CONTROL-M on Microsoft Windows Clusters

Implementation Manual

Supporting

CONTROL-M/Enterprise Manager 6.2.01 with Fix Pack 1
CONTROL-M for Distributed Systems 6.2.01
CONTROL-M/Server for Microsoft Windows 6.2.01
CONTROL-M/Agent for Microsoft Windows 6.2.01
BMC Batch Impact Manager 6.2.01
CONTROL-M/Forecast 6.2.01

September 15, 2005

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- operating system and environment information
  - machine type
  - operating system type, version, and service pack or other maintenance level such as PUT or PTF
  - system hardware configuration
  - serial numbers
  - related software (database, application, and communication) including type, version, and service pack or maintenance level
- sequence of events leading to the problem
- commands and options that you used
- messages received (and the time and date that you received them)
  - product error messages
  - messages from the operating system, such as `file system full`
  - messages from related software

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About this book

This document contains technical information about how to implement CONTROL-M on Microsoft Windows clusters and is intended for system administrators and database administrators (DBAs). A relatively high level of understanding of CONTROL-M architecture and internals, as well as cluster administration, is needed to implement the content of this document. Therefore, consider contacting BMC Software personnel to assist you while you carry out these instructions.

Related publications

The following reference documents and links provide supplemental information:

- Windows 2000 Clustering Technologies, http://www.microsoft.com/windows2000/technologies/clustering/default.asp.
- Windows 2000 Clustering Technologies: Cluster Service Architecture (white paper), http://www.microsoft.com/windows2000/techinfo/howitworks/cluster/clusterarch.asp.
- Windows Clustering Technologies – An Overview (white paper), http://www.microsoft.com/windows2000/techinfo/planning/clustering.asp.
- Introducing Windows 2000 Clustering Technologies (white paper), http://www.microsoft.com/windows2000/techinfo/howitworks/cluster/introcluster.asp.
- Windows Server 2003 Server Cluster Architecture, http://www.microsoft.com/windowsserver2003/techinfo/overview/servercluster.mspx.
- Technical Overview of Windows Server 2003 Clustering Services, http://www.microsoft.com/windowsserver2003/techinfo/overview/clustering.mspx.

- Microsoft Windows Server 2003 Clustering Services, http://www.microsoft.com/windowsserver2003/technologies/clustering/default.mspx.
- Windows 2000 Cluster Technologies Community Center, http://www.microsoft.com/windows2000/community/centers/clustering/default.mspx.
- Scott Schnoll's Microsoft Cluster Server Center, http://www.nwnetworks.com/cluster.html.
- SQL Server 2000 Failover Clustering, http://www.microsoft.com/technet/prodtechnol/sql/2000/maintain/failclus.mspx.
- Oracle9i Real Application Clusters Whitepapers, http://www.oracle.com/technology/products/database/clustering/RACWhitepapers.html.
- Oracle Real Application Server/Parallel Server FAQ, http://www.orafaq.com/faqrac.htm.
- CONTROL-M Certification for Windows 2000 Datacenter —Announcement, http://www.bmc.com/corporate/nr2003/032403_1.html.

Conventions

This book uses the following special conventions:

- `All syntax, operating system terms, and literal examples are presented in this typeface.`
- Variable text in path names, system messages, or syntax is displayed in angle brackets < >.

Syntax statements

The following example shows a sample syntax statement:

```
COMMAND KEYWORD1 [KEYWORD2 | KEYWORD3] KEYWORD4={YES | NO} <FILE_NAME>...
```

The following table explains conventions for syntax statements and provides examples:

Item	Example
Items in angle brackets < > represent variables that you must replace with a name or value. Variables typically are displayed in uppercase letters. If a variable is represented by two or more words, underscores (_) distinguish the second and subsequent words.	<ALIAS> <DATABASE_DIRECTORY> <SERVER_HOST_NAME>
Brackets indicate a group of optional items. Do not type the brackets when you enter the option. A comma means that you can choose one or more of the listed options. You must use a comma to separate the options if you choose more than one option.	[-FULL, -INCREMENTAL, -LEVEL]
Braces indicate that at least one of the enclosed items is required. Do not type the braces when you enter the item.	{-A | -C}
A vertical bar means that you can choose only one of the listed items. In the example, you would choose either *commit* or *cancel*.	{-COMMIT | -CANCEL}
An ellipsis indicates that you can repeat the previous item or items as many times as necessary.	COLUMN_NAME . . .

Chapter 1

Introduction to cluster technologies

Overview

A cluster is a group of independent computers working together as a single system to ensure that mission-critical applications and resources are as highly available as possible. The group is managed as a single system specifically designed to tolerate component failures and transparently support the addition or removal of components.

The individual computers that compose the cluster are called nodes, and the collection of components on each node that perform cluster-specific activities is called a cluster service.

Cluster service is the Windows 2000 and Windows 2003 name for the cluster technology that Microsoft Corporation introduced in Windows NT 4 Server Enterprise Edition. At that time, the service was called Microsoft Cluster Server (MSCS).

In Windows 2000, Microsoft Corporation introduced two clustering technologies that can be used independently or in combination, based on the requirements of a given application or service:

- **cluster service:** This service is intended primarily to provide failover support for applications such as databases, enterprise resource planning (ERP) applications, messaging systems, and file / print services. Cluster service is ideal for ensuring the availability of critical line-of-business and other back-end systems, such as Microsoft Exchange Server, Microsoft SQL Server database, or CONTROL-M.

The number of supported nodes depends on the specifics of the operating system:

— In the Windows 2000 Advanced Server operating system, cluster service supports 2-node failover clusters.

— In the Windows 2000 Datacenter Server operating system, cluster service supports 4-node failover clusters.

— In the Windows 2003 Enterprise Edition and Datacenter Edition, cluster service supports 8-node failover clusters.

- **network load balancing (NLB):** This service is available in the Windows 2000 Datacenter Server operating system and in all editions of the Windows Server 2003 family. It load-balances incoming Internet Protocol (IP) traffic across clusters of up to 32 nodes. NLB enhances both the availability and scalability of Internet server-based programs such as web servers, streaming media servers, and Terminal Services. NLB does not require any special hardware or software, unlike cluster service, which requires a shared or replicated storage device.

NOTE

CONTROL-M is not supported on an NLB service; therefore, NLB will not be further discussed in this document.

What is in this document?

This document discusses the following topics:

- considerations related to the implementation of the CONTROL-M database

  Chapter 3, "CONTROL-M database configuration," on page 27 describes the various ways to configure the CONTROL-M database in a Windows cluster environment and the installation of MS-SQL Server 2000 (Enterprise Edition) in a Windows cluster.

- technical tips and hints related to the implementation of CONTROL-M / Server and CONTROL-M / Agent on Windows clusters

  Because these configurations are supported "out-of-the-box" and fully described in the product installation guides, this document provides only tips and best practices technical information in Chapter 4, "Best practices for CONTROL-M / Server and CONTROL-M / Agent," on page 31.

- guidelines for implementing CONTROL-M / Enterprise Manager in a Windows cluster environment

The guidelines in Chapter 5, “CONTROL-M/EM installation,” on page 43 describe the configuration steps required for CONTROL-M/Enterprise Manager to run in a Windows cluster.

Chapter 2

Cluster architecture and terminology

This chapter describes the architecture of Windows cluster technology and explains some of the relevant components and terms.

Server clusters

Server clusters are based on a *shared-nothing model* of cluster architecture. This model refers to how servers in a cluster manage and use local and common cluster devices and resources. In the shared-nothing cluster, each server owns and manages its local devices. Devices common to the cluster, such as a common disk array and connection media, are selectively owned and managed by a single server at any given time.

Cluster network configuration

The nodes in a cluster can exist in a single cabinet or be physically separated and connected in a local area network (LAN).

All nodes in a cluster must be a part of the same domain, and each node can be configured as a domain controller or member server. Ideally, clusters will have at least two nodes acting as domain controllers and providing failover for critical domain services. If the domain controllers are not cluster members, the availability of the cluster resources is tied to those domain controllers.

Private and public network addresses

Each node in a cluster is typically configured with both private network and public network addresses.

- *Private network addresses* are used for node-to-node communications; that is, transferring cluster configuration and administration data between the nodes in the cluster. This is also referred to as an *internal network*.

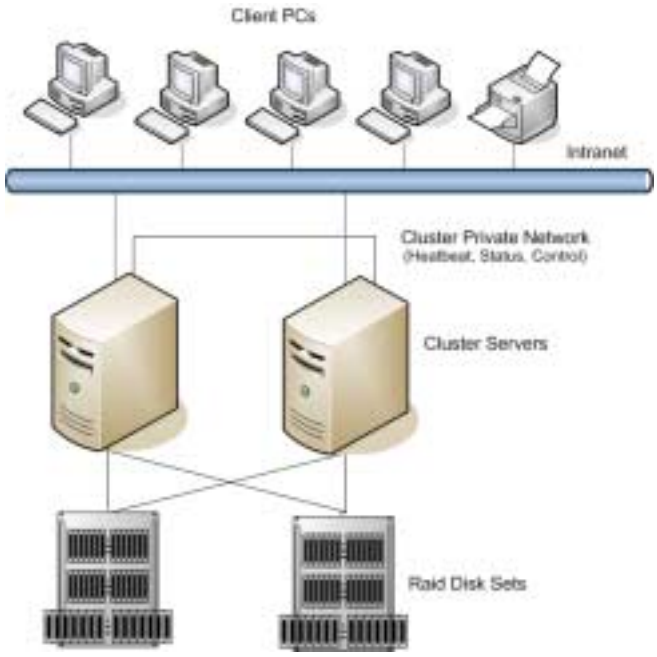
- *Public network addresses* are used for client-to-cluster communications; that is, transferring data between the applications that are configured on the cluster and the application clients. This is also referred to as an *external network*.

Cluster storage media

In addition to the local (system) disks of each node, the active node and all backup nodes in the cluster are physically connected to a shared storage medium. The shared disk is usually divided into multiple logical volumes, where each volume can be available to only one node at a given time and will typically be used by only one application (resource group).

Figure 1 illustrates the typical two-node cluster architecture:

Figure 1 Typical two-node cluster architecture



NOTE

- This document describes installation on a two-node cluster, but the same principles apply to cluster implementations with a larger number of nodes.
- In Windows 2003 servers, a cluster technology was introduced, named Majority Node Set (MNS) clusters. This technology allows you to connect multiple Windows 2003 servers in a cluster without using a shared disk by saving a copy of the cluster configuration on the local (system) disk of each node. Because the application data is not shared between nodes in this configuration, this technology is irrelevant to CONTROL-M and therefore will not be further discussed in this document.

Resources

The term *resource* refers to each hardware or software component within the cluster that is managed by the cluster service. They are physical or logical entities. Hardware devices such as disk drives and network interfaces are examples of physical cluster resources. Internet Protocol (IP) addresses, applications, and application databases are example of logical cluster resources.

Each node in the cluster has its own local resources. However, the nodes in a cluster also share common resources (such as a common data storage array and private cluster network) that are accessible by each node in the cluster.

Resources have the following characteristics. They can be

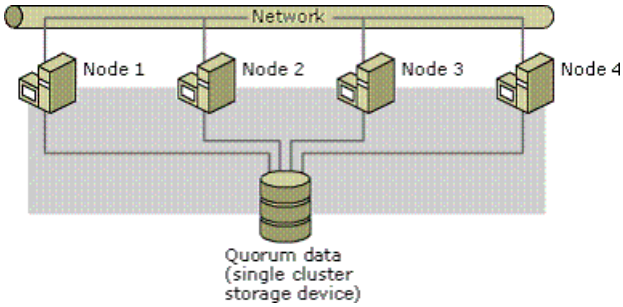
- brought online and taken offline
- managed by a cluster service
- owned by only one node at a time

A resource is online when it is available and providing service to the cluster.

Quorum

One special common resource is the quorum resource, a physical disk in the common cluster disk array that plays a critical role in cluster operations. It must be present for node operations to occur, such as forming or joining a cluster. Figure 2 illustrates the role of the quorum resource:

Figure 2 A quorum resource in a cluster



The quorum resource is used as a tie-breaker to avoid “split-brain,” a situation in which all network communication links between two or more cluster nodes fails. In such a case, only the cluster partition that “owns” the quorum can continue and run the cluster applications. The rest of the cluster partitions are evicted from the cluster.

The quorum disk also contains the quorum log, which is a configuration database for the server cluster. It holds cluster configuration information such as which servers are part of the cluster, what resources are installed in the cluster, and what state those resources are in (for example, online or offline). The quorum log is located by default in **\MSCS\quolog.log** on the quorum disk.

Since the quorum disk is critical to the cluster operation it is not recommended to install any application on it.

Resource group

A resource group is a collection of resources managed by the cluster service as a single, logical unit. Application resources and cluster entities can be more easily managed when logically related resources are defined into a resource group. A cluster service operation performed on a resource group affects all individual resources in the group. Typically, a resource group is defined to contain all the elements needed by a specific application server and clients for successful use of the application.

Before adding an application to a resource group, whether the application can work within the cluster environment must be determined, which depends on whether the application is cluster-aware or cluster-unaware:

- **Cluster-aware applications** are those that can work within the cluster environment and support cluster events. Cluster-aware applications can register with the cluster service to receive status and notification information. CONTROL-M / Server 6.2.01 and CONTROL-M / Agent 6.2.01 are cluster-aware applications.

