

Microsoft **Exchange** 2000 **Server**

Using Microsoft® Exchange Server Load Simulator 2000

Exchange Core Documentation

Produced by Exchange User Education

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Using Microsoft Exchange Server Load Simulator 2000

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For the latest information, see <http://www.microsoft.com/exchange>

Introduction

Microsoft® Exchange Server Load Simulator 2000 (LoadSim2000) is a benchmarking tool designed to test how a server responds to mail load. LoadSim2000 allows you to simulate the delivery of multiple MAPI client messaging requests to an Exchange 2000 server. To simulate the delivery of these messaging requests, you run LoadSim tests on client computers. These tests send multiple messaging requests to the Exchange server, thereby causing a mail load.

After the tests are complete, you can use the results to:

- Calculate the client's response time when the server is experiencing mail loads.
- Calculate the realistic number of users per server.
- Identify bottlenecks on the server.

Important Microsoft Load Simulator 2000 is strictly a benchmarking tool that tests the effect of an isolated client load on a server. LoadSim2000 is not intended to simulate the load in a real production environment. When planning your Exchange deployment, do not use these tests to simulate actual user loads on your production server.

Improvements to LoadSim for Exchange 2000

LoadSim2000 contains the following improvements for Exchange 2000 Server customers:

- **New user profile** In the **Test Properties** dialog box of LoadSim2000, the MAPI Messaging Benchmark version 2 (MMB2) replaces the "light" profile. The MMB2 profile features larger files and a higher load. MMB2 is the default profile for all tests of Exchange 2000.
- **New LoadSim process option** In previous versions of LoadSim, you could use the **Maximum number of processes** option to set the maximum number of processes that LoadSim used. In LoadSim2000, a single instance of the LoadSim process runs with a small number of threads. To set the thread value, in **Options**, on the **Tasking** tab, use the **Maximum number of LoadSim threads** option. **Maximum number of LoadSim threads** has a default value of 16 and maximum of 64.
- **New Test/Logon tab** In LoadSim2000, you can use the new **Test/Logon** tab to customize test properties — specifically, the LoadSim tasks, the initialization properties, and the logon behavior of the clients. To decrease the preparation time, by default, all users are logged on to Exchange before a new test begins. You can use the new **Test/Logon** tab to change this default option.

- **Public folder initialization** You are now offered the choice of initializing public folders for each server.
- **New performance counters** New performance counters have been added.
- **Mailbox initialization** To reduce the initial high load, LoadSim2000 now initializes Inboxes with the appropriate ratio of read and unread messages.

System Requirements

To use LoadSim2000, you must have the following components:

- One or more client computers with Microsoft Outlook® 2000 installed. You can run LoadSim2000 on any computer that supports Outlook 2000.
- One or more servers running Exchange 2000 or later versions.

Configuring LoadSim2000 on a Client Computer

To simulate a large number of clients sending messaging requests to an Exchange server, you must install and configure LoadSim2000 on one or more separate client computers. This section provides the installation procedures for each client computer.

Important Do not install LoadSim on your Exchange server. You must install LoadSim on separate client computers.

To configure LoadSim 2000 on a client computer

1. Install LoadSim on your client computer by downloading and extracting the files from the Microsoft Web site at <http://go.microsoft.com/fwlink/?linkid=1710>.
2. Install special System Monitor counters for LoadSim.

Each of these steps is detailed in the following sections.

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Installing LoadSim2000 on Your Client

To install LoadSim2000, simply download and extract the software files from the Microsoft Web site at <http://go.microsoft.com/fwlink/?linkid=1710>.

To install LoadSim 2000

1. Whether you are running Microsoft Windows NT® or Microsoft Windows® 2000, log on as the domain administrator by specifying the domain.

Important If you do not log on as the domain administrator (for example if you log on as the local administrator), LoadSim cannot create users in the Microsoft Active Directory® directory service.
2. From the Microsoft Web site at <http://go.microsoft.com/fwlink/?linkid=1710>, extract the LoadSim files from the download package into a folder of your choice.

Note As an example, this document uses a folder named **Loadsim**.
3. Verify that the following files from the package were downloaded successfully:
 - 100katt.msg
 - 1k.msg
 - Isctrs.h
 - Isperf.ini
 - pf10kat.msg

- pf1k.msg
- pf2k.msg
- pf4k.msg
- ups10kat.msg
- ups10kat1.msg
- ups1k.msg
- ups2k.msg
- ups4k.msg
- upsbmobj.msg
- upswdatt.msg
- upxlatt.msg
- upxlobj.msg
- loadout.dll
- loadsim.exe
- lslog.exe
- lsp perf.dll
- lsp perf.reg
- mcpp100katt.msg
- mcpp1matt.msg
- mcwd2matt.msg
- opf1k.msg
- opf2k.msg
- opf4k.msg
- oups10kat.msg
- oups1k.msg
- oups2k.msg
- oups4k.msg
- oupsjapp.msg
- oupsjrcv.msg
- oupsjrnl.msg
- oupsbmobj.msg
- oupswdatt.msg
- oupsxlatt.msg
- oupsxlobj.msg
- opf10kat.msg

Installing System Monitor Counters for LoadSim2000

After you download the LoadSim software, you must install LoadSim System Monitor counters. These counters allow you to monitor LoadSim activity on your clients.

To install LoadSim System Monitor counters

1. On the client computer, close any System Monitor applications that are currently running. If System Monitor is running, it prevents the LoadSim counter installation.
2. Click **Start**, click **Run**, and then type **cmd** to open a command prompt.
3. Move to the folder in which you installed the LoadSim software. (For example, type **cd Loadsim**.)
4. At the command prompt, type **unlodctr loadsim**. This command removes any previous versions of the LoadSim counters. This command does not return a status, but it logs an entry in Event Viewer.
5. At the command prompt, type **lsperf.reg**. This command creates the necessary registry key for LoadSim System Monitor objects.
6. At the command prompt, type **lodctr lsperf.ini**. This command loads the new System Monitor counters. This command does not return a status, but it logs an entry in Event Viewer.
7. Open Windows Explorer and navigate to the directory in which you installed the LoadSim software (for example, c:\Loadsim).
8. Move **Lsperf.dll** either into the default **Winnt** directory or into the Windows installation directory you specify (which must be in the path).
9. Start System Monitor: Click **Start**, click **Run**, and then type **perfmon.msc**.
10. In **Performance**, click **System Monitor**, and then click **+** (the **Add** icon) on the toolbar to open the **Add Counters** dialog box.
11. In **Add Counters**, under **Performance object**, verify that the System Monitor objects **LoadSim Action** and **LoadSim Global** are displayed (see Figure 1).

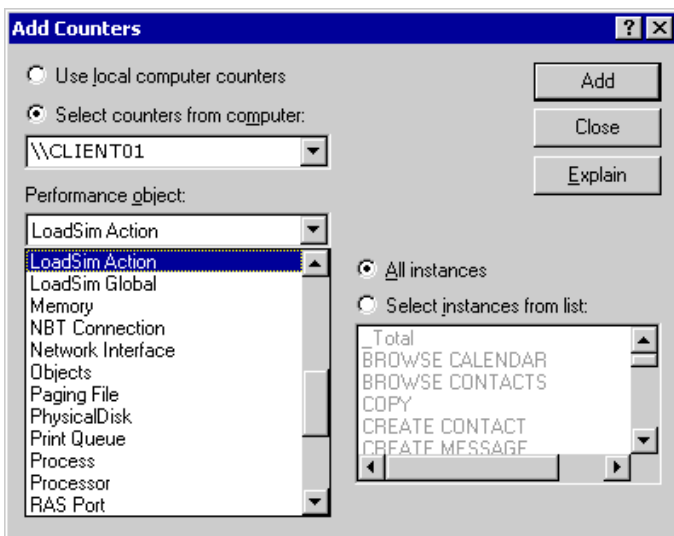


Figure 1 LoadSim counters in System Monitor

Troubleshooting System Monitor Counter Installation

If the System Monitor counters are not visible after installation, perform the following troubleshooting procedure.

Warning This section contains information about using Registry Editor. Using Registry Editor incorrectly can cause serious problems that may require you to reinstall your operating system. Microsoft cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. For information about how to edit the registry, view the "Change Keys and Values" Help topic in Registry Editor (Regedit.exe) or the "Add and Delete Information in the Registry" and "Edit Registry Information" Help topics in Regedt32.exe. Note that you should back up the registry before you edit it. If you are running Windows NT or Windows 2000, you should also update your Emergency Repair Disk (ERD).

To troubleshoot System Monitor counter installation

1. Perform the procedure in the "[Installing System Monitor Counters for LoadSim2000](#)" section again.
2. Verify that any LoadSim counters that were installed with an earlier version of LoadSim are successfully removed. These counters should have been removed when you ran the **unlodctr** command. To verify that these LoadSim counters are removed:
 - a. Click **Start**, click **Run**, type **eventvwr**, and then click **OK**.
 - b. In **Event Viewer**, click **Application Log** to view the events.
 - c. Verify that the old LoadSim System Monitor counters are successfully removed and that the new counters are successfully loaded.

Table 1 lists the events and corresponding descriptions that display in Event Viewer when the **unlodctr** command successfully removes the old LoadSim Monitor counters, and the **lodctr** command successfully loads the new counters.

Table 1 Entries in Event Viewer

Command Generating the Entry	Event Type	Event Source	Description
Unlodctr	Information	LoadPerf	Performance counters for the LoadSim service were successfully removed. The Record Data contains new values of the system Last Counter and Last Help registry entries.
Lodctr	Information	LoadPerf	Performance counters for the LoadSim service were loaded successfully. The Record Data contains the new index values assigned to this service.

3. Use Registry Editor to confirm that the registry key for LoadSim System Monitor objects was successfully added to the registry. To confirm that the registry key was successfully added:
 - a. Start Registry Editor: Click **Start**, click **Run**, and then type **regedit**.
 - b. Navigate to HKLM\SYSTEM\CurrentControlSet\Services\Loadsim\Performance.
 - c. Verify that the **LoadSim** folder has a **Performance** subfolder. Your registry should look similar to Figure 2.

