domain is `APP_PW`, Enterprise Manager agents provide a Tuxedo application password for authentication. If the `SECURITY` parameter is `USR_AUTH`, `ACL` or `MANDATORY_ACL`, Enterprise Manager agents provide application password, user name, and user password for authentication; meanwhile, `AUTHSVR` must be configured in the `UBBCONFIG` file.

The client name of Tuxedo users used by Enterprise Manager must be `"tpsadm"`; otherwise, some metrics and job requests will fail.

JOB

When any JOB (based on Tuxedo security configuration), is invoked, the following three cases may occur.

- NONE

No "Credentials" page appears. Your job is executed immediately.

- APP_PW

"Credentials" page appears, requiring you to provide Tuxedo username, password, and application password. Enterprise Manager OMS takes such information together to talk with JMX agent. If authentication is passed, your job is executed ; otherwise, your job will be rejected.

Note: Even though Tuxedo does not use the value of Tuxedo Username and Tuxedo Password fields to authenticate or authorize, the two fields must be inputted as place holders.

- ACL/ACL_MANDATORY

"Credentials" page appears requiring you to provide Tuxedo username, password, and application password. Enterprise Manager OMS uses this information to talk with JMX agent. If authentication is passed, the job is executed afterwards; by contrast, if either authentication or authorization is failed, your job will be rejected.

Note: The startup of Tuxedo targets with Tuxedo Domain or Tuxedo Machine type:

- does not need Authentication or Authorization;
- can be invoked under any its target status.

Discovery

After discovery, all targets, which are required to update status/metric, are updated with username/password and application password into its target instance property.

For more information, see [Discovering and Adding Tuxedo Targets](#).

Metric Fetchlet

Invoked by Enterprise Manager Agent, fetchlet utilizes username, password, and application password (which are stored as target instance properties), to connect with Tuxedo JMX Agent when Tuxedo security is enabled.

SSL Connection Between EM OMS/Agent and JMX Agent Embedded in "tlisten" Process

SSL connection has two types:

- Between EM OMS and JMX agent

For example: Admin job action from every Tuxedo target home page, such as startup/shutdown, etc.

- Between EM Agent and JMX agent

Both Metric fetchlet and Discovery (Manual / Automatic) are based on this connection.

Note: You must install Enterprise Manager Cloud Control using advanced configuration mode, otherwise the admin job (modify UBB/boot or shutdown one target) will fail.

For more information, see [Starting the tlisten Process](#).

JMX Agent

To enable SSL, you should enable SSL at `tlisten` startup. For more information, see [Starting the tlisten Process](#).

If JMX Agent enables SSL, Enterprise Manager OMS/Agent must enable SSL; otherwise, OMS fails to connect with JMX Agent.

Discovery

If JMX Agent enables SSL, the "Use SSL" checkbox must be checked on the discover UI page; otherwise, discovery will be rejected.

At discovery UI, if the "Use SSL" checkbox is checked, the discovery process runs with SSL security. Before discovery with the enabled SSL, the SSL runtime environment should be ready in three areas: Tuxedo Application, Enterprise Manager OMS, and Enterprise Manager Agent.

- For Tuxedo Application

Make sure SSL is enabled for JMX Agent. For more information, see [Starting the tlisten Process](#).

- For Enterprise Manager OMS

- Trust store should be configured well.

- Each time auto discovery is invoked, "Use SSL" property on the domain target is checked. If "Use SSL" is `true`, the connection between OMS and JMX Agent is under SSL; otherwise, it is not.
- Each time a job is invoked from Tuxedo target home page, "Use SSL" property on the domain target is checked. If "Use SSL" is `true`, the connection between OMS and JMX Agent is under SSL; otherwise, it is not.
- For Enterprise Manager agent
 - Trust store should be well configured.
 - Modify startup options for SSL.
 - If a metric collection is scheduled, "Use SSL" property on that target is checked. For the connection between Enterprise Manager agent and JMX agent, if "Use SSL" is `true`, SSL is enabled; otherwise, it is not.
 - If discovery is successful, Enterprise Manager OMS saves all targets discovered using target properties (of which "Use SSL" should be set to `true`).

