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Forecast Capacity Planner

User Guide

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Forecast Capacity Planner version C.02

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INTRODUCTION

Welcome to Forecast Capacity Planner

Forecast Capacity Planner™ is a performance, capacity-planning tool that allows system administrators and planners to answer questions about cost efficiency and system performance throughout the life of a computer system.

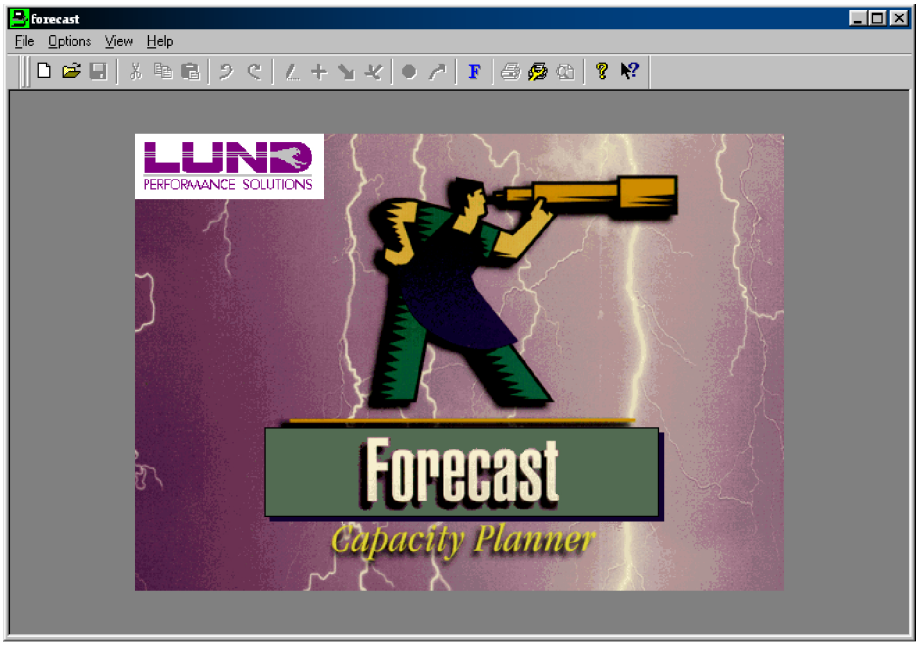

Figure 1.1 *Initial Forecast Capacity Planner screen*

Forecast Capacity Planner (also referred to as Forecast) is a PC-based software tool that uses data gathered by a host-based collector program to calculate and report present and future system performance. Full-color graphs and reports allow system administrators and capacity

planners to predict future hardware requirements, as well as determine the effect of application changes.

Capacity planning is an integral part of managing computer resources for future growth. By developing and maintaining a capacity planning strategy for your operation, you can ensure the efficient management of your organization's computer assets.

System Requirements

The Windows-based Forecast Capacity Planner program requires the following system hardware and software.

Hardware

- Personal computer with a 486/33 or higher processor (Pentium 166 recommended)
- 16 megabytes (MB) of RAM (32 MB recommended)
- 8 MB of free hard disk space (16 MB required for installation)
- 10X CD-ROM drive
- 256-color VGA or better video
- Two-button mouse (a three-button mouse is recommended)
- Connectivity to the host system

Software

- Microsoft Windows 9X/NT 4.0/2000 operating system
- Microsoft Internet Explorer 4.x (or higher) Web browser

  Internet Explorer should be installed on your system to enable specific system files to be updated.
- A host data collector:
  - SOS/3000 Performance Advisor™ by Lund Performance Solutions
  - SOS/9000 Performance Advisor™ by Lund Performance Solutions
- FTP (file transfer protocol) or terminal emulation software to transfer data log files from the host system to the PC

Product Support

When you purchase support from Lund Performance Solutions, you benefit from the knowledge and experience of our technical support team. We are glad to help you interpret data and resolve performance issues. Our contracted product support entitles you to receive timely updates, bug fixes, documentation and direct technical support.

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At Lund Performance Solutions, we are working hard to provide you with intuitive software products. Additionally, we try to provide superior online and printed documentation. However, should you find yourself with a technical question that you cannot answer with the tools provided, please contact our technical support team.

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NOTE You must be a registered user to access Lund Performance Solutions' support services. Lund Performance Solutions' support services are subject to Lund Performance Solutions' prices, terms, and conditions in place at the time the service is used.

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When you call, please be at your computer, have the product documentation in hand, and be prepared to provide the following information:

- Product name and version number.
- Type of computer hardware you are using.
- Software version number of your operating system(s).
- Exact wording of any messages that appear on your screen.
- What you were doing when the problem occurred.
- How you tried to solve the problem.

Lund Performance Solutions Documentation Team

Lund Performance Solutions makes every effort to produce the highest quality documentation for our products, and we welcome your feedback. If you have comments or suggestions about our online Help or printed guides, send an e-mail message to **documentation@lund.com** or contact your account manager.

Lund Training Institute Certified Trainers

Lund Training Institute (LTI) presents system performance training courses at their corporate training center in Oregon and at various locations across the United States and Canada throughout the year. The Certified Trainer Program is designed for trainers from all educational areas, including academia, consulting, and business.

For information about Lund Training Institute or to receive an application, please review the LTI Web site (**http://www.lund.com/Training/index.html**), send an e-mail message to **lti@lund.com**, or contact your Lund account manager.

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Product Documentation

User's Guide

This user's guide accompanies the Forecast Capacity Planner software as a guide for the new user and as a quick reference for experienced users.

This guide assumes that you have a working knowledge of the Windows operating system.

Document Conventions

The user interface in Forecast is designed to accommodate a variety of work styles. Some users prefer using standard menu commands; others are more comfortable with shortcut menus, keyboard commands or toolbar buttons.

Generally, standard menu commands appear in the procedural sections of this document. Alternative methods of accessing menus, controls, and commands are discussed in "Keyboard Commands" on page 139.

Online Help System

In the online Help system, you will find explanations of the many features of Forecast, as well as tips to guide you through the program's basic functionality.

Reference Materials

- *Quantitative System Performance, Computer System Analysis Using Queueing Network Models*, Edward D. Lazowska, John Zahojan, G. Scott Graham, and Kenneth C. Sevcik. Copyright ©1984 by Prentice-Hall, Inc.
- *SOS/3000 Performance Advisor User Manual*. Copyright © 1992-2000 by Lund Performance Solutions, Albany, Oregon, USA.
- *SOS/9000 Performance Advisor User Manual*. Copyright © 1992-2000 by Lund Performance Solutions, Albany, Oregon, USA.
- *Taming UNIX: UNIX Performance Management Series, Volume I*, Robert A. Lund. Copyright ©1997 by Robert A. Lund.

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PRODUCT OVERVIEW

Product Description

Forecast Capacity Planner (Forecast) allows system administrators and planners to answer what-if questions regarding the impact of new applications, additional users, performance tuning, and hardware upgrades.

Using Forecast, an administrator can create models to view the future performance of the system and address a variety of questions based on application workload and business growth, such as:

- Can an upgrade be postponed until next year?
- What response service levels can be expected?
- What will be the effect of upgrading to a larger system?
- Can we extend the life of the existing system by balancing workloads?
- Will changes to applications change response times?

Components

Collection

A ***collection*** is a raw collection data file that contains information about a computer system that has been gathered at time intervals specified by the user. This file usually includes information about the processor, memory, disk statistics, and process information. A collection has not yet been validated within Forecast. These are saved within Forecast as *.col files.

Model

A ***model*** is raw data attached to working algorithms and saved. By saving data as a model, the user is verifying that the model accurately represents the actual data and information on their systems. These are saved within Forecast as *.mdl files.

Resource

A ***resource*** is a hardware component of any host system, including CPUs and disk drives. These can be saved within Forecast as a *.dat file in the Resource.dat file.

Center

A ***center*** is a collection of like resources (see previous section). For example, one or more CPUs is a CPU center; one or more disk drives is a disk drive center.

Workload Group

A ***workload group*** is a group of similar, identifiable transactions on the host system performed by individual users and programs. Workload groups can be grouped by:

- Applications
- User login
- Departmental processes
- Drive device

A workload group may be as simple as one user running one program, or as complex as entire departments running many programs.

Desktop

A ***desktop*** is the current state of the Forecast display area, which includes the size and position of the main program window and all of the charts or panes currently open in the application, saved to disk as a Forecast desktop file (*.dsk). By saving and loading a desktop, a previous session can be quickly and easily restored with minimal work duplication.

Product Audience

Forecast Capacity Planner is designed for use by MPE/iX and HP-UX host system administrators and system planners. However, the usefulness of timely and accurate forecasting will benefit an entire organization—from online users to top management.

Procedural Summary

Forecast Capacity Planner allows you to collect data from your system, build a baseline model of your system, and create performance projections from that model. The major procedural steps in the process include:

1. Identify the resources, (CPU, and disk drive types) on your host system.
2. Identify and characterize the workload groups on your host system.
3. Run the data collection and reduction software:
   - SOS/3000 Performance Advisor for MPE/iX™,
   - SOS/9000 Performance Advisor for HP-UX™,

   to create a data collection file.
4. Transfer the data collection file to your PC to create an unvalidated model (a collection) in Forecast Capacity Planner.
5. Create a model. Evaluate and modify the projected model as needed to ensure that it is an accurate representation of your host system.
6. Validate the baseline model.
7. Create a performance projection for your validated model.

New Product Features

The following features have been added to the Forecast Capacity Planner product since version B.0x:

- With version C.0x, Forecast Capacity Planner is fully compliant with the Windows user-interface standards. Windows 9X/NT/2000 users will find the interface familiar and easy to navigate. Menus and tools are logically placed and organized for quick access. All of the commands needed to load, validate, and forecast a model are accessible from the **Main Program** window.
- A number of multi-step procedures are combined or automated in version C.0x. For example, generating detailed information on model components is now done with a simple mouse click.
- The **Save Desktop** command in version C.0x allows you to save the current desktop as a named file to preserve settings and layouts for future use.

If you have used earlier versions of Forecast Capacity Planner, you can use one of the Quick Tours in Chapters 5 and 6 to familiarize yourself with the new features and functions in version C.0x.

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PRODUCT STARTUP

Starting Forecast Capacity Planner

To start Forecast Capacity Planner, do the following:

1 From the **WIndows** task bar, click **Start**.

2 From the **Programs** submenu, click **Forecast 32**.

3 From the **Forecast 32** submenu, click **Forecast 32**.

Help Topics

To access the online indexed Help, select **Help Topics** from the **Help** menu. Select a book or page from the Help **Contents** tab, or use the **Index** or **Find** tabs

Context-Sensitive Help

To access context-sensitive Help on a specific dialog box, click the **Help** button in the dialog box. Help about the dialog box will display in a separate window.

To get context-sensitive Help elsewhere in Forecast, do either of the following:

- Position your mouse over the item in question and press the F1 function key. This is especially helpful for open dialog boxes that do not contain a **Help** button, as the Help Toolbar button will not open dialog boxes and cannot be selected if a dialog box is already open.

  OR

- Select the Help toolbar button  for use with toolbar buttons or menu items. This will change the cursor to a question mark. Move the question mark pointer over an item and click to get Help for that item.

Tip of the Day

The Tip of the Day box displays a different informational message each time Forecast Capacity Planner is started on your PC. The messages are designed to help you enhance your productivity when using Forecast Capacity Planner.

Exiting Forecast Capacity Planner

To exit the Forecast Capacity Planner program, select **Exit** from the **File** menu.

Uninstalling Forecast Capacity Planner

Running the Uninstall Forecast 32 program removes the Forecast Capacity Planner application and all associated files from your PC.

To uninstall Forecast Capacity Planner, do the following:

1 From the **WIndows** task bar, click **Start**.

2 From the **Programs** submenu, click **Forecast 32**.

From the **Forecast 32** submenu, click **Uninstall Forecast 32**.

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DATA COLLECTION, EXTRACTION, AND EXPORT

Overview

Forecast Capacity Planner creates a model of your system based on the data collection (*.col) files transferred from your MPE/iX system. To accurately predict future performance, it is important to start with an accurate picture of your current system. The usefulness of your forecast depends on the quality and relevance of your baseline data.

Some of the procedures described in this chapter require Lund Performance Solutions' SOS Performance Advisor software. Refer to your SOS Performance Advisor User's Guide for further information.

Data Collection Process

1. Identify host system resources.
2. Identify and characterize the workload groups on the host system.
3. Create a workload definition file.
4. Collect performance data on the host system.
5. Reduce the performance data on the host system.
6. Download/export performance data to the PC.

Identifying System Resources

The modeling algorithms used by Forecast Capacity Planner depend on the performance attributes of the hardware. It is important to accurately identify the following components of the host system:

- Hardware configuration
- CPU type
- Disk drive type(s)

NOTE The SOS Performance Advisor programs automatically recognize most CPU types, but not disk drive types. It is important to use the proper syntax to identify the disk drives on your system.

To use Forecast Capacity Planner to review the list of disk drives:

1. Run Forecast Capacity Planner as described in "Starting Forecast Capacity Planner" on page 11.
2. On the **Options** menu, click **Resources**.
3. In the **Resources** dialog box, click the **Disks** tab.
4. Use the horizontal scroll bar to review the list of disk drives.

Identifying and Characterizing Workload Groups

A workload group is a group of similar, identifiable transactions on the host system performed by individual users and programs. Group processes to form a meaningful model of system usage. Identifying and grouping similar components is the key to creating an accurate and useful model. For example, workloads can be grouped by:

- Applications
- User login
- Departmental processes
- Disk devices

A workload group may be as simple as one user running one program, or as complex as entire departments running many programs.

Forecast Capacity Planner creates a model of your host system using Mean Value Analysis (MVA) queuing network algorithms. MVA algorithms use average workload groups to generate system data. For that reason, make sure model inputs such as workload groups are homogeneous. A homogeneous workload group consists of processes of a similar type, function, and priority.

Averaging is meaningless for workload groups made up of dissimilar transactions. For example, if an average accounts receivable transaction takes 200 milliseconds of the CPU's time, while general ledger transactions average 500 milliseconds, taking an average of the two does not provide a meaningful average for either transaction.

Identifying Workload Groups

Input from management and system users is essential in identifying and defining workload groups. Interview managers and users to determine how the system is used, and to identify distinct functions, such as order entry, telemarketing, or accounting. Break down the various departmental functions into essential components, based on your desired result. Identify

groupings that will provide you with the needed information. These grouped components make up your workload groups.

While it is important to keep your model as simple as possible and the number of workload groups to a minimum, it is more important to keep all workload groups in the model as homogeneous as possible. Do not sacrifice the accuracy of your model for simplicity.

Characterizing Workload Groups

Once you have identified your workload groups, use the following guidelines to further refine your workload definitions:

- Limit the components of any workload group to users or transactions with service demands of comparable magnitude and similar balance across the system. Do not mix heavy-CPU/ low-I/O transactions with light-CPU/heavy-I/O transactions.
- Do not mix interactive processes and batch processes in the same workload group. System resources, priorities, and think times are different for interactive and batch processes.
- Consider the desired outputs of the model when defining workload groups. For example, if response times for database queries are a concern, do not group database queries with other workload components. Create a separate workload group for this task, preferably defined by user logon.
- Use separate workload groups for specific divisions, branches, or departments as needed to further refine the model.
- Identify workload groups by user logon, if possible.

MPE/iX Host Data

Creating an MPE/iX Workload Definition File

You can use the three pre-defined MPE/iX workload groups or create your own workload definitions file.

Predefined Workload Groups

Forecast Capacity Planner uses three predefined (default) workload groups:

- JOB Includes all batch job streams
- SESSION Includes all interactive (online) terminal sessions
- SYSPROCS Includes all system processes

If you prefer to use more specific workload groups, you may create a workload definitions file (see the next section, "User-defined Workload Groups.").

User-defined Workload Groups

Defining specific workload groups is a good way to track specific processes, such as processes run by a specific department in your business. However, user-defined workload groups are optional—they are not required to run Forecast.

Creating a Workload Definitions File

User-defined workload groups are created in the **soswkdef.pub.lps** file. Use your editor to create an **soswkdef** file (**quad.util.lps** is included on the distribution tape).

The basic format of the **soswkdef** file requires three items for each workload group:

- The name of the group (up to 10 characters).
- The type of the processes included in the group (JOB, SESSION, or BOTH).
- The user and/or program specifications (a list of one or both of the following):
  - USER The account by which MPE knows you (your user or login ID)
  - PROG The MPE fully-qualified program file name

Workload Definition File Configuration Rules

1. A workload group name of up to 10 characters is required.
2. A workload group type specification is necessary to indicate which types of processes to include or exclude from the workload definition. This makes it possible to create two workload groups for processes that run in both interactive and batch modes. For example:
   - JOB includes only batch processes.
   - SESSION includes only interactive (online) terminal sessions.
   - SYSPROCS includes only system processes.
3. Workload groups must be separated by one or more blank lines within a definition file.
4. Comments can be included on any line if preceded by an exclamation point (!).
5. Either a user or a program specification is required. The specification must be entered one per line and must be one of the following three types:
   - A program specification (PROG=PROGRAM.GROUP.ACCOUNT).
   - A user specification (USER=SESSION, USER.ACCOUNT,GROUP). The session name and logon group are optional.
   - The MPE logical device number (LDEV=nnn) or range of device numbers (LDEV=nnn-nnn).