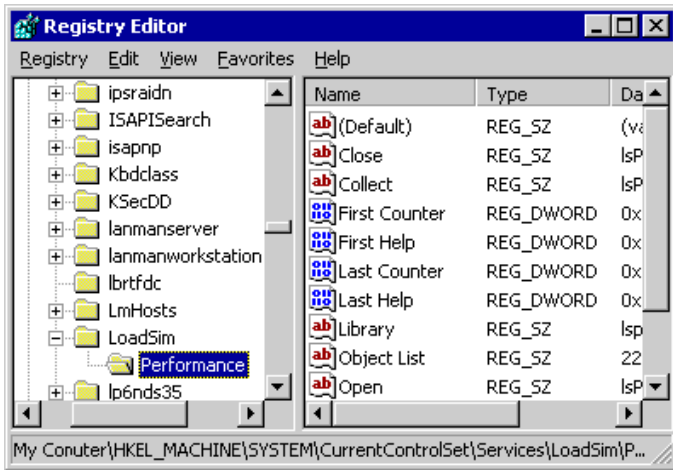


Figure 2 The Performance folder in Registry Editor

Configuring Storage Groups and Databases on Your Exchange Server

Before you use LoadSim to create and run tests, you must prepare your Exchange organization. For optimal performance, you should move your databases and log files to separate storage systems that possess sufficient throughput so that, when data is written to the transaction logs and database files, the storage systems do not become a bottleneck for the test.

Additionally, you must decide what types of scenarios you want to test. For example, to test scenarios in which multiple users send requests to different mailbox stores on different storage groups, you can add additional storage groups and databases to your Exchange server.

To configure your Exchange server for LoadSim testing

1. To achieve optimal performance, move the transaction logs and database files to separate storage systems.
2. Add an additional storage group on your Exchange server.
3. Add mailbox stores to each storage group that is dedicated to LoadSim testing.

Figure 3 illustrates an example of an Exchange server that is configured for LoadSim testing. In this example, Exchange System Manager is used to add a second storage group called Second Storage Group. Also, two mailbox stores are added to each

storage group. These mailbox stores are named 1priv1 and 1priv2 in First Storage Group, and 2priv1 and 2priv2 in Second Storage Group.

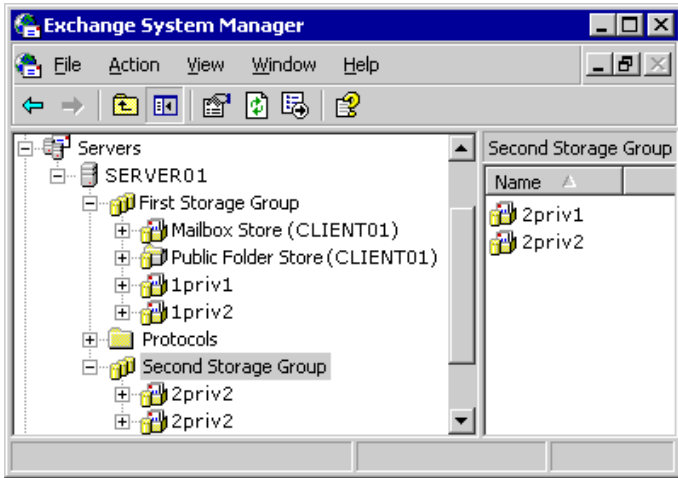


Figure 3 Exchange System Manager with an additional storage group and additional mailbox stores

Relocating Transaction Logs on an Existing Storage Group

To configure your Exchange server for LoadSim testing, you should move your existing storage groups' log files from their default location to a high throughput system.

To move the transaction log files

1. Open Exchange System Manager: Click **Start**, point to **Programs**, point to **Microsoft Exchange**, and then click **System Manager**.
2. In the console tree, expand **Servers**, and then expand the server you want.
3. Right-click the storage group you want, and then click **Properties** (see Figure 4).

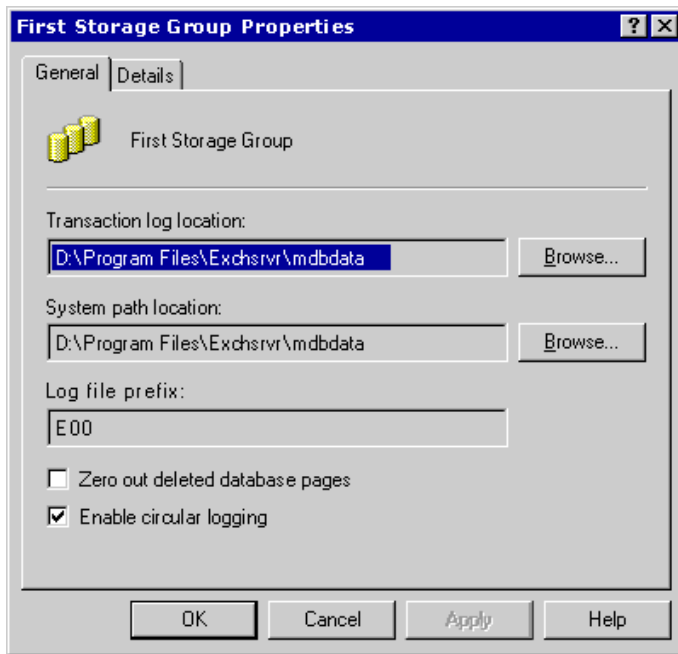


Figure 4 The **First Storage Group Properties** dialog box

4. On the **General** tab, under **Transaction log location**, click **Browse**.
5. Select the location of the storage system to where you want the log files moved.
6. Click **OK**.

Creating Additional Storage Groups on Your Exchange Server

To simulate client requests to and from mailbox stores in different storage groups, you can create additional storage groups on your Exchange server. After you create these additional groups and set up the LoadSim test on your client computer, you can disperse users across different storage groups to test this scenario.

To create additional storage group on your Exchange server with two mailbox stores

1. Open Exchange System Manager: Click **Start**, point to **Programs**, point to **Microsoft Exchange**, and then click **System Manager**.
2. Expand **Servers**.
3. Right-click the server you want, point to **New**, and then click **Storage Group**.
4. In the **Name** box, type a new name for the storage group. (For example, type **Second Storage Group**.)
5. Under **Transaction log location**, click **Browse** to move the log files from their default location to a separate storage system. This step is optional, but recommended. Isolating your transaction files and database files on separate storage systems prevents bottlenecks when these files are written to disk.

6. Under **System path location**, click **Browse** to select the location of the storage system to where you want the log files moved.
7. Click **OK**.

Creating Mailbox Stores on a Storage Group

This procedure explains how to create additional mailbox stores on your storage groups. Creating additional mailbox stores allows you to simulate a scenario in which clients send requests to and from multiple mailbox stores.

To create additional mailbox stores on a storage group

1. Open Exchange System Manager: Click **Start**, point to **Programs**, point to **Microsoft Exchange**, and then click **System Manager**.
2. Expand **Servers**, and then expand the server you want.
3. Right-click the storage group you want (for example, **First Storage Group**), point to **New**, and then click **Mailbox Store**.
4. In **Properties**, on the **General** tab, in the **Name** box, type a name for the mailbox store. (For example, type **1priv1** for the first mailbox store.)
5. Click the **Database** tab.
6. Move the Exchange database files and streaming database files to a separate storage system (see Figure 5). To move the Exchange database files and streaming database files to a separate storage system:
 - a. Next to **Exchange database**, click **Browse**.
 - b. Select the location of the storage system where you want the database files moved, and then click **Save**.
 - c. Next to **Exchange streaming database**, click **Browse**.
 - d. Select the location of the storage system where you want the streaming database files moved, and then click **Save**.

Note This step is optional, but recommended. Isolating your transaction files and database files on separate storage systems prevents bottlenecks when these files are written to disk.

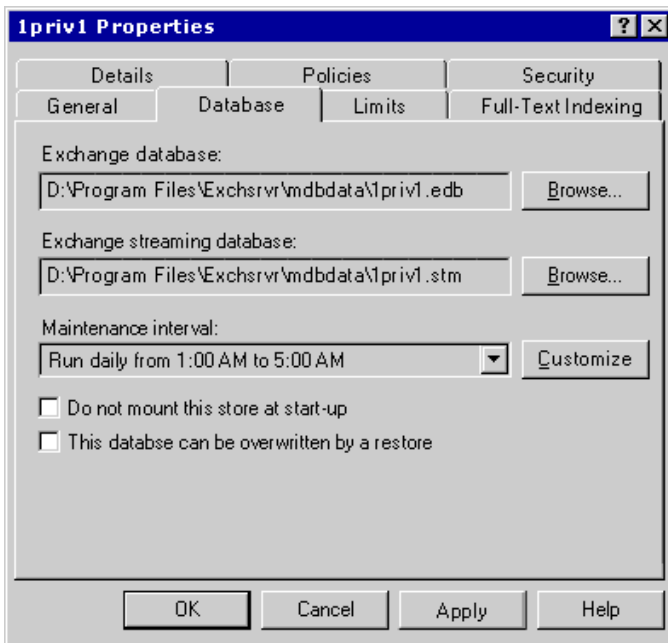


Figure 5 The **Database** tab in a mailbox store **Properties** dialog box

7. Click **OK** to create the mailbox store.
8. In the confirmation dialog box that displays, click **Yes** to mount the mailbox store.
9. Repeat steps 4 through 8 to create and mount each additional mailbox store in the storage group.

Creating and Running the LoadSim Test on a Client Computer

After you properly configure your storage groups and mailbox stores on your Exchange server, you can create and run your LoadSim tests. This section explains how to create and run a LoadSim test.

To create and run LoadSim tests on a client, perform each of the following steps. Each step is described in detail later in this section.

1. [Set up the test topology](#). To set up the test topology, specify the number of users you want to simulate for each mailbox store.
2. [Configure the test properties](#). To configure the test properties, specify the length of time and range of simulated users that will run on the client computer.
3. [Customize the test \(optional\)](#). To customize the test, customize the default behaviors of the test tasks, logon processes, and initialization.
4. [Save the simulation file and copy the file to other clients](#). If you use more than one client for your LoadSim test, save the simulation (.sim) file to use on each additional client that you want to participate in the test. When you copy the simulation file to other client machines, you do not need to configure the same topology on each additional client.

5. [Create the topology on the first client](#). This step creates the LoadSim users and distribution lists in Active Directory on the Exchange server. You only need to perform this step on the first client.
6. [Initialize the test](#). You only need to perform this step on the first client.
7. [Configure logging options](#). You can configure how information is displayed in the LoadSim output window, the level of information that is logged, and whether logs are archived.
8. [Configure the processor threads \(optional\)](#). You can increase or decrease the default number of processor threads that LoadSim uses.
9. [Run the test](#). You must manually start the test on each client participating in the test.