- **Cluster-unaware applications** do not support cluster events. Some cluster-unaware applications, however, can be assigned to resource groups and can be failed over, although failover usually requires intervention by the cluster administrator during configuration of the application resources in the cluster. CONTROL-M / Enterprise Manager is such a cluster-unaware application.

Applications that meet the following criteria can be assigned to resource groups:

- The application uses an IP-based protocol for its network communications (it cannot use NetBEUI, IPX, AppleTalk or other protocols to communicate).

- The application stores its data in a configurable location. This criterion is necessary because nodes in the cluster access the application data through shared storage devices. (If the application does not do so, the application data will not be available on failover.)

- The application client can retry and recover from a temporary loss of network connectivity that occurs during failover.

Virtual servers

Applications and services running on a server cluster can appear to users and workstations as running on *virtual servers*. A virtual server is a resource group that contains at least one Network Name resource and one IP Address resource, in addition to the specific application resources. Multiple virtual servers representing multiple applications can be hosted in a cluster.

The user or client software that connects to an application that is running in a virtual server does not know which node is actually hosting the virtual server. To users and clients, connecting to an application or service that is running as a clustered virtual server appears no different from connecting to a single, physical server.

Services or applications not accessed by user or client applications can run on a cluster node without being managed as a virtual server.

In the event of an application or server failure, the cluster service moves the entire virtual server resource group to another node in the cluster. When such a failure occurs, the client will detect a failure in its session with the application and attempt to reconnect in exactly the same manner as the original connection. The reconnection is possible because the cluster service simply maps the published IP address of the virtual server to a surviving node in the cluster during recovery operations. The client session can reestablish the connection to the application without needing to know that the application is now physically hosted on a different node in the cluster.

Each resource in a group may depend on other resources in the cluster. Dependencies are relationships between resources that indicate which resources need to be started and available before another resource can be started. For example, a database application may depend on the availability of a disk, IP address, and network name to be able to start and provide services to other applications and clients.

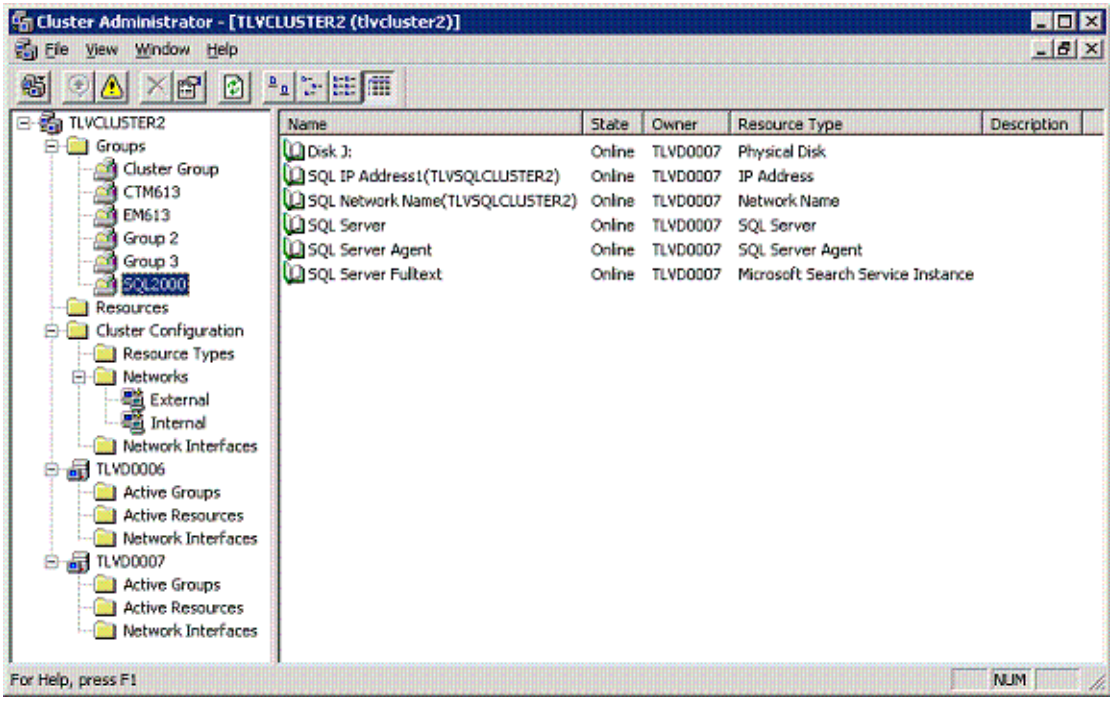
Resource dependencies are identified by using cluster resource properties and enable the cluster service to control the order in which resources are brought online and offline. The scope of any identified dependency is limited to resources within the same resource group. Cluster-managed dependencies cannot extend beyond the resource group, because resource groups can be brought online and offline and moved independently.

Cluster administration

A cluster is administered using the Cluster Administrator interface, shown in Figure 3 on page 25, which enables the performance of maintenance, monitoring, and failover administration. Also, the Cluster Administrator interface contains an automation tool that you can use to create cluster resources, nodes, and the cluster itself.

In Windows 2003 server platforms, the Cluster Administrator interface can be installed and used regardless of whether the server is a cluster node.

Figure 3 Cluster Administrator interface



Chapter 3

CONTROL-M database configuration

You can use the following types of implementations for the CONTROL-M database in a Windows cluster environment:

- **clustered configuration**: A single database installation on the cluster can be accessed by both nodes. The database files are located on the shared disk and the database server availability is controlled by the cluster.
- **local database configuration**: The database server is locally installed on one of the cluster nodes. Only a database client is installed on the other nodes.
- **remote database configuration**: The database is installed on a non-clustered server or on a cluster different from where CONTROL-M is installed. In this case, only database clients are installed on each of the CONTROL-M cluster nodes.

Clustered configuration

This section describes a cluster configuration for both a Microsoft SQL Server 2000 Enterprise Edition and Oracle Real Application Cluster (RAC).

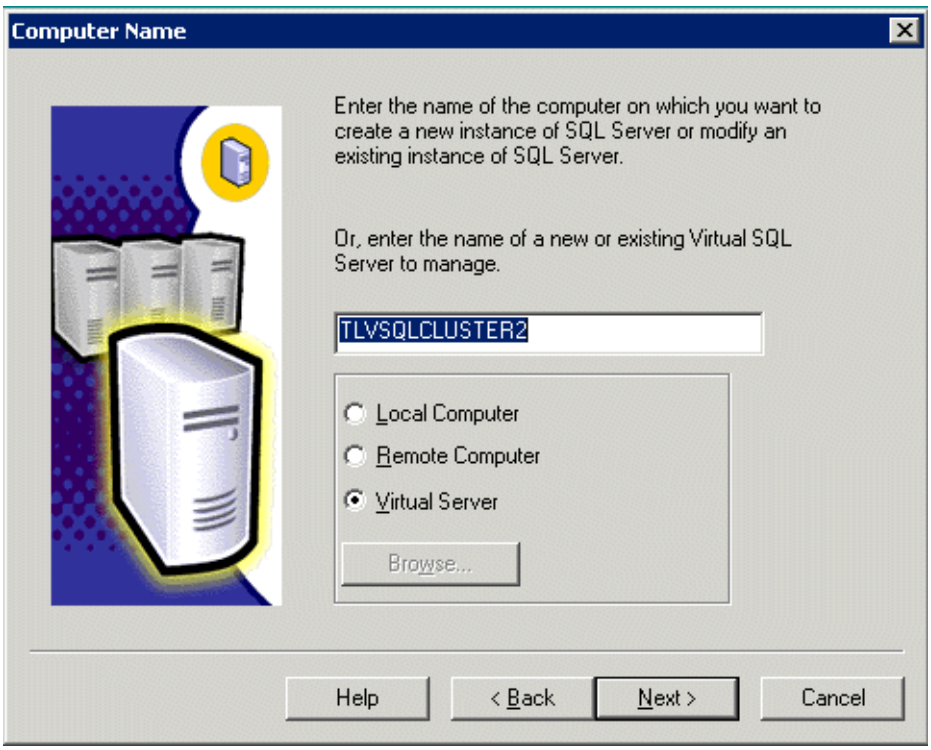
Microsoft SQL Server 2000 Enterprise Edition

When you install Microsoft SQL (MS-SQL) Server 2000 Enterprise Edition on a cluster, the software binaries of the product are placed on the local drives of each one of the selected nodes and the data files are placed on the assigned disk resource on the shared drive. This configuration differs from the MS-SQL Server 7.0 configuration, in which both the binaries and the data files were placed on the assigned disk resource on the shared drive.

Also, the MS-SQL Server services (one service is created on each cluster node) are named by default as the virtual server name. When the MS-SQL resource group is moved from one node to another, the MS-SQL services are stopped on the original (primary) node and started on the alternate node.

Installation of MS-SQL Server 2000 Enterprise Edition on a Windows 2000 cluster automatically creates, in the selected resource group, the Network Name and IP Address resources, in addition to the MS-SQL services resources. At that point, the MS-SQL resource group becomes a virtual server and can be accessed by client applications by the virtual name, as shown in Figure 4:

Figure 4 Computer Name window during MS-SQL 2000 Server Enterprise Edition installation on a cluster



NOTE

If, during installation, the **Virtual Server** option in the Computer Name window is disabled, you are installing an edition of MS-SQL different from the Enterprise Edition, and the MS-SQL server cannot be installed in a clustered mode.

For more information about installing MS-SQL Server 2000 Enterprise Edition on a Windows 2000 Cluster, see “SQL Server 2000 Failover Clustering” at http://www.microsoft.com/technet/prodtechnol/sql/2000/maintain/failclus.mspx.

Oracle Real Application Cluster (RAC)

A normal Oracle installation consists of a single Oracle instance that accesses a database on the same computer system. With RAC (formerly known as Oracle Parallel Server), multiple instances on different nodes can access the same database files simultaneously. In case of a node failure, the workload of this node will be handled by the other node of the cluster.

After you prepare the system for installation, the Oracle Universal Installer (OUI) presents the list of all cluster nodes, enabling you to select a subset as targets. Then the OUI copies the Oracle software onto the first node, and then propagates the software onto the rest of the chosen nodes of the cluster. Along with all the Oracle software, Oracle Enterprise Manager (the central managing console) is automatically installed and set up. When the installation is finished, the database creation wizard and the network configuration wizard will be automatically invoked.

For more information about Oracle RAC installation, see the Oracle installation documentation or the Oracle RAC whitepapers at http://www.oracle.com/technology/products/database/clustering/RACWhitepapers.html.

NOTE

Oracle high availability features are only relevant for CONTROL-M/Enterprise Manager

Local database configuration

This configuration is based on the concept of installing the database server on one of the cluster nodes and the database clients on the rest of the cluster nodes. In this way, the database can be accessible to all the nodes in the cluster, but it will not be maintained in a highly available manner. This configuration is not recommended for CONTROL-M when implemented in a clustered configuration.

Remote database configuration

When the database server is located on a remote node (not one of the cluster nodes), you can install a database client on each of the cluster nodes and connect them to the remote database server. In this type of implementation, you do not need to install additional database software on the cluster (besides the database client).

This configuration is common when database platforms reside in a centralized location. However, the availability of CONTROL-M in this type of configuration is tied to and dependent on the remote database server availability.

Chapter 4

Best practices for CONTROL-M/Server and CONTROL-M/Agent

CONTROL-M/Server and CONTROL-M/Agent are cluster-aware applications and are certified to be installed on Windows clusters. The complete installation procedures are provided in the installation guides, so they are not discussed in this document. This chapter presents tips, hints, and best-practices information for the implementation of version 6.2.01 of CONTROL-M/Server and CONTROL-M/Agent.

CONTROL-M/Server

Virtual host name and IP address resources

When you install CONTROL-M/Server version 6.2.01 on a Windows cluster, the product installation automatically creates the Network Name and IP Address cluster resources. This ability is most suitable if you install CONTROL-M/Server using a remote or non-clustered database server or if you install the CONTROL-M/Server into a dedicated virtual server (resource group).

When you install CONTROL-M/Server into a virtual server that already contains virtual host name and IP address resources, such as the clustered MS-SQL host name and IP address resources, you can encounter a conflict if you specify the existing host name or IP address.

To avoid this conflict, install CONTROL-M/Server by using a dummy virtual host name and dummy virtual IP address, and when the installation is finished:

1. Remove the dependencies between the CONTROL-M/Server resource and the dummy virtual host name and dummy virtual IP address by modifying the CONTROL-M/Server cluster resource definition.

2. Delete the dummy virtual host name and dummy virtual IP address.

3. Modify the CONTROL-M/Server cluster resource and create a dependency on the original resource group virtual host name.

4. Verify CONTROL-M/Server Local IP Host Interface Name parameter is set to the original resource group virtual host name.

Resolution for Bug BMPM009086

In some cases in a Windows cluster environment, after you start CONTROL-M/Server, the following message is created every few seconds in the Microsoft Windows event log:

```
Microsoft Clustering Service could not write file %temp%\clsvxxx.tmp
```

You can view this message by using the Microsoft Windows event viewer.