WARNING: If you have already discovered all Tuxedo targets with SSL disabled and then started JMX agent with SSL enabled, Enterprise Manager OMS/Agent fails to connect with JMX agent; all relative targets status is unknown and all job actions from the Tuxedo home page are rejected.

Solution: you should run manual discovery again if this scenario occurs.

Keystore and Trust Store Configuration

JMX Agent

keystore

`tlisten` startup options provide keystore location/password to enable SSL.

Notes:

- You must keep or know the keystore password;
- Reboot `tlisten` after keystore change if `tlisten` is active.

Listing 3 Example - Generate keystore.jks

```
$ keytool -genkeypair -alias tuxedo -keyalg RSA -validity 1825 -keystore  
keystore.jks
```

```
Enter keystore password:
```

```
Re-enter new password:
```

```
What is your first and last name?
```

```
[Unknown]: Tuxedo
```

```
What is the name of your organizational unit?
```

```
[Unknown]: Oracle Tuxedo
```

```
What is the name of your organization?
```

```
[Unknown]: Oracle Corporation
```

```
What is the name of your City or Locality?
```

```
[Unknown]: Redwood Shores
```

```
What is the name of your State or Province?
```

```
[Unknown]: CA
```

```
What is the two-letter country code for this unit?
```

```
[Unknown]: US
```

```
Is CN=Tuxedo, OU=Oracle Tuxedo, O=Oracle Corporation, L=Redwood Shores,  
ST=CA, C=US correct?
```

```
[no]: yes
```

```
Enter key password for <tuxedo>
```

```
(RETURN if same as keystore password):
```

Enterprise Manager OMS

Trust Store

On the OMS side, SSL follows the standard Java Secure Socket Extension (JSSE). For more information, see the Java Secure Socket Extension (JSSE) Reference Guide.

To configure trust store, do the following steps:

1. Generate a JMXAgent trust certificate from JMXAgent keystore. (Suppose the certificate name is `tuxedo.cer`.)
2. Import JMXAgent trust certificate into one of the following trust stores:
 - The trust store given by `javax.net.ssl.trustStore`, if such option is set in the WLS startup script, `startWebLogic.sh`, or WLS startup system property.
 - `$MW_HOME/jdk16/jdk/jre/lib/security/jssecacerts`, if it exists.
 - `$MW_HOME/jdk16/jdk/jre/lib/security/cacerts`, if it exists.

Where, `$MW_HOME` is the Oracle Enterprise Manager installation directory.

Listing 4 Example - Export Certificate

```
$ keytool -export -alias tuxedo -keystore keystore.jks -rfc -file
tuxedo.cer
```

```
Enter keystore password:
```

```
Certificate stored in file <tuxedo.cer>
```

Listing 5 Example - Import tuxedo.cer

```
$ keytool -import -alias tuxedo -file tuxedo.cer -keystore
$MW_HOME/jdk16/jdk/jre/lib/security/jssecacerts
```

```
Enter keystore password:
```

```
Re-enter new password:
```

```
Owner: CN=Tuxedo, OU=Oracle Tuxedo, O=Oracle Corporation, L=Redwood Shores,
ST=CA, C=US
```

```
Issuer: CN=Tuxedo, OU=Oracle Tuxedo, O=Oracle Corporation, L=Redwood
Shores, ST=CA, C=US

Serial number: 4fab2940

Valid from: Thu May 10 10:34:40 CST 2012 until: Tue May 09 10:34:40 CST 2017

Certificate fingerprints:

    MD5: 63:E2:6E:93:AD:5A:7F:21:CB:3C:51:3F:8C:92:AA:0D

    SHA1: 77:D2:86:4F:74:A3:84:64:A0:5B:CA:50:7A:EF:66:DC:7F:92:83:0F

Signature algorithm name: SHA1withRSA

Version: 3

Trust this certificate? [no]: yes

Certificate was added to keystore
```

Note: The default password for `$MW_HOME/jdk16/jdk/jre/lib/security/jssecacerts` and `$MW_HOME/jdk16/jdk/jre/lib/security/cacerts` is **changeit**.