   The symbol "@" can be used as a wildcard for any of the criteria, just as it can with normal MPE/iX rules (partial or full).

NOTE The drive specification means that you can capture activity on a terminal-by-terminal basis, or even within a range of terminals. Use this option carefully!

6 There is virtually no limit to the number of user, program, and LDEV specifications allowed for each workload group.

7 The name and type of specification lines are required. All other lines are optional. In order to be considered part of a workload group, a process must satisfy the program, user, and LDEV specifications, if all three are present.

- If more than one program specification lines are included, a program needs to satisfy only one of the program specifications to be included in the group.
- If no program specifications are entered, all process programs are considered to be in the group, unless the process is somehow disqualified by the user or drive specification.
- The user and drive specifications are resolved in the same way. For instance, the lines in the following example should be entered into the **soswkdef** file to define the workload called "WORKTEST."

```
WORKTEST                          !Workload name
SESSION                           !Only terminals
PROG=@.PUB.MFG
PROG=MONEND.PUB.QTR
USER=JANE, MGR.MFG
USER=@,@.QTR
LDEV=50-60
```

Figure 4.1 *Workload definition file (example)*

For a process to be included in the WORKTEST workload group, it must satisfy only one program specification, one user specification, and one LDEV specification. Each is considered to be an "and" condition. For instance, a program, INVEN01.PUB.MFG, run by MGR.QTR at LDEV 56 would be counted in the WORKTEST workload group.

8 When selecting any of the following system-type processes, the program group and the account must be specified as "@."

- Specify command interpreter processes by the program file name "ci" (PROG=ci).
- Specify spooler processes by the program file name "sp" (PROG=sp).
- All other system processes can be identified by name.

To strip out command interpreters from the catch-all sessions workload group, create a separate workload with the program name "ci" to track the response times for sessions. It will reflect what the users actually experience.

9 A process can belong to only one workload group. If a process meets the criteria for two or more groups, it will be assigned to the first workload group in the file for which it qualifies.

Collecting MPE/iX Performance Data

Data collection on an MPE/iX system can be accomplished with or without the SOS/3000 Performance Advisor software from Lund Performance Solutions.

Steaming the Data Collector Job with SOS/3000

24-hour Collection

To establish 24-hour continuous data collection, do the following:

From the HP e3000 terminal, type **:Stream sosmonj.pub.lps**

8-hour Collection

To establish 8-hour continuous data collection, do the following:

From the HP e3000 terminal, type **:Stream sosjob.pub.lps**

Steaming the Data Collector Job without SOS/3000

24-hour Collection

To establish 24-hour continuous monitoring, do the following:

1 From the HP e3000 terminal, verify the **Duration of job in minutes** value is 0 (zero).

2 Type **:Stream fcpcolj.pub.lps**

These changes will cause the **fcpcolj** job to automatically restream itself every 24 hours at midnight. If your backup jobs kill this job, you will need to restream it as part of a daily routine.

8-hour Collection

To establish 8-hour continuous data collection, do the following:

1 From the HP e3000 terminal, verify the **Duration of job in minutes** value is **480**.

2 Comment out the **Stream fcpcolj** line near the bottom of the screen. Do not remove the line.

3 Type **:Stream fcpcolj.pub.lps**

Changing the Sampling Interval Length

By default, the performance data sampling interval for all data collection job streams is 300 seconds (five minutes). Every five minutes, an average of all performance indicators for the current cycle is recorded in the log file.

To change the interval:

1. Locate the **Data collection interval in seconds** line in the job stream file.
2. Replace the default value with the desired number of seconds.

Extracting MPE/iX Performance Data

The SOS Performance Advisor SOSLOGX program reduces data from the collected log files, based on the criteria defined by the user. The process consists of two steps:

1. The program scans the collected data and selects only the records that meet criteria set by the user.
2. The program creates a data file to download to your PC.

Running SOSLOGX

To run SOSLOGX:

1. Enter the command **Run soslogx.pub.lps** at the prompt.
2. Enter the following information as prompted:
   a. The start date of the initial sample using the format **mm/dd/yy**. If you do not provide a date, the program will retrieve the earliest sample date recorded by default.
   b. The start time using the format **hh:mm**. If you do not provide a start date, the program will retrieve the start time of the earliest sample data recorded, by default.

If the SOSLOGX parameters are acceptable, go to the next section, “Creating the SOSLOGX Reduction File” on page 21.

1 From the log screen, select **OPTIONS (F1)**. The **SOSLOGX MAIN OPTION MENU** displays.

```
SOSLOGX MAIN OPTION MENU
    1)      Current log file location (LOGFILES.LPS)
    2)      Display process information (Y)
    3)      Use function keys to select reports (Y)
    4)      Process display option menu (SUBMENU)
    5)      Data break configuration menu (SUBMENU)
    6)      Export file configuration menu (SUBMENU)
    7)      Log information exclusions (SUBMENU)
    8)      Zone configuration (SUBMENU)
    9)      Report card configuration (SUBMENU)
    10)     Forecast data reduction configuration (SUBMENU)
    11)     Performance Gallery configuration (SUBMENU)
    12)     Report output configuration menu (SUBMENU)
Which Option:__
```

Figure 4.2 *SOSLOGX Main Option Menu*

2 Select option **10**, **Forecast data reduction configuration (SUBMENU)**.

3 Press the **Enter** key. The **SOSLOGX Forecast Data Reduction** submenu displays.

```
SOSLOGX Forecast Data Reduction
    1)      Workload analysis period minimum time (10)
    2)      Workload analysis period decay percentage (95)
    3)      Workload analysis start buffer time (10)
    4)      Workload analysis end buffer time (10)
    5)      Load sample analysis period minimum time (60)
    6)      Load sample analysis period decay percentage (30)
    7)      Suspicious delay time warning threshold percentage (30)
    8)      Memory wait warning threshold percentage (30)
Which Option:__
```

Figure 4.3 *SOSLOGX Forecast Data Reduction Configuration Menu*

4 If necessary, reset the parameters as follows:

   a In the space at the bottom of the screen, type the number of the parameter to be changed and press **Enter**.

   b Type the new value.

   c Press **Enter**.

5 Select **EXIT OPTIONS (F8)**. The program will ask if you want to save these options.

6 Press the **F1** key or **Y** key to save the options.

Creating the SOSLOGX Reduction File

To create the SOSLOGX reduction file:

1 Select **UTILITY KEYS (F5)**.

2 Select **FORECAST ANALYSIS (F5)**. A series of prompts appears. Respond to the prompts as outlined in Table 4.1

Table 4.1 *SOSLOGX Forecast Analysis prompts*

Prompt	Response
Enter name of output collection file:	Type an MPE file name for the data file.
Enter the reduction period start date (mm/dd/yy):	Type the month, day, and year using the format given.
Enter the reduction period start time (hh:mm):	Type the start time using the format given.
Enter the reduction period end date (mm/dd/yy):	Type the month, day, and year using the format given.
Enter the reduction period end time (hh:mm):	Type the end time using the format given.

3 Press **Enter**.

4 The program scrolls through the system configuration, including CPU and disk types, then asks if this configuration is correct.

   - Type **Y** if the current configuration is correct.
   - Type **N** if the current configuration is not correct. You will then be prompted to change the CPU(s) and each of the disks for your system.

5 The program scans the appropriate log files and writes the reduction file. The extraction process may take a few moments to several minutes to complete, depending on the size of the data file and the speed of your computer's processor.

As the program runs, a series of informational messages displays. You may want to print these messages for later reference.

Evaluating the SOSLOGX Reduction File

By default, the program chooses a period when the CPU is most busy. Review the reduction file to determine if the data is an accurate representation of activity on the system.

- If you are satisfied that the reduction is accurate, press the **Y** key to save the reduction file to your user's group.
- If you are not satisfied with the reduction, press the **N** key. The program will ask you to define a new period.

Exiting SOSLOGX

To exit SOSLOGX:

1. Select **MAIN KEYS (F8)**.
2. Select **EXIT SOSLOGX (F8)**.
3. Press the **Y** key to confirm.

Exporting MPE/iX Performance Data

Close SOSLOGX before exporting files. The transfer of data from the MPE/iX system to the PC requires:

- A PC connected to the host MPE/iX system
- FTP (file transfer protocol) or terminal emulation software such as Reflections, Business Session for Windows, MiniSoft32, Or AdvanceLink

Refer to the documentation provided with your terminal emulation software for instructions to download from the MPE/iX system to the PC **using binary format**. The name of the file on the PC should include the extension ".col." The extension can be added during the download process, or the file can be renamed after it is transferred to the PC.

HP-UX Host Data

Creating an HP-UX Workload Definition File

Once you have identified and refined your workload groups as described in "Identifying and Characterizing Workload Groups" on page 14, enter the data in a workload definition file.

User-defined Workload Groups

User-defined workload groups are created in **/opt/lps/lib/workdefs**. Use your editor to create the **workdefs** file.

Workload Definition Requirements

The **workdefs** file requires the following information for each workload:

- The name of the workload, up to ten characters.
- The type of process or processes included in the workload, such as **ATTACH**, **DETACH**, **SYS**, or **ALL**.
- The user or program specification, including one or more of the following (see Figure 4.4 for an example):
  - **USER** (your user ID or logon ID).
  - **PROG** (the name of the executable program file).
  - **TTY** (the device name of your terminal).
  - **GROUP** (the user group identification).

```
FINANCE                 !Name of workload
BOTH                    !Group type (ATTACH/DETACH/SYS/BOTH/ALL)
USER=johndoe            !User specifications (optional)
GROUP=managers          !Group identification
TTY=ttyp1               !Device file specification
                        !At least on blank line (required)
EDITORS                 !Name of workload
ATTACH                  !Group type
PROG=vi                 !Program file name
PROG=ed                 !Program file name
                        !At least one blank line (required)
COMPILING               !Name of workload
BOTH                    !Group type
PROG=cobol              !Program file name
PROG=c                  !Program file name
```

Figure 4.4 *HP-UX sample workload definition file*

Workload Definition File Configuration Rules

Use the following guidelines to create or edit workload definition files:

- Separate workloads by one or more blank lines.
- Include comments on any line, if desired, preceded by an exclamation character (!).

- A workload type specification is needed to indicate the types of processes to include or exclude from the workload definition. This makes it possible to create two workloads for processes that run in both interactive and batch modes. For example:
  - **DETACH** (detached processes).
  - **ATTACH** (attached processes).
  - **SYS** (HP-UX system processes).
  - **BOTH** (detached and attached processes, but not system processes).
  - **ALL** (all processes).
- Program and user specifications are specified by:
  - **PROG=program name**.
  - **USER=user name/group name**. System group names are valid specifications. Check the **/etc/group** file for a list of existing group names.

    For more information about group names, refer to your *HP-UX HP 9000 Reference*, Volume 3, Section 5, regexp (Regular Expressions).
- Device file specifications, such as **TTY=tty0p2**, are also valid. You can capture activity on a terminal-by-terminal basis, or for multiple terminals.
- There is no limit to the number of user, program, and tty specifications allowed for each workload.
- Name and type specification lines are required. All other lines are optional.
- To be included in a workload group, a process must satisfy the program, user, and tty specifications, if all three are present.
  - If one or more program specification lines are included, a program needs to satisfy only one of these to be included in the group.
  - If no program specifications are entered, only users and/or devices are specified, then all process programs are included in the group, unless the process is somehow disqualified by the user or tty specifications.
- A process can belong to only one workload group. If it fits the criteria for two or more groups, it is assigned to the first workload in the file for which it qualifies.
- Three workloads appear by default: **DETACH**, **ATTACH**, and **SYS**. Processes that do not fit into user-defined workload groups will be included in one of these pre-defined workload groups.

Collecting HP-UX Performance Data

Running SOSLOGD

SOS Performance Advisor for HP-UX uses the program SOSLOGD to collect and log raw data on your HP-UX system for later extraction and download for use with Forecast Capacity Planner.

SOSLOGD creates one logical file record for every batch interval. The default interval is 10 minutes (600 seconds). The log file is saved in the SOS Performance Advisor log directory and named using the format **SLyyjjjs**.

- **SL** represents the SOS log file.
- **yy** represents the current year.
- **jjj** represents the Julian day of the year.
- **s** represents the sequence of the log (up to 26 characters, from a through z).

To begin the collection process, enter **soslogd** at the shell prompt of your home directory. This assumes that your path statements are set up properly.

Using Command Line Switches

Use the command line switches to modify the SOSLOGD configuration. Enter **soslogd -h** at the shell prompt of your home directory. The following list of switches are displayed

```
$soslogd -h
SOS command line switches
-c      Run in continuous mode (must kill w/LPSKILL <daemon name>)
-o      Display configuration options at startup
```

Figure 4.5 *SOSLOGD command line switches*

The effects of the command line switches vary depending on whether you are using the default or advanced configuration parameters.

The functions of the command line switches are summarized in Table 4.2.

Table 4.2 *SOSLOGD command line switch functions*

Switch	Result (Default)	Result (Advanced)
-c	Log continuously (24 hours) by restarting at 00:00 hours.	Log continuously (24 hours) by restarting after the Run Time value has expired.
-h	Display the command line switches.	Display the command line switches.

Switch	Result (Default)	Result (Advanced)
-o	Display the default configuration.	Display the configuration parameters in the **.soslogrc** file.

Default Configuration Parameters

To view the default configuration parameters for your system, type **soslogd -o** from your home directory. The default parameters are described in Table 4.3.

Table 4.3 *SOSLOGD default configuration parameters*

Parameter	Description
Enter duration of job in minutes (0)	The duration of the job is 24 hours.
Interval time in seconds (600)	The program will take a sample and write a log record every 10 minutes.
Company name ( )	The company name is blank, by default.
Display advice messages (Y)	SOSLOGD will display advice messages.

Advanced Configuration Parameters

To create a custom configuration parameter file:

1 Create a custom file, **.soslogrc**, with your editing program, listing the parameters as described in Table 4.4.

Table 4.4 *SOSLOGD advanced configuration parameters*

Parameter	Description
Run time	The amount of time (minutes) SOS Performance Advisor will monitor your system's processes.
Cycle time	The amount of time (seconds) between samples.
Company name	Your company name (added to the title of each log report). (This can be the name of your system or another subheading, if desired.)

2 Place the **.soslogrc** file in your home directory (the same directory as SOSLOGD) to enable batch logging parameters.

3 To change the configuration, edit the parameters in the **.soslogrc** file. For example:

- To collect data in one-hour batches, change the batch run time to 60 minutes by typing **Batch Run Time=60**.
- To shorten the interval time to five minutes (300 seconds), type **Cycle Time=300**.
- To add the name of your company (or another subheading) to the title of each log report, type **Company Name=<your company's name>**.

```
Batch Run Time = 60
Cycle Time = 300
Company Name = Acme Systems
```

Figure 4.6 *Sample of user-defined configuration parameters (.soslogrc file)*

Extracting HP-UX Performance Data

The SOS Performance Advisor SOSLOGX program extracts data from the collected log files, based on the criteria defined by the user. The extraction process consists of two steps:

1. The program scans the collected data and selects only the records that meet criteria set by the user.
2. The program creates a data file to download to a PC.

Running SOSLOGX

To run SOSLOGX:

1. From your home directory, enter **soslogx** at the prompt.
2. Enter the following information as prompted:
   a. The start date of the initial sample using the format **mm/dd/yy**. If you do not provide a date, the program will retrieve the earliest sample date recorded by default.
   b. The start time using the format **hh:mm**. If you do not provide a start date, the program will retrieve the earliest sample data recorded for that date, by default.

Modifying SOSLOGX Parameters

If the SOSLOGX parameters are acceptable, go to the next section, “Creating the SOSLOGX Reduction File” on page 29.

To modify the current SOSLOGX parameters:

1 From the log screen, select **OPTIONS (F1)**. The **SOSLOGX MAIN OPTION MENU** displays (see Figure 4.7).

```
SOSLOGX MAIN OPTION MENU
    1)      Current log file location (/opt/lps/log)
    2)      Company name ( )
    3)      Use function keys to select reports (N)
    4)      Maximum lines per report page (60)
    5)      Data break configuration menu (SUBMENU)
    6)      Log information exclusions (SUBMENU)
    7)      Export file configuration menu (SUBMENU)
    8)      Forecast data reduction configuration (SUBMENU)
    9)      Performance Gallery configuration (SUBMENU)
Which Option:__
```

Figure 4.7 *SOSLOGX Main Option Menu (HP-UX)*

2 Select option **8**, **Forecast data reduction configuration (SUBMENU)**.

3 Press the **Enter** key. The **SOSLOGX Forecast Data Reduction** submenu displays.

```
SOSLOGX Forecast Data Reduction
    1)      Workload analysis period minimum time (10)
    2)      Workload analysis period decay percentage (95)
    3)      Workload analysis start buffer time (10)
    4)      Workload analysis end buffer time (10)
    5)      Load sample analysis period minimum time (60)
    6)      Load sample analysis period decay percentage (95)
    7)      Suspicious delay time warning threshold percentage (30)
    8)      Memory wait warning threshold percentage (30)
Which Option:__
```

Figure 4.8 *SOSLOGX Forecast Data Reduction Configuration Menu (HP-UX)*

4 If necessary, reset the parameters as follows:

   a In the space at the bottom of the screen, type the number of the option to be changed and press **Enter**.

   b Type the new value.

   c Press **Enter**.