Step 1: Set up the Test Topology

This procedure explains how to specify the number of users you want to simulate for each mailbox store that receives LoadSim requests. If you use more than one client to run the same LoadSim test, you only need to perform this step on one client. For each client, you must configure the number of users in the mailbox stores to which you want to send requests.

To set up the topology for a LoadSim test

1. Log on to your client computer.
2. Start LoadSim2000: Navigate to the folder where you installed the LoadSim files, and then double-click **LoadSim.exe**.
3. From the **Configuration** menu, click **Topology Properties**.
4. In **Topology Properties**, on the **Servers** tab, under **Containers**, expand the server you want, and then expand the storage groups to display the mailbox stores.
5. Under **User Counts**, click the user count that corresponds to each mailbox store, and then enter the number of users you want to simulate. Figure 6 illustrates an example topology with 2000 users and four mailbox stores. The numbers of users are evenly distributed across the mailbox stores; therefore, because the example topology contains four mailbox stores, the number of users for each mailbox store (500) equals one-quarter the number of the total users (2000).

Note The number of users in the storage groups and server are automatically calculated from the numbers you enter for each mailbox store.

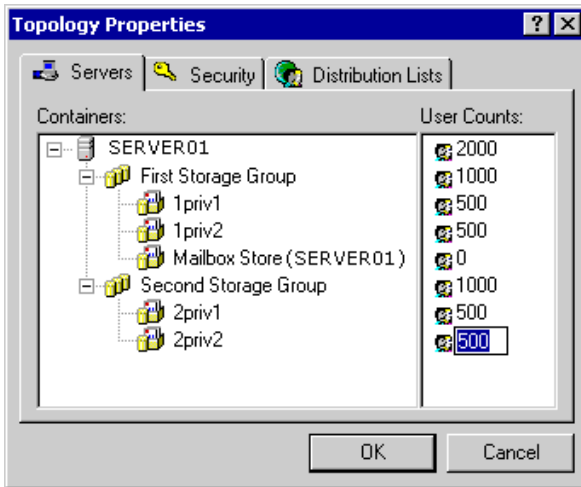


Figure 6 The **Topology Properties** dialog box

Note If you design tests to determine the optimal number of users per server, you must configure each client computer with identical user counts. To ensure consistency, save and copy the simulation file (.sim) for additional clients. For more information about how to save and copy the simulation file, see [“Step 4: Save the Simulation File and Copy the File to Other Clients”](#) later in this document.

6. Leave the default values on the **Security** and **Distribution Lists** tabs.
7. Click **OK**.

Step 2: Configure the Test Properties

This procedure explains how to configure the test properties, specifically the number of users you want to run on the client and the length of time for which you want the test to run.

Note In the following procedure, the example topology has 2000 users divided equally between two client computers. Therefore, the procedure shows how to set up both the first client (CLIENT01) and the second client (CLIENT02) with 1000 users each.

To configure the test properties

1. Log on to your client computer.
2. Start LoadSim2000: Navigate to the folder where you installed the LoadSim files, and then double-click **LoadSim.exe**.
3. From the **Configuration** menu, click **Test Properties** to open the **Test Properties** dialog box (see Figure 7).

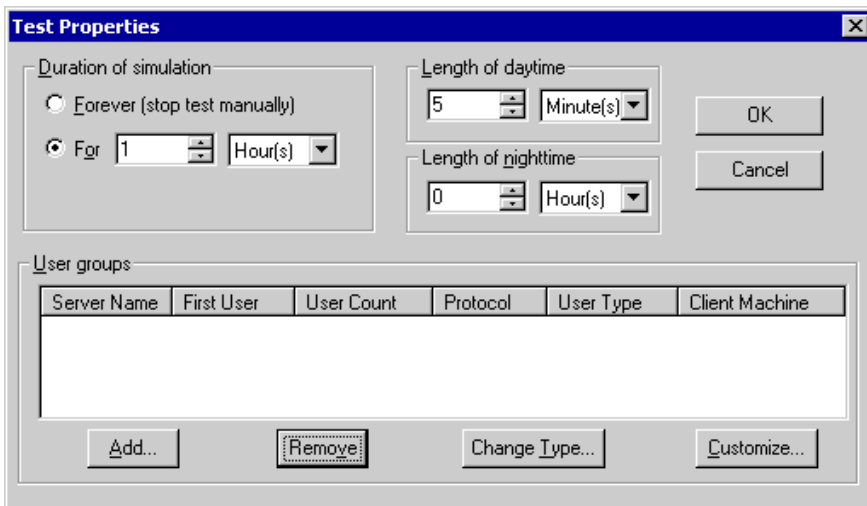


Figure 7 The **Test Properties** dialog box

4. In **Test Properties**, under **Duration of simulation**, click one of the following buttons to specify the duration of the test:
 - Click **Forever (stop test manually)** to run the test until you manually stop it.
 - Click **For** to specify the time for which you want the test to run — in minutes, hours, or days.
5. Under **Length of daytime**, specify the amount of daytime for which you want the test to run — in minutes, hours, or days.
6. Under **Length of nighttime**, specify the amount of nighttime for which you want the test to run — in minutes, hours, or days.
7. To configure a client, select one of the following options:
 - To add a client computer, click **Add**. You can add the local client computer or any other computer in the same domain.
 - To change an existing client computer, under **User groups**, select the client you want to change, and then lick **Change Type**.

Note When you click either **Add** or **Change Type**, the **Edit User Group** dialog box appears (see Figure 8).
8. In **Edit User Group**, in the **Server** list, select the correct Exchange server name.
9. In the **First user** list, enter the user number of the first user.
10. In the **Number of users** list, enter the number of users you want to run on this client. For example, in Figure 8, the first client, CLIENT01, will start at user number zero and run through number 999 for the first 1,000 users.
11. In the **User type** list, select one of the following options:
 - **MMB2**
 - **Medium**
 - **Heavy**

Note You should use **MMB2** for most tests because it most closely simulates user activity. However, be aware that the MMB2 user profile does not simulate

network traffic and other activities that occur in a production environment. Do not use benchmark numbers obtained from MMB2 profile test for deployment purposes. For more information about MMB2, see the technical paper *Comparing MMB and MMB2 Workloads* at <http://go.microsoft.com/fwlink/?linkid=7475>.

12. Click **OK**.

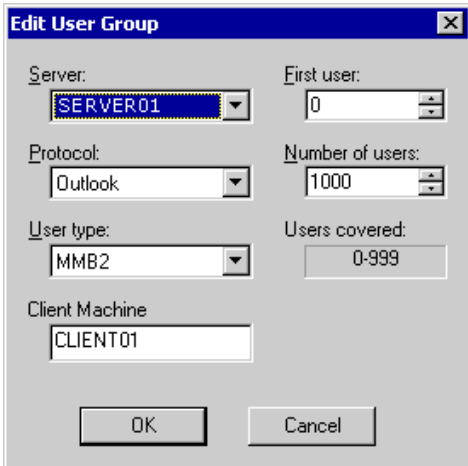


Figure 8 The **Edit User Group** dialog box

13. To complete the test set up for each additional client, repeat steps 7 through 12.

Figure 9 illustrates the resulting test properties for the client computers CLIENT01 and CLIENT02. The first client computer will start with user number zero for the first user and run with 1000 users. The second client computer will start with user 1000 and run with another 1000 users.

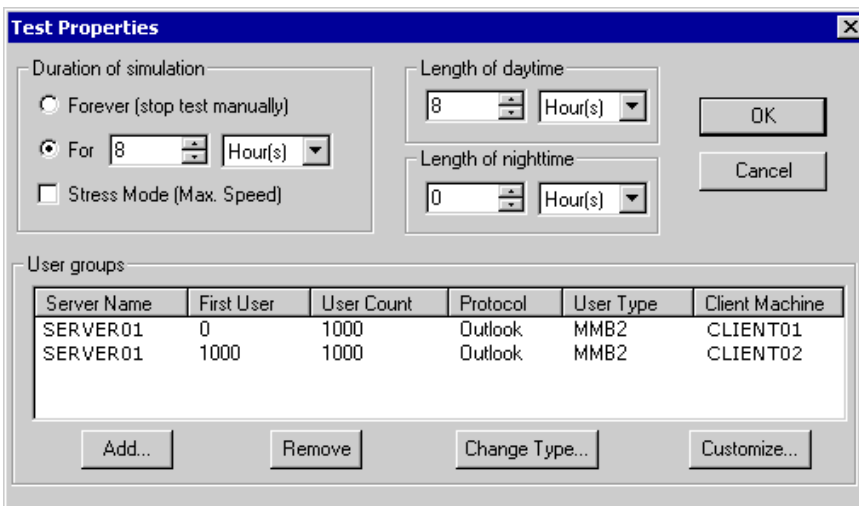


Figure 9 The **Test Properties** dialog box after the properties are specified

14. Click **OK** to save the test properties.

Note To remove existing client computers that you do not want to include in this test, under **User groups**, select the client, and then click **Remove**.

Step 3: Customize the Test (Optional)

These procedures explain how to customize the default behaviors of the test tasks, logon processes, and initialization. Customization is optional; if you want to use the default settings, proceed to "[Step 4: Save the Simulation File and Copy the File to Other Clients.](#)"

Customize LoadSim Tasks

To customize the LoadSim tasks, you can enable or disable the available tasks. You can also increase or decrease the frequency of each task's occurrence and modify other attributes of each task.

To customize the test properties of the LoadSim tasks

1. Start LoadSim2000: Navigate to the folder where you installed the LoadSim files, and then double-click **LoadSim.exe**.
2. From the **Configuration** menu, click **Test Properties**.
3. In **Test Properties**, under **User groups**, select the test you want to customize, and then click **Customize**.
4. In **Customize Test**, on the **Tasks** tab, the enabled tasks appear with an "X" under the **Enabled** column (see Figure 10). To enable or disable a task, select the task, and then click **Enable/Disable task**.