Enterprise Manager Agent

Trust Store

Enterprise Manager Agent may have a trust store pre-installed , `$ORACLE_HOME/sysman/config/montrust/AgentTrust.jks`, where `$ORACLE_HOME` is the installed Enterprise Manager agent directory (e.g., `/testarea/em/installed_em/EM_110922/agent/agent_inst`).

If `AgentTrust.jks` exists, you should import your public key into `AgentTrust.jks`; otherwise, copy `TuxedoTrust.jks` to `$ORACLE_HOME /sysman/config/montrust/` and rename it to `AgentTrust.jks`.

Usually, on the Enterprise Manager Agent side, you need to import the CA certificate into `$EMAGENT_HOME/agent_inst/sysman/config/montrust/AgentTrust.jks`. For AIX 5.3 64-bit platforms, you must also import the CA certificate into `$EMAGENT_HOME/core/12.1.0.2.0/jdk/jre/lib/security/cacerts`.

For example, type the following commands:

```
cd $EMAGENT_HOME/core/12.1.0.2.0/jdk/jre/lib/security
```

```
keytool -import -alias tuxedo -file tuxedo.cer -keystore
$EMAGENT_HOME/core/12.1.0.2.0/jdk/jre/lib/security/cacerts -storepass
changeit
```

Where:

- \$EMAGENT_HOME is the agent install home on the AIX host
- tuxedo is the CA certificate alias
- tuxedo.cer is the CA certificate file

Notes:

- The Trust store name is AgentTrust.jks and the password is "welcome"; both of them are unchangeable.
- Reboot Enterprise Manager Agent after truststore change if Enterprise Manager Agent is active.

Listing 6 Example - Import into AgentTrust.jks

```
$ keytool -import -alias tuxedo -file tuxedo.cer -keystore AgentTrust.jks
Enter keystore password:
Owner: CN=Tuxedo, OU=Oracle Tuxedo, O=Oracle Corporation, L=Redwood Shores,
ST=CA, C=US
Issuer: CN=Tuxedo, OU=Oracle Tuxedo, O=Oracle Corporation, L=Redwood
Shores, ST=CA, C=US
Serial number: 4fab2940
Valid from: Thu May 10 10:34:40 CST 2012 until: Tue May 09 10:34:40 CST 2017
Certificate fingerprints:
    MD5: 63:E2:6E:93:AD:5A:7F:21:CB:3C:51:3F:8C:92:AA:0D
    SHA1: 77:D2:86:4F:74:A3:84:64:A0:5B:CA:50:7A:EF:66:DC:7F:92:83:0F
    Signature algorithm name: SHA1withRSA
    Version: 3
Trust this certificate? [no]: yes
```

Certificate was added to keystore

Listing 7 Example - Verify AgentTrust.jks

```
$ keytool -list -v -keystore AgentTrust.jks
```

```
Enter keystore password:
```

```
Keystore type: JKS
```

```
Keystore provider: SUN
```

```
Your keystore contains 11 entries
```

```
...
```

```
Alias name: tuxedo
```

```
Creation date: May 10, 2012
```

```
Entry type: trustedCertEntry
```

```
Owner: CN=Tuxedo, OU=Oracle Tuxedo, O=Oracle Corporation, L=Redwood Shores,  
ST=CA, C=US
```

```
Issuer: CN=Tuxedo, OU=Oracle Tuxedo, O=Oracle Corporation, L=Redwood  
Shores, ST=CA, C=US
```

```
Serial number: 4fab2940
```

```
Valid from: Thu May 10 10:34:40 CST 2012 until: Tue May 09 10:34:40 CST 2017
```

```
Certificate fingerprints:
```

```
MD5: 63:E2:6E:93:AD:5A:7F:21:CB:3C:51:3F:8C:92:AA:0D
```

```
SHA1: 77:D2:86:4F:74:A3:84:64:A0:5B:CA:50:7A:EF:66:DC:7F:92:83:0F
```

```
Signature algorithm name: SHA1withRSA
```