5 Select **EXIT OPTIONS (F8)**.

Creating the SOSLOGX Reduction File

To create the SOSLOGX reduction file:

1 Select **UTILITY KEYS (F5)**.

2 Select **FORECAST ANALYSIS (F5)**. A series of prompts appears.

Table 4.5 *Forecast prompts*

Prompt	Response
Enter name of output collection file:	Type a name for the data file. Include the collection file extension (*.col).
Enter the reduction period start date (mm/dd/yy):	Type the month, day, and year using the format given.
Enter the reduction period start time (hh:mm):	Type the start time using the format given.
Enter the reduction period end date (mm/dd/yy):	Type the month, day, and year using the format given.
Enter the reduction period end time (hh:mm):	Type the end time using the format given.

3 Press **Enter**.

The program scans the appropriate log files and writes the reduction file. The extraction process may take a few moments to several minutes to complete, depending on the size of the data file and the speed of your computer's processor.

As the program runs, a series of informational messages displays. You may want to print these messages for later reference.

Evaluating the SOSLOGX Reduction File

By default, the program chooses a period when the CPU is most busy. Review the reduction file to determine if the data is an accurate representation of activity on the system.

- If you are satisfied that the reduction is accurate, press the **Y** key to save the reduction file to your user's group.
- If you are not satisfied with the reduction, press the **N** key. The program will ask you to define a new period.

Exiting SOSLOGX

To exit SOSLOGX:

1 Select **MAIN KEYS (F8)**.

2 Select **EXIT SOSLOGX (F8)**.

3 Press the **Y** key to confirm.

Exporting HP-UX Performance Data

Transferring the data from the host system to your PC requires:

- A PC connected to the host system.
- FTP (file transfer protocol) or terminal emulation software, such as Reflection, Business Session for Windows, MiniSoft92, or AdvanceLink.

Refer to the documentation for your terminal emulation software and select the option to download from the host system to the PC using **binary** data format.

The name of the file on the PC should include the extension for collection files (*.col). The extension can be added to the file during the download or the file can be renamed after it is downloaded to the PC.

5

QUICK TOUR FOR MPE/iX SYSTEMS

Overview

The Quick Tour in this chapter introduces first-time users to the features and functions of Forecast Capacity Planner. For users upgrading from earlier versions of the software, these tours provide a quick and easy way to get acquainted with the changes in the current version.

Before beginning the tour, install Forecast Capacity Planner along with the appropriate sample files on your personal computer.

Running Forecast Capacity Planner

Run Forecast Capacity Planner on your personal computer as described in “Starting Forecast Capacity Planner” on page 11.

Loading a Collection File

Forecast Capacity Planner creates a model of your system based on the data collection (*.col) files transferred from the host system. See “MPE/iX Host Data” on page 15 for information on host data collection and data transfer.

Your software includes a sample collection file **(HP3000A1.col)** for use with this tour.

To load the collection file:

1. On the **File** menu, click **Load/Validate model**. The **Open** dialog box will appear (Figure 5.1).
2. In the **Files of type** list, click **Collections (*col)**.
3. Click once on the collection file, **HP3000A1.col**, to select the file.

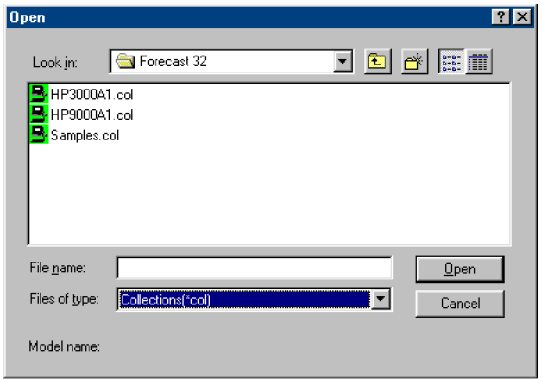


Figure 5.1 *Open dialog box (showing *.col files)*

4 Click **Open** to load the collection file.

Choosing a CPU Equivalent

In some instances, the CPU naming conventions on the host will differ from those on the PC. When that happens, Forecast will generate the **Choose CPU** dialog.

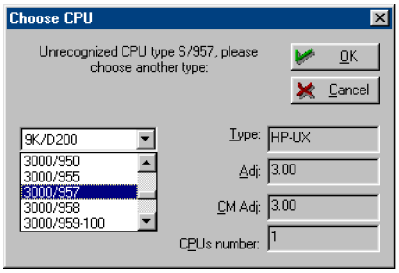


Figure 5.2 *Choose CPU dialog box*

The **Choose CPU** dialog states which CPU type cannot be found by the Forecast application. In the example shown in Figure 5.2, the CPU in question is a 3000/957. To resolve the issue, select the equivalent CPU name from the pull-down list (for example, 3000/957) and click **OK**.

Investigating Validation Messages

As the loading process runs, you will receive a list of warnings and informational messages in the **Validation Messages** dialog (Figure 5.3). These messages provide information about workload groups that may violate one or more modeling algorithm assumptions. For information about these assumptions, see “Validation Failures” on page 118.

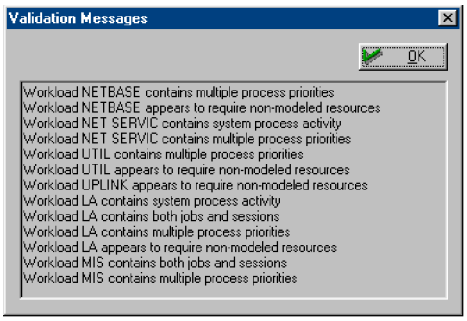


Figure 5.3 *Validation Messages dialog box*

Normally, you would investigate the causes of these messages and determine what, if any, influence they have on your model. It may be necessary to repeat running the data collection process to collect another sample from the host system. Information about evaluating workload groups is provided in “Identifying and Characterizing Workload Groups” on page 14.

For this exercise, assume that the messages do not affect the validity of the model. Click **OK** to continue.

Previewing the Unvalidated Baseline Model

When the loading procedure is complete, the **Main Program** window will display. The name of the file will also appear at the top left corner of the Forecast window. The window contains the unvalidated data loaded from the host system. (The model is not validated until it is saved in the Model (*.mdl) format.) The **Main Program** window for an unvalidated model is divided into three panes:

- The **file manager** pane.
- The **global unvalidated centers** pane.
- The **global unvalidated workloads** pane.

The content of each pane is described following the example shown in Figure 5.4.

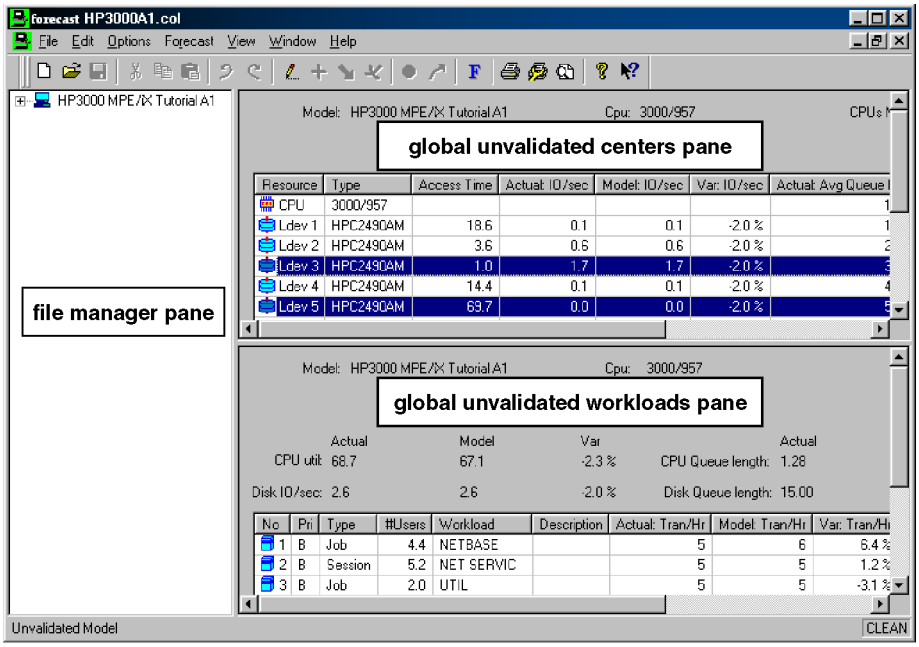


Figure 5.4 *Main Program window panes (unvalidated model)*

The file manager pane

The **file manager** pane is a representation of the unvalidated model in outline form.

- To expand or collapse the outline, click the Plus (+) or Minus (-) icons (respectively) within the **file manager** pane.
- To access detailed information, click the individual CPU, Disk, or Workload icons.
  - Clicking on Centers (or anything contained within) will cause the Workloads pane to be hidden. Clicking on Workloads (or anything contained within) will cause the Centers pane to be hidden. To re-display both panes, click on the file name (HP 3000 MPE/iX Tutorial A1).
- To edit items on the **file manager** pane, double-click the associated icon.

The global unvalidated centers pane

The **global unvalidated centers** pane displays the results for each CPU and disk drive in the model. To view detailed information about a single resource in the model, click the associated icon in the **file manager** pane.

The global unvalidated workloads pane

The **global unvalidated workloads** pane displays the results for each workload group included in the model. To view detailed information about a single workload group in the model, click the associated icon in the **file manager** pane.

Validation Thresholds

Normally, you would review the data in the **Main Program** window to determine if the model is a valid representation of the system's baseline performance. For this exercise, assume that the model is valid.

Acceptable validation thresholds for each system resource are listed in the following table.

Resource	Pane/Column	Acceptable Validation Variance
CPU utilization		up to 15 percent
Transaction/hour (throughput)	Workloads/ Var: Tran/Hr	up to 30 percent
Response time	Workloads/ Var: Resp. Time	up to 30 percent
Disk I/O/second	Centers/ Var: IO/sec	Variances for disk I/O/second and disk queue length are ignored because most real-world situations do not account for issues like database spreading.
Disk queue length	Centers/ Var: Avg. Queue Length	

If your numbers are out of range, review your workload definitions as described in "Identifying and Characterizing Workload Groups" on page 14. Model numbers can be changed in the Edit Workload screen. To change your variances:

1. Select the workload group to revise.
2. Press **Enter**.
3. In the **Edit Workload** screen, make your changes.
4. Press **OK**.

Validating the Baseline Model

Validate the baseline model you have created:

1. On the **Forecast** menu, click **Validated Model**.
2. In the **forecast** dialog box, click **Yes** to begin the validation process. Notice that the name of the document (top left corner of the window) changes from **HP3000A1.col** to **HP3000A1.mdl**.
3. On the **File** menu, click **Save Model As...**.
4. In the **Save As** dialog box, click **Save** to save the model in the default location on your computer.

Graphing the Model

The validated model created in the previous steps provides an accurate snapshot of your host system. The real power of Forecast Capacity Planner is its ability to predict future performance based on user-supplied what-if scenarios designed to illustrate the forecasting and graphing capabilities of the software.

The examples in this section are based on the following assumptions:

- Standard system performance tuning (defragging and balancing disk drives, repacking the database, etc.) will not significantly reduce CPU utilization or dramatically improve online response time, or reduce batch job completion time.
- Workload definitions on the host system are unchanged.
- Memory size and the type of disk drives are unchanged.

One CPU with Zero Growth Rate

For this example, graph the model validated in the previous exercises and assume no change in utilization occurs for 24 months.

To create the graph:

1 On the **Forecast** menu, click **Forecast Options**. The **Forecast Options** dialog box will appear, showing the **Options** tab.

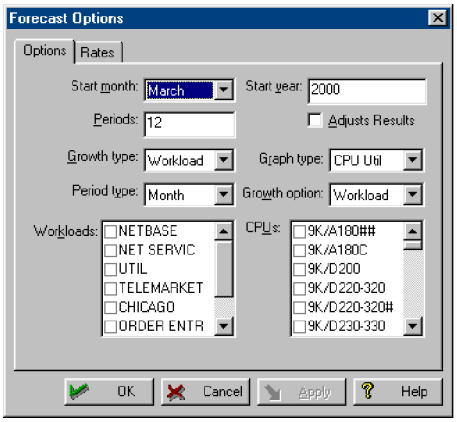


Figure 5.5 *Forecast Options dialog box: Options tab*

2 In the **Forecast Options** dialog box, change the number in the **Periods** box to **24**.

3 In the **Growth Type** list box, select **Linear**.

4 Verify the **Period type** is **Month**.

5 In the **Workloads** list box, verify that only the **All workloads** check box is selected.

6 Select the **Adjust Results** check box.

7 In the **Graph Type** list box, verify that **CPU Util** is selected.

8 In the **Growth Option** list box, click **Override**.

9 In the **CPUs** list box, verify that only the **3000/957** check box is selected (clear all other check boxes in the **CPUs** list box).

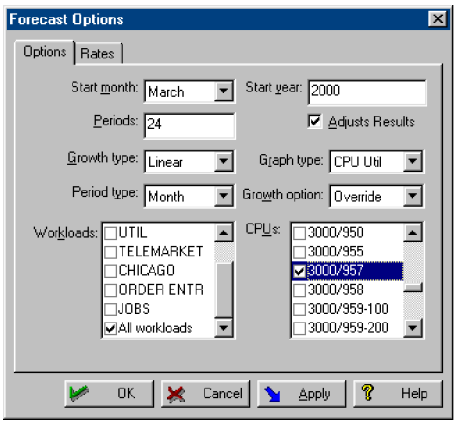


Figure 5.6 *Forecast Options dialog box: Options tab with new settings*

10 In the **Forecast Options** dialog box, click the **Rates** tab.

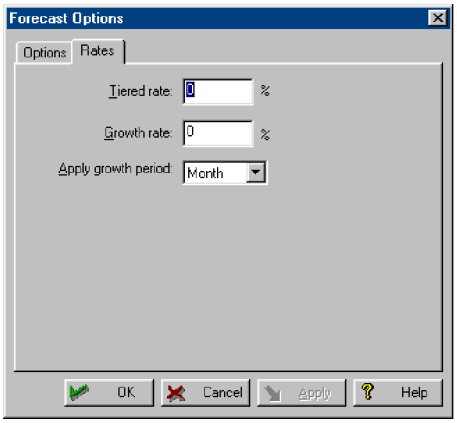


Figure 5.7 *Forecast Options dialog box: Rates tab*

11 Verify that **Tiered rate** and **Growth rate** are both set to **0** (zero).

12 Click **OK** to close the **Forecast Options** dialog box and save your changes.

13 On the **Options** menu, deselect the **Prompt for titles** option if it has been selected.

14 On the **Forecast** menu, click **Graph Forecast**. The forecast graph displays.

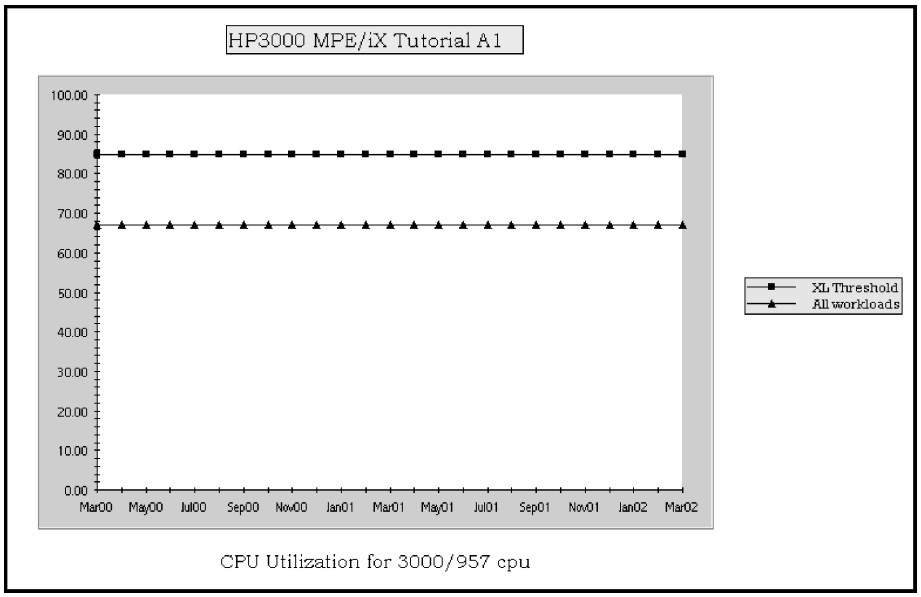


Figure 5.8 *Baseline graph for one CPU with zero growth rate*

NOTE If the graph labels are overlapped, adjust the Font and Size parameters in the Graph Options dialog box from the Options menu (see "Fonts Options" on page 85 and "Sizes Options" on page 86).

The upper line (XL Threshold) in the example graph (Figure 5.8) represents the CPU utilization threshold of 85 percent. 85 percent is the default threshold limit for MPE/iX systems and is generally considered the level at which response time and batch process completion rates become unacceptable. For information on changing threshold limits, see "Setting Thresholds" on page 113.

The lower line (All workload groups) in the graph represents overall CPU utilization for all workload groups identified in the model (3000/957). The modeled CPU utilization of 67.1 percent is approximately 18 percent below the threshold limit of 85 percent.

Four CPUs with Zero Growth Rate

In this example, compare the baseline forecast for your original model with three larger CPUs.