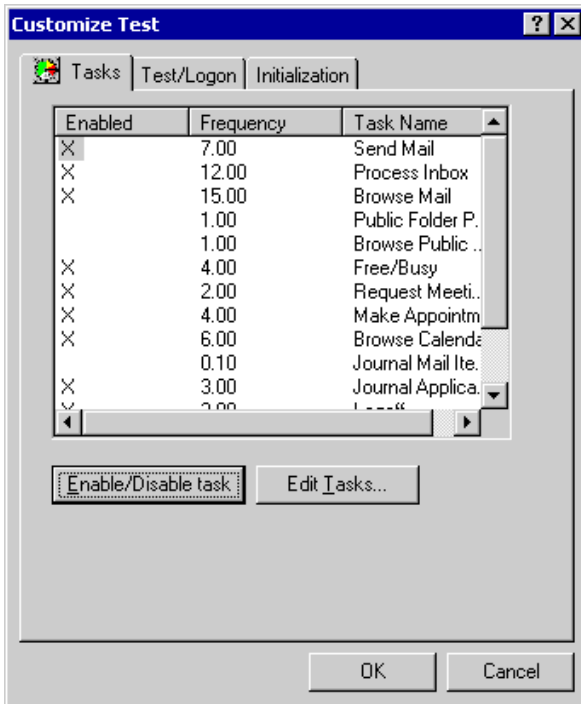


Figure 10 The **Tasks** tab in the **Customize Test** dialog box

5. Click **Edit Tasks** to view the task's properties.
6. In **Task Properties**, click the appropriate tabs to modify the task.
7. Click **OK** to save the tasks.
8. Click **OK** to save the test properties.

Customize the Logon Behavior of LoadSim Users

You can use the **Test/Logon** tab in the **Customize Test** dialog box to modify the default logon behavior of the LoadSim users.

To customize the logon behavior of LoadSim users

1. Start LoadSim2000: Navigate to the folder where you installed the LoadSim files, and then double-click **LoadSim.exe**.
2. From the **Configuration** menu, click **Test Properties**.
3. In **Test Properties**, under **User groups**, select the test you want to customize, and then click **Customize**.
4. In **Customize Test**, click the **Test/Logon** tab (see Figure 11). By default, under **Logon/off properties**, the following check boxes are selected:
 - **Log on immediately at the very beginning of the test**
 - **Log off at the end of each simulated day**
 - **Empty the Deleted Items folder on logoff**

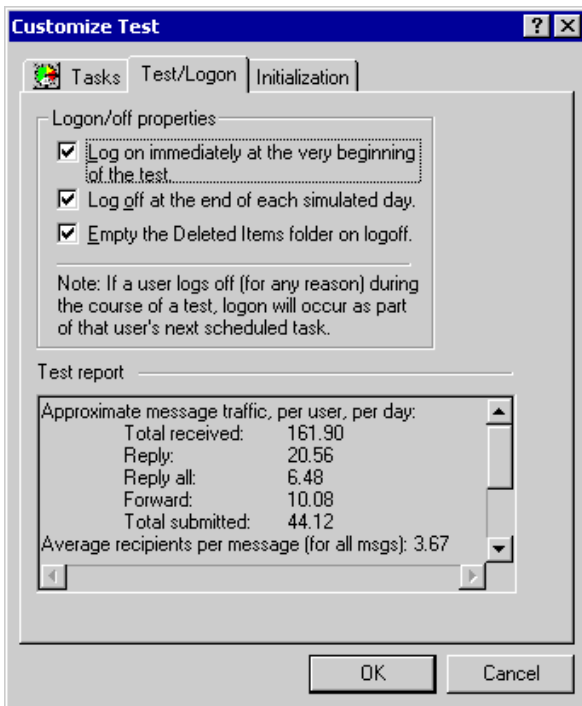


Figure 11 The **Test/Logon** tab in the **Customize Test** dialog box

5. If you want to change any of the properties under **Logon/off properties**, clear the appropriate check box.
6. Under **Test report**, the expected message traffic for this test (per user, per day) is displayed. Use these figures after the test runs to determine if the actual load on the server matches these expected values.
7. Click **OK**.
8. Click **OK** to save the test properties.

Customize the Initialization of the LoadSim Test

You can use the **Initialization** tab in the **Customize Test** dialog box to change how the test is initialized.

To customize the initialization of the test

1. Start LoadSim2000: Navigate to the folder where you installed the LoadSim files, and then double-click **LoadSim.exe**.
2. From the **Configuration** menu, click **Test Properties**.
3. In **Test Properties**, under **User groups**, select the test you want to customize, and then click **Customize**.
4. In **Customize Test**, click the **Initialization** tab (see Figure 12).

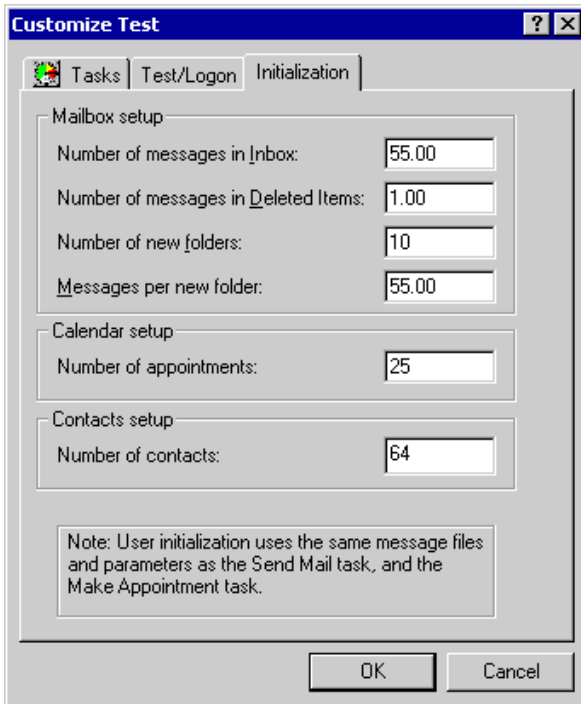


Figure 12 The **Initialization** tab in the **Customize Test** dialog box

Note User initialization uses the same message files and parameters as the **Send Mail** task and the **Make Appointment** task. Therefore, if you used the **Edit Tasks** button on the **Tasks** tab to specify the files and parameters for these tasks, you do not need to specify them on the **Initialization** tab as well.

5. Under **Mailbox setup**, in the **Number of messages in Inbox** box, type the number of messages you want to appear in each user's Inbox when the test initializes.
6. In the **Number of messages in Deleted Items** box, type the number of messages in you want to appear in each user's Deleted Items folder when the test initializes.
7. In the **Number of new folders** box, type the number of new folders you want to appear in each user's mailbox when the test initializes.
8. In the **Messages per new folder** box, type the number of messages you want to appear in each new folder when the test initializes.
9. Under **Calendar setup**, in the **Number of appointments** box, type the number of appointments that you want each user to have when the test initializes.
10. Under **Contacts setup**, in the **Number of contacts** box, type the number of contacts that you want each user to have when the test initializes.
11. Click **OK**.
12. Click **OK** to save the test properties.

Step 4: Save the Simulation File and Copy the File to Other Clients

If you plan to run LoadSim on multiple clients, you can save the configured topology in a simulation (.sim) file, and then open that file in LoadSim on other clients to use the same topology.

Important Do not use existing .sim files that were saved with previous versions of LoadSim because of the potential format differences.

To save the configured topology in a .sim file

1. Start LoadSim2000: Navigate to the folder where you installed the LoadSim files, and then double-click **LoadSim.exe**.
2. From the **File** menu, click **Save As**.
3. Save the .sim file to a disk or network share, and then copy the file to another client computer.
4. On the client computer to where you copied the .sim file, start LoadSim2000: Navigate to the folder where you installed the LoadSim files, and then double-click **LoadSim.exe**.
5. From the **File** menu, click **Open**.
6. In **Open Simulation File**, navigate to the .sim file, and then click **Open**. LoadSim uses the saved topology so that you do not have to specify it again on this client.

Step 5: Create the Topology on the First Client

After you specify the topology parameters, you need to create the topology on the first client. This step creates the LoadSim users and distribution lists in Active Directory on the Exchange server.

Note If you use more than one client, you only need to perform this procedure once. You do not need to create the topology on every client.

To create the topology

1. Start LoadSim2000: Navigate to the folder where you installed the LoadSim files, and then double-click **LoadSim.exe**.
2. From the **Run** menu, click **Create Topology**.
3. Before you begin running tests, verify that the Recipient Update Service has completed on the Exchange server. To verify that the Recipient Update Service has completed:
 - a. On the Exchange server, right-click on the taskbar, and then click **Task Manager**.
 - b. In **Windows Task Manager**, click the **Processes** tab.
 - c. On the **Processes** tab, under **Image Name**, locate **Isass.exe** (the directory process), and then, under **CPU**, note the CPU percentage that is being used by the Isass.exe process. After the recipient updates complete, the Recipient Update Service should be using close to 0% of the CPU.
4. Verify that the user is created in Active Directory. To verify that the user is created in Active Directory:

- a. On the Exchange server, start Active Directory Users and Computers: Click **Start**, point to **Programs**, point to **Administrative Tools**, and then click **Active Directory Users and Computers**.
- b. In the console tree, navigate to the domain you want, and then expand that domain.
- c. Expand **Loadsim Users**, and then verify that a subfolder with your Exchange server name exists. The distribution lists appear in the **LoadSim Users** folder, and the user accounts appear in the Exchange server subfolder. Figure 13 illustrates how users and computers appear in Active Directory.