Version: 3

Summary

Before enabling SSL, do the following steps:

1. Ensure that keystore at JMX agent is available and start `tlisten` with SSL enabled options correctly
2. Ensure Enterprise Manager agent trust store is available. Restart Enterprise Manager agent
3. Ensure Enterprise Manager OMS trust store is available
4. Reboot `tlisten`/EM Agent/OMS after keystore/trustore is changed
5. Ensure that SSL follows the rule of Maximum Key length (Bits) used in SSL (For example, RSA: 512 and larger; AES: 256/128). For more information, see "[Java Secure Socket Extension \(JSSE\) Reference Guide](#)" at SSL relative document of Oracle office web site.

Use Cases

This section provides several typical deployment use cases to demonstrate how Enterprise Manager for Oracle Tuxedo is deployed in different circumstances.

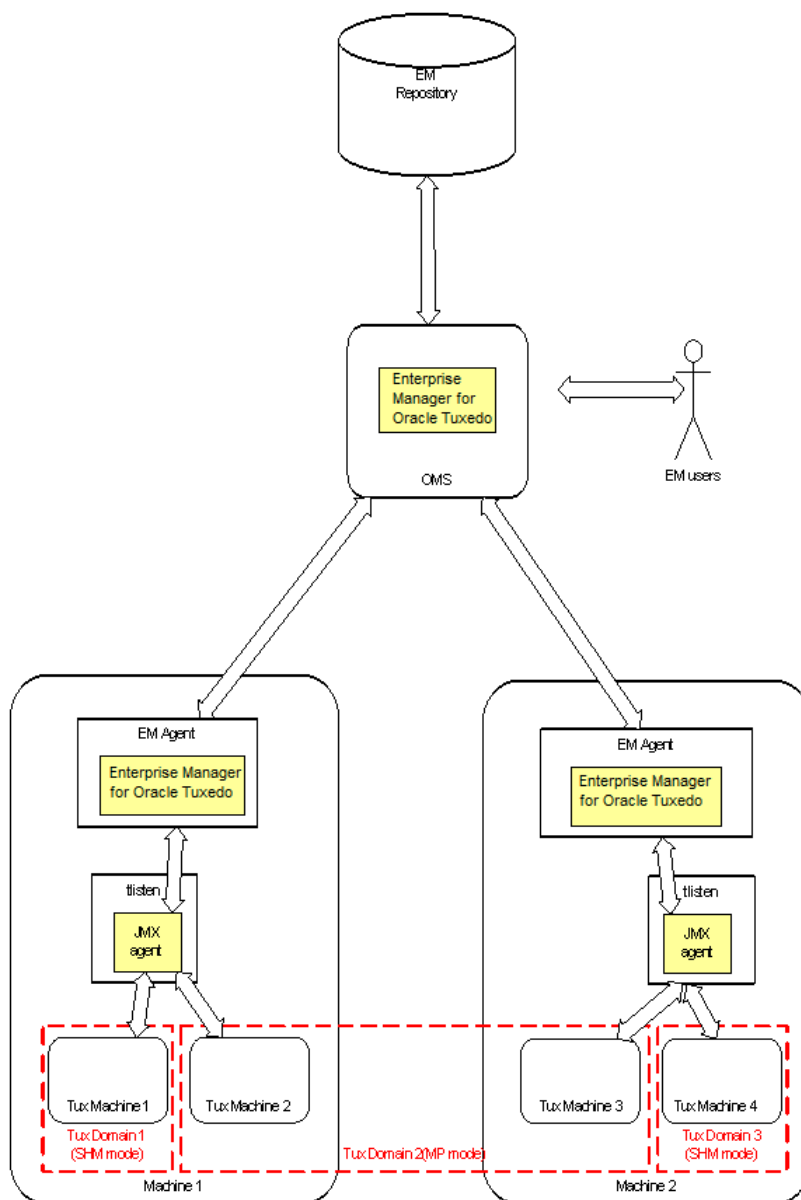
Note: For all the nodes involved in an Enterprise Manager for Oracle Tuxedo monitoring environment (including the machines on which Tuxedo applications, Enterprise Manager agents, Enterprise Manager OMS, and Enterprise Manager repository are running), it is highly recommended that you synchronize their clocks.