To create the graph:

1. On the **Forecast** menu, click **Forecast Options**.
2. In the **Forecast Options** dialog box, select the following CPU check boxes in the **CPUs** list box:
   - **3000/957** (CPU selected in original model)
   - 3000/977
   - 3000/992-100
   - 3000/995-200
3. Click **OK** to close the **Forecast Options** dialog box and update your graph.

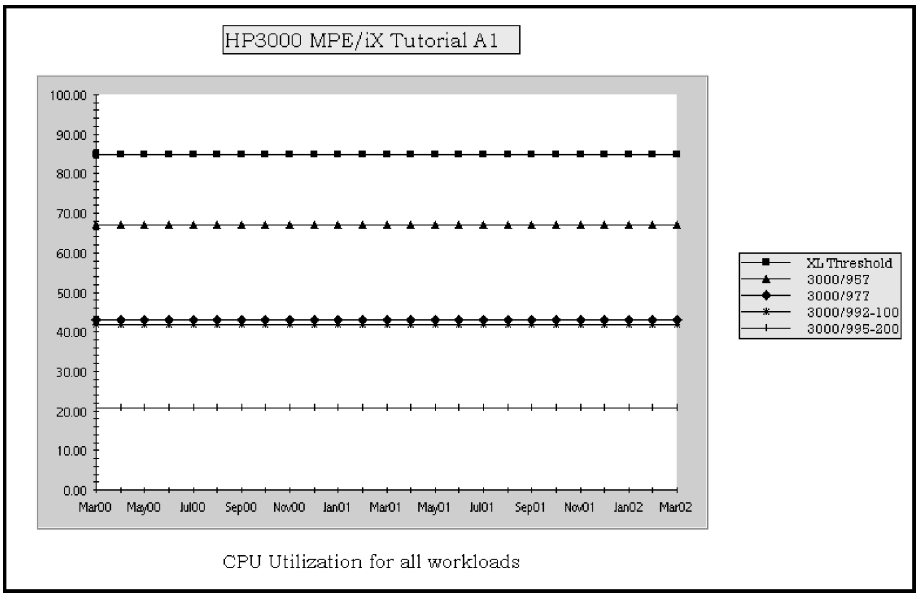


Figure 5.9 *Baseline graph for four CPUs with zero growth rate*

The upper line (XL Threshold) in the graph represents the 85 percent CPU utilization threshold for MPE/iX. The other four lines represent the CPU utilization for each of the four CPUs, based on the workload groups identified in the original, baseline model.

As expected, the larger CPUs show a lower utilization rate for the modeled workload groups. The 3000/995-200, for example, can handle the same workload groups with approximately 21 percent CPU utilization, compared with 67.1 percent CPU utilization on the 3000/957.

Four CPUs with Five-Percent Growth Rate

Repeat the forecast with a five-percent growth rate for all four CPUs.

To create the graph:

1. On the **Forecast** menu, click **Forecast Options**.
2. In the **Forecast Options** dialog box, verify that the following CPU check boxes are selected in the **CPUs** list box:
   - 3000/957
   - 3000/977
   - 3000/992-100
   - 3000/995-200
3. Click the **Rates** tab in the **Forecast Options** dialog box.
4. Click in the **Growth Rate** text box and type **5**.
5. Click **OK** to close the **Forecast Options** dialog box and update your graph.

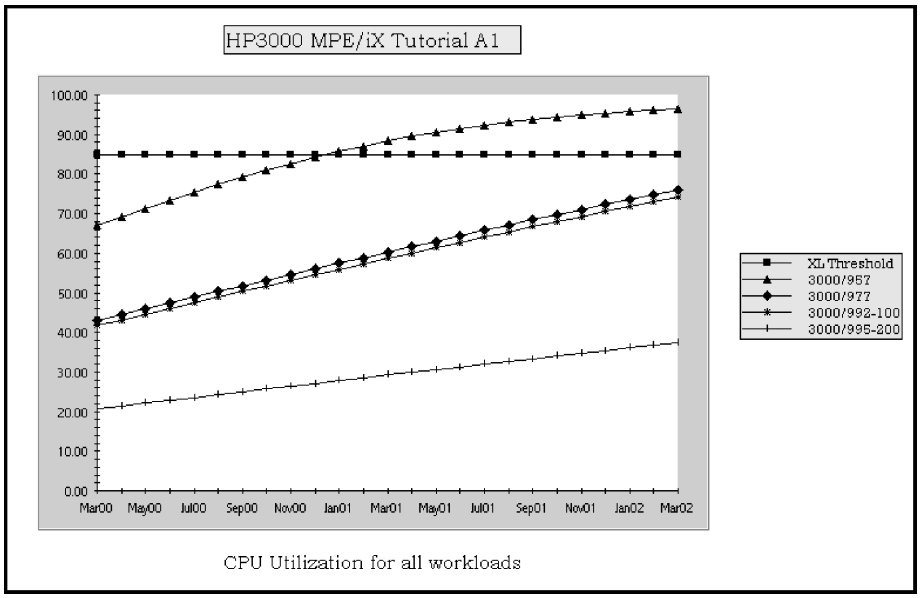


Figure 5.10 *Baseline graph for four CPUs with five-percent growth rate*

This example graph represents the modeled utilization rate for the 3000/957 relative to the rates for the larger CPUs at a growth rate of five percent over 24 months. Notice that the model does not simply add five-percent utilization to the rate for each month. The five-percent growth rate is a factor used to calculate the growth of each of the workload groups, subject to the modeled capacity of the system.

For example, the plotted curve for the 3000/957 begins to flatten at the threshold limit of 85 percent. The amount of increase in CPU utilization is constrained by the model as the CPU approaches 100 percent utilization.

Without remedial action, the 3000/957 will reach the threshold capacity in December 2000. Remedial action might include replacing the 3000/957 with a larger CPU, or improving system performance.

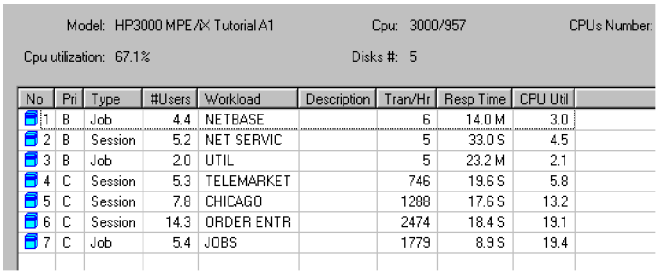
Utilization by Workload Group for One CPU

For the last example, graph your original model for the 3000/957 for each workload group, assuming a five-percent growth rate.

To create the graph:

1 On the **Forecast** menu, click **Graph Forecast** to close the graph and return to the **Main Program** window.

2 Note the percent utilization for each workload group displayed in the **global validated workloads** pane.



No	Pri	Type	#Users	Workload	Description	Tran/Hr	Resp Time	CPU Util
1	B	Job	4.4	NETBASE		6	14.0 M	3.0
2	B	Session	5.2	NET SERVIC		5	33.0 S	4.5
3	B	Job	2.0	UTIL		5	23.2 M	2.1
4	C	Session	5.3	TELEMARKET		746	19.6 S	5.8
5	C	Session	7.8	CHICAGO		1288	17.6 S	13.2
6	C	Session	14.3	ORDER ENTR		2474	18.4 S	19.1
7	C	Job	5.4	JOBS		1779	8.9 S	19.4

Figure 5.11 Main Program window: global validated workloads pane

The CPU utilization for each workload group should read:

- NETBASE: 3.0
- NET SERVIC: 4.5
- UTIL: 2.1
- TELEMARKET 5.8
- CHICAGO 13.2
- ORDER ENTR 19.1
- JOBS 19.4

3 On the **Forecast** menu, click **Forecast Options**.

4 In the **Workloads** list box, deselect the **All Workloads** check box. Select each of the seven workloads individually.

5 In the **Forecast Options** dialog box, deselect all of the CPUs except the **3000/957** in the **CPUs** list box.

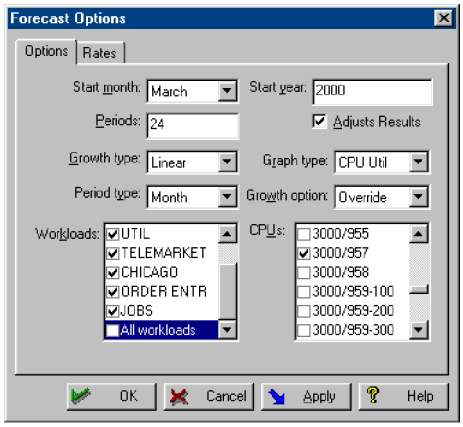


Figure 5.12 *Forecast Options dialog box, Options tab*

6 Click **OK** to close the **Forecast Options** dialog box and save your changes.

7 On the **Forecast** menu, click **Graph Forecast**. The forecast graph displays.

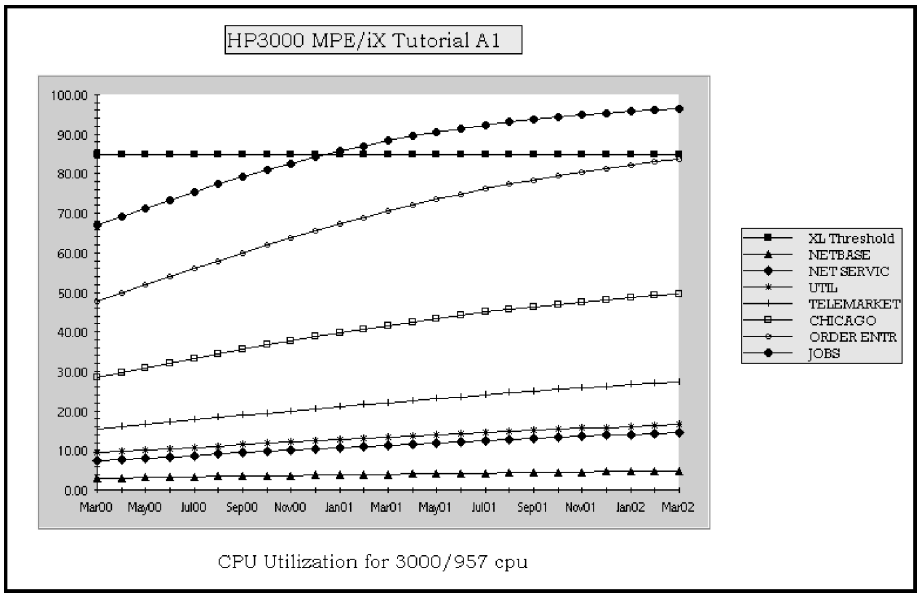


Figure 5.13 *Graph showing utilization by workload group for one CPU*

The utilization growth for each workload group is plotted based on the workload definition given in the data collection file and the constraints in the baseline model.

As expected, the larger workload groups, JOBS and ORDER ENTR, contribute the most to the 85-percent system threshold.

This type of forecasting can predict the impact of adding workload groups to an existing system. It is also useful in balancing workload groups across multiple systems.

Individual Workload Group Growth

What if, on top of your assessed 5% growth, you figured that one or more individual workload groups would increase as well? Forecast Capacity Planner allows you to change the growth rate of individual workload groups in order to see the final outcome. To change individual workload groups from the previous example:

1 Under the **Forecast** menu, click on **Graph Forecast** to deselect the option and close the graph.

2 Double-click on the row that contains the **CHICAGO** workload. This opens the **Edit Workload** dialog box.

3 Click on **Growth Rate**. This opens the **Edit Growth Rate** dialog box.

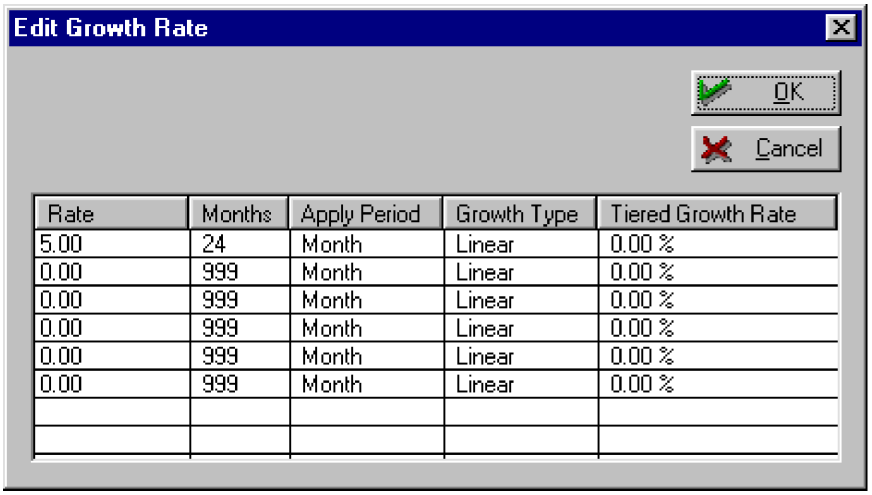


Figure 5.14 *Edit Growth Rate (Individual Workload Group) dialog box*

a In the first row, change the rate to **5.00**.

b Change the months from 999 to **24**.

c Click **OK**.

4 Click **OK** again to exit the **Edit Workload** dialog box.

5 Under the **Forecast** menu, open **Forecast Options**.

6 On the **Options** tab, change the **Growth Option** to **Add**.

7 Click **OK**.

8 Under the **Forecast** menu, select **Graph Forecast** to open the graph.

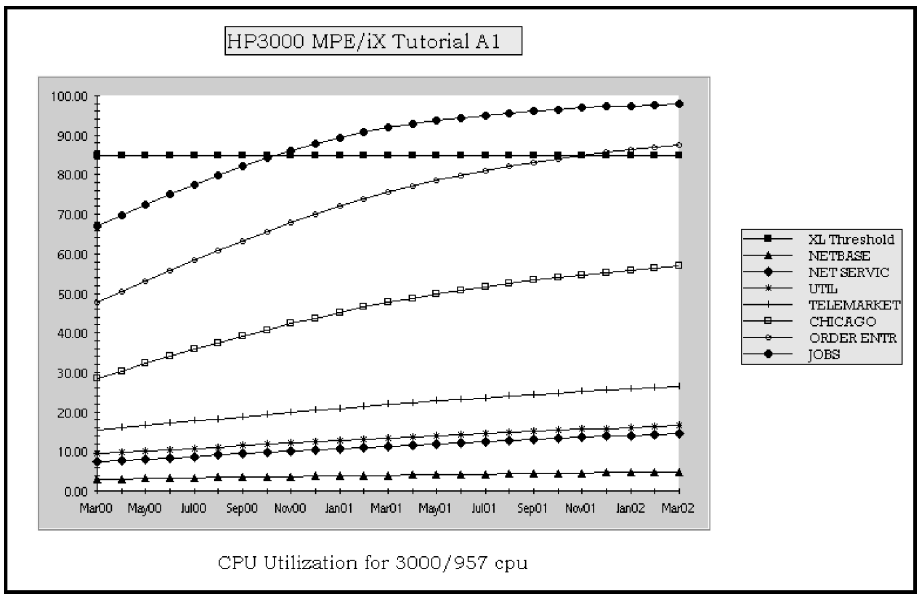


Figure 5.15 *Graph showing 5% individual growth for the CHICAGO workload group.*

As you can see by comparing this graph to the graph generated in the previous section, the CHICAGO workload group increases more noticeably. (ORDER ENTRY and JOBS show an increase only because they are stacked on top of CHICAGO.) At this rate of growth, CPU utilization will surpass the 85% mark by November of 2000.

On the **File** menu, click **Close**. If you want to use this model again, save your sample file at the prompt.

6

QUICK TOUR FOR HP-UX SYSTEMS

Overview

The Quick Tour in this chapter introduces first-time users to the features and functions of Forecast Capacity Planner. For users upgrading from earlier versions of the software, these tours provide a quick and easy way to get acquainted with the changes in the current version.

Before beginning the tour, install Forecast Capacity Planner along with the appropriate sample files on your personal computer.

Running Forecast Capacity Planner

Run Forecast Capacity Planner on your personal computer as described in “Starting Forecast Capacity Planner” on page 11.

Loading a New Model

Forecast Capacity Planner creates a model of your system based on the data collection (*.col) files transferred from the host system. (See “HP-UX Host Data” on page 22 for information on host data collection and data transfer.)

Your software includes a sample collection file **(HP9000A1.col)** for use with this tour.

To load the collection file:

1. On the **File** menu, click **Load/Validate model**. The **Open** dialog box displays (see Figure 6.1).
2. In the **Files of type** list, click **Collections (*col)**.
3. Click once on the collection file, **HP9000A1.col**, to select the file.

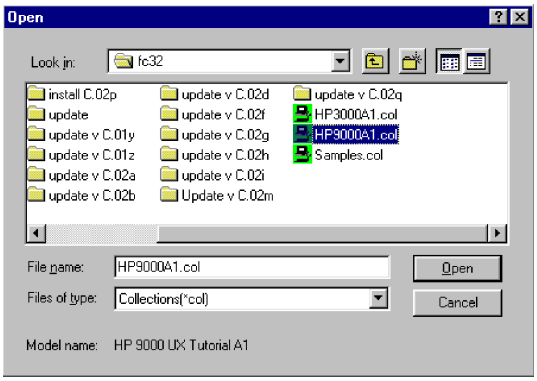


Figure 6.1 *Open dialog box*

4 Click **Open** to load the collection file.

Choosing a CPU Equivalent

In some instances, the CPU naming conventions on the host will differ from those on the PC. When that happens, Forecast will generate the **Choose CPU** dialog.