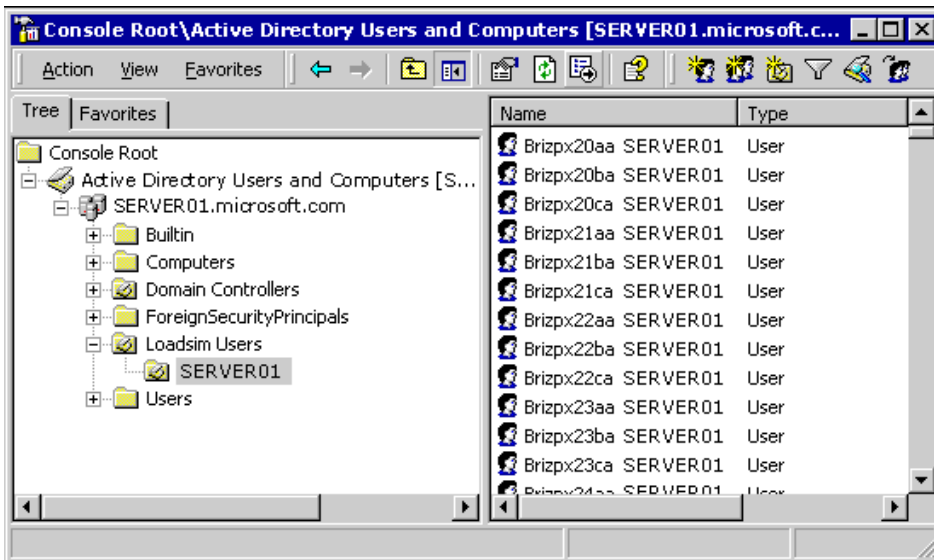


Figure 13 The **Console Root\Active Directory Users and Computers [server name]** dialog box

Note In previous versions of LoadSim, users were created in the **Users** folder. If you receive an error similar to the following, you may need to delete all of the LoadSim-created users and distribution lists in Active Directory Users and Computers:

```
Sep 12 12:44:41: -----Begin Topology Creation-----
Sep 12 12:46:03: ERROR: LDAP search error: Already Exists
Sep 12 12:46:03: -----End Topology Creation-----
```

Step 6: Initialize the Test on the First Client

Before you run a LoadSim test, you must initialize the test on the first client. When you initialize the test, the correct number and message types are added to the Inbox of each user in the test.

Note If you use more than one client, you only need to perform this procedure once. You do not need to initialize the test on every client.

To initialize the test

1. Start LoadSim2000: Navigate to the folder where you installed the LoadSim files, and then double-click **LoadSim.exe**.
2. From the **Run** menu, click **Initialize Test**.
3. When initialization starts, a warning message similar to the message illustrated in Figure 14 appears. As the message implies, only one client computer in your simulation should perform the public folder initialization. If this is the first client on which you have run LoadSim, click **Yes**. Do not perform this step on subsequent clients that are participating in this LoadSim test.

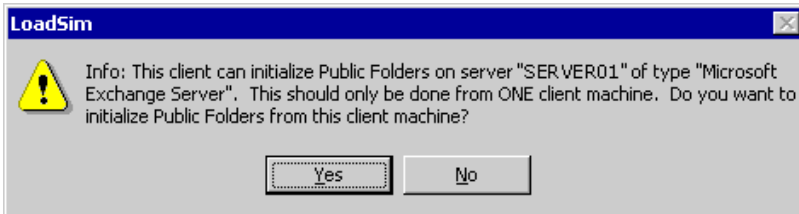


Figure 14 LoadSim warning message

Saving Initialized Mailbox Stores for Future Use

Initialization can be time consuming. Therefore, to save time in future LoadSim tests, you can copy a newly initialized mailbox store that has not been used in a test, and then use that mailbox store for subsequent tests. If you do this, consider the following guidelines:

- You must use the same Exchange server in the same domain.
- When the number of users for the test is less than the number of users for which the databases are saved, you cannot use a saved, initialized mailbox store; this is because some distribution lists will point to unused mailboxes.
- Initialization and distribution lists work differently with different profiles. For example, you cannot save initialized mailbox stores with one user profile and then reuse them with a different profile because the number of folders and distributions lists differs with each profile. Instead, you must reuse a mailbox store using same profile that you used when you initialized it.

To copy and replace a mailbox store for subsequent runs

1. After initialization completes, on the Exchange server, stop the Microsoft Exchange Information Store service. To stop the Exchange Information Store service:
 - a. Click **Start**, point to **Programs**, point to **Administrative Tools**, and then click **Services**.
 - b. In **Services**, in the details pane, right-click **Microsoft Exchange Information Store**, and then click **Stop**.
2. Copy all of the .edb, .stm, .log, and .chk files from their present locations to another location.

3. Start the Exchange Information Store service, and then run the test. To start the Exchange Store service:
 - a. Click **Start**, point to **Programs**, point to **Administrative Tools**, and then click **Services**.
 - b. In **Services**, in the details pane, right-click **Microsoft Exchange Information Store**, and then click **Stop**.
4. When the test is finished, stop the Exchange Information Store service, and then delete the .edb, .stm, and .log files.
5. Copy the saved versions of the database and log files back to their original locations for subsequent test runs.
6. For future use, keep the clean copies of the files you saved.
7. Start the Exchange Information Store service. Initially, the databases are not connected, as indicated by the icons next to the mailbox stores 2priv1 and 2priv2 illustrated in Figure 15.

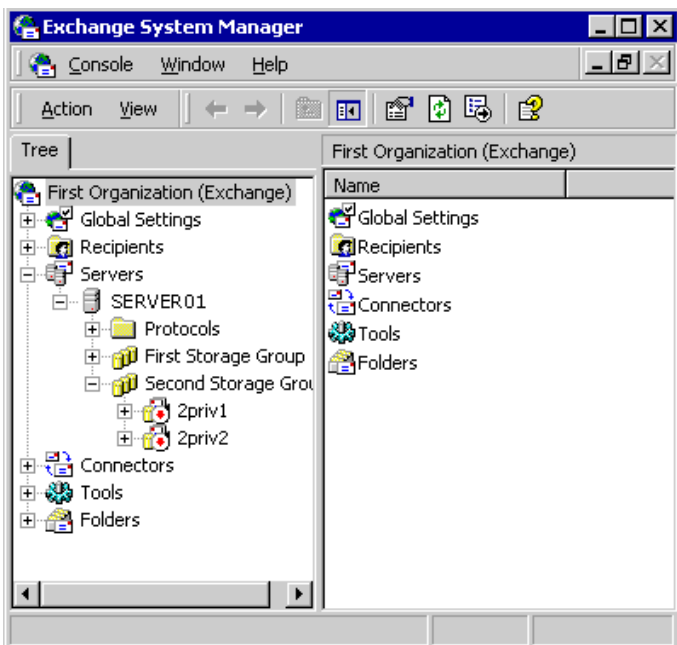


Figure 15 Exchange System Manager with unmounted mailbox stores

8. Right-click the database you want, and then click **Mount** to connect the databases.
9. When the warning message illustrated in Figure 16 appears, click **Yes**.

Note The warning message appears because you replaced the database files.

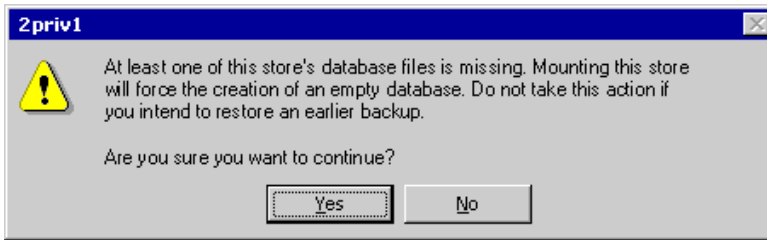


Figure 16 Warning message

10. Create the topology, initialize additional users, or run the test.

Important Remember to save the database and log files each time you initialize more users.

Step 7: Configure Logging Options

LoadSim offers the following customization options:

- You can customize the way information is displayed on the LoadSim console and in the output window.
- You can choose whether or not information is logged to a file.
- You can choose whether or not performance data is logged.
- You can choose to archive previous log files.

Note Archiving previous files is recommended — it allows you to compare test scores from different test runs.

To configure your logging options

1. Start LoadSim2000: Navigate to the folder where you installed the LoadSim files, and then double-click **LoadSim.exe**.
2. From the **Tools** menu, click **Options** to open the **Options** dialog box (see Figure 17).

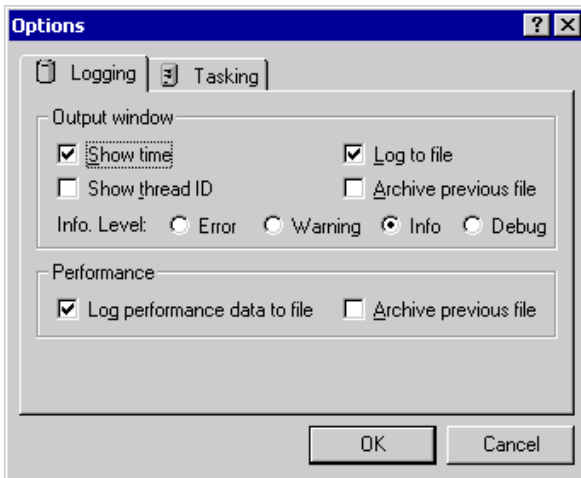


Figure 17 The **Logging** tab in the **Options** dialog box

3. On the **Logging** tab, under **Output window**, use the following options to specify the way you want information displayed in the output window of LoadSim:
 - Select the **Show time** check box to display the time of each action in the output window. This option is selected by default.
 - Select the **Show thread ID** check box to display the identifier of the thread for each action.
 - Select the **Log to file** check box to record this information to the LoadSim.out file in the LoadSim folder. This option is selected by default.
 - Select the **Archive previous file** check box to archive previous LoadSim.out files.
 - Next to **Info. Level**, click the logging level of information you want displayed in the output window. By default, **Info** is selected. The following options are available:
 - Click **Error** to display only errors on the output window. No other information is displayed or logged.
 - Click **Warning** to display errors and warnings on the output window. No other information is displayed or logged.
 - Click **Info** to display all information, warning, and errors that occur during the test. Each action is logged, regardless of its status.
 - Click **Debug** to display all the information included in the **Info** option, as well as additional debugging details. Use this setting for troubleshooting only.
4. Under **Performance**, leave the default options in the **Log performance data to file** and **Archive previous file** check boxes.

Step 8: Configure the Processor Threads (Optional)

In previous versions of LoadSim, you could configure the maximum number of processes. In LoadSim2000, a single instance of the application runs with a small number of threads. By default, LoadSim2000 runs with sixteen working threads. The default values adequately compensate for server latency; however, you can configure LoadSim to use up to sixty-four threads.

To configure the number of working threads LoadSim uses

1. Start LoadSim2000: Navigate to the folder where you installed the LoadSim files, and then double-click **LoadSim.exe**.
2. From the **Tools** menu, click **Options**.
3. In **Options**, click the **Tasking** tab (see Figure 18).