Basic Monitoring

[Figure 1](#) shows a typical Enterprise Manager for Oracle Tuxedo deployment scenario.

For performance and security considerations, if the Enterprise Repository agent supports the specific platform on which Tuxedo domains are running, it is recommended to deploy an Enterprise Repository agent on each physical machine that has Tuxedo domains monitored.

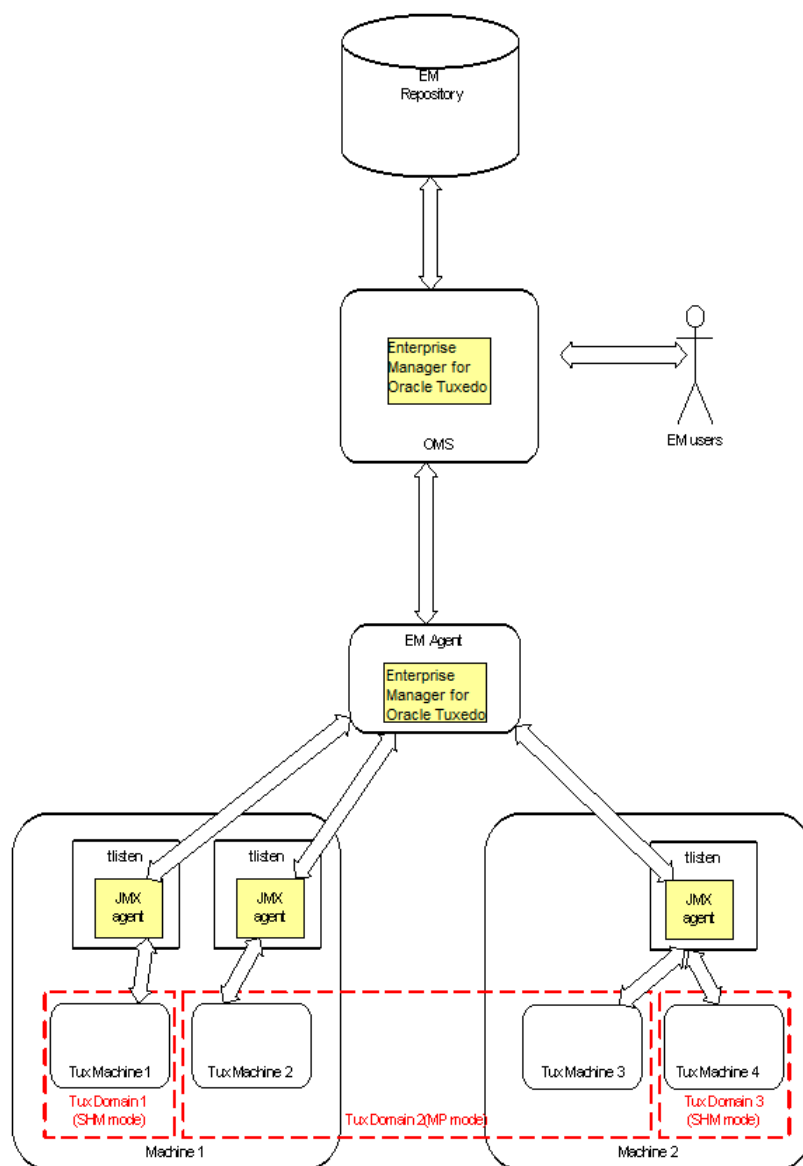
Figure 1 Typical Enterprise Manager for Oracle Tuxedo Deployment Scenario