In some cases when this problem occurs, you might see another message in the cluster log file similar to the following message:

```
[CP] CppCheckpoint failed to get registry database to file
C:\DOCUME~1\DOM-SI~1\LOCALS~1\Temp\CLS142B.tmp error 5
```

To resolve this problem, use the following procedure:

1. From the Cluster Administrator interface, take the CONTROL-M/Server cluster resource offline.

2. Ensure that no new errors appear in the Event Viewer or in the cluster log.

3. Delete the CONTROL-M/Server cluster resource.

4 Create a new cluster resource for CONTROL-M/Server that has the following parameters:

Parameter	Value
Resource Name	CONTROL-M Server
Resource Type	generic service
Dependencies	Network Name Resource
	IP Address Resource
	Shared Disk Resource
Service Name	ControlM_Server
Use Network Name	Yes (select check box)
Registry Replication	SOFTWARE\BMC Software\CONTROL-M/Server\SYSPRM
	SOFTWARE\BMC Software\CONTROL-M/Server\PassWord
	SOFTWARE\BMC Software\CONTROL-M/Server\SmtpParameters
	SOFTWARE\BMC Software\CONTROL-M/Server\SecurityPolicy

5 Bring the CONTROL-M/Server cluster resource online.

6 Ensure that no new errors appear in the Event Viewer or in the cluster log.

Starting and stopping CONTROL-M/Server

When CONTROL-M/Server is installed in a Windows cluster environment, only use either one of the following for starting and stopping CONTROL-M/Server:

- the Cluster Administrator
- the **cluster.exe** utility

Stopping CONTROL-M/Server by means other than the Cluster Administrator or the **cluster.exe** utility (such as by using ctm_menu, the start_ctm & shut_ctm scripts or the Microsoft Windows services control) might cause the CONTROL-M/Server resource group to failover to another cluster node.

CONTROL M/Agent

Creating IP Address and Network Name cluster resources

CONTROL-M / Agent version 6.2.01 installation require Network Name and IP Address virtual resources to be created before you begin. When you install CONTROL-M / Agent to the same virtual server (resource group) as CONTROL-M / Server, you do not need to manually create the Network Name and IP address cluster resources. They are automatically created by the CONTROL-M / Server installation.

When you install CONTROL-M / Agent into a new resource group or a resource group that does not include Network Name and IP Address resources, use the following procedures to create these cluster resources and bring them online.

To create the IP Address resource

1 From the Cluster Administrator interface, select the relevant resource group.

2 Right-click an empty space in the group and choose **New => Resource**.

As an alternative, from the menu bar, choose **File => New => Resource**.

3 In the New Resource window, shown in Figure 5 on page 35, perform the following steps, and then click **Next**:

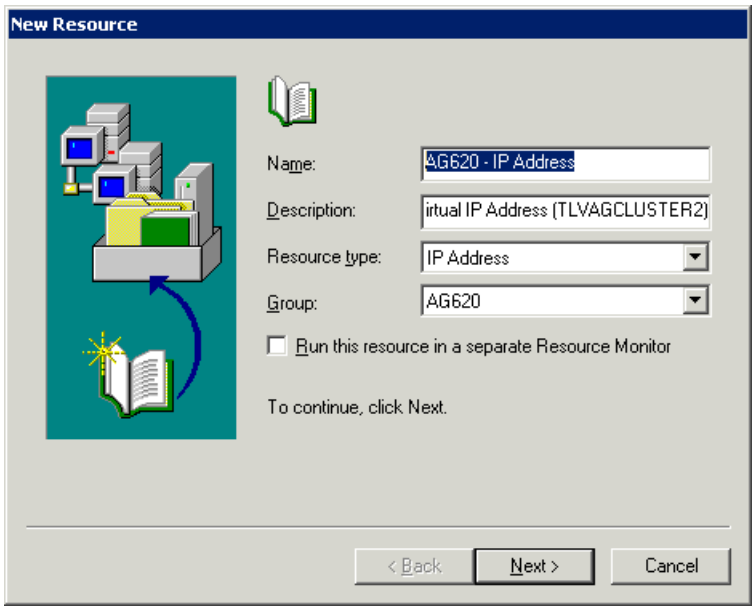
A Enter the name that will be assigned to the IP address cluster resource (for example, **AG620 – IP Address**).

B Enter a description for the IP address cluster resource (for example, **Virtual IP Address (TLVAGCLUSTER2)**).

C Select resource type **IP Address**.

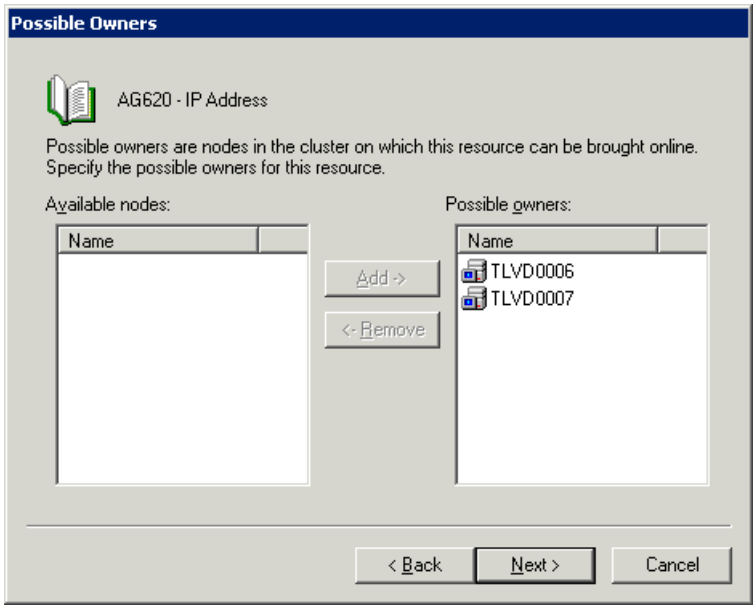
D Ensure that the selected group is the CONTROL-M / Agent resource group (for example, **AG620**).

Figure 5 New Resource window for creating the IP Address resource



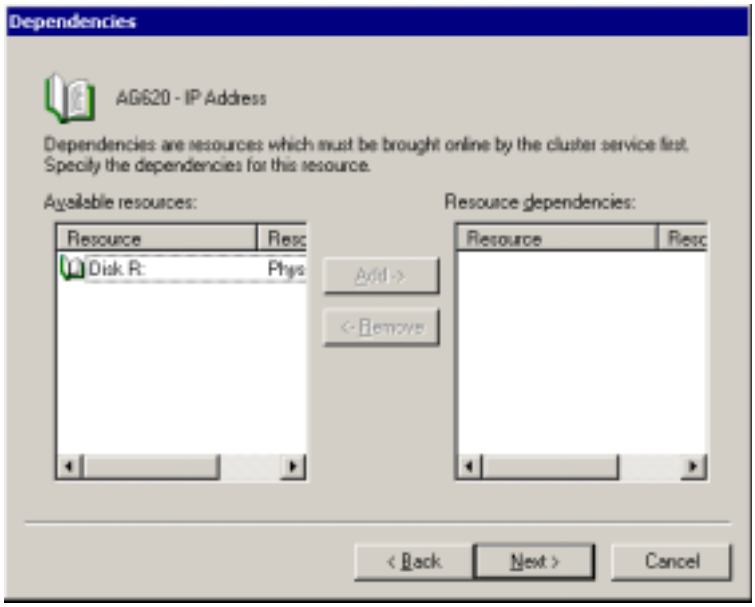
4 In the Possible Owners window, ensure that all the nodes on which the CONTROL-M / Agent can be brought online are listed in the right column, as shown in Figure 6, and then click **Next**:

Figure 6 Possible Owners window for creating the IP Address resource



5 In the Dependencies window, shown in Figure 7, click **Next**.

Figure 7 Dependencies window for creating the IP Address resource



6 In the TCP/IP Address Parameters window, shown in Figure 8, perform the following steps, and then click **Finish**:

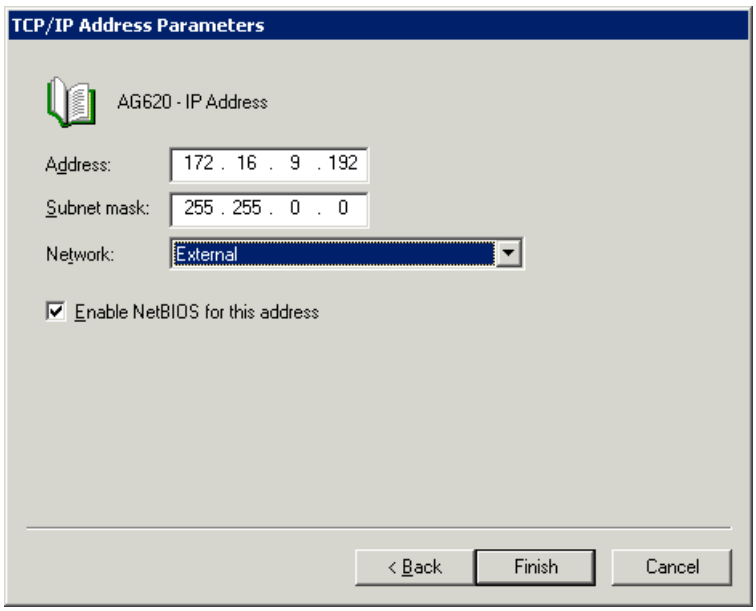
A Enter the CONTROL-M/Agent virtual IP address.

The **Subnet mask** field is automatically set.

B Select **Network** type **External**.

C Select the **Enable NetBIOS for this address** check box.

Figure 8 TCP/IP Address Parameters window



To create the Network Name resource

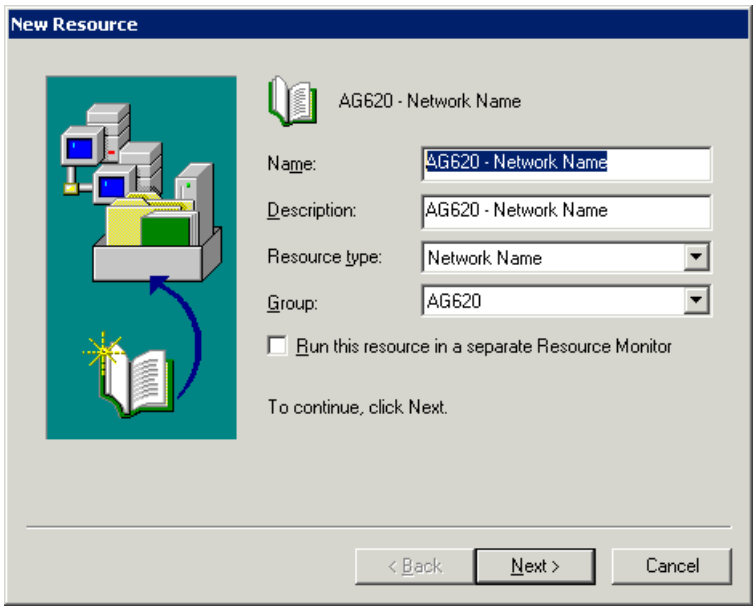
1 From the Cluster Administrator interface, select the relevant resource group.

2 Right-click an empty space in the group and choose **New => Resource**.

As an alternative, from the menu bar, choose **File => New => Resource**.

The New Resource window is displayed, as shown in Figure 9 on page 38.

Figure 9 New Resource window for creating the Network Name resource



3 In the New Resource window, perform the following steps, and then click **Next**:

A Enter the name that will be assigned to the Network Name cluster resource (for example, **AG620 – Network Name**).

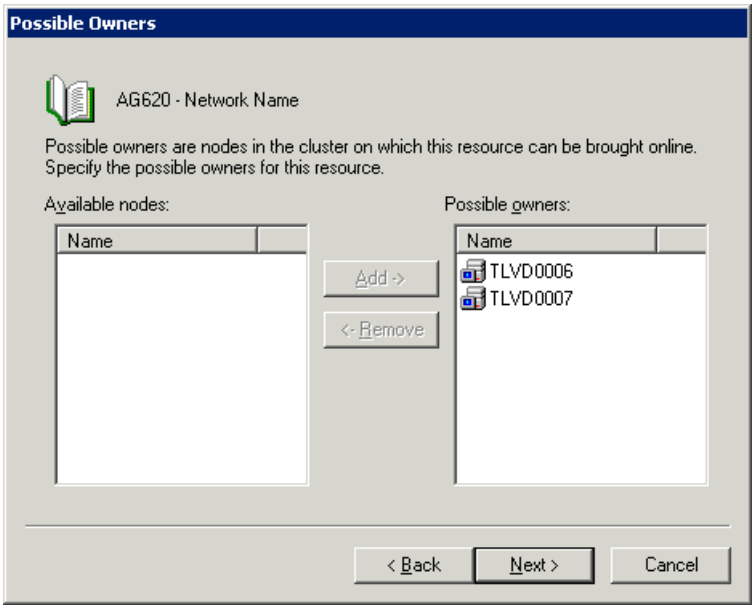
B Enter a description for the Network Name cluster resource (for example, **AG620 – Network Name**).

C Select resource type **Network Name**.

D Ensure that the selected group is the CONTROL-M / Agent resource group (for example, **AG620**).