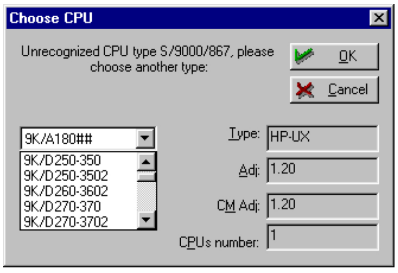


Figure 6.2 *Choose CPU dialog box*

The **Choose CPU** dialog states which CPU type cannot be found by the Forecast application. To resolve the issue, select the equivalent CPU name from the pull-down list and click **OK**.

Validation Messages

As the loading process runs, you will receive a list of warnings and informational messages in the **Validation Messages** dialog box (see Figure 6.3). These messages provide information about workload groups that may violate one or more modeling algorithm assumptions. (See “Validation Failures” on page 118 for information on modeling algorithm assumptions.)

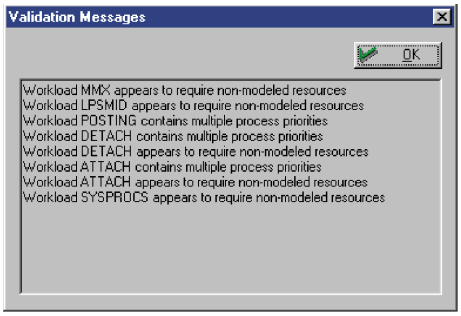


Figure 6.3 *Validation Messages dialog box*

Normally, you would investigate the causes of these messages and determine what, if any, influence they have on your model. It may be necessary to repeat running the data collection process to collect another sample from the host system. (See “Identifying and Characterizing Workload Groups” on page 14 for more information on evaluating workload groups.)

For this exercise, assume that the messages do not affect the validity of the model. Click **OK** to continue.

Main Program Window

When the loading procedure is complete, the **Main Program** window displays. This window contains the unvalidated data loaded from your host system. The model is not validated until it is saved in the Model (*.mdl) format.

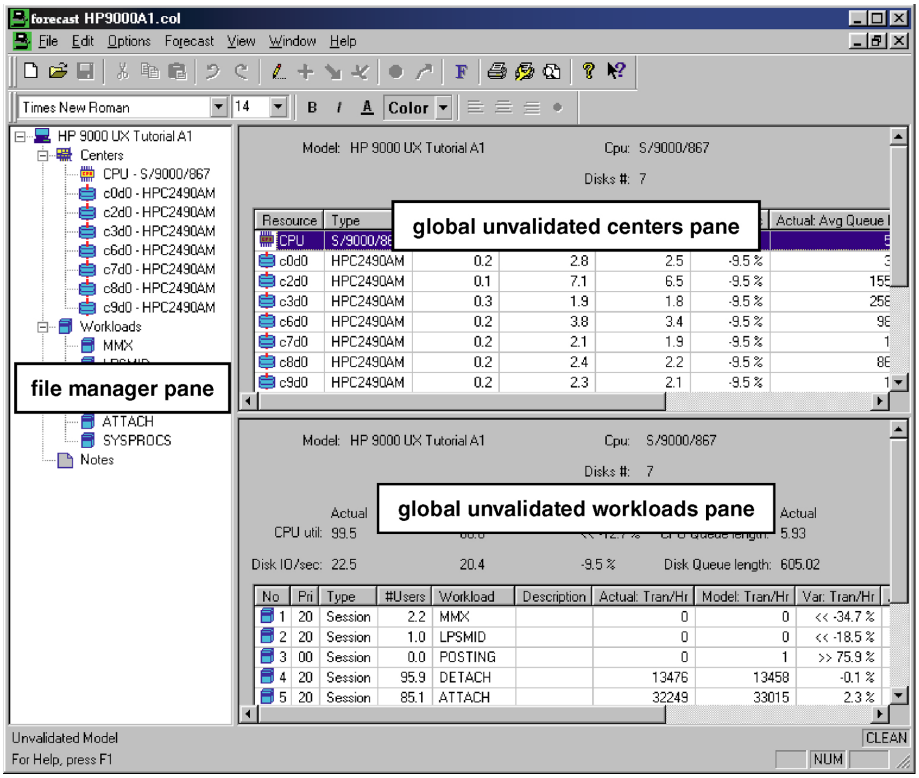


Figure 6.4 *Main Program window*

The **Main Program** window contains the following panes:

- The **file manager** pane is a representation of the unvalidated model in outline form.
  - To expand or collapse the outline, click the Plus (+) or Minus (-) icons (respectively).
  - To access detailed information, click the individual CPU, Disk, or Workload icons.
  - To edit items within the **file manager** pane, double-click the associated icon.
- The **global unvalidated centers** pane displays the results for each CPU and disk drive in the model. To view detailed information on a single resources in the model, click on the associated icon in the **file manager** pane.
- The **global unvalidated workloads** pane displays the results for each workload group included in the model. To view detailed information on a single workload group in the model, click on the associated icon in the **file manager** pane.

Reviewing Validation Thresholds

Normally, you would review the data in the **Main Program** window to determine if the model is a valid representation of the system's baseline performance. For this exercise, assume that the model is valid.

Acceptable validation thresholds are listed in Table 6.1.

Table 6.1 *Acceptable resource validation thresholds*

Resource	Acceptable Validation Threshold
CPU utilization	15 percent
Transaction/hour (throughput)	15 percent
Response time	30 percent
Disk I/O/second	Variances for disk I/O/second and disk queue length are ignored because most real-world situations do not account for issues like database spreading.
Disk queue length	

It is common for values to be outside the acceptable range on the first attempt at validating a model. If your numbers are out of range, review your workload definitions as described in "Identifying and Characterizing Workload Groups" on page 14.

Validating the Baseline Model

Validate the baseline model you have created:

1. On the **Forecast** menu, click **Validated Model**.
2. In the **Forecast** dialog box, click **Yes** to begin the validation process. Notice that the name of the document changes from **HP9000A1.col** to **HP9000A1.mdl**.
3. On the **File** menu, click **Save Model**.
4. In the **Save As** dialog box, click **Save** to save the model in the default location on your computer.

Graphing the Model

The validated model created in the previous steps provides an accurate snapshot of your host system. The real power of Forecast Capacity Planner is its ability to predict future performance based on user-supplied "what-if" scenarios designed to illustrate the forecasting and graphing capabilities of the software.

The examples in this section are based on the following assumptions:

- Standard system performance tuning (defragging and balancing disk drives, repacking the database, etc.) will not significantly reduce CPU utilization or dramatically improve online response time, or reduce batch job completion time.
- Workload definitions on the host system are unchanged.
- Memory size and the type of disk drives are unchanged.

One CPU with Zero Growth Rate

For this example, graph the model validated in the previous exercises and assume no change in utilization occurs for 12 months.

To create the graph:

1 On the **Forecast** menu, click **Forecast Options**.

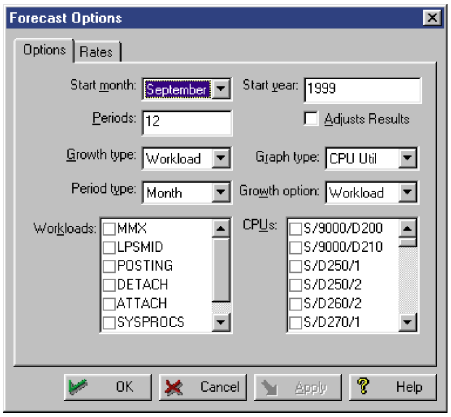


Figure 6.5 *Forecast Options dialog box: Options tab*

2 In the **Forecast Options** dialog box, verify the number in the **Periods** box is **12**.

3 In the **Growth Type** list box, select **Linear**.

4 Verify the **Period type** is **Month**.

5 In the **Workloads** list box, verify that only the **All Workloads** check box is selected.

6 Select the **Adjust Results** check box.

7 In the **Graph Type** list box, verify that **CPU Util** is selected.

8 In the **Growth Option** list box, click **Override**.

9 In the **CPUs** list box, verify that only the **S/9000/867** check box is selected (clear all other check boxes in the CPUs list box).

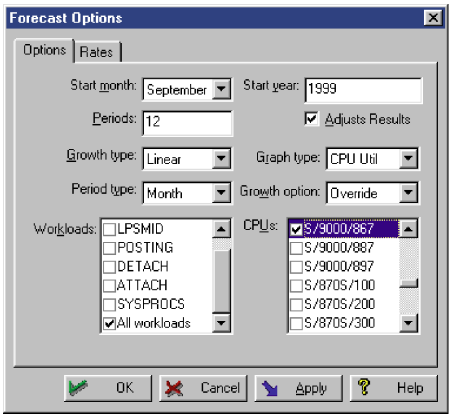


Figure 6.6 *Forecast Options dialog box: Options tab with new settings*

10 In the **Forecast Options** dialog box, click the **Rates** tab (see Figure 6.7).

11 Verify that **Tiered Rate** and **Growth Rate** are both set to **0** (zero).

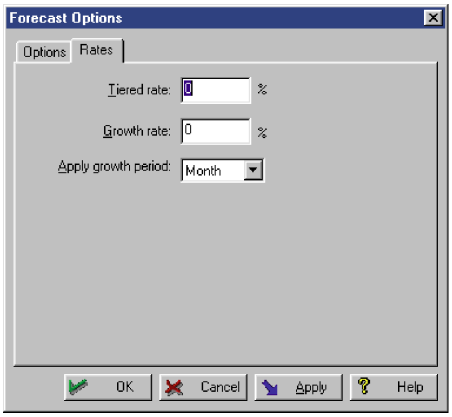


Figure 6.7 *Forecast Options dialog box: Rates tab*

12 Click **OK** to close the **Forecast Options** dialog box and save your changes.

13 On the **Options** menu, ensure that **Prompt for titles** is not enabled. (See “Prompt for all disks” on page 100.)

14 On the **Forecast** menu, click **Graph Forecast**. The forecast graph displays (see Figure 6.8).

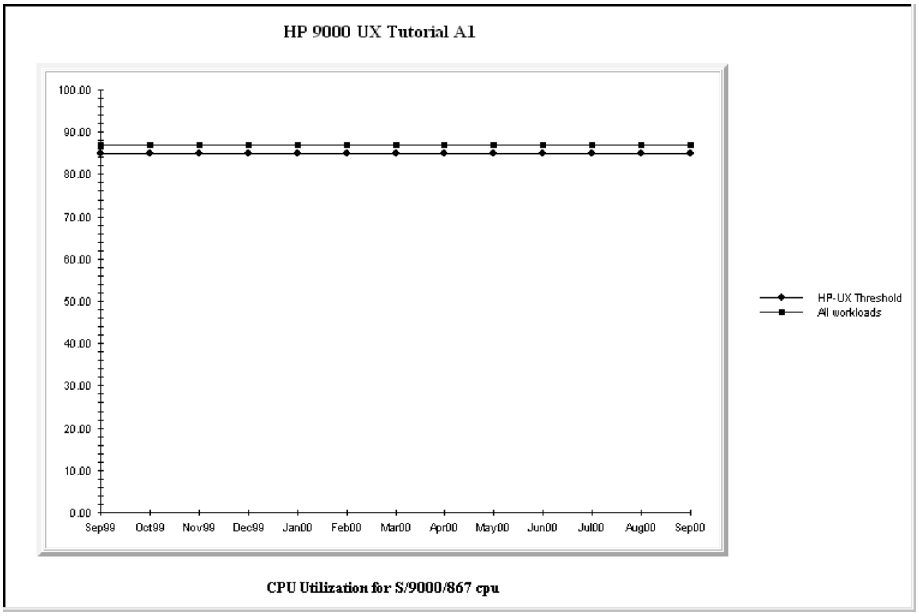


Figure 6.8 *Baseline graph for one CPU with zero growth rate*

NOTE If the graph labels are overlapped, adjust the Font and Size parameters in the Graph Options dialog box from the Options menu (see "Fonts Options" on page 85 and "Sizes Options" on page 86). The graph in Figure 6.8 has the parameters listed in the following two tables:

Table 6.2 *Suggested Font parameters*

Font Parameter	Font	Bold	Italic
Header font	Times New Roman	3	
Footer font	Times New Roman	3	
Legend font	Arial		
Label font	Arial		

Table 6.3 *Suggested Size parameters*

Size Parameter	Size
Header font size	16
Footer font size	14
Legend font size	10
Label font size	10

The lower line in the graph (HP-UX Threshold) represents the CPU utilization threshold of 85 percent. This is the default threshold limit for the HP-UX and is generally considered the level at which response time and batch process completion rates become unacceptable. (For information on changing threshold limits, see “Setting Thresholds” on page 113.)

The upper line in the graph represents overall CPU utilization for all workload groups identified in the model. The modeled CPU utilization of 87 percent is 2 percent above the threshold limit of 85 percent.

Four CPUs with Zero Growth Rate

For this example, compare the baseline forecast for your original model with three larger CPUs.

To create the graph:

1. On the **Forecast** menu, click **Forecast Options**.
2. In the **Forecast Options** dialog box, select the following CPU check boxes in the **CPUs** list box:
   - **S/9000/867** (CPU selected in original model)
   - S/9000/897
   - S/870S/400
   - S/890/400
3. Click **OK** to close the **Forecast Options** dialog box and update your graph.

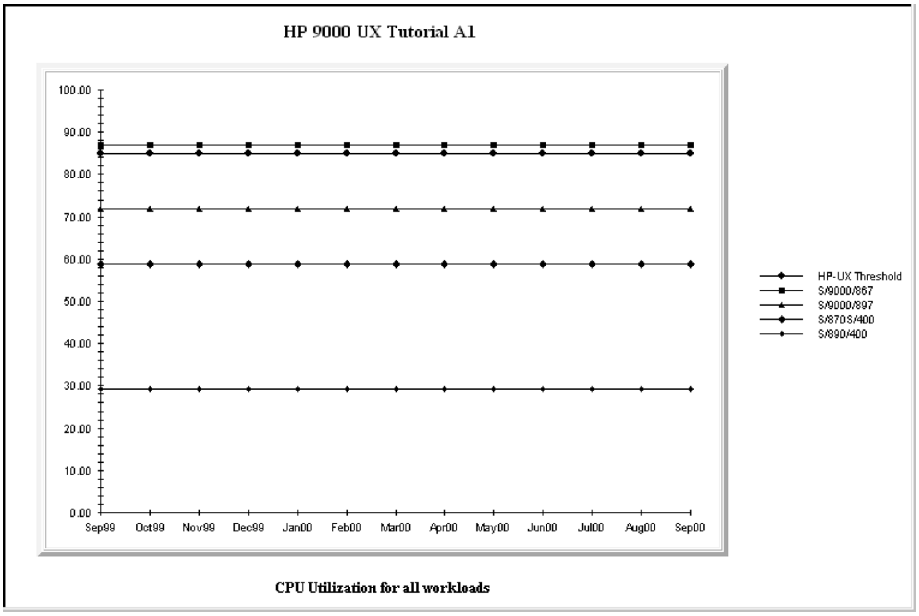


Figure 6.9 *Baseline graph for four CPUs with zero growth rate*

The second line in the graph (XL Threshold) represents the 85 percent CPU utilization threshold for HP-UX. The other four lines represent the CPU utilization for each of the four CPUs, based on the workload groups identified in the original model.

As expected, the larger CPUs show a lower utilization rate for the modeled workload groups. The S/890/400, for example, can handle the same workload groups with approximately 29 percent CPU utilization, compared with 87 percent CPU utilization on the S/9000/867.

Four CPUs with Five-percent Growth Rate

Utilization and other system variables change over time. Repeat the forecast with a five-percent growth rate for all four CPUs.

To create the graph:

1. On the **Forecast** menu, click **Forecast Options**.
2. In the **Forecast Options** dialog box, verify the check boxes for the following CPUs are selected in the **CPUs** list box:
   - S/9000/867
   - S/9000/897
   - S/870S/400
   - S/890/400

3 Click the **Rates** tab in the **Forecast Options** dialog box.

4 Click in the **Growth Rate** text box and type **5**.

5 Click **OK** to close the **Forecast Options** dialog box and update your graph.

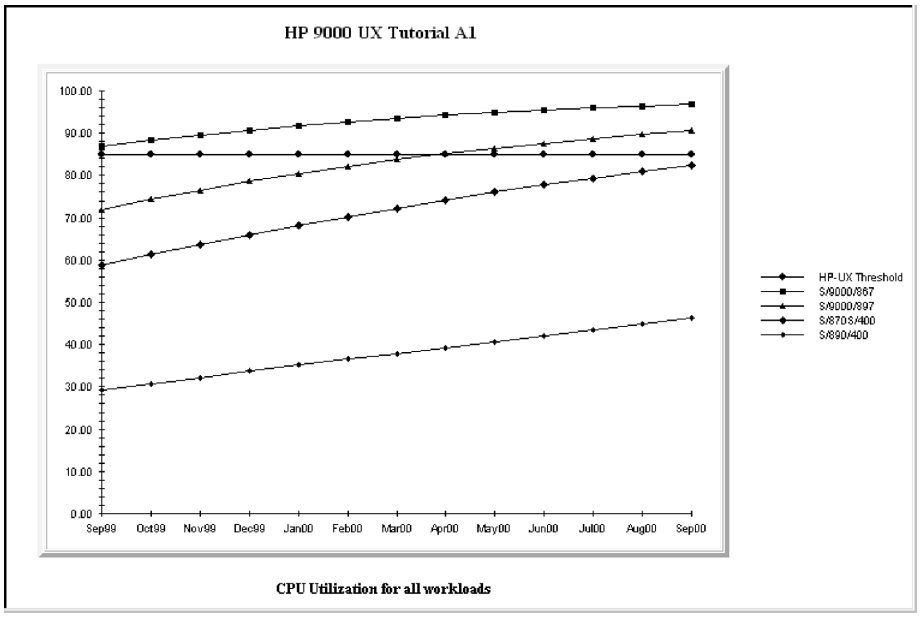


Figure 6.10 *Baseline graph for four CPUs with five-percent growth rate*

This graph represents the modeled utilization rate for the S/9000/867 relative to the rates for the larger CPUs at a growth rate of five percent over 12 months. Notice that the model does not simply add five-percent utilization to the rate for each month. The five-percent growth rate is a factor used to calculate the growth of each of the workload groups, subject to the modeled capacity of the system.