Remote Monitoring From Enterprise Repository Agent

[Figure 2](#) shows a scenario where Enterprise Repository agent is monitoring Tuxedo domains remotely. This deployment topology is useful for platforms supported by Tuxedo rather than by Enterprise Repository agent.

Figure 2 Remote Monitoring From Enterprise Repository Agent



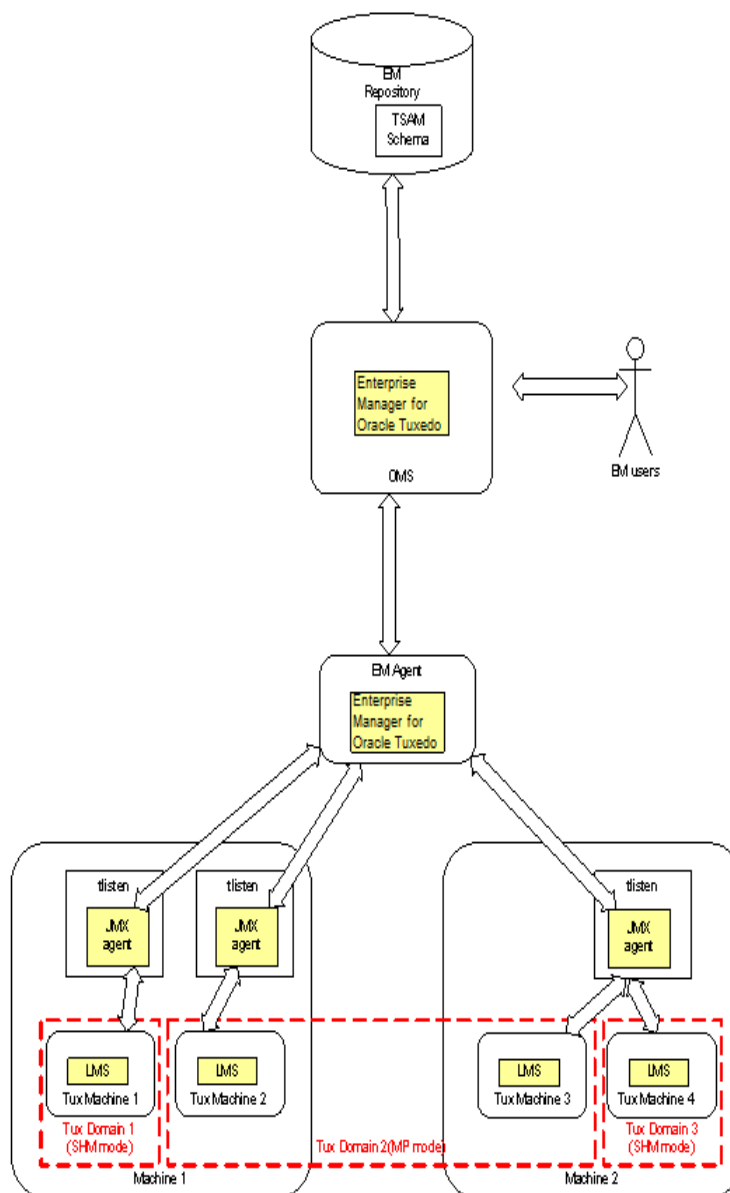
Multiple `tlisten` Processes on One Physical Machine

In some circumstances, you may need to deploy multiple `tlisten` instances on a physical machine for the following reasons:

- Security: Each `tlisten` process starts as a different user with different privileges.
- Administration: Each `tlisten` process represents a different department.