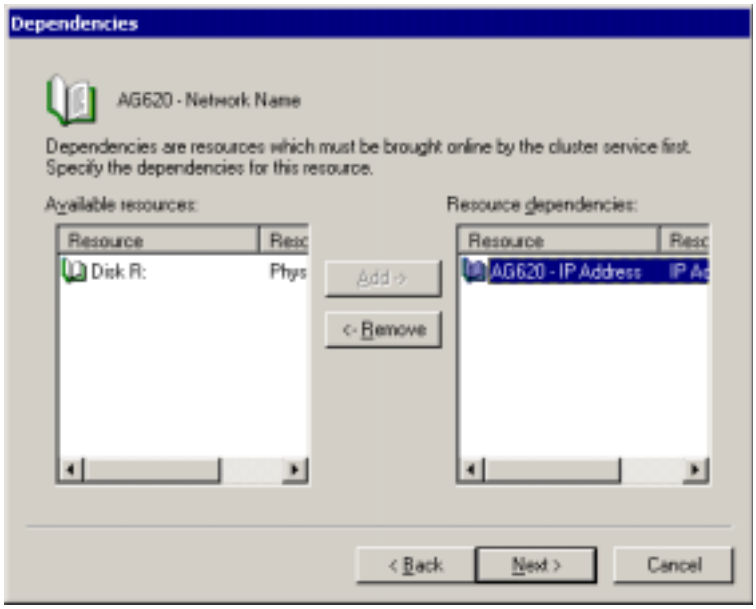
4 In the Possible Owners window, shown in Figure 10 on page 39, ensure that all the nodes on which the CONTROL-M / Agent can be brought online are listed in the right column, and then click **Next**.

Figure 10 Possible Owners window for creating the Network Name resource



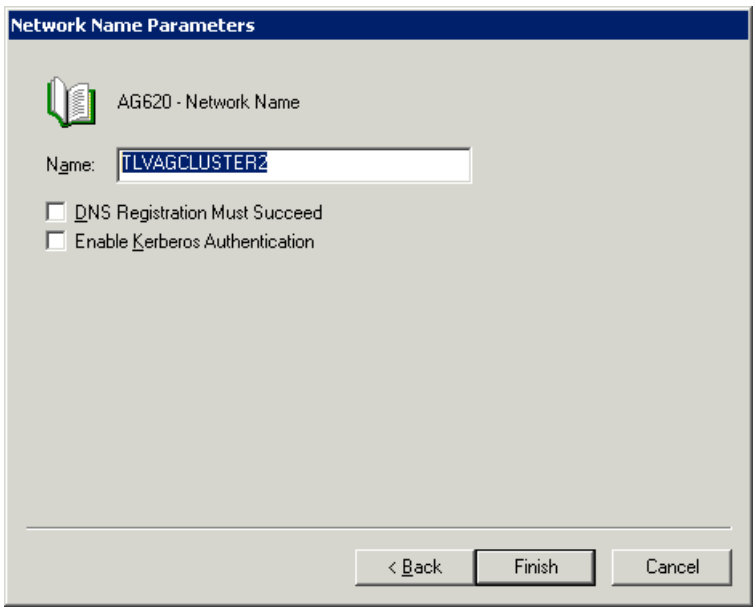
5 In the Dependencies screen, shown in Figure 11, select the Network Name cluster resource that you are creating and click **Add** to add it to the resource dependencies list in the right column.

Figure 11 Dependencies window for creating the Network Name resource



6 In the Network Name Parameters window, shown in Figure 12 on page 40, enter the name for the CONTROL-M / Agent virtual server, and then click **Finish**.

Figure 12 Network Name Parameters window



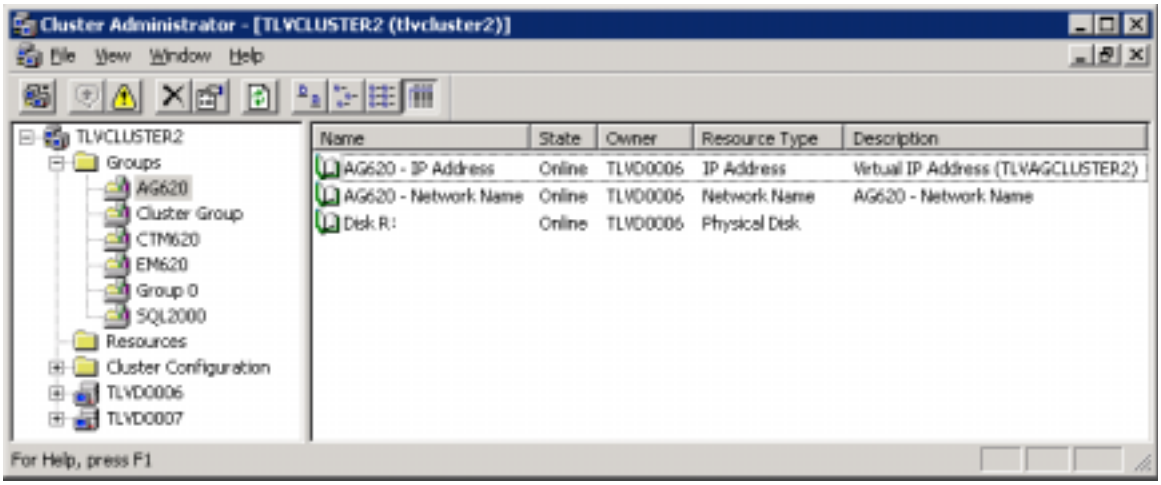
To bring the resources online

1 From the Cluster Administrator interface, select the CONTROL-M / Agent resource group.

2 Right-click the group and choose **Bring Online**.

As an alternative, from the menu bar, you can choose **File => Bring Online**.

Figure 13 Cluster Administrator interface window for bringing resources online



Reasons for jobs disappearing

Every time a job is submitted, a process is created to monitor the job and report about its completion. This process is called Agent Monitor (AM). When the AM is started (with every job), it creates two files for the job: a status file and a procid file.

In a normal scenario, the AM detects the job completion, updates the procid file and sends a trigger to the Agent Tracker (AT) about the completion. The AT then sends the update to CONTROL-M/Server.

In a failover scenario, while the job is still executing, the agent process is stopped and the agent partition is disconnected from the first host. In this case the job can keep running, but the procid file will not be updated when the jobs completes (the agent partition will be mapped to the backup node). Therefore, when the agent is started on the backup node, and the next AT Track-All time arrives, it will find the original procid file but it will not find the actual process. This is why the job is marked as disappeared.

Job disappeared workaround

As an optional workaround, you can define a JLOST ON statement for the jobs that run on the clustered agent (Statement=*, Code=**JLOST**) and execute a DO RERUN command. In this case the jobs will be automatically restarted (rerun) on the backup server when CONTROL-M/Server finds they have disappeared.

NOTE

You must enter value greater than 0 in the MAX RERUN parameter in order for the job to be resubmitted.

Implementing CONTROL-M control modules in cluster installations

NOTE

The section is relevant when installing CONTROL-M control modules versions earlier than 6.2.01.

When CONTROL-M / Agent is installed in cluster mode (as opposed to local mode), every CONTROL-M / Agent must have a unique name so that they can all run on the same cluster node. In such an installation, the default agent installation is disabled. CONTROL-M control modules (CMs) versions earlier than version 6.2.01 are supported only on default agents. Use the following procedure to work around this problem and implement CMs local Windows cluster nodes:

1. Install a local CONTROL-M / Agent on each of the relevant cluster nodes.
2. Install the relevant CONTROL-M / CM on each of the local agents.
3. Apply the latest software updates (maintenance updates, fix packs, and so forth).
4. After the CONTROL-M / CM accounts are created on one of the nodes, copy the account file from that node to the others.
5. In CONTROL-M / Server, create a node group that includes the physical host names of all the relevant cluster nodes.
6. When creating the relevant skeleton in CONTROL-M / EM for the CM jobs, use the node group name.

NOTE

The node group name can be different from the CONTROL-M / Server virtual host name in case another agent is implemented in clustered mode in the CONTROL-M / Server virtual server.

Chapter 5

CONTROL-M/EM installation

This chapter comprises the following phases, which help you install CONTROL-M/Enterprise Manager (CONTROL-M/EM) to work on Windows clusters:

This example implementation is based on two CONTROL-M/EM installations, one on each node, where both instances access the same database. Each installation is performed separately, and after the first installation is finished, the CONTROL-M/EM database and database owner are deleted. When CONTROL-M/EM is installed on the second node, the same database parameters are entered as for the first node, and a new database is created.

In this implementation, the CONTROL-M/EM components are not managed by the administration facility, but by the cluster. Each component is defined as a cluster resource.

The following attributes describe the environment in which CONTROL-M/EM is installed for the examples in this chapter:

- The name of the cluster in which CONTROL-M/EM is installed is TLVCLUSTER2.

- The names of the nodes in the CONTROL-M/EM cluster are TLVD0006 and TLVD0007.

- The CONTROL-M/EM database platform is MS-SQL 2000 Enterprise Edition, installed in cluster mode on the same cluster as CONTROL-M/EM, using the virtual host name TLVSQLCLUSTER2. The database files are located on disk J (shared disk).

- The cluster resources group in which CONTROL-M/EM is installed is named EM620.

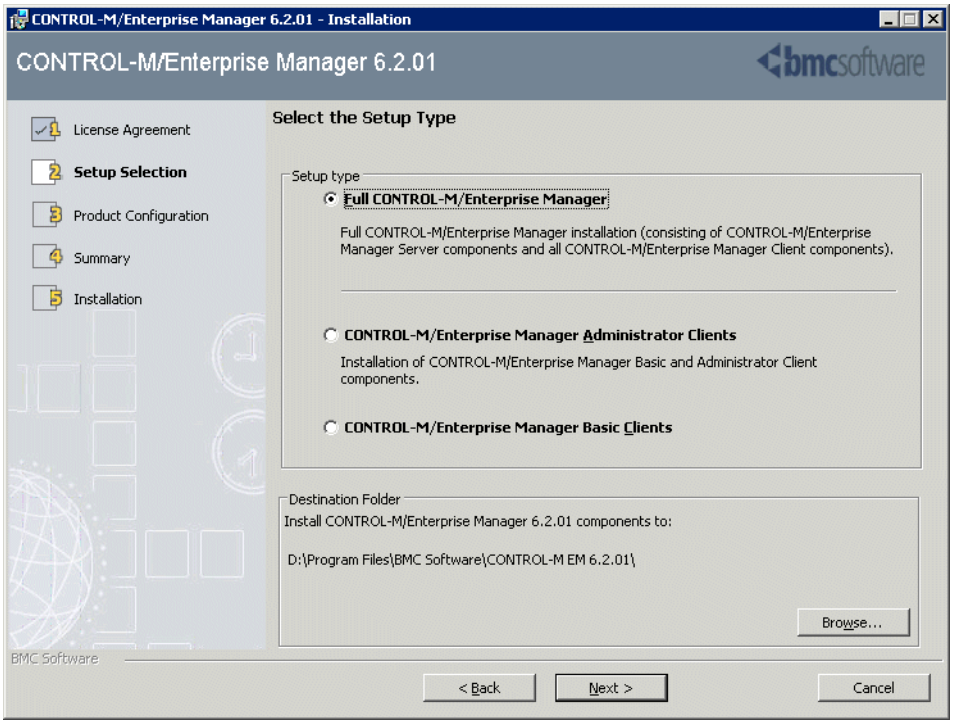
- The Virtual Network Name that is used for the CONTROL-M/EM resource group is TLVEMCLUSTER2 and the Virtual IP Address in the resource group is 172.16.9.191.

Phase 1: Install CONTROL-M/EM on the first node

Install CONTROL-M/EM on the first node, TLVD0006, according to the instructions provided in the *CONTROL-M Installation Guide* and using the following configuration attributes:

- Use Setup Type **Full**, as shown in Figure 14:

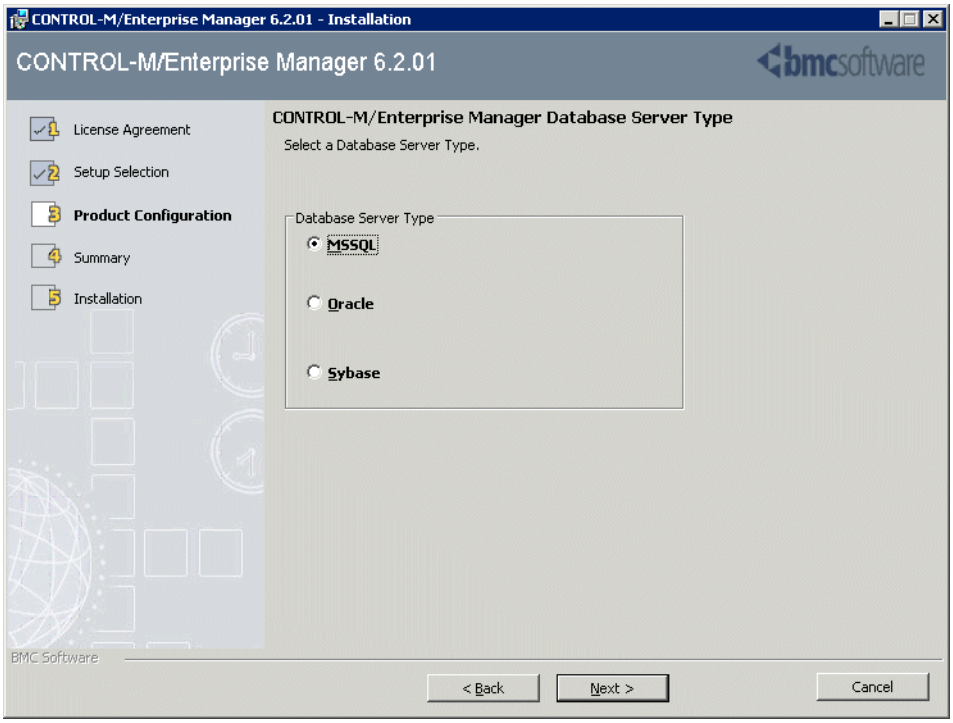
Figure 14 Setup type selection window



- Use a local disk for the installation destination directory (for example, **D:\Program Files\BMC Software\CONTROL-M EM 6.2.01**).