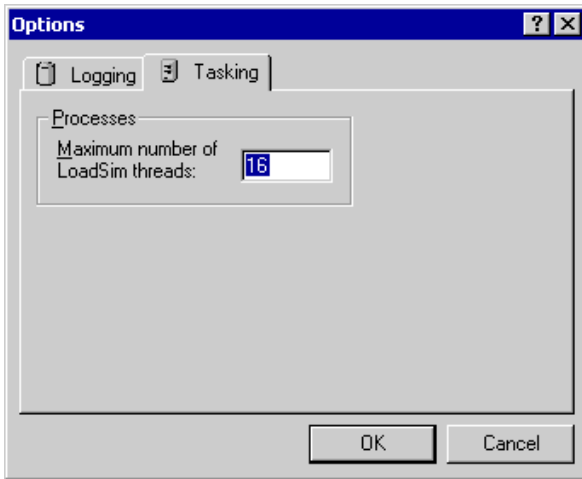


Figure 18 The **Tasking** tab in the **Options** dialog box

4. In the **Maximum number of LoadSim threads** box, type the number of working threads that you want LoadSim to use.
5. Click **OK**.

Step 9: Run the Test

A typical test with an average number of users (2,500 to 3,200) takes five hours. You should allow at least two hours for an adequate warm-up time. After this warm-up period, the clients and the server operate at a sustained baseline because the intensive start-up processes have completed. After the server starts and code is paged into memory, the server operates in a consistent pattern. If the mailbox store database is new, more database activity can occur as index pages split. The server does not reach a sustained baseline for adequate benchmarking until this activity level decreases.

You should collect test information while the server is in this consistent state. After the server has reached a sustained baseline, it must run long enough to collect statistically significant data. The amount of time this takes depends on the complexity of the user model and the cumulative rate at which user actions are being generated. Perform a long calibration test run before you run your actual tests. For example, if you perform an eight-hour test run and find variation from hour to hour, but not between two-hour segments, the results are consistent. This indicates that your test runs should include at least two hours where the server has reached a sustained baseline of consistent behavior.

You should log the System Monitor data from both the Exchange server and the LoadSim client on a single, separate computer. For more information about consolidating your log files on a single computer, see "[Consolidating System Monitor \(Perfmon\) Data](#)" later in this document.

To run the test

1. Start LoadSim2000: Navigate to the folder where you installed the LoadSim files, and then double-click **LoadSim.exe**.
2. From the **Run** menu, click **Run Simulation**.

3. Repeat this process on each client computer in the test. LoadSim simulates user actions, such as sending, forwarding, and replying to messages at the rates specified, and then sends these requests to the Exchange servers.
4. Monitor the test by viewing the messages on the LoadSim output window. When the test is running, messages about actions that are being performed and the users who are performing them are displayed in the LoadSim output window. These messages are also logged to the LoadSim.out file. Also, the timing information that LoadSim uses to generate scores is written to the Lsperf.log file.
5. When the test completes, check the LoadSim.out file (located in the LoadSim folder) for error messages.
6. Rename the Lsperf.log and LoadSim.out files so LoadSim does not overwrite these files during the next test.

Stopping a Test

A LoadSim test runs for the duration that you specified in the **Test Properties** dialog box. You can stop the test at any time.

To stop a test

1. In LoadSim, from the **Run** menu, click **Stop Now!**. This immediately stops all client activity.
2. After the test is run, rename the Lsperf.log and LoadSim.out files so LoadSim does not overwrite these files during the next test. Also, check the LoadSim.out file for error messages.

Repeating the Test

After you have the results from the first test, you should run subsequent tests using different client numbers and characteristics. Running subsequent tests gives you a better idea about the capabilities of the Exchange server.

Step 1: Delete Log Files from Exchange

Before you perform additional tests with a different number of users against your Exchange server, you must delete the database and log files from your Exchange server.

To delete database and log files from your Exchange server

1. On your Exchange server, click **Start**, point to **Programs**, point to **Administrative Tools**, and then click **Services**.
2. In **Services**, in the details pane, right-click **Microsoft Exchange Information Store**, and then click **Stop** to stop the Exchange Information Store service.
3. Navigate to the location where you stored the database files .edb and .stm for each mailbox store used in the test, and then delete these files.
4. Navigate to the directory where you placed the transaction logs, and then delete the .log files.
5. In **Services**, right-click **Microsoft Exchange Information Store**, and then click **Start** to restart the Exchange Information Store service.

Step 2: Delete Existing LoadSim Users in Active Directory

Before you change the number of users, you must completely remove the existing LoadSim users and distribution lists from Active Directory.

To delete existing LoadSim users from Active Directory

1. On the Exchange server, start Active Directory Users and Computers: Click **Start**, point to **Programs**, point to **Microsoft Exchange**, and then click **Active Directory Users and Computers**.
2. In the console tree, navigate to the domain you want, and then expand that domain.
3. Right-click the **LoadSim Users** folder, and then click **Delete**.

Understanding LoadSim2000 Tasks

LoadSim simulates some of the calls that Microsoft Outlook makes to the Exchange 2000 server. The most common user tasks are combined into one LoadSim task called Process Inbox. With Process Inbox, the simulated user reads all the mail in the Inbox and replies to, replies to all, forwards, moves, or deletes a certain percentage of the mail.

Table 2 lists the available tasks that LoadSim can perform during a test. You can use the **Tasks** tab in the **Customize Test** dialog box to specify which tasks are enabled in each test and to select the frequency and other attributes of each task.

Table 2 LoadSim tasks and descriptions

Task	Description
Send	Send new mail.
Process Inbox	Read mail in inbox and reply, reply all, forward, move, or delete. Load attachments on a percentage of the messages with attachments.
Browse Mail	Browse old mail in folders other than the Inbox.
Public Folder Post	Post to a public folder (disabled by default).
Browse Public Folders	Open folders, read posts per folder, and reply to, delete, move, or copy posts (disabled by default).
Free/Busy	Check free and busy information on the calendar.
Request Meeting	Send a meeting request to multiple users.
Make Appointments	Schedule a new appointment on the calendar.
Browse Calendar	Open and browse the calendar.
Journal Mail Items	Write mail activities to the journal.
Journal Applications	Write application activities to the journal.
Browse Contacts	Open and browse the existing contacts.

Task	Description
Create a Contact	Create a new contact in the Contacts folder.
Log off	Log off (disabled by default).

Understanding LoadSim2000 Log Files

LoadSim2000 provides the following two logging utilities:

- **Lsperf.log** Lsperf.log is an automatically-generated log file that contains basic statistics about LoadSim.
- **Lslog.exe** The LoadSim log program (Lslog.exe) is a command-line tool that you can run against Lsperf.log to generate more extensive statistics.

Understanding Lsperf.log Data

Lsperf.log is a comma-delimited text file, located in the LoadSim directory. Lsperf.log lists the actions and response times of the LoadSim actions. Lsperf.log also contains “weights” that are assigned to each action, with the most common actions assigned a higher weight. When you run Lslog.exe against Lsperf.log, Lsperf.log uses the weights to generate percentile scores for each action.

Understanding the Lsperf.log Report Format

Table 3 lists the fields in Lsperf.log.

Table 3 Fields in Lsperf.log

Field	Description
Date/Time	The date and time of the action generated.
Action	The mail action generated by LoadSim. Possible values include FORWARD, READ, RESOLVE NAME, SUBMIT, DELETE, and CHANGE.
Time (ms)	The time, in milliseconds, that it took the complete the action.
Unique ID	A unique identifier generated by LoadSim and assigned to this action.
Weight	The weight assigned to an action. Weights are intended to reflect the most common actions a user performs. Certain actions have a weight of zero, such as RESOLVE NAME, because they are generated as part of another action; RESOLVE NAME is part of the action of sending mail. These weights are used to calculate the weighted averages and percentile response time for various actions.
Module	Contains the value outl , which signifies the Outlook client.

Table 4 lists the LoadSim actions included in Lsperf.log.

Table 4 Actions recorded in Lsperf.log

Task	Description
SEND	Send new mail.
READ	Read new mail in the inbox and browse old mail in folders.
REPLY	Reply to sender.
REPLY ALL	Reply to sender and all recipients.
FORWARD	Forward to users or users in a distribution list.
MOVE	Move message or post to another folder.
COPY	Copy message or post to another folder.
DELETE	Delete a mail message or a posted message.
POST	Post message to public folder.
REPLY FOLDER	Post reply to a public folder message.
S+ CHANGE	Update Schedule+ file.
S+ UPDATE FREE/BUSY	Update free and busy information.
S+ QUERY FREE/BUSY	Query free and busy information.
DELIVER	Total time required to send and deliver the message. (The rate has limited usefulness for this counter.)
RESOLVE NAME	Resolve name.
SUBMIT	Send anything. This is the sum of the rates for new mail, reply, reply all, and forward.
LOAD ATTACH	Open an attachment on a message or post.
NON-DELIVERY REPORT (NDR)	Messages that were sent but not delivered.
CREATE MESSAGE	Create new message.
EMPTY FOLDER	Empty the Deleted Items folder.
CREATE PROFILE	Create MAPI profile.
OPEN MSG STORE	Equivalent to starting the mail client.
LOGON	Log on to server.

The following is an example of an excerpt from Lsperf.log:

```
Date/Time,Action,Time(ms),Unique ID,Weight,Module
Nov 02 10:19:44,FORWARD,688,0x000001c4,1,out1
Nov 02 10:19:44,READ,203,0x000001c4,1, out1
Nov 02 10:19:46,RESOLVE NAME,203,0x000001c4,1, out1
```

```
Nov 02 10:19:46,SUBMIT,422,0x000001c4,1, out1
Nov 02 10:19:46,FORWARD,735,0x000001c4,1, out1
Nov 02 10:19:46,READ,156,0x000001c4,1, out1
Nov 02 10:19:48,DELETE,484,0x000001c4,1, out1
Nov 02 10:19:48,READ,563,0x000001c4,1, out1
Nov 02 10:19:50,DELETE,375,0x000001c4,1, out1
Nov 02 10:21:02,READ,359,0x00000130,1, out1
Nov 02 10:21:04,SUBMIT,297,0x00000130,1, out1
Nov 02 10:21:04,REPLY,344,0x00000130,1, out1
Nov 02 10:22:09,S+ CHANGE,453,0x000001ca,1, out1
```

Archiving Lsperf.log

After each test run, you can archive the Lsperf.log to preserve historical data.

To archive existing log files

1. Start LoadSim2000: Navigate to the folder where you installed the LoadSim files, and then double-click **LoadSim.exe**.
2. From the **Tools** menu, click **Options**.
3. In **Options**, on the **Logging** tab, under **Performance**, select the **Archive previous file** check box, and then click **OK**.