Utilization by Workload Group for One CPU

For the last example, graph your original model for the S/9000/867 for each workload group, assuming a five-percent growth rate.

To create the graph:

1 On the **Forecast** menu, click **Graph Forecast** to return to the **Main Program** window. Note the percent utilization for each workload group displayed in the **global unvalidated workloads** pane (see Figure 6.11).

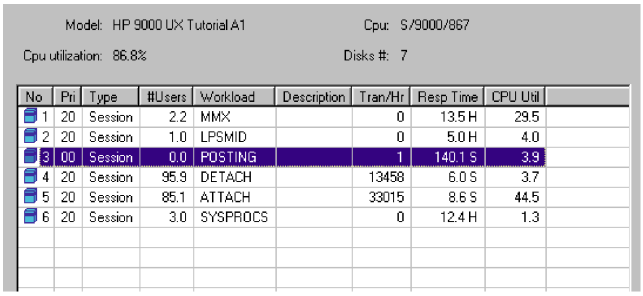


Figure 6.11 *Main Program window: global unvalidated workloads pane*

The CPU utilization for each workload group should read:

- MMX: 29.5
- LPSMID: 4.0
- POSTING: 3.9
- DETACH: 3.7
- ATTACH: 44.5
- SYSPROCS: 1.3

2 On the **Forecast** menu, click **Forecast Options**.

3 In the **Forecast Options** dialog box, deselect all of the CPUs except the **S/9000/867** in the **CPUs** list box.

4 In the **Workloads** list box, deselect the **All Workloads** check box. Select each of the five workload groups individually.

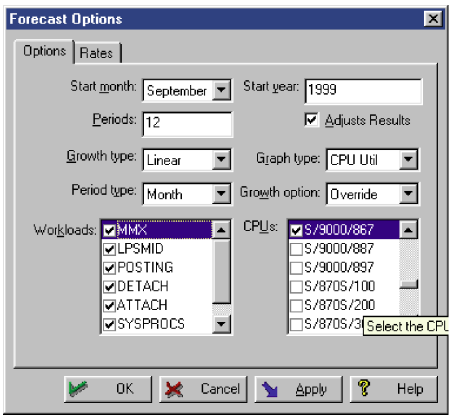


Figure 6.12 *Forecast Options dialog box, Options tab*

5 Click **OK** to close the **Forecast Options** dialog box and save your changes.

6 On the **Forecast** menu, click **Graph Forecast**. The forecast graph displays.

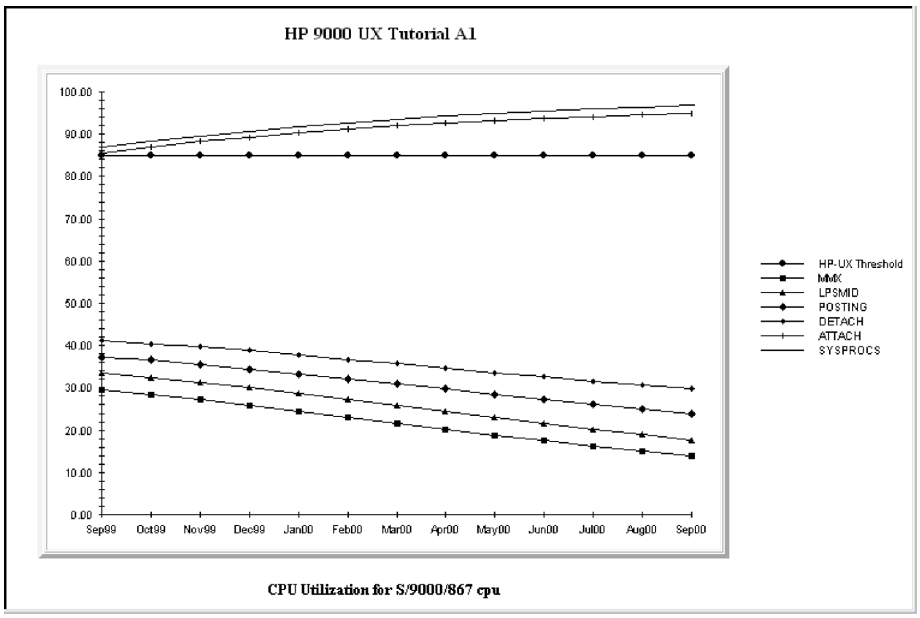


Figure 6.13 *Graph showing utilization by workload group for one CPU*

The utilization growth for each workload group is plotted based on the workload definition given in the data collection file and the constraints in the original model. *As expected, the larger workload groups, **JOBS** and **ORDER ENTR**, contribute the most to the 85-percent system threshold.* Some

workload groups show a decline in CPU utilization. This is due to the fact that the CPU has reached its maximum load potential. Since these groups are less important and run in a lower priority status, they will receive less of the CPU resource as the higher priority groups take more.

This type of forecasting can predict the impact of adding workload groups to an existing system. It is also useful in balancing workload groups across multiple systems.

On the **File** menu, click **Close**. Save your sample file if desired.

7

FORECAST WINDOW PANES

Main Program Window Panes (Unvalidated)

The **Main Program** window enables you to review data on the host system for accuracy before the model is validated. Although the window structure is the same, some of the sub windows in the **Main Program** window function differently when viewing an unvalidated model.

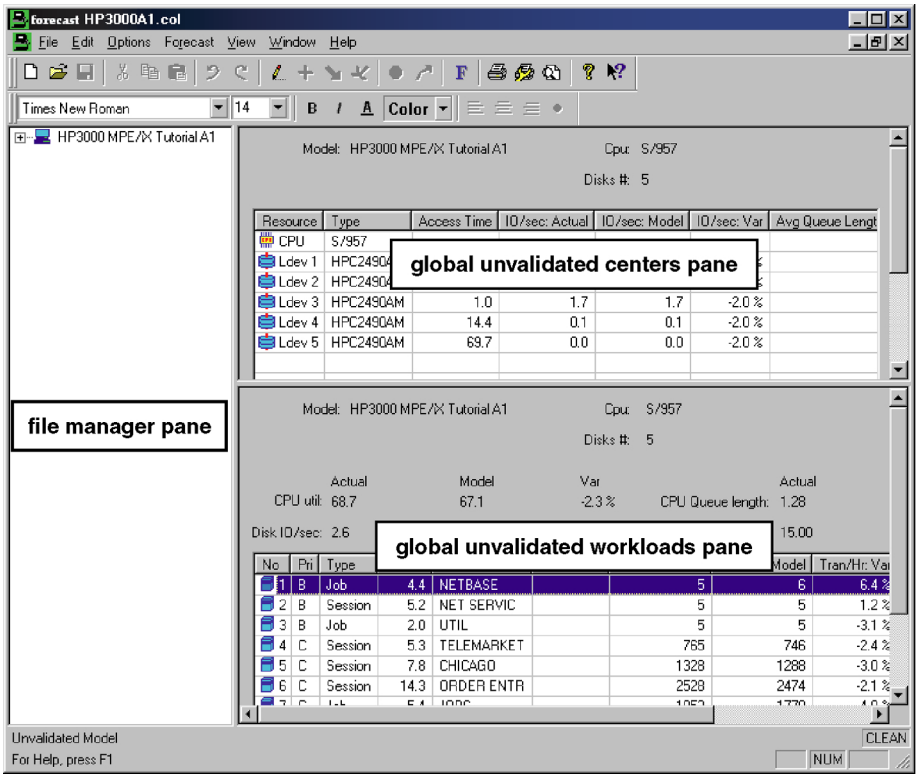


Figure 7.1 *Main Program window (unvalidated model)*

The **Main Program** window is divided into three panes:

- The **file manager** pane.
- The **global unvalidated centers** pane.
- The **global unvalidated workloads** pane.

File Manager Pane

The **file manager** pane contains an outlined view of the model. It provides a quick and easy way to access and change information about the model.

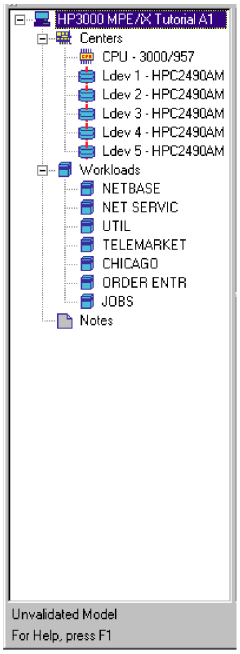


Figure 7.2 *Main Program window: file manager*

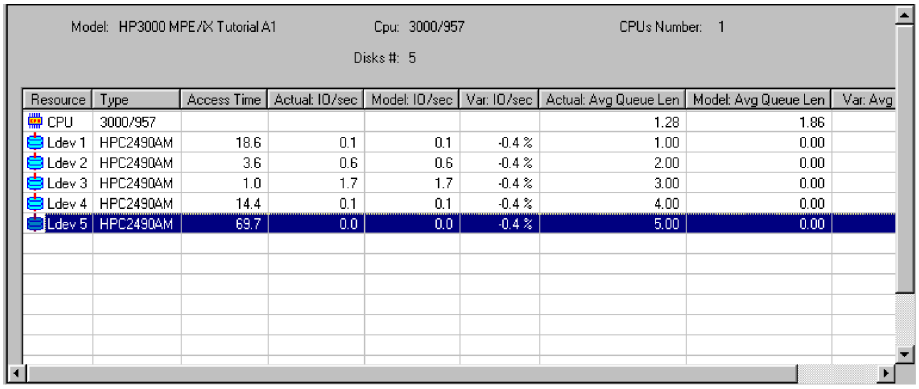
From the **file manager**, you can:

- Expand or collapse the outline by clicking the Plus (+) or Minus (-) icons.
- Change the view in the right-hand side of the **Main Program** window by clicking the icons in the **file manager** pane:
  - Click the Centers icon to change the right part of the window to and expanded view of the **global unvalidated centers** pane.
  - Click the Workloads icon to change the right part of the window to and expanded view of the **global unvalidated workloads** pane.

- Edit the model name by double-clicking the Model icon.
- Edit the individual resources (CPU or disk drive) or workload groups by double-clicking the appropriate icon in the **file manager** pane.

Global Unvalidated Centers Pane

The **global unvalidated centers** pane in the **Main Program** window displays the results for each CPU and disk drive in the model.



Resource	Type	Access Time	Actual: IO/sec	Model: IO/sec	Var: IO/sec	Actual: Avg Queue Len	Model: Avg Queue Len	Var: Avg
CPU	3000/957					1.28	1.86	
Ldev 1	HPC2490AM	18.6	0.1	0.1	-0.4 %	1.00	0.00	
Ldev 2	HPC2490AM	3.6	0.6	0.6	-0.4 %	2.00	0.00	
Ldev 3	HPC2490AM	1.0	1.7	1.7	-0.4 %	3.00	0.00	
Ldev 4	HPC2490AM	14.4	0.1	0.1	-0.4 %	4.00	0.00	
Ldev 5	HPC2490AM	69.7	0.0	0.0	-0.4 %	5.00	0.00	

Figure 7.3 *Main Program window: global unvalidated centers pane*

Global results are listed by:

- **Resource Name**
- **Resource Type**
- **Access Time**
- **IO/sec:**
  - Actual
  - Model
  - Variation between the model and the actual data as a percentage
- **Average Queue Length:**
  - Actual
  - Model
  - Variation between the model and the actual data as a percentage

Global Unvalidated Workload Pane

The global unvalidated workloads pane displays the results for each CPU and disk drive in the model.

Global results are listed by:

- **Number**

  The number of each workload group.

- **Priority**

  Which queue the workload group is in.

- **Type**

  Whether the workload group is a JOB or TRANSACTION.

- **Number of users**

  The number of users who were on the system during the sampling interval.

- **Workload**

  The name given to the workload groups.

- **Description**

  If the workload group was given a description beyond a name and definition.

- **Transactions/Hour:**
  - Actual
  - Model
  - Variation between the model and the actual data as a percentage
- **Response Time:**
  - Actual
  - Model
  - Variation between the model and the actual data as a percentage
- **CPU Utilization:**
  - Actual
  - Model

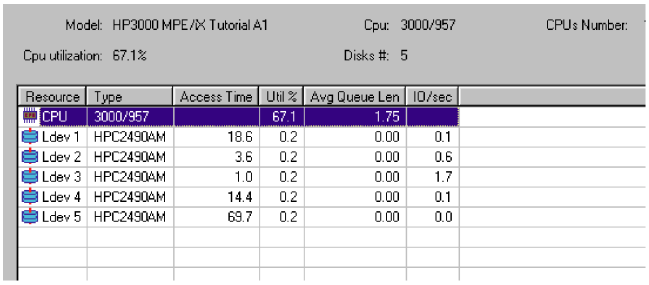
To view detailed information on a single resource in the model, click the associated icon in the **file manager** pane.

Main Program Window Panes (Validated)

Once the model is validated, the data fields in the **global validated centers** pane and the **global validated each workload group** pane change to reflect the validated model as shown in Figure 7.4 and Figure 7.5, respectively.

Global Validated Centers Pane

The **global validated centers** pane displays the modeled data for each CPU and disk drive in the model.



Resource	Type	Access Time	Util %	Avg Queue Len	IO/sec
CPU	3000/957		67.1	1.75	
Ldev 1	HPC2490AM	18.6	0.2	0.00	0.1
Ldev 2	HPC2490AM	3.6	0.2	0.00	0.6
Ldev 3	HPC2490AM	1.0	0.2	0.00	1.7
Ldev 4	HPC2490AM	14.4	0.2	0.00	0.1
Ldev 5	HPC2490AM	69.7	0.2	0.00	0.0

Figure 7.4 *Main Program window (validated model): global centers pane*

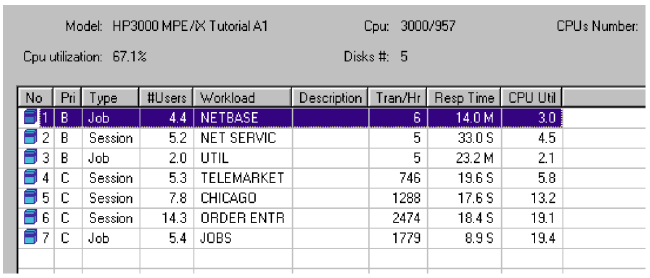
To view detailed information on a single resource in the model, click on the associated icon in the **file manager** pane.

Results are listed by:

- **Resource Name -** name of the hardware device as seen by the operating system.
- **Resource Type -** identification name of the hardware.
- **Access Time -** average access time for all processes.
- **Utilization** as a percent of total.
- **Average Queue Length** for the validated model.
- **IO/sec** for the validated model.

Global Validated Workload Pane

The **global validated workload** pane in the **Main Program** window displays the modeled data for each workload group included in the model (see Figure 7.5).



No	Pri	Type	#Users	Workload	Description	Tran/Hr	Resp Time	CPU Util
1	B	Job	4.4	NETBASE		6	14.0 M	3.0
2	B	Session	5.2	NET SERVIC		5	33.0 S	4.5
3	B	Job	2.0	UTIL		5	23.2 M	2.1
4	C	Session	5.3	TELEMARKET		746	19.6 S	5.8
5	C	Session	7.8	CHICAGO		1288	17.6 S	13.2
6	C	Session	14.3	ORDER ENTR		2474	18.4 S	19.1
7	C	Job	5.4	JOBS		1779	8.9 S	19.4

Figure 7.5 *Main Program window (validated model): global workloads pane*

To view detailed information about a particular workload in the model, click the associated icon in the **file manager** pane.

Results are listed by (see "Global Unvalidated Workload Pane" on page 64 for descriptions):

- **Number**
- **Priority**
- **Type**
- **Number of Users**
- **Workload Name**
- **Description**
- **Transactions/Hour** for the validated model.
- **Response Time** for the validated model
- **CPU Utilization** for the validated model

8

MENUS AND COMMANDS

Overview

Forecast Capacity Planner has a total of seven main menus. (The **Edit**, **Forecast**, and **Window** menus will not display until a collection or model is loaded.)