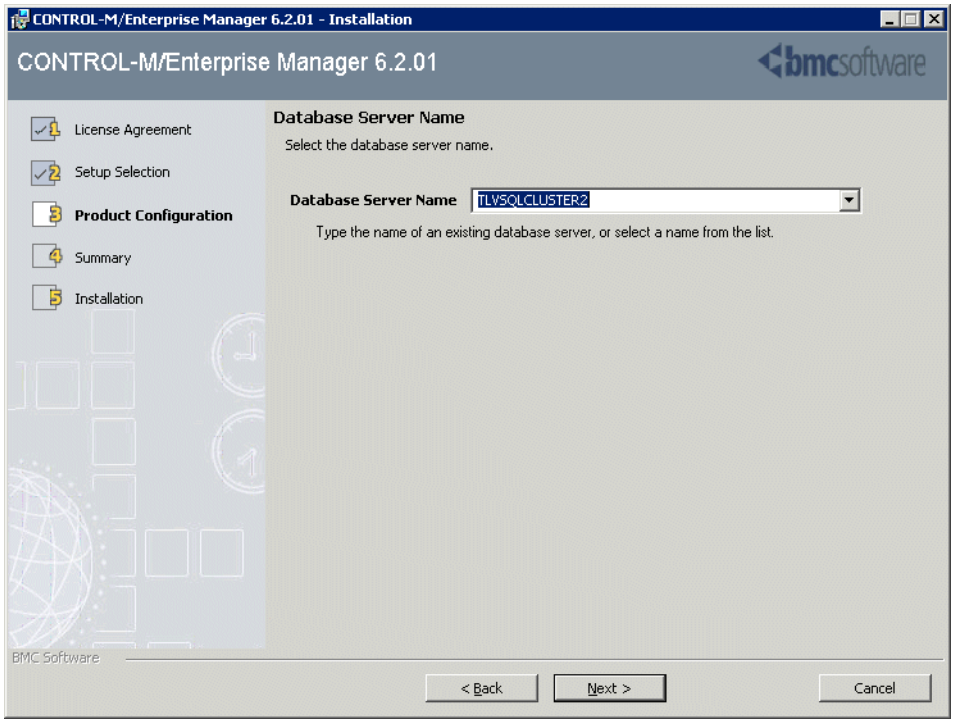
- Select Database Server Type **MSSQL**, as shown in Figure 15:

Figure 15 Database server type selection window



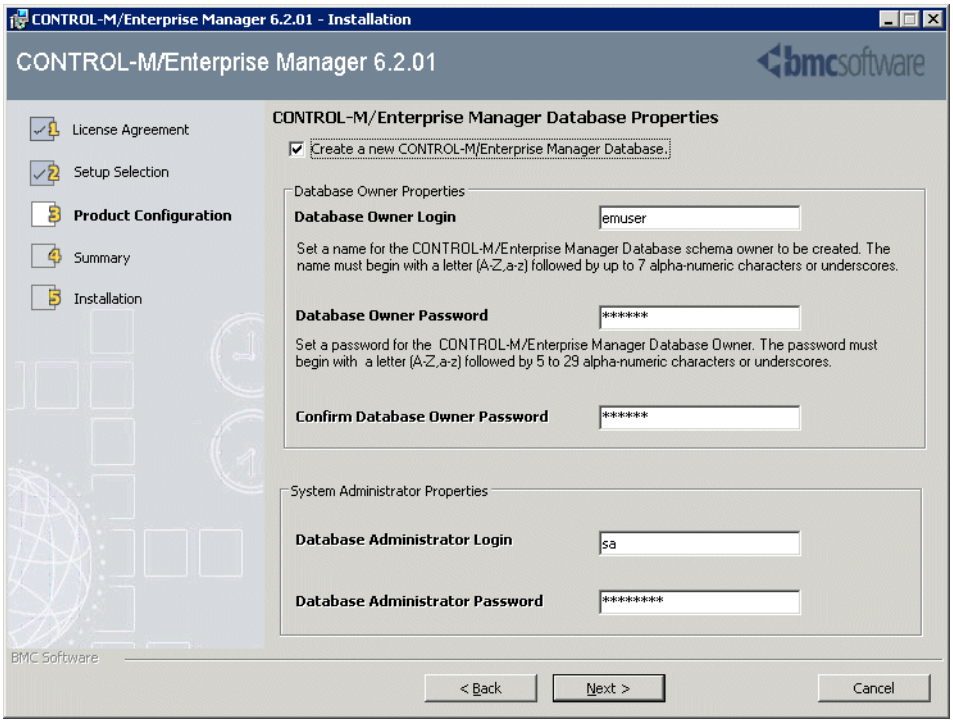
- For the Database Server Name window, enter the virtual name of the MS-SQL server, **TLVSQLCLUSTER2**, as shown in Figure 16:

Figure 16 Database Server Name window



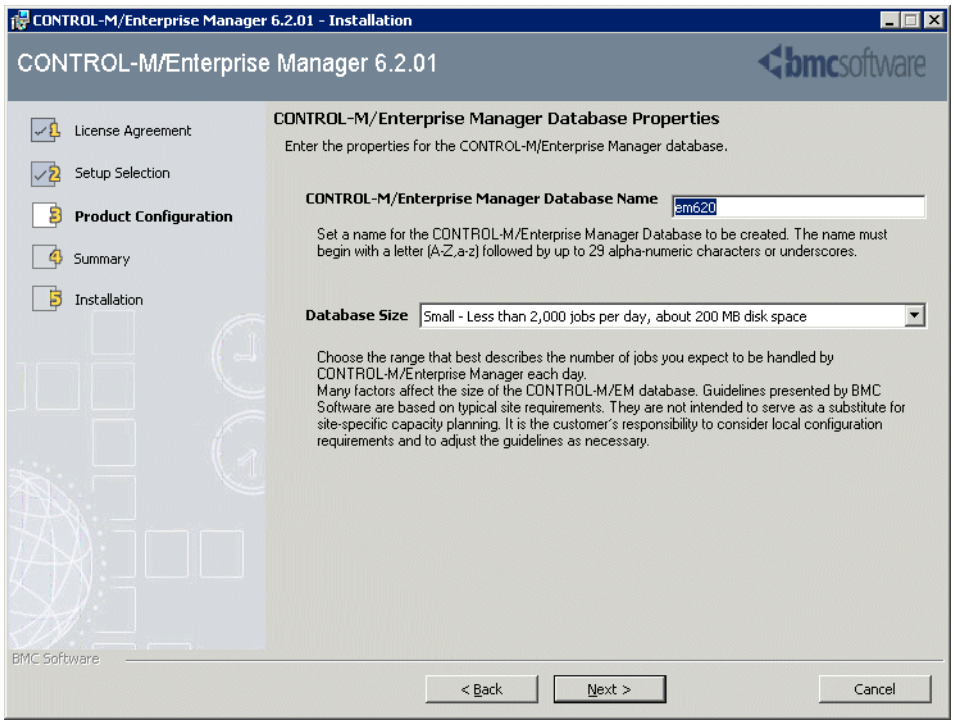
- For the **Database Owner Login** field of the Database Properties window, enter the CONTROL-M/EM DBO user name, which is created by the installation (**emuser** in the example shown in Figure 17).

Figure 17 Specifying Database Owner Login in the Database Properties window



- For the CONTROL-M/EM Database Name, use **em620**, as shown in Figure 18:

Figure 18 Specifying Database Name in the Database Properties window

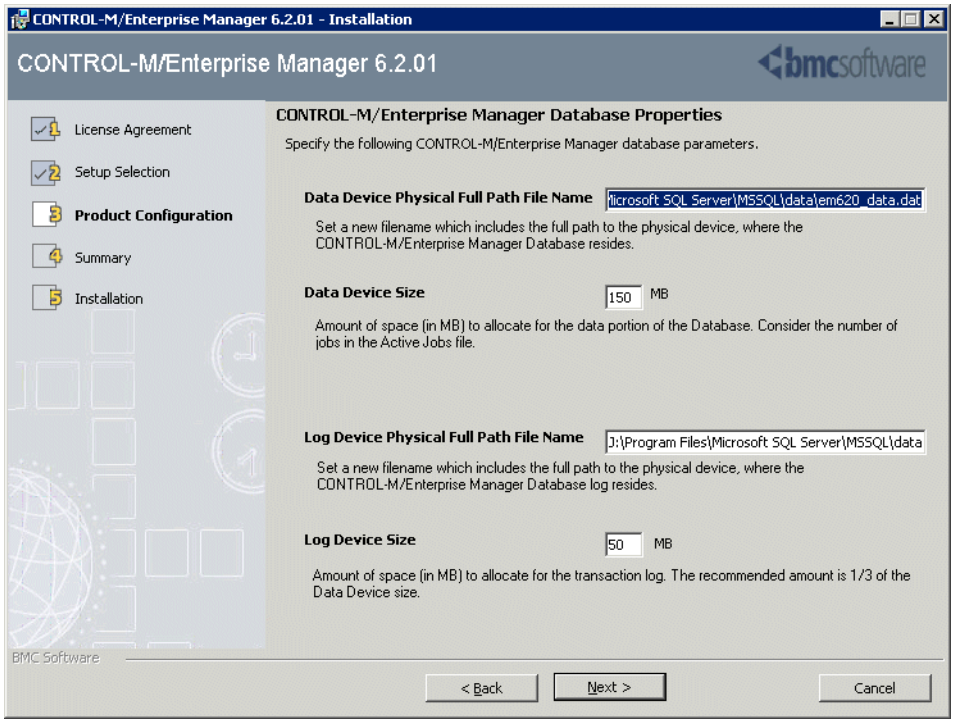


- For the location of the Data Device and the Log Device, enter the path and file names, located on the shared disk of the MS-SQL resource group, as shown in Figure 19 on page 50:

  — for the Data Device:
  J:\Program Files\Microsoft SQL Server\MSSQL\Data\em620_data.dat

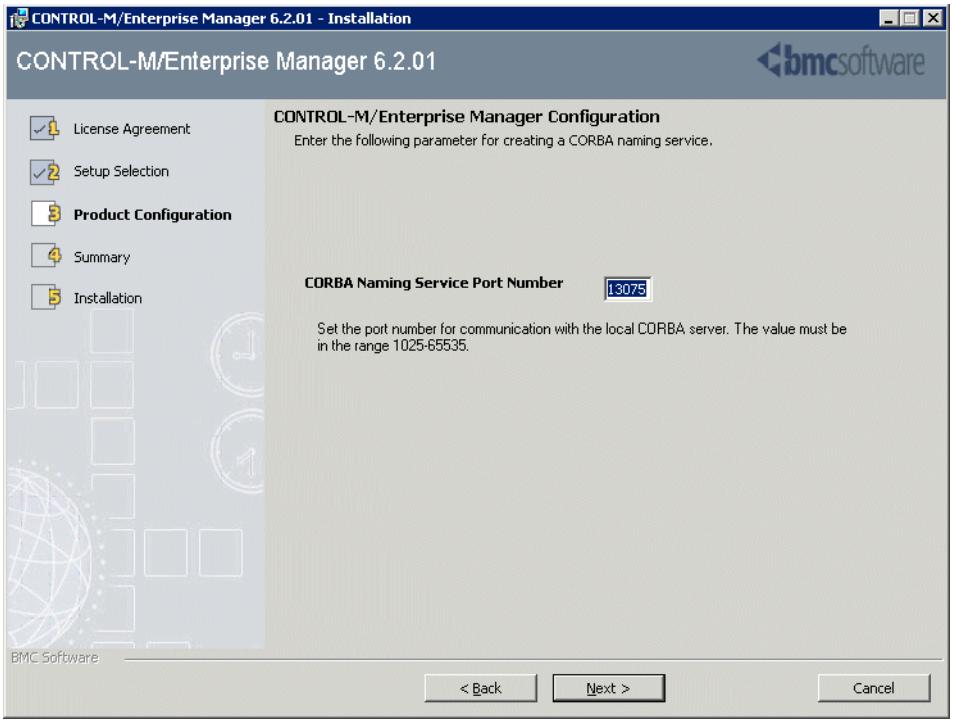
  — for the Log Device:
  J:\Program Files\Microsoft SQL Server\MSSQL\Data\em620_log.dat

Figure 19 Specifying Data Device and Log Device locations



- For the **CORBA Naming Service Port Number**, enter a port that is available on both cluster nodes (**10375** in the example, shown in Figure 20):

Figure 20 Specifying the port number for the CORBA Naming Service



After you have provided information for all of the configuration windows, review the summary and start the installation process.

When the installation completes, install the latest Fix Pack to apply the most recent software updates.

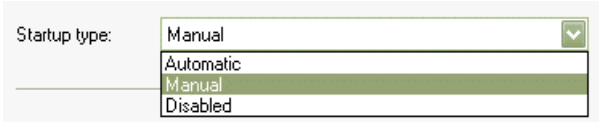
NOTE

CONTROL-M/EM version 6.2.01 is supported only on Windows clusters if Fix Pack 1 or later is installed.