At the start of a test run, pre-existing Lsperf.log files are renamed to LoadSim.*nnn*, where *nnn* is a number starting at 000 and increasing higher.

Understanding the LoadSim Log Program (Lslog.exe)

The LoadSim log program (Lslog.exe) is used to manipulate the LoadSim data files (Lsperf.log) from each client computer in the simulation. You can use Lslog.exe in conjunction with the Lsperf.log files to generate various benchmarking scores. If you are using multiple clients in your tests, the LoadSim scores are reported separately for each client computer. However, you can use Lslog.exe to consolidate the Lsperf.logs into a single report.

By default, Lslog.exe generates ninety-fifth percentile scores, fiftieth percentile scores, mean scores, and standard deviation for all the user actions in your test. To understand the percentile scores, consider an example where a RESOLVE NAME command takes 200 milliseconds at the ninety-fifth percentile — this means that 95 times out of 100 the RESOLVE NAME command takes less than 200 milliseconds to complete.

Understanding the Generated Scores

The LoadSim score, shown in the bottom right corner of the generated report, is one point on the response time versus load curve; this score shows the weighted average of several LoadSim actions. Based on the response times, you may decide to run another test at a higher or lower user load or to alter the topology in some way. Running a single test is rare. Typically, you should repeat the test.

Table 5 lists an example of a report from a LoadSim test.

Table 5 Example report from a LoadSim test

Category	Weight	Hits	50th Pctile	95th Pctile	Mean	Std. Dev.
SEND	1	11	765	1437	843	227
READ	10	246	219	422	241	90
REPLY	1	27	313	578	376	199
REPLY ALL	1	14	531	750	517	104
FORWARD	1	17	735	1250	797	178
MOVE	1	44	375	609	389	124
DELETE	2	78	312	546	324	113
S+ CHANGE	0	16	453	1844	565	363
DELIVER	0	119	170	611	642	2089
RESOLVE NAME	0	28	187	375	234	115
SUBMIT	0	69	390	672	394	142
LOAD ATTACH	0	10	78	266	95	59
NDR	0	9	0	0	0	0
EMPTY FOLDER	0	10	859	1266	862	254
CREATE PROFILE	0	10	2281	4281	2103	1074
OPEN MSG STORE	0	20	1438	5234	1552	1334
LOG ON	0	10	14625	18375	13706	3554
Weighted Average	17	738	325	584	257	115<-- "score"

In this example, the weighted response time for Exchange clients at the ninety-fifth percentile was 584 milliseconds (0.5 seconds). Although the LoadSim log displays both the fiftieth percentile and mean scores, you should use the ninety-fifth percentile for your measurements. If you require a different definition of the score, change the default weights using the `/w` flag for Lslog.exe. For information about the `/w` flag, see "[Understanding Lslog.exe Syntax](#)" later in this document.

Running the Lslog.exe Utility

The Lslog.exe utility is located in the Loadsim directory. You can run the utility from a command prompt.

To run Lslog.exe

1. On a client computer, click **Start**, click **Run**, and type **cmd** to open a command prompt.

2. Move to the LoadSim folder.
3. Type **Isload ops arg > output file**. For information about the parameters and available operations for the commands, see "[Understanding Lslog.exe Syntax](#)" later in this document.

Understanding Lslog.exe Syntax

The LoadSim log program (Lslog.exe) uses the following syntax: **Islog ops args**, where:

- ops = the operation performed against the file.
- args = the arguments or parameters used by the operation.

The following operations are available in Lslog.exe:

- Truncate
- Merge
- Answer
- Times

The following sections explain each of these operations in detail.

Using the Truncate Operation to Create Reports for Truncated Periods

The truncate operation allows you to specify a specific period within the test for which you want to generate statistics. This command removes times in the test that occur before the "begin" parameter and end after the "end" parameter. The truncate operation also allows you to generate a score based on the truncated time period of the test that you specify. You can truncate log entries that are in the warm-up period of the test or beyond the desired length of the test run. The truncate operation requires the following syntax:

```
lslog truncate logfile [begin end] > outputfile
```

where:

- *logfile* = Lsperf.log or the name of another log file you have created for which you want to generate scores.
- *begin* = a parameter that specifies the beginning point for the report in hours and minutes (HH:MM). If you do not specify a time, the default is 1:00 — this means that the scores begin with actions generated after the first hour. All activity during the first hour is excluded from the generated report.
- *end* = a parameter that specifies the ending point for the report in hours and minutes (HH:MM). If you do not specify a time, the default is 4:00 — this means that all actions that occur after four hours into the test are excluded from the generated scores.
- *outputfile* = the output file in which you want to save the generated scores.

The following example saves data from the run1.log from 30 minutes to 2 hours into the Run1.trunc file:

```
lslog truncate mylogfile :30 2:00 run1.log > run1.trunc
```

Using the Merge Operation to Combine Multiple Log Files

The merge operation allows you to combine multiple log files from different clients and generate a report that retains the sequential order of the actions on all the clients. You can copy and rename your log files on one client computer, or you can access different Lsperf.log files on remote shares. The merge operation requires the following syntax:

```
lslog merge [/r] logfile1 logfile2 > outputfile
```

where:

- */r* = a rebase flag that you can optionally use to set the starting time on all files to Jan (January) 01 00:00:00. The */r* parameter is useful if you have not synchronized the clocks on all your client computers. Using the rebase flag allows you to standardize the time stamps for all your clients.
- *logfile1* = the name of the log file, renamed from Lsperf.log, from the first client that you want to merge.
- *logfile2* = the name of the log file, perhaps renamed from Lsperf.log, of the second client you want to merge.
 - Note** You can merge as many log files you want.
- *outputfile* = the output file in which you want to save the generated scores.

Using the Answer Operation to Compute Specified Percentiles

The answer operation allows you to compute and output specified percentiles, mean and standard deviations, and single and weighted average response times for the given Lsperf.log. The answer operation requires the following syntax:

```
lslog answer [/i] [/c] logfile [pctile1 pctile2] [/w action N] >outputfile
```

where:

- */i* = the ignore flag. If specified, weight values for specific actions of a given type are ignored, and all actions of the same type are weighted equally.
- */c* = a comma-separated value (csv) flag. If specified, the output is generated in a comma-delimited file.
- *pctile1* and *pctile2* = the specified percentiles for which you want to generate statistics. If you do not specify any percentiles, by default, the command generates data for the 50th and 95th percentiles.
 - Note** You can specify as many percentiles as you want
- */w* = the weight flag. For a given action, the weight flag assigns the specified weight. The weight flag takes two parameters:
 - *action* specifies the given action.
 - *N* specifies the weight it assigns to the action.
- *outputfile* = the output file in which you want to save the generated scores.

Using the Times Operation to Output the First and Last Times Logged

The times operation allows you to output the first and last log times logged in a file. These times can then give you the range between which you want to truncate the file. The times operation requires the following syntax:

```
lslog times logfile > output file
```

where:

- *logfile* = the log file from which you want to extract the first and last log times.
- *outputfile* = the output file in which you want to save the generated scores.

Consolidating System Monitor (Perfmon) Data

You should consolidate System Monitor (perfmon) data by logging all LoadSim client counters and Exchange server System Monitor counters into one data log.

To log all LoadSim client counters and Exchange server counters into one data log

1. Log on to the computer on the domain where you want to log all System Monitor data.
2. Open Services: Click **Start**, point to **Programs**, point to **Administrative Tools**, and then click **Services**.
3. In **Services**, in the details pane, under **Name**, right-click **Performance Logs and Alerts**, and then click **Properties**.
4. In **Performance Logs and Alerts Properties (Local Computer)**, click the **Log On** tab, and then click **This account** (see Figure 19).
5. Click **Browse**.
6. In **Select User**, select the domain administrator account, and then click **OK**.
7. On the **Log On** tab, in the **Password** box, type the password for the domain administrator account.
8. In the **Confirm password** box, retype the password for the domain administrator account.
9. Click **OK**.

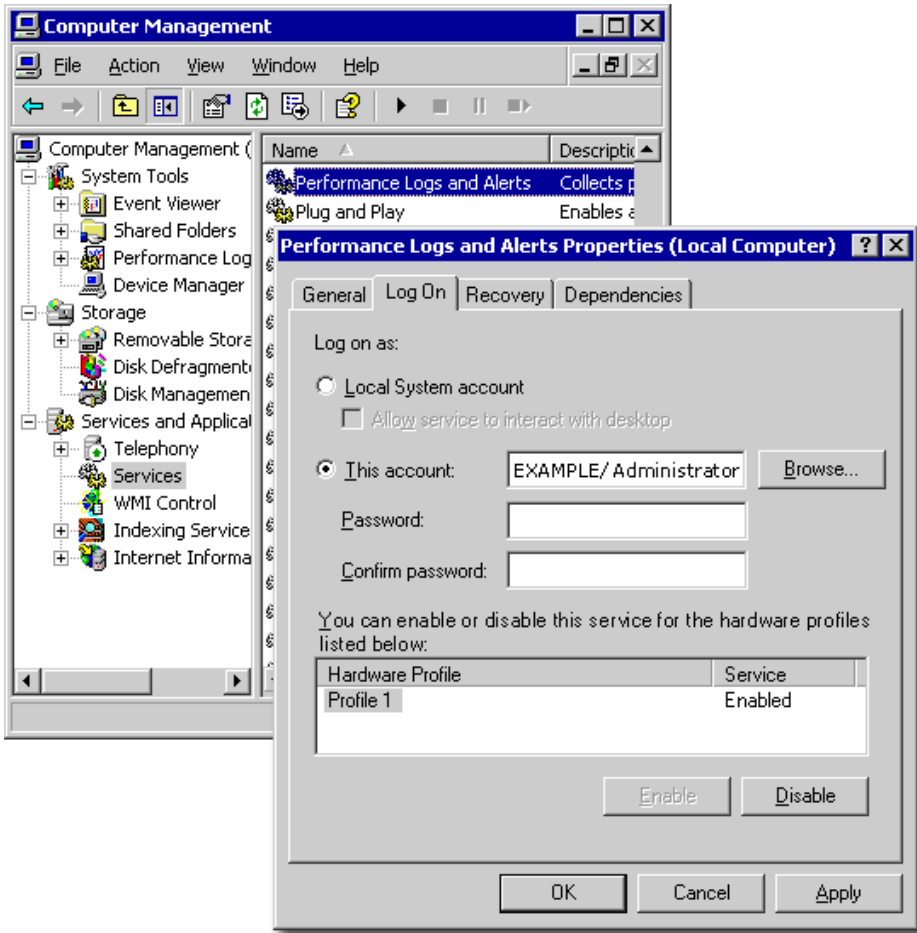


Figure 19 The **Computer Management** and **Performance Logs and Alerts Properties (Local Computer)** dialog boxes

10. Close **Services**.
11. Click **Start**, click **Run**, and then type **perfmon.msc** to access the **Performance** dialog box.
12. In **Performance**, click **System Monitor**, and then click **+** (the **Add** icon) on the toolbar to open the **Add Counters** dialog box (see Figure 20).