Figure 8.1 *Forecast Menu Bar (validated model)*

The Forecast Capacity Planner menus and their contents change as you proceed through the loading, validation, and forecast graphing processes, depending on the current open window and the status of the current model. There are three main windows in the program:

- **Logo** screen
- **Main Program** window (unvalidated model)
- **Main Program** window (validated model)

File Menu and Commands

The **File** menu (shown in Figure 8.2) lists commands to:

- Create, load, save, close, and delete models
- Print and send reports
- Load and save resources
- Load, save, and restore a desktop
- Recall a recently-used file
- Exit the program

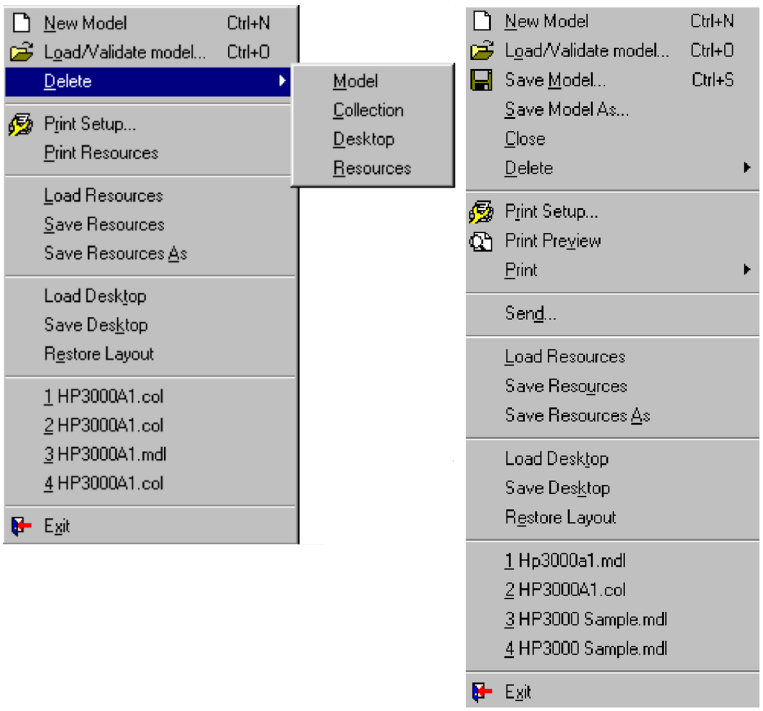


Figure 8.2 *File menu before and after loading a collection*

New Model

The **New Model** command enables you to create a blank model and enter the data manually without the use of a data collection file. If you plan to use this option, please contact Lund Performance Solutions for assistance (see "Lund Performance Solutions Technical Support Team" on page 4).

To open a new model:

1. On the **File** menu, click **New Model**.
2. On the **File** menu, click **Save Model As...**.
3. In the **Save As** dialog box, click **Save** to save the model to the default location on your computer.

NOTE When creating a new model, it is possible to populate the new model from an existing one. Open an existing model and a new model, select a workload group from the existing model and drag the workload group to the Workloads pane of your new model.

Load/Validate Model

The **Load/Validate Model** command opens an existing model file (*.mdl) or a new collection file (*.col).

To load and validate a new model:

1 On the **File** menu, click **Load/Validate Model**. The **Open** dialog displays.

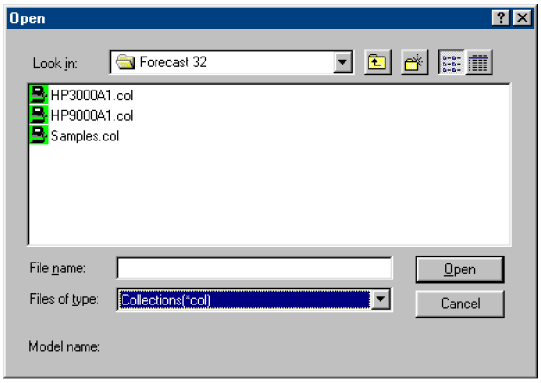


Figure 8.3 *Open dialog box*

2 In the **Files of type** list, select **Collections (*col)**.

3 Click once on the collection file to select the file.

4 Click **Open** to load the collection file. If naming conventions between the host system and the PC differ, the **Choose CPU** dialog box will appear (see Figure 8.4).

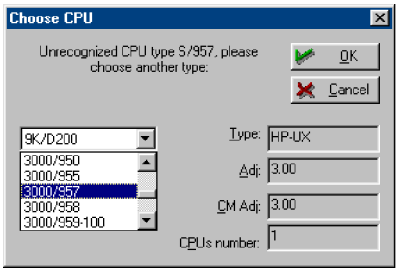


Figure 8.4 *Choose CPU dialog box*

Once you have found and selected the appropriate CPU, click OK. If you can not find your CPU by name, then you can choose a CPU that closely resembles your CPU based on the following settings:

- Type: the type of system (i.e. MPE or HP-UX).
- Adj: relative performance factor. This number is produced by Hewlett-Packard.
- CM Adj: Compatibility Mode performance factor. Certain CPUs have a more difficult time running software that is written in CM mode rather than Native mode.
- CPUs number: how many CPUs are contained within the system.

5 As the loading process runs, a list of warnings and informational messages appear in the **Validation Messages** dialog box.

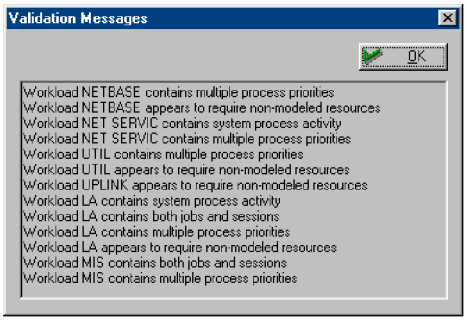


Figure 8.5 *Validation Messages dialog box*

Validation messages provide information about workload groups that may violate one or more modeling algorithm assumptions (see "Queuing Model Algorithm Assumptions" on page 118).

6 Review the messages presented in the **Validation Messages** dialog box and decide what, if any, influence they have on your model. Consider the following examples.

Table 8.1 *Example validation messages*

Validation Message	Description
Workload NETBASE contains multiple process priorities	"Multiple process priorities" means that there are processes defined in the NETBASE workload group with different queues. Therefore, the NETBASE workload group may not be homogeneous. (See "Identifying and Characterizing Workload Groups" on page 14 for information on homogeneous workload groups.) In these cases, the program assumes the highest priority for all processes.

Validation Message	Description
Workload LA contains both jobs and sessions	The workload group LA contains both jobs (batch processes) and sessions (interactive processes). Batch and interactive processes use system resources differently. (See “Identifying and Characterizing Workload Groups” on page 14 for information on mixing batch and interactive processes in single workload groups.)

In both examples, it may or may not be necessary to redefine the workload groups and repeat the collection and reduction processes on the host system. For instance, if the workload group NETBASE accounts for only a small percentage of total CPU utilization on the host system, the effect on the model and your forecast may be negligible.

7 You can print the contents of the **Validation Messages** box for reference. (See “Print Notes” on page 74.)

8 Once you are satisfied that the messages in the **Validation Messages** dialog box will not affect the model, click **OK** to close the box and complete the loading process.

Save Model

The **Save Model...** command saves the active document to the current name and directory. If you want to change the name or directory before saving the model, choose the **Save Model As...** command instead.

To save a validated model: On the **File** menu, click **Save Model...**.

Save Model As...

The **Save Model As...** command enables you to save and name a validated model using a standard Windows **Save As** dialog box. (Refer to your Windows documentation for instructions.) To save an active document without changing the name or directory, choose the **Save Model** command instead.

Close

Use the **Close** command to close all active windows in the document and return to the **Logo** screen. When you close an unnamed document, the **Save As** dialog box will display so you can name and save the document.

Delete

The **Delete** menu item has four submenu commands that enable you to delete the forecast model or specific components of the model:

- **Model**
- **Collection**
- **Desktop**
- **Resources**

Delete Model

The **Delete Model** command enables you to delete a model.

1 On the **File** menu, click **Delete**.

2 From the **Delete** submenu, click **Model**.

3 In the **Delete model file** dialog box, select the model file (*.mdl) to delete.

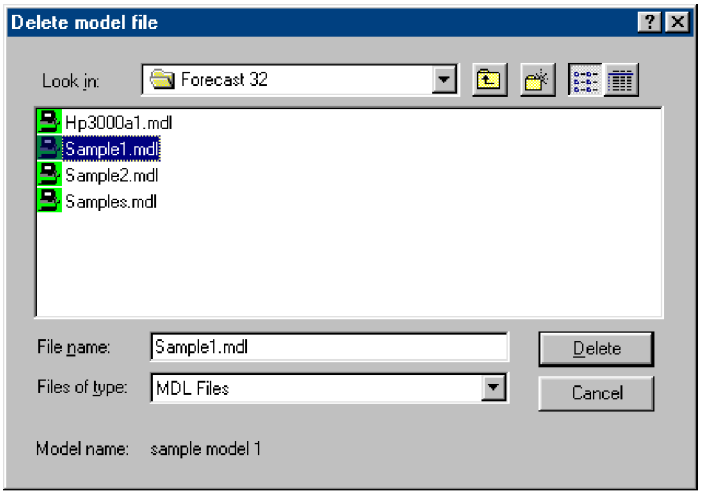


Figure 8.6 *Delete model file dialog box*

4 Click **Delete** to delete the file, or click **Cancel** to abort the deletion process.

Delete Collection

The **Delete Collection** command enables you to delete a collection file.

1 On the **File** menu, click **Delete**.

2 From the **Delete** submenu, click **Collection**.

3 In the **Delete collection file** dialog box, select the collection file (*.col) to delete.

4 Click **Delete** to delete the file, or click **Cancel** to abort the deletion process.

Delete Desktop

The **Delete Desktop** command enables you to delete a desktop file.

1 On the **File** menu, click **Delete**.

2 From the **Delete** submenu, click **Desktop**.

3 In the **Delete desktop file** dialog box, select the desktop file (*.dsk) to delete.

4 Click **Delete** to delete the file, or click **Cancel** to abort the deletion process.

Delete Resources

The **Delete Resources** command enables you to delete a resource file.

1 On the **File** menu, click **Delete**.

2 From the **Delete** submenu, click **Resources**.

3 In the **Delete resource file** dialog box, select the resource file (*.dat) to delete.

4 Click **Delete** to delete the file, or click **Cancel** to abort the deletion process.

Print Setup...

The **Print Setup...** command opens the **Print** dialog box.

1 On the **File** menu, click **Print Setup...**.

2 Select the pages to print, the number of copies, the destination printer, and other standard Windows print options.

3 Click **OK**.

Print Preview

The **Print Preview** command opens the report document for the active model in the **Print Preview** window as it will appear when printed. Use the **Print Preview** toolbar to view pages in the document, zoom in or out, and begin the printing process.

1 On the **File** menu, click **Print Preview...**.

- Use the **Zoom In** button to examine the page in closer detail, then click the **Zoom Out** button to view the entire page.
- Use the **Next Page** and **Previous Page** buttons to view multiple pages, one page at a time.
- Use the **Two Page** button to view two consecutive pages, side by side.

2 When you finish previewing the chart(s), either click **Close** to return to the program window, or choose the **Print...** command button to send the chart(s) to the printer.

Print

The **Print** command, with the exception of the **Print Resources** submenu command, is not available in the **Logo** screen or the **Main Program** window of an unvalidated model.

The **Print** command has four submenu commands that enable you to print a forecast model, graph, validation notes, the current screen, or resources associated with the current model.

Print Model

The **Print Model** command sends the forecast report for the active model to your default printer.

Print Graph

The **Print Graph** command creates a graph for the active model and sends it to your default printer.

Print Notes

The **Print Notes** command sends the validation notes for the active model to your default printer.

Print Screen

The **Print Screen** command sends a graphic representation of the current screen to your default printer.

Print Resources

The **Print Resources** command sends the complete listing of all the available CPUs and disks listed in Forecast to your default printer. This listing also includes the CPU adjustment factor for HP-UX systems, the Native Mode and Compatibility Mode factors for MPE, and the Access Time for each disk. This command is available from the **Logo** screen and the **Main Program** window of an unvalidated model.

Send...

The **Send** command enables you to send the active model as an e-mail attachment file using the Microsoft Exchange Setup Wizard. (Please refer to your Windows documentation for information.)

Load Resources

The **Load Resources** command loads a new resource file.

1. On the **File** menu, click **Load Resources**.
2. In the **Load Resources From** dialog box, select the resource file (*.dat) to load.
3. Click **OK**.

Save Resources

The **Save Resources** command saves the currently-loaded resource file using the same file name and directory location. To change the file name or directory location, choose the **Save Resources As...** command.

Save Resources As

The **Save Resources As...** command enables you to save the currently-loaded resource file with a different file name or directory location using the **Save Resources As** dialog box.

Load Desktop

A *desktop* is the current state of the Forecast Capacity Planner display area, which includes the size and position of the **Main Program** window, saved to disk as a desktop file (*.dsk).

The **Load Desktop** command loads a previously-saved desktop file (*.dsk).

1. On the **File** menu, click **Load Desktop**.
2. In the **Open** dialog box, select the desktop file to open.
3. Click **Open** to load the file or **Cancel** to abort the process.

Save Desktop

At any time during the validating and forecasting processes, you can save and rename the current desktop to preserve any changes to the model. This can be useful if you plan to generate multiple-performance projections from your baseline model.

The **Save Desktop** command saves all of your current settings, links to currently-opened files, and window layout options, as a named file using the **Save As** dialog box.

Restore Layout

The **Restore Layout** command restores all settings from a previously-saved desktop, without opened files or layout options.

1 On the **File** menu, click **Restore Layout**.

2 From the **Open** dialog box, select the desktop file (*.dsk) to restore.

3 Click **Open** to restore the file or click **Cancel** to abort the process.

Recently Used Files

The **File** menu contains a list of the four most-recently-used Forecast Capacity Planner files. On the **File** menu, click the file name to open the file.

Exit

The **Exit** command ends the current session of Forecast Capacity Planner. If the current model is not saved, the **Save As** dialog box displays so you can name and save the document.

Edit Menu and Commands

The **Edit** menu commands (Figure 8.7) are described in the following sections.

Figure 8.7 *Edit menu*

Undo

The **Undo** command cancels the last operation executed in the program. It is only available in the **Main Program** window of a validated model.

Redo

The **Redo** command restores the last operation cancelled by the **Undo** command. This command is only available in the **Main Program** window of a validated model.

Cut

The **Cut** command removes selected text or data from the document and places it in temporary memory so that the cut portion of the document can be inserted (pasted) elsewhere. This command is only available in the **Main Program** window of a validated model.

Copy

The **Copy** command duplicates selected text or data from a document and places it in temporary memory so that the copied portion of the document can be inserted (pasted) elsewhere (either in the same document or in another document). This command is only available in the **Main Program** window of a validated model.

Paste

The **Paste** command inserts selected text or data that has been cut or copied from one document into a different location in the same document or a different document. This command is only available in the **Main Program** window of a validated model.

Edit

The **Edit** command opens the **Edit** dialog box associated with the selected item:

- **workload group** (see “Editing a Workload Group” on page 122)
- **disk drive** (see “Editing a Disk Drive” on page 126)
- **CPU** (see “Editing a CPU” on page 126)

Add

The **Add** command adds a new disk drive or workload group to the end of the disk drive or workload group list that contains the selected item. CPUs cannot be added.

- **workload group** (see "Adding a Workload Group" on page 125)
- **disk drive** (see "Adding a Disk Drive" on page 127)

The **Add** command is only available in the **Main Program** window of a validated model.

Insert

The **Insert** command inserts a new disk drive or workload group following the selected like item on the screen. CPUs cannot be added.

- **workload group** (see "Inserting a Workload Group" on page 125)
- **disk drive** (see "Inserting a Disk Drive" on page 127)

This command is only available in the **Main Program** window of a validated model.

Delete

The **Delete** command eliminates the selected text or data from a document permanently. This command is only available in the **Main Program** window of a validated model.

Options Menu and Commands

The **Options** menu commands (Figure 8.8) are described in the following sections.

Figure 8.8 *Options menu*

Report Fonts

The **Report Fonts** command opens a standard Windows **Font** dialog box (Figure 8.9). The options selected in the **Font** dialog box affect the fonts in all reports and possibly the first graph display. (See also, “Fonts Options” on page 85.)

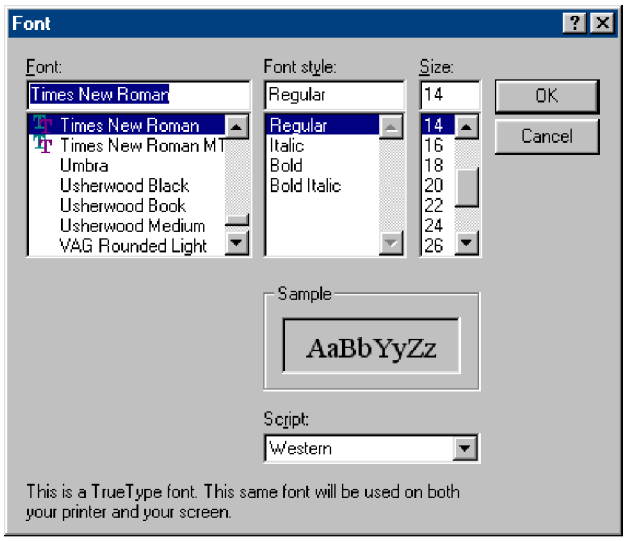


Figure 8.9 *Font dialog box*

View Options

The **View Options** command opens the **View Options** dialog box, which contains two tabs: **General** and **View Background**.