Phase 2: Modify Windows services on the first node

1 On node TLVD0006, modify the Windows service named NuTCRACKER to start in **Manual** mode, as indicated in Figure 21:

Figure 21 Startup type for CONTROL-M Windows services



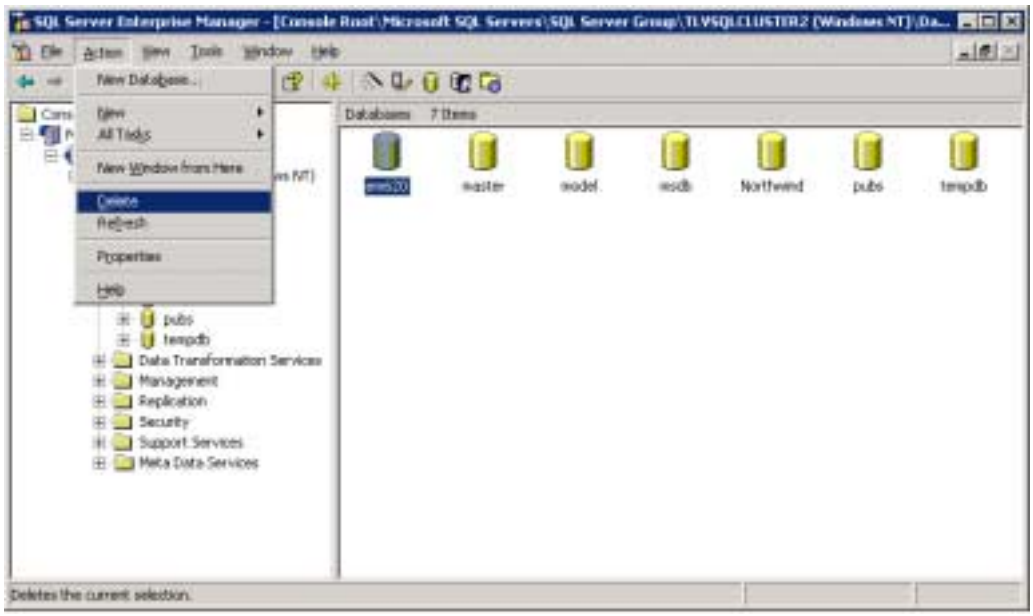
2 Modify the CONTROL-M/EM Administration Agent Windows service to use startup type **Disabled**.

Phase 3: Delete first installation database and database user

1 Ensure that all CONTROL-M/EM components and services are stopped.

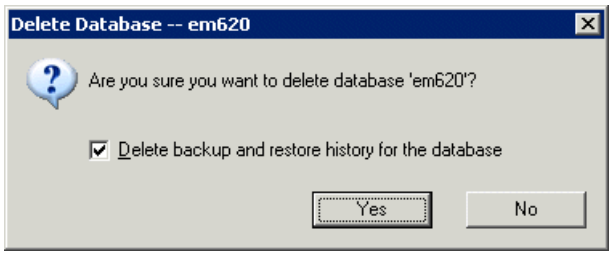
2 Using the Microsoft SQL Server Enterprise Manager console, delete the **em620** database, as shown in Figure 22:

Figure 22 Deleting the database



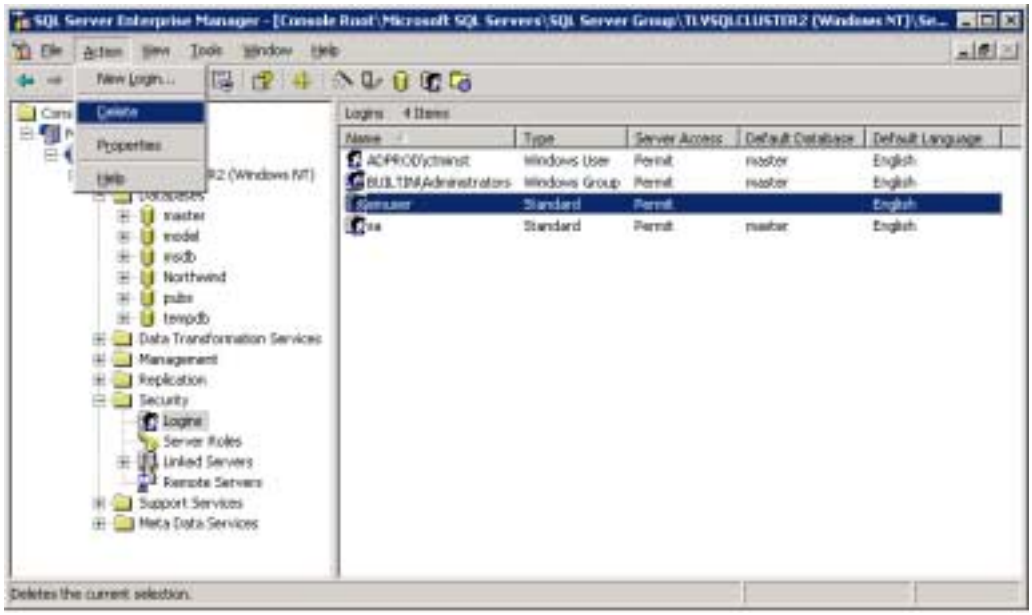
3 Confirm the database deletion and delete the backup and restore history for the database, as shown in Figure 23:

Figure 23 Deletion confirmation



4 Using the Microsoft SQL Server Enterprise Manager console, delete the CONTROL-M/EM Database Owner named **emuser**, as shown in Figure 24:

Figure 24 Deleting the database user



Phase 4: Install CONTROL-M/EM on the second node

Similarly to phase 1 on page 45, install the second CONTROL-M/EM instance on the second node, TLVD0007, according to the instructions provided in the *CONTROL-M Installation Guide* and using the following configuration attributes:

- Use Setup Type **Full**.

- Use a local disk for the installation destination directory (for example, **D:\Program Files\BMC Software\CONTROL-M EM 6.2.01**).
- Select Database Type **MSSQL**.
- For the Database Server Name window, enter the virtual name of the MS-SQL server, **TLVSQLCLUSTER2**.
- For the **Database Owner Login** field of the Database Properties window, enter the CONTROL-M/EM DBO user name, which is created by the installation (**emuser** in the example).
- For the CONTROL-M/EM Database Name, use **em620**.
- For the location of the Data Device and the Log Device, enter the path and file names, located on the shared disk of the MS-SQL resource group:
  - **J:\Program Files\Microsoft SQL Server\MSSQL\Data\em620_data.dat**
  - **J:\Program Files\Microsoft SQL Server\MSSQL\Data\em620_log.dat**
- For the **CORBA Naming Service Port Number**, enter a port that is available on both cluster nodes (**10375** in the example).

After you have provided information for all of the configuration windows, review the summary and start the installation process.

When the installation completes, install the latest Fix Pack to apply the most recent software updates.

NOTE

CONTROL-M/EM version 6.2.01 is supported on Windows clusters only if Fix Pack 1 or later is installed.

Phase 5: Modify Windows services on the second node

1. On node TLVD0007, modify the CONTROL-M Windows service named NuTCRACKER to start in **Manual** mode, as indicated in Figure 21 on page 52.
2. Modify the CONTROL-M/EM Administration Agent Windows service to use startup type **Disabled**.

Phase 6: Create CONTROL-M/EM network cluster resources

1 Use the Cluster Administrator interface to create the IP Address and Network Name resources in the CONTROL M/EM resources group, EM620, using the attributes listed in Table 1 and Table 2:

Table 1 Attributes for IP Address resource

Attribute	Value
Resource Name	EM620 - IP Address
Description	EM Virtual IP Address (TLVEMCLUSTER2)
Resource Type	IP Address
Group	EM620
Dependencies	none
IP	172.16.9.191 (Virtual IP Address)
Subnet	Auto (255.255.0.0)
Enable NetBIOS for this address	Yes (select the check box)

Table 2 Attributes for Network Name resource

Attribute	Value
Resource Name	EM620 - Network Name
Description	EM620 - Network Name
Resource Type	Network Name
Group	EM620
Dependencies	EM620 - IP Address
Name	TLVEMCLUSTER2

2 Use the Cluster Administrator to start the Network Name and IP Address resources.

3 To ensure the network name and IP address are published in the network, ping TLVEMCLUSTER2 from the command prompt.

Phase 7: Reconfigure TAO

TAO is an implementation of the CORBA protocol that is used to manage the communication between the CONTROL-M/EM client and server components. The Naming Service is the TAO component that manages the registered servers and their connection parameters.

The following procedure configures the Naming Service to use (publish) the virtual host name of CONTROL-M/EM so that client components can access the product without knowing which node it is running on. Perform the procedure on each of the cluster nodes (TLVD0006 and TLVD0007). Start with the procedure on the first node (TLVD0006) with the CONTROL-M/EM resource group online, and then failover the CONTROL-M/EM resource group to the second node (TLVD0007) and perform the same procedure there.

1. On the first node, TLVD0006, ensure that the following servers are not running:

   - CONTROL-M/EM GUI Server
   - Global Alerts Server
   - BMC Batch Impact Manager Server (BIM)
   - CONTROL-M/Forecast

2. Ensure that the Windows service named TAO NT Naming Service is stopped.

3. Open a command prompt.

4. Set the JAVA_HOME environment variable to the JRE installation directory.

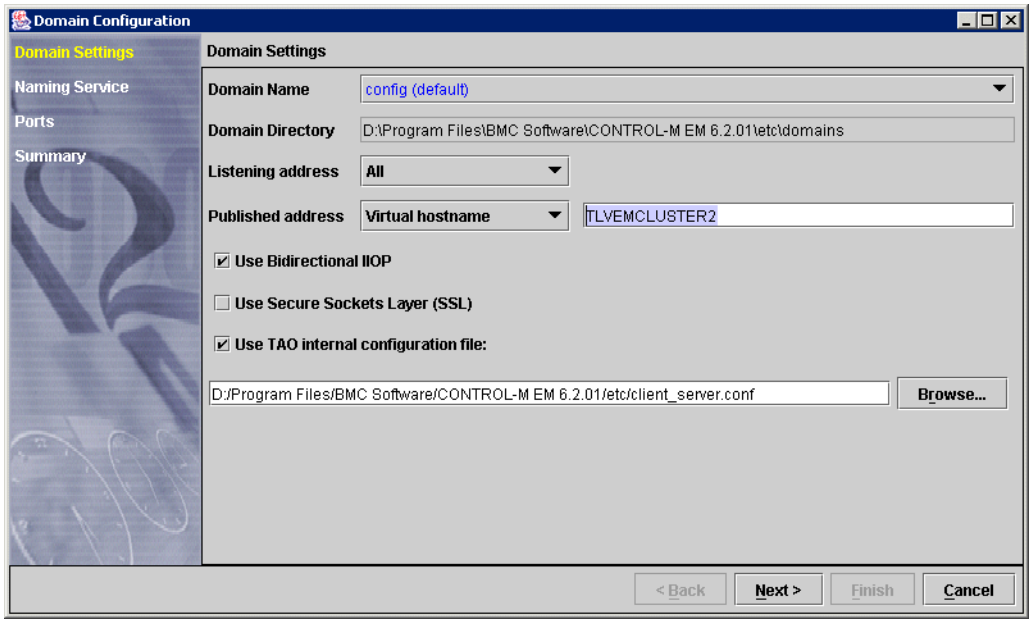
   For example: **set JAVA_HOME= D:\Program Files\Java\j2re1.4.1_02**

5. Navigate to the **bin** folder under the product installation directory (**%NDS_ECS_ROOT%\bin**).

6. Activate the Configuration Wizard by running the orbconfigure java utility.

The Domain Settings configuration window is displayed, as shown in Figure 25:

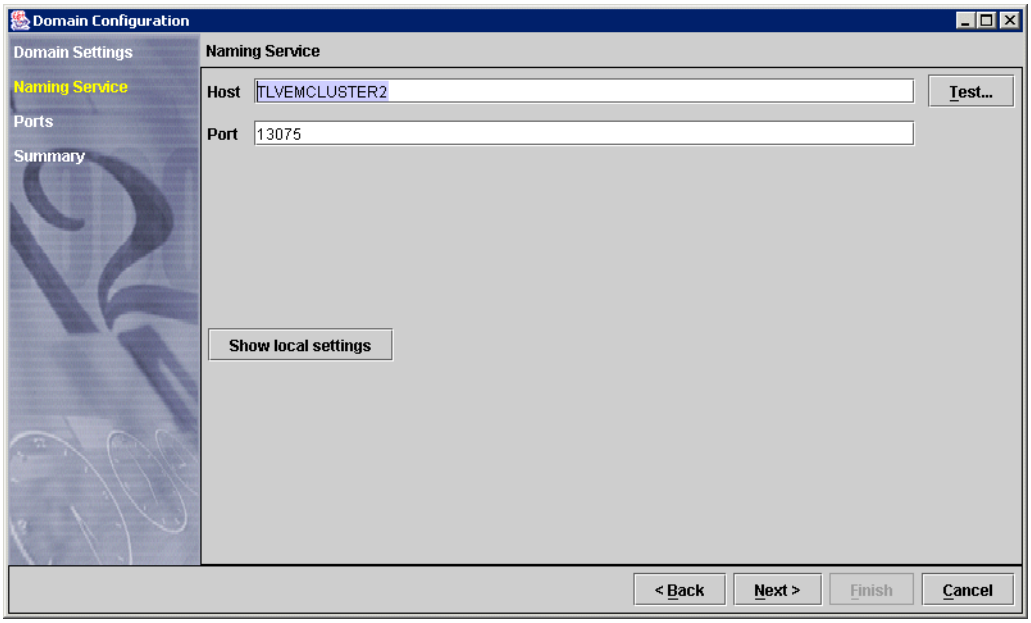
Figure 25 Domain Settings window



7 Modify the published address to **virtual hostname** and enter the CONTROL-M/EM virtual host name (in the example, **TLVEMCLUSTER2**); and then click **Next**.