[Figure 3](#) shows how to deploy multiple `tlisten` processes on a physical machine. Please note that each `tlisten` process is able to interconnect with different Enterprise Repository agents respectively, no matter if it is running locally or remotely.

Figure 3 Multiple tlisten Processes Running On a Physical Machine



Multiple Agents and Clients Connecting to One `tlisten` Concurrently

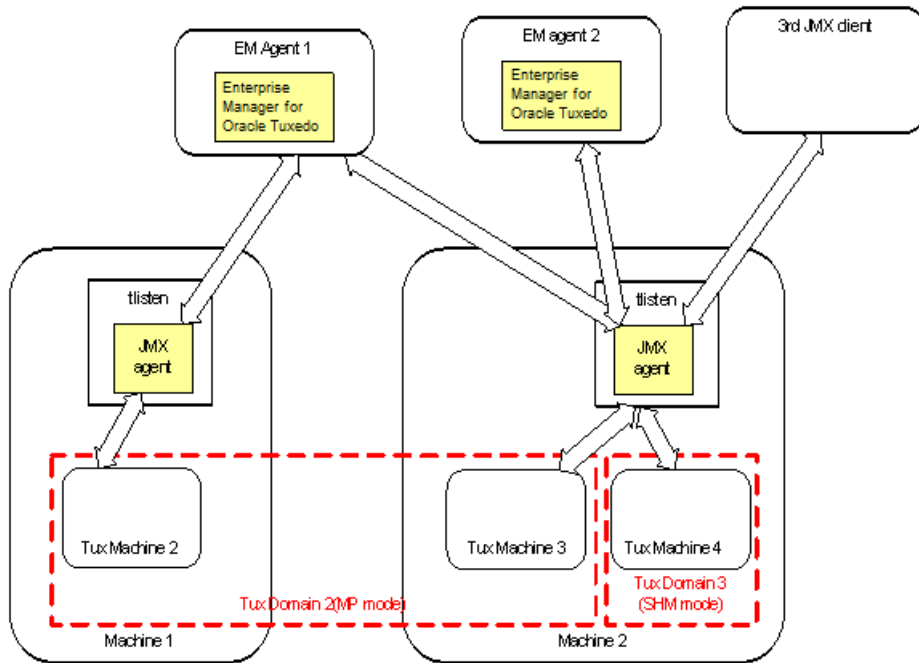
A `tlisten` process with JMX agent embedded is able to interconnect with multiple Enterprise Repository agents concurrently. [Figure 4](#) shows a `tlisten` process running on "Machine 2" is connected and monitored by "EnterpriseManager Agent 1" and "EnterpriseManager Agent 2" concurrently.

In this scenario, you can separate Enterprise Repository agents and Tuxedo Domains related to a `tlisten` process into two groups (for example, "EnterpriseManager Agent 1" monitors "Tux Domain 2" and "EnterpriseManager agent 2" monitors "Tux Domain 3").

You can also let "EnterpriseManager Agent 1" and "EnterpriseManager Agent 2" monitor both "Tux Domain 2" and "Tux Domain 3" at the same time.

Since JMX is a widely used and supported JRE standard, some third-partyJMX clients or JMX connectors are potentially supported by Enterprise Manager for Oracle Tuxedo, which makes Tuxedo monitoring and management functionalities more flexible.

Figure 4 Multiple Agents and Clients Connecting to One tlisten Concurrently



Note: In this scenario, once an active domain has been discovered by Enterprise Manager for Oracle Tuxedo, even if the domain is down afterwards, the Enterprise Manager for Oracle Tuxedo still can discover it (unless `tlisten` is rebooted).