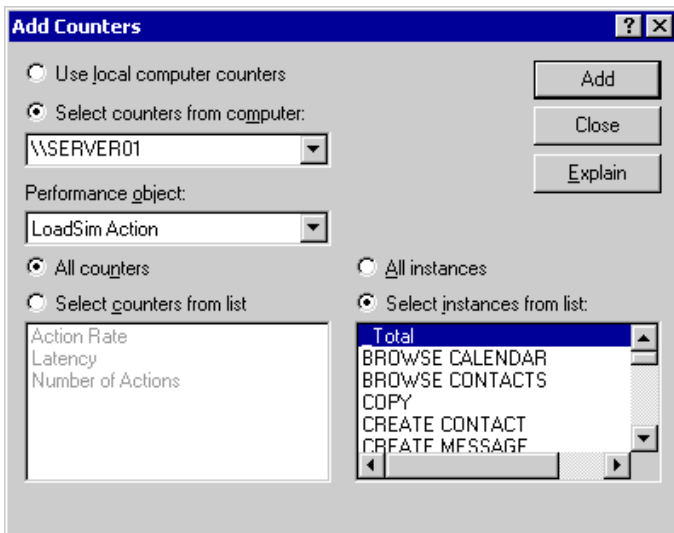


Figure 20 The **Add Counters** dialog box

13. Click **Select counters from computer**, and then type the server or client name in the corresponding drop-down list box.
14. In the **Performance object** list, select the performance object you want to add. At a minimum, you should add **LoadSim Action** and **LoadSim Global** for each client.
15. Click **All counters** to add all counters for the object, or click **Select counters from list** to individually select the counters you want to add for the object.
16. Repeat steps 14 and 15 for each performance object you want to monitor for this computer.
17. Repeat steps 12 to 16 for each additional client or server for which you want to consolidate the logs.

Note As an alternative, you can use Windows NT 4.0 Performance Monitor to consolidate logs. Windows NT 4.0 Performance Monitor can log across domains. Before starting Performance Monitor, use the `net use machine name` command to specify the machines where the logs reside. To view the syntax of the `net use` command, type `net use ?` in a command prompt.

Using System Monitor Data

LoadSim test scores represent only a partial view of your system's operations. To fully understand how your system works, analyze the information in the Windows 2000 and Exchange 2000 counters by running System Monitor during the LoadSim test.

Use System Monitor data to do the following:

- Track how close various resources are to saturation, and adjust subsequent LoadSim tests accordingly.
- Use the server performance data to identify bottlenecks and resources that are in high demand, and consider re-tuning the system and then running the same test again.

Analyzing Data from LoadSim and System Monitor

Consider the following questions when looking at LoadSim test results and the performance data from System Monitor. To further help you answer these questions, view the log files in LoadSim and Windows 2000 System Monitor.

- **Were there any errors in the test? Did they significantly affect the load?**

You can use both the LoadSim.out files and Windows 2000 Event Viewer to locate any test errors. To determine the validity of the test, examine the type and quantity of errors.

- **Did the client computers create the expected load?**

If too many users are simulated per client computer, LoadSim generates less than the expected load. To determine if too many users are causing LoadSim to generate a lighter load, you can designate a control client (a single client) with one-fourth or one-eighth the number of users as the other client computers as a control for your test. If the per-user rate of events that LoadSim generates differs between the control client and the other clients, your experiment is invalid because the workload that is generated is incorrect. If your other client computers are bottlenecked, they will generate less than the expected requests. Furthermore, if you compare the response times between the normal clients and the control client, you can also help determine if the number of users per client computer is affecting the results.

- **What was the actual load on the server in terms of transactions per user per day? Does this match the expected value?**

It is critical that you answer these two questions. To better understand the accuracy of the test and the performance characteristics of a server, consider the actual work that the server performed. If the server performed a different amount of work than expected, your test represents a different workload than intended. The expected traffic per user, per day is calculated on the **Test/Logon** tab in the **Customize Test** dialog box.

- **Were there any server resources that were saturated? Were there any software queues growing unbounded?**

Table 6 lists the counters that can help you determine how close to saturation your server's resources are. The expected values are only recommendations and may change depending on the goals of your test and the role of the server.

Note To use the disk counters listed in Table 6, you must run the command **diskperf -y**, and then reboot the computer before simulation begins on each client and server participating in the test.

Table 6 System Monitor counters

Object and Counter	Description	Expected Result
Processor	Displays the total processor time.	As the load increases, this counter increases to almost 100 percent, at which point the processor is bottlenecked, and no further rate increases are possible.
Physical disks	Displays the average disk queue length.	The number should be less than the number of spindles in the drive array.
Physical disk	Displays the current disk queue.	The queue length should drop to zero periodically throughout the test.
MSExchangeIS Mailbox: Send Queue Size	Displays the number of items awaiting mail delivery; that is, the number of items waiting to move from the mailbox store to the SMTP queue in Internet Information Services (IIS) for categorization. SMTP determines the appropriate server to which to send mail.	The average number should be less than one percent of the number of users in the simulation. Average queue size should not increase during the test; it should remain relatively constant.
SMTP server: Categorizer queue length	Displays the queue of items waiting to be categorized in IIS.	Average queue size grows during the test; it should remain relatively constant.
SMTP server: local queue length	Displays the queue of items waiting in IIS to be delivered to the local mailbox store after categorization.	Average queue size should not increase during the test; it should remain relatively constant.
SMTP server: remote queue length	Displays the queue of items in IIS waiting to be delivered on another server after categorization.	Average queue size should not increase during the test.
LoadSim global: task queue length	Displays the queue of pending tasks on a LoadSim client.	Average queue size should not increase during the test.
LoadSim action: latency (_total)	Indicates LoadSim client response times.	This value must not exceed 1,000 milliseconds for any of the LoadSim clients used on the server.

Object and Counter	Description	Expected Result
MSExchangeIS mailbox: messages submitted per minute	Indicates the message submission rate.	System Monitor data should match the LoadSim predicted value for message submission rate. Messages submitted for each MMB2 user in an eight-hour test is 51. The expected average rate is: Messages submitted per minute = (.11) * (number of users) Note This rate varies during a test run because of users logging on and off and users replying to and forwarding messages.
MSExchangeIS mailbox: message recipients delivered per minute	Indicates the message delivery rate.	System Monitor data should match the LoadSim predicted value for message received rate. Messages received per MMB2 user over an eight-hour period are 185. The expected average rate is: Message recipients delivered per minute= (0.39) * (number of users)

Best Practices for Using LoadSim

You can use the following best practices to obtain optimal results from your LoadSim tests.

Synchronize Client Clocks

Before you run a multi-client test, synchronize the clocks on all client computers. Synchronizing the clocks helps when you merge the log files. On each client computer, use the Windows 2000 net time command from a command prompt to set the time. Save this command in a batch file in the startup directory of each computer to synchronize the clocks automatically when the computer is rebooted.

Note To view the syntax of the net time command, type **net use ?** in a command prompt.

Monitor for Saturation

The typical goal of LoadSim tests is to analyze the load that the server can support while still providing adequate response times. However, sometimes the goal of LoadSim tests is to determine what load the network can support while still providing adequate response times. You should saturate the resource you are focusing on with the test, but do not saturate other resources in your test. For example, you cannot effectively study the server behavior if the client computers or the network are saturated.

The following are two methods you can use to monitor for saturation:

- Monitor the demands on the clients, network, and server.
- Do not let the clients become the bottleneck in an experiment. If you are not sure whether your clients can handle the number of simulated users, use one client as a control computer.

Use a Control Client

A control client helps you to monitor the performance of your clients and ensure they are not creating bottlenecks that impact the test scores. Use the following guidelines when using a control client:

- The control client should emulate one-fourth to one-eighth the number of users as the other client computers. As a baseline for extrapolation, 400 medium Exchange users can be supported on a 200-MHz Pentium Pro with 256 MB of RAM; however, be aware that memory is the main bottleneck for LoadSim. It is important to look at the response times that are being measured. If the response times that are measured on the control clients are significantly different from those measured on the other clients, the client load is distorting the measurements.
- If the per-user rate of the events that are generated differs between the control client and the other clients, your experiment is invalid because the workload that is generated is incorrect. For example, if a control client with 100 Exchange users generates 550 send commands in a two-hour run, and another client in the same experiment runs 400 users with the same profile and generates 1,600 send commands, the experiment is invalid because the control client generated 5.5 sends per user, and the other client generated 4 sends per user. Because the other client is not keeping up with the specified test, that client is bottlenecked and, therefore, distorting the test results.

Monitor Mail Queues

Use System Monitor to ensure mail delivery is working properly. Specifically, monitor the Send Queue Size counter of the MExchange IS Mailbox performance object. A large number of messages in the send queue indicates a server bottleneck. Because your server must operate at a consistent baseline for adequate benchmarking, a server bottleneck invalidates your test results.

Additional Resources

The following technical paper and Microsoft Knowledge Base article provide valuable information about LoadSim2000.

Technical Paper

The following technical paper is available on the Web at

<http://www.microsoft.com/exchange>:

- *Comparing MMB and MMB2 Workloads*
<http://go.microsoft.com/fwlink/?LinkId=7475>

Field Code Changed

Microsoft Knowledge Base Article

The following Microsoft Knowledge Base article is available on the Web at <http://support.microsoft.com/>:

- [Q294668](#) - XADM: LoadSim Error "The Specified Number Is Invalid"



For more information: <http://www.microsoft.com/exchange/>

Does this paper help you? Give us your feedback. On a scale of 1 (poor) to 5 (excellent), how do you rate this paper?

<mailto:exchdocs@microsoft.com?subject=Feedback: Using Microsoft Exchange Server Load Simulator 2000>