The Naming Service configuration window is displayed, as shown in Figure 26:

Figure 26 Naming Service configuration window

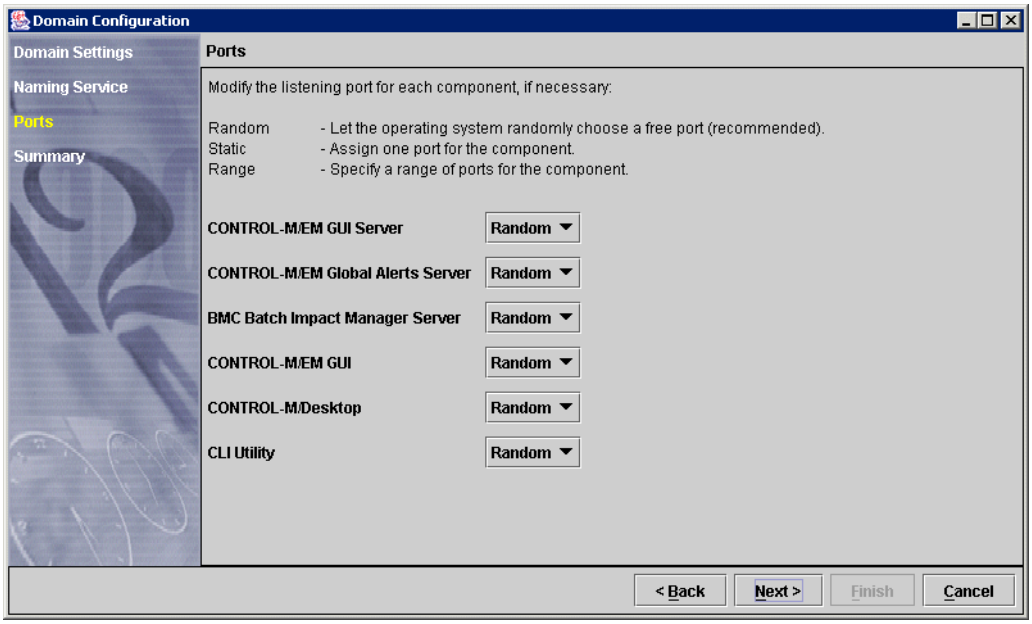


8 Enter the CONTROL-M/EM virtual host name (in the example, **TLVEMCLSUTER2**) and the relevant port (default: **13075**), and then click **Next**.

Ensure that the port is available and is not used by any other program on any of the cluster nodes.

The Ports configuration window is displayed, as shown in Figure 27:

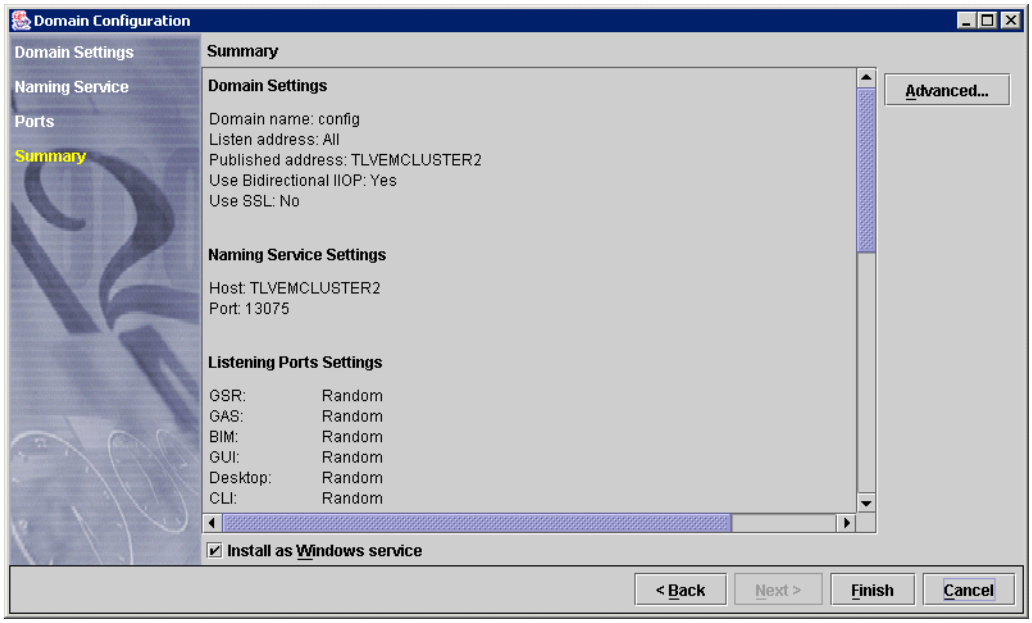
Figure 27 Ports configuration window



9 Set CONTROL-M/EM ports or leave default settings, and then click **Next**.

The Summary screen is displayed, as shown in Figure 28:

Figure 28 Domain Configuration Summary window



10 Ensure that the **Install as Windows Service** check box is selected (this is the default).

11 Ensure all relevant entries in the summary reports refer to the virtual host name, and then click **Finish**.

12 Modify the TAO NT Naming Service Windows service to start in **Manual** mode, as shown in Figure 21 on page 52.

13 Perform step 1 on page 56 through step 12 on page 59 on the second node, TLVD0007.

Phase 8: Create CONTROL-M/EM components cluster resources

Using the Cluster Administrator interface, create the following resources in the CONTROL-M/EM resources group:

- generic service resources, as listed in Table 3
- generic application resources, as listed in Table 4 on page 60 and Table 5 on page 61

NOTE

When implementing CONTROL-M/EM on a Microsoft Windows 2000 cluster, replace the %NDS_ECS_ROOT% variable with the obsolete path in the command line and current directory parameters, for all generic application resources. For example, replace %NDS_ECS_ROOT%\bin with **D:\Program Files\BMC Software\CONTROL-M EM 6.2.01\bin**. To find the value of the %NDS_ECS_ROOT% variable, open Command Prompt and enter **echo %NDS_ECS_ROOT%**.

Table 3 CONTROL-M/EM infrastructure resources

Resource / Attribute	CONTROL-M-EM-TAO NT Naming Service	CONTROL-M-EM-NuTCRACKER
Description	CONTROL-M/EM TAO NT Naming Service	CONTROL-M/EM NuTCRACKER Service
Resource type	generic service	generic service
Group	EM620	EM620
Dependencies	EM620 - Network Name	EM620 - Network Name
Service name	TAO_NT_Naming_Service	NuTCRACKERService
Use network name	Yes (select check box)	Yes (select check box)

Table 4 CONTROL-M/EM server resources: applications, part 1

Resource / Attribute	CONTROL-M-EM-GSR	CONTROL-M-EM-GAS
Description	CONTROL-M/EM GUI Server	CONTROL-M/EM Global Alert Server
Resource type	generic application	generic application
Group	EM620	EM620
Dependencies	■ CONTROL-M/EM TAO NT Naming Service	■ CONTROL-M/EM TAO NT Naming Service
Command line	%NDS_ECS_ROOT%\bin\ecs_guisrv.exe -name *virtualHostName*	%NDS_ECS_ROOT%\bin\ecs_gasrv.exe -name *virtualHostName*
Current directory	%NDS_ECS_ROOT%\bin	%NDS_ECS_ROOT%\bin
Use network name	Yes (select check box)	Yes (select check box)

Table 5 CONTROL-M/EM server resources: applications, part 2

Resource Attribute	CONTROL-M-EM-GCS	CONTROL-M-EM-Gateway (*CTM/SRVName*)
Description	CONTROL-M/EM Global Condition Server	CONTROL-M/EM Gateway
Resource type	generic application	generic application
Group	EM620	EM620
Dependencies	■ CONTROL-M-EM-NuTCRACKER	■ CONTROL-M-EM-NuTCRACKER
Command line	%NDS_ECS_ROOT%\bin\ecs_gcsrv.exe	%NDS_ECS_ROOT%\bin\ecs_gtw.exe -dc *DCName*
Current directory	%NDS_ECS_ROOT%\bin	%NDS_ECS_ROOT%\bin
Use network name	Yes (select check box)	Yes (select check box)
Pending timeout (seconds)	10	10

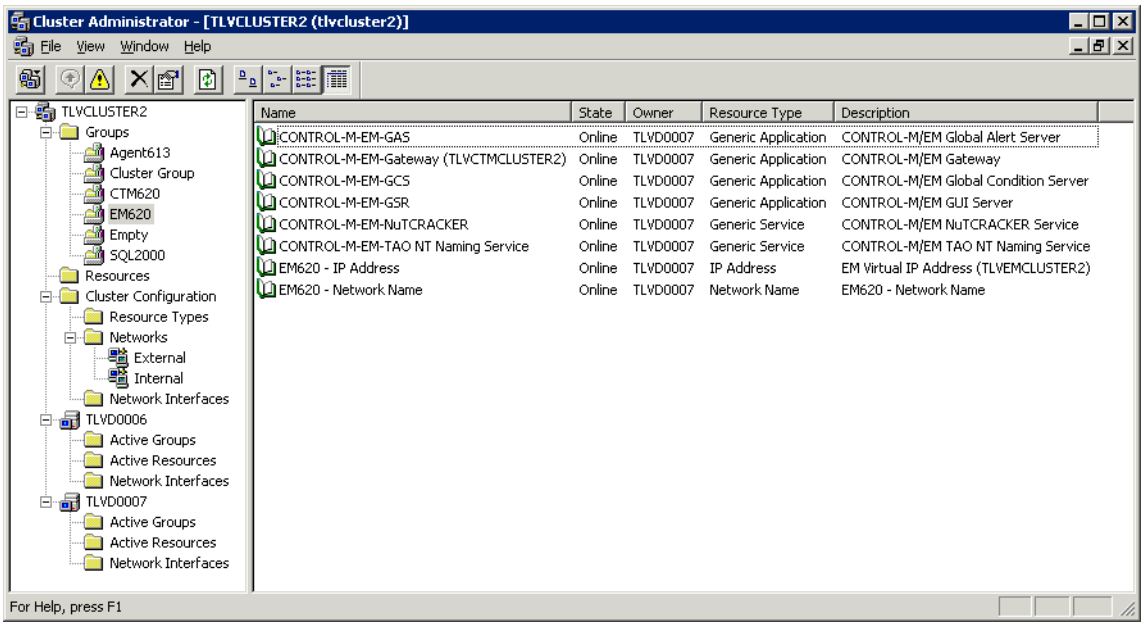
NOTE

Before defining the CONTROL-M/EM Gateway cluster resource, the CONTROL-M/Server should be defined using the Communication Administration window in CONTROL-M/EM.

Create a Gateway resource for each CONTROL-M/Server that is connected to CONTROL-M/EM. In the resource command line, indicate the CONTROL-M/Server name as a value to the -dc parameter.

Figure 29 shows an example of the CONTROL-M/EM resource group in the Cluster Administrator interface.

Figure 29 CONTROL-M/EM resource group



Phase 9: Configure cluster local client components

Run the following commands on each one of the cluster nodes (TLVD0006 and TLVD0007, as shown in Figure 29) to configure the local client components (those that are installed on the cluster nodes) to operate locally. The change is required as the CORBA configuration on the cluster nodes is configured to publish the virtual network name of CONTROL-M/EM (TLVEMCLUSTER2, as shown in Figure 29) while these components of these clients run locally.

orbadmin variable modify -scope GUI -value "iiop://" -ORBListenEndpoints
orbadmin variable modify -scope Desktop -value "iiop://" -ORBListenEndpoints
orbadmin variable modify -scope CLI -value "iiop://" -ORBListenEndpoints

Phase 10: Install and log into CONTROL-M/EM client components

1 Ensure that the virtual host name (in the example: **TLVEMCLUSTER2**) is properly defined in the DNS or host file so it can be accessed by name or IP address from Microsoft Windows.

2 During installation, enter the virtual host name as the location for the

- GUI Server
- CORBA Naming Service
- Database Server Name (when installing client administration components)

3 When logging into the CONTROL-M/EM GUI, as shown in Figure 30, use the virtual host name configured by the orbconfigure utility (in "Phase 7: Reconfigure TAO" on page 56) to connect to the CORBA Naming repository.

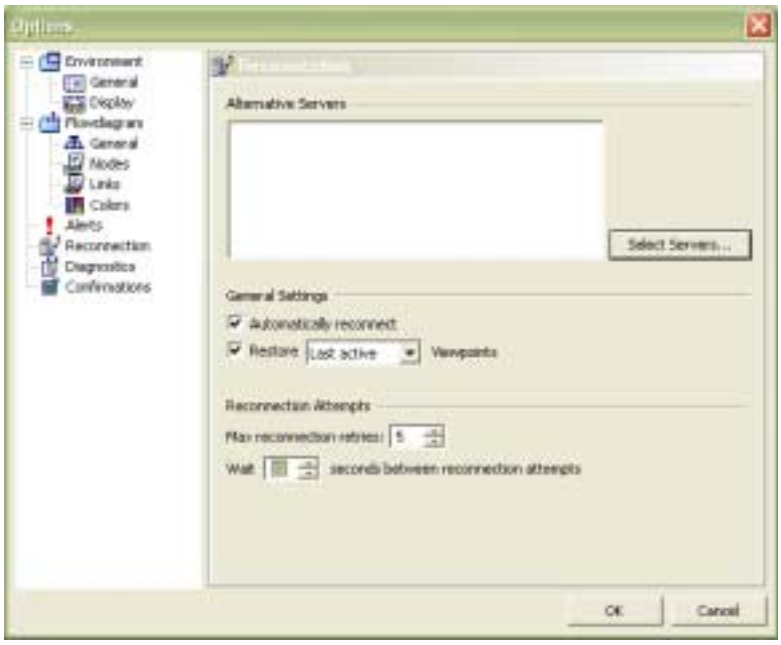
The virtual host name should be entered in the Host Name field, which is displayed after clicking **Advanced**. This name is resolved by the network and should be identical to the name configured by the orbconfigure utility.

Figure 30 Logging into CONTROL-M/EM

4 The server name is automatically displayed once the connection to the CORBA Naming service is established.

5 By default, CONTROL-M/EM client components are configured to reconnect to the GUI Server upon disconnection. If the failover time of the resource group is longer than the reconnection retries and timeout, change these parameters in the CONTROL-M/EM reconnection panel of the options menu, shown in Figure 31.

Figure 31 Options menu reconnection panel



Phase 11: Install BMC Batch Impact Manager

This phase is optional. It is intended only for customers who are licensed to use BMC Batch Impact Manager (BIM).

1 Install BMC Batch Impact Manager on the first cluster node (TLVD0006), according to the instructions provided in the *BMC Batch Impact Manager User Guide*.

The target installation should be on the same local drive that CONTROL-M/EM was installed on (in the example, **D:\Program Files\BMC Software\CONTROL-M EM 6.2.01\ECSBimServer**).

2 Log on to the CONTROL-M/EM database as the CONTROL-M/EM DBO user:

- for MS-SQL:
  osql –U <*EM DBO User*> **-P** <*EM DBO Password*> **-S** <*EM Database server name*>

  For example: **osql -U emuser -P empass -S TLVSQLCLUSTER2**

- for Oracle:
  Sqlplus <*emuser*>/<*empass*>**@**<*Database Name*>

  For example: **sqlplus emuser/empass@TLVSQLCLUSTER2**

3 Run the following SQL commands to delete the database records created by the installation.

These records will be recreated when installing BIM on the second node of the cluster.

- for MS-SQL:

```
DELETE FROM dbo.ACTIVEJOBSAUTHORIZATIONS WHERE USERNAME = 'bimuser'
DELETE FROM dbo.GENERALAUTHORIZATIONS WHERE USERNAME = 'bimuser'
DELETE FROM dbo.JOBACTIONS WHERE USERNAME = 'bimuser'
DELETE FROM dbo.RESOURCESAUTHORIZATIONS WHERE USERNAME = 'bimuser'
DELETE FROM dbo.USERSGROUPS WHERE USERNAME = 'bimuser'
DELETE FROM dbo.PARAMS WHERE PTYPE = 'bim'
go
```

- for Oracle:

```
DELETE FROM ACTIVEJOBSAUTHORIZATIONS WHERE USERNAME = 'bimuser';
DELETE FROM GENERALAUTHORIZATIONS WHERE USERNAME = 'bimuser';
DELETE FROM JOBACTIONS WHERE USERNAME = 'bimuser';
DELETE FROM RESOURCESAUTHORIZATIONS WHERE USERNAME = 'bimuser';
DELETE FROM USERSGROUPS WHERE USERNAME = 'bimuser';
DELETE FROM PARAMS WHERE PTYPE = 'bim';
COMMIT;
```

4 Fail over the CONTROL-M/EM resource group to the second cluster node (TLVD0007) and ensure that all components are shown as online in the Cluster Administrator interface.

5 Install BMC Batch Impact Manager on the second cluster node (TLVD0007), according to the instructions in the *BMC Batch Impact Manager User Guide*.

The target installation should be on the same local drive that CONTROL-M/EM was installed on (in the example, **D:\Program Files\BMC Software\CONTROL-M EM 6.2.01\ECSBimServer**).

6 Using the Cluster Administrator interface, create the BMC-BIM-Server resource in the CONTROL M/EM resource group:

Table 6 Attributes for the BMC-BIM-Server resource (part 1 of 2)

Attribute	Value
Resource Name	BMC-BIM-Server
Description	BMC Batch Impact Manager Server
Resource Type	generic application
Group	EM620
Dependencies	■ EM620 - Network Name ■ CONTROL-M-EM-TAO NT Naming Service ■ CONTROL-M-EM-GSR

Table 6 Attributes for the BMC-BIM-Server resource (part 2 of 2)

Attribute	Value
Command line	%NDS_ECS_ROOT%\bin\ecs_bim.exe -gsr=TLVEMCLUSTER2
Current directory	%NDS_ECS_ROOT%\bin
Use network name	Yes (select check box)

7 Install the latest BMC Batch Impact Manager Fix Pack on each of the cluster nodes.

8 Install the web application server on each of the cluster nodes (TLVD0006 and TLVD0007).

NOTE

Refer to Appendix A to for an example to the installation of Apache Tomcat version 5.0.28 on a cluster.

9 Deploy the BMC Batch Impact Manager web application according to the instructions provided in the *BMC Batch Impact Manager User Guide* on each of the cluster nodes (TLVD0006 and TLVD0007).

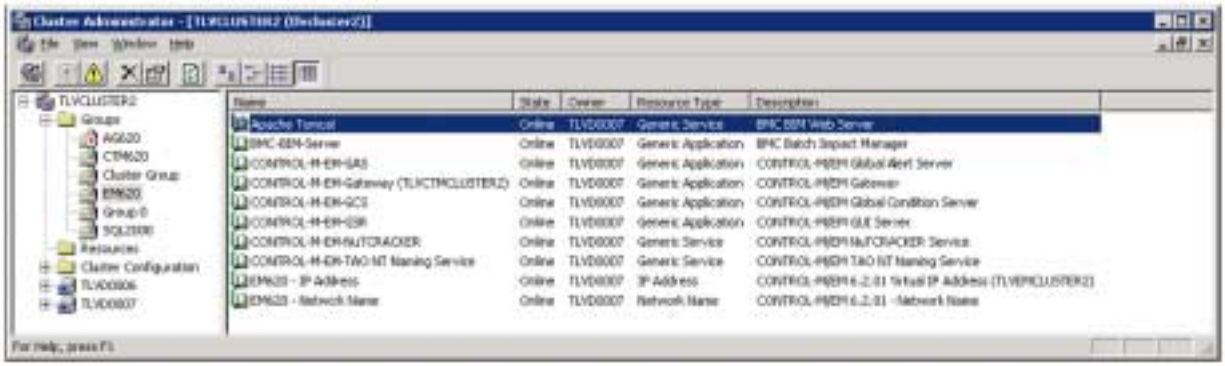
10 Using the CONTROL-M/EM Administration Facility, modify the value of the following system parameters to the CONTROL-M/EM virtual host name (in the example: **TLVEMCLUSTER2**):

- BIMHostName
- BMCImpactCellID
- BackupGUIServers

11 Using the Cluster Administrator interface, create the web application server resource in the CONTROL M/EM resource group (in the example, Apache Tomcat).

12 Bring online the BMC Batch impact Manager and the web application server cluster resources, as shown in Figure 32.

Figure 32 Cluster Administrator interface showing the CONTROL-M/EM 6.2.01 resource group with BMC Batch Impact Manager and Tomcat resources



13 Open the web browser and enter the following URL:

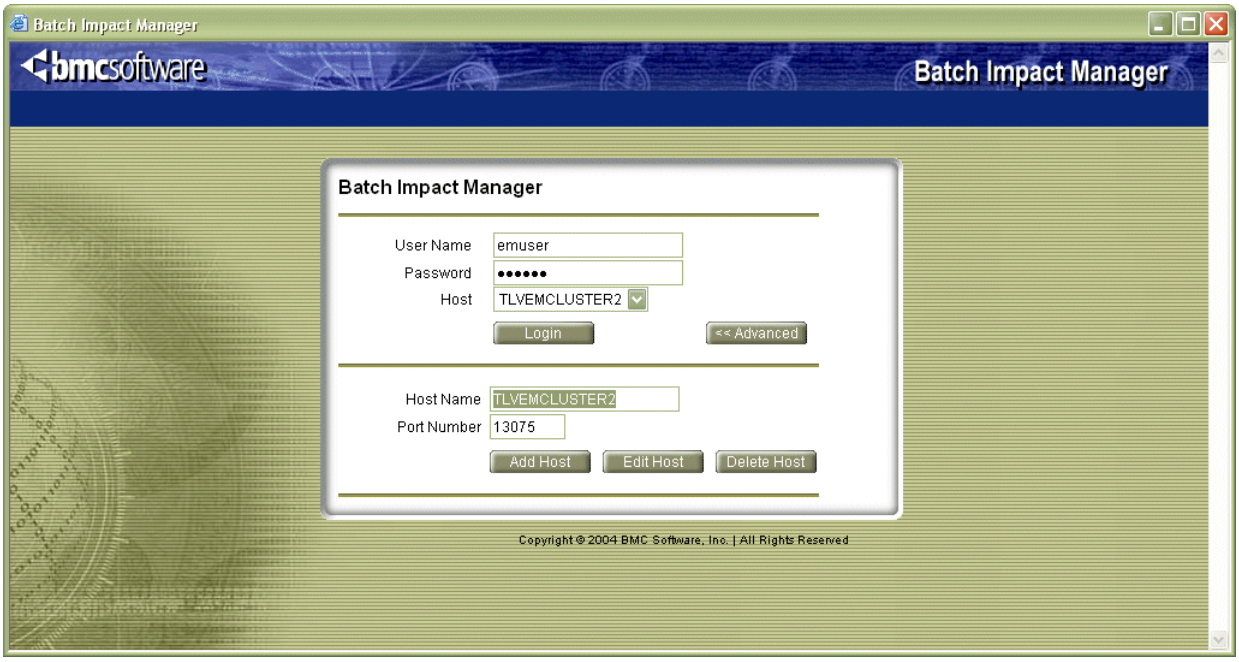
`http://virtualName:8080/bim`

EXAMPLE

`http://tlvemcluster2:8080/bim`

14 A page similar to the following is displayed:

Figure 33 BMC Batch Impact Manager login window



15 Click **Advanced**.

16 Modify the following field values:

Field	Value
Host	By default, the host name indicates the physical host name of the cluster node. Replace the default host name with the CONTROL-M/EM virtual host name (in this example: **TLVEMCLUSTER2**).

17 Click **Add Host**.

18 Click **Login** to log on to BMC Batch Impact Manager.

Phase 12: Install the CONTROL-M/Forecast Server

This phase is optional. It is intended only for customers who are licensed to use CONTROL-M/Forecast.

1 Install the CONTROL-M/Forecast on each of the cluster nodes (TLVD0006 and TLVD0007).

2 Using the Cluster Administrator interface, create the CONTROL-M resource in the CONTROL-M/EM resources group.

Table 7 Attributes for the CONTROL-M/Forecast Server

Attribute	Value
Resource Name	CONTROL-M-EM-Forecast
Description	CONTROL-M/EM Forecast Server
Resource Type	generic application
Group	EM620
Dependencies	CONTROL-M/EM TAO NT Naming Service
Command Line	**%NDS_ECS_ROOT%\bin\emforecastserver.exe -n *virtualHostName* -gsr= *virtualHostName***
Current Directory	**%NDS_ECS_ROOT%\bin**
Use network name	Yes (select check box)

Example of installing Apache Tomcat on Windows clusters

This appendix provides an example of installing Apache Tomcat version 5.0.28 on Windows clusters. This version of Apache Tomcat requries JAVA SDK version 1.4.x or later to be installed on each of the cluster nodes.

NOTE

You can download Apache Tomcat from http://jakarta.apache.org/tomcat.

1 Install Apache Tomcat on each the cluster nodes.

2 Ensure that you are installing the software on the local drive (for example, **D:\Program Files\Apache Software Foundation\Tomcat 5.0**).

3 During the installation, select the Service component, as shown in Figure 34.

Figure 34 Service component selection window for Tomcat installation

4 When you are prompted for the JAVA virtual machine location, enter the JAVA SDK installation folder.

5 When the installation is finished, do not start the Apache Tomcat Windows service.

6 On each of the cluster nodes (TLVD0006, TLVD0007) modify the Apache Tomcat Windows service to start in Manual mode.

7 Using the Cluster Administrator interface, create the Apache Tomcat resource in the CONTROL M/EM resource group:

Table 8 Attributes for the Apache Tomcat resource

Attribute	Value
Resource Name	Apache Tomcat
Description	Apache Tomcat Web Server
Resource Type	generic service
Group	EM620
Dependencies	EM620 - Network Name
Service name	Tomcat5
Use network name	Yes (select check box)

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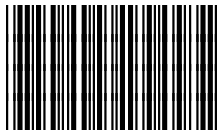
Notes



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