General View Options

To set general view options:

1 On the **Options** menu, click **View Options**. The **View Options** dialog box will display (Figure 8.10).

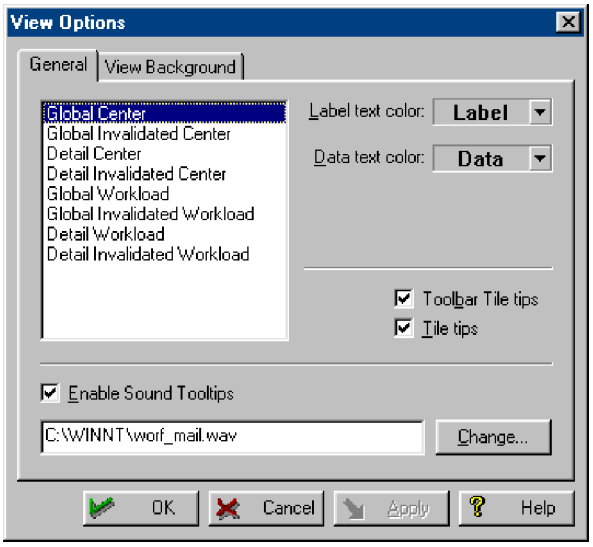


Figure 8.10 *View Options dialog box: General tab*

2 From the list box in the **General** tab, select the component of the model to which the option will apply.

3 From the **General** tab in the **View Options** dialog box, enter or select new options as described in Table 8.2.

Table 8.2 *General View options*

Option	Instructions
Label text color	1 From the **Label text color** drop-down list box, select a color to apply to the model component: • Select **Automatic** to apply the default color. • Select a pre-defined color swatch. • Select **More Colors...** and define your own custom color from the Color dialog box. 2 Click **OK** to apply the color.
Data text color	1 From the **Data text color** drop-down list box, select a color to apply to the model component: • Select **Automatic** to apply the default color. • Select a pre-defined color swatch. • Select **More Colors...** and define your own custom color from the Color dialog box. 2 Click **OK** to apply the color.
Toolbar Tile tips	Click to deselect/select the Toolbar Tile tips check box to disable/enable the tips associated with Toolbars.
Tile tips	Click to deselect/select the Tile tips check box to disable/enable tips associated with Forecast Capacity Planner tools.
Enable Sound Tooltips	Click to deselect/select the Enable Sound Tooltips check box to disable/enable a sound wave file (*.wav) to alert you to tool tips. Click the Change button to locate your favorite sound wave.

3 Click **OK** to apply the change(s) and return to the **Main Program** window, or click the **View Background** tab to change the background color.

View Background Options

To set general view options:

1 On the **Options** menu, click **View Options**.

2 In the **View Options** dialog box, click the **View Background** tab (Figure 8.11).

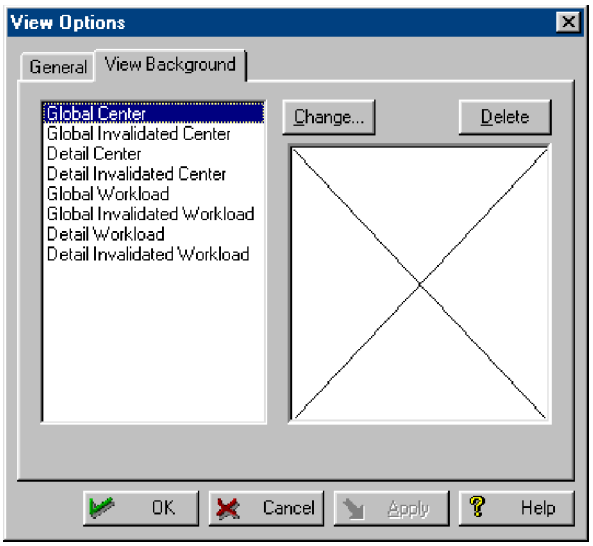


Figure 8.11 *View Options dialog box: View Background tab*

3 From the list box in the **View Background** tab, select the item to which the background will apply.

4 Click the **Change** button. Browse to select a background file (*.bmp) from another file location. (There are no preconfigured files.)

5 Click **Apply**. Repeat Steps 3 and 4 as needed to apply backgrounds to other items.

6 Click **OK** to return to the **Main Program** window.

To remove a custom background, click the **Delete** button instead of the **Apply** button in Step 5.

Report Options

Report Options are described in detail in "Setting Report Options" on page 135.

Graph Options

The **Graph Options** command opens the **Graph Options** dialog box, which contains:

- **General** tab (see “General Graph Options” on page 84)
- **Fonts** tab (see “Fonts Options” on page 85)
- **Sizes** tab (see “Sizes Options” on page 86)
- **Borders** tab (see “Borders Options” on page 87)
- **Aspects** tab (see “Aspect Options” on page 88)
- **Colors** tab (see “Colors Options” on page 90)
- **Chart Colors** tab (see “Chart Colors Options” on page 91)
- **Point Patterns** tab (see “Point Patterns Options” on page 92)
- **Fill Patterns** tab (see “Fill Patterns Options” on page 93)

The graph options affect the appearance of all forecast graphs. The graph options are saved in memory.

Forecast Graph Components

Figure 8.12 identifies some of the key components of a forecast graph that may be modified.

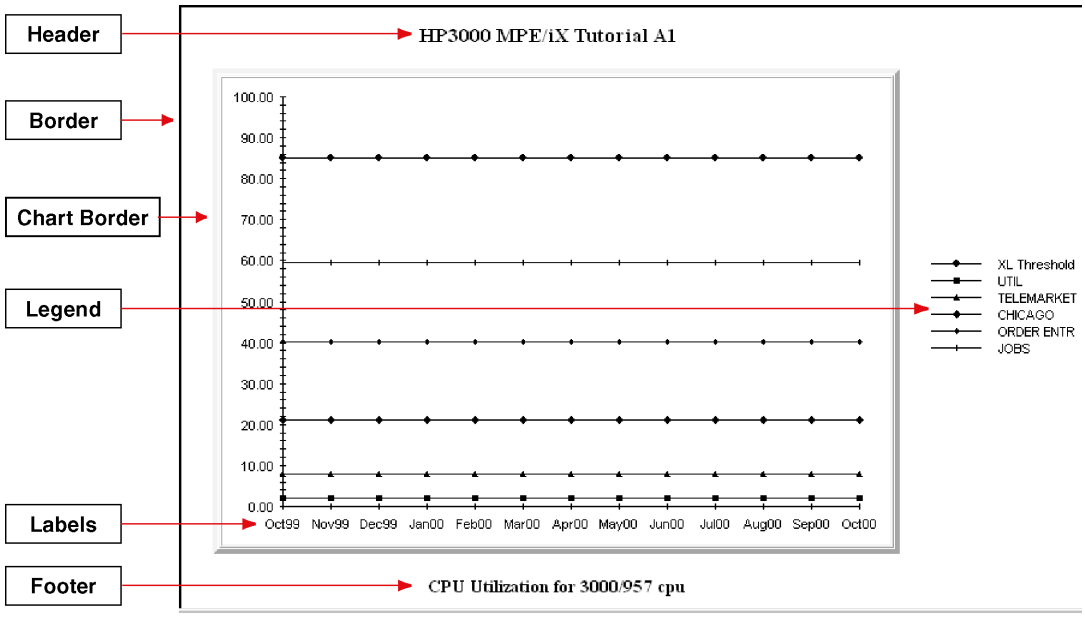


Figure 8.12 *Forecast graph components*

General Graph Options

The **General** graph options affect the size of the graph lines and data points.

To modify the **General** graph options:

1 On the **Options** menu, click **Graph Options**.

2 In the **Graph Options** dialog box, click the **General** tab (Figure 8.13).

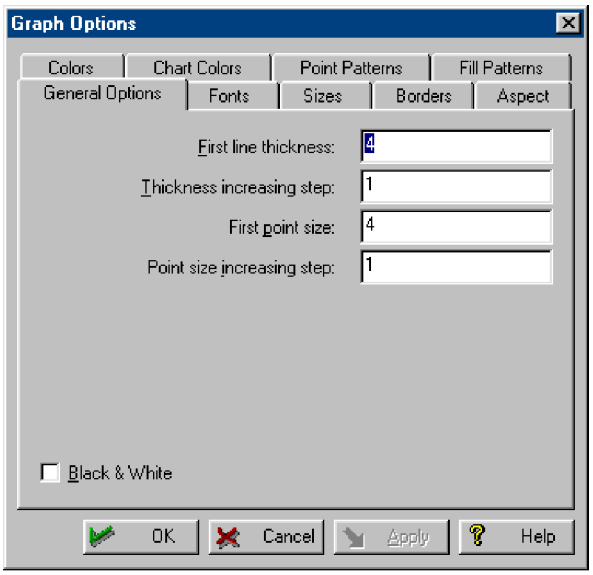


Figure 8.13 *Graph Options dialog box: General tab*

3 In the **General** tab, enter or select new options as described in Table 8.3.

4 Click **OK** to apply the change(s) and return to the **Main Program** window, or click another tab within the **Graph Options** dialog box.

Table 8.3 *General Graph options*

Option	Instructions
First line thickness	Assign a line thickness size (an integer from 1 to 20) to the first line in a graph.
Thickness increasing step	Assign a line thickness increment (an integer from 1 to 20) to be added to each consecutive line in a graph. Enter 0 (zero) to maintain the first line thicknesses for all lines.

Option	Instructions
First point size	Assign a point size (an integer from 1 to 20) to the first data line in a graph.
Point size increasing step	Assign a point size increment (an integer from 1 to 20) to be added to the data points of each consecutive line in a graph. Enter 0 (zero) to maintain the first point size for all lines.
Black and White (monochrome)	Select this check box to display all graphs in black and white (gray scale). This is useful when printing to a monochrome printer.

Fonts Options

The **Fonts** options affect the font and font style of the graph header, footer, legend, and labels. To modify the **Fonts** options:

1 On the **Options** menu, click **Graph Options**.

2 In the **Graph Options** dialog box, click the **Font** tab (Figure 8.14).

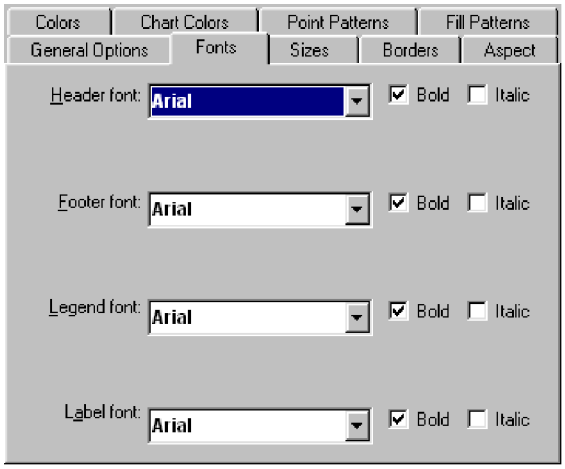


Figure 8.14 *Graph Options dialog box: Fonts tab*

3 In the **Fonts** tab, enter or select new options as described in Table 8.4.

4 Click **OK** to apply the change(s) and return to the **Main Program** window, or click another tab within the **Graph Options** dialog box.

Table 8.4 *Fonts options*

Option	Instructions
Header font	Select the font type and/or style (bold and/or italic) for the graph header.
Footer font	Select the font type and/or style (bold and/or italic for the graph footer.
Legend font	Select the font type and/or style (bold and/or italic for the graph legend.
Label font	Select the font type and/or style (bold and/or italic for the graph labels.

Sizes Options

The **Sizes** options affect the font size of the graph header, footer, legend, and labels. To modify the font **Sizes** options:

1 On the **Options** menu, click **Graph Options**.

2 In the **Graph Options** dialog box, click the **Sizes** tab (Figure 8.15).

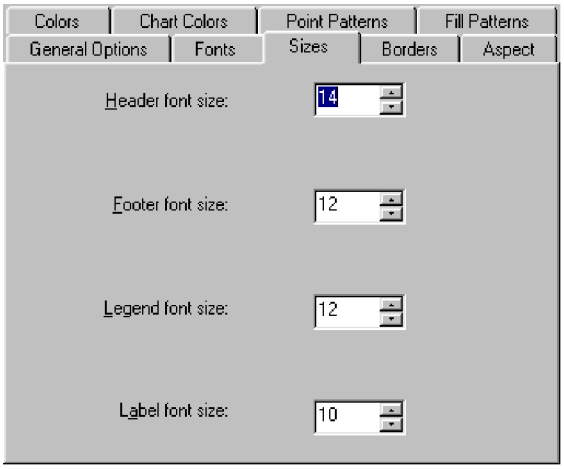


Figure 8.15 *Graph Options dialog box: Sizes tab*

3 In the **Sizes** tab, enter or select new options as described in Table 8.5.

4 Click **OK** to apply the change(s) and return to the **Main Program** window, or click another tab within the **Graph Options** dialog box.

Table 8.5 *Sizes options*

Option	Instructions
Header font size	Enter or select a font point size for the graph header.
Footer font size	Enter or select a font point size for the graph footer.
Legend font size	Enter or select a font point size for the graph legend.
Label font size	Enter or select a font point size for the graph labels.

Borders Options

The **Borders** options affect the style and width of the borders surrounding the graph header, footer, legend, and chart. To modify the **Borders** options:

1 On the **Options** menu, click **Graph Options**.

2 In the **Graph Options** dialog box, click the **Borders** tab (Figure 8.16).

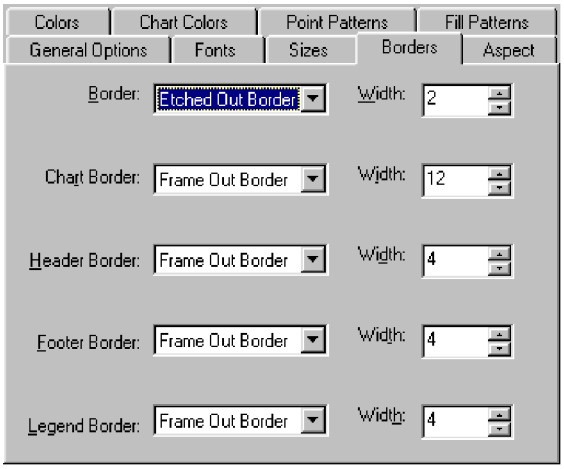


Figure 8.16 *Graph Options dialog box: Borders tab*

3 In the **Borders** tab, enter or select new options as described in Table 8.6.

4 Click **OK** to apply the change(s) and return to the **Main Program** window, or click another tab within the **Graph Options** dialog box.

Table 8.6 *Borders options*

Option	Instructions
Border	Select a border type and width (1-99 points) to apply to the each border. • No Border • 3-D In Border • 3-D Out Border. • Plain Border • Etched In Border • Etched Out Border • Frame In Border • Frame Out Border • Bevel Border
Chart Border	
Header Border	
Footer Border	
Legend Border	

Aspect Options

The **Aspect** options affect the type and characteristics of the chart. To modify the **Aspect** options:

1 On the **Options** menu, click **Graph Options**.

2 In the **Graph Options** dialog box, click the **Aspect** tab (Figure 8.17).

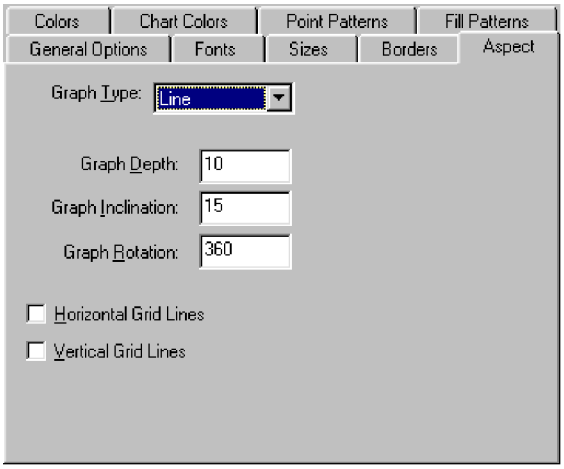


Figure 8.17 *Graph Options dialog box: Aspect tab*

3 In the **Aspect** tab, enter or select new options as described in Table 8.7.

4 Click **OK** to apply the change(s) and return to the **Main Program** window, or click another tab within the **Graph Options** dialog box.

Table 8.7 *Aspect options*

Option	Instructions
Graph Type	Select a graph type: line, bar, pie, stacked bar, or area.
Graph Depth	Assign a graph depth value (0-100 points). This adjusts the depth of the space surrounding the graph within the window.
Graph Inclination	Assign a graph inclination (0-100 points). This adjusts the three-dimensional view of a bar or stacked bar graph.
Graph Rotation	Assign a graph rotation (1-360 degrees). This adjusts the three-dimensional view of a bar or stacked bar graph.
Horizontal Grid Lines	Click to select/deselect this check box to show/hide horizontal grid lines.
Vertical Grid Lines	Click to select/deselect this check box to show/hide vertical grid lines.

Colors Options

The **Colors** options affect the background and foreground colors of the chart. To modify the **Colors** options:

1 On the **Options** menu, click **Graph Options**.

2 In the **Graph Options** dialog box, click the **Colors** tab (Figure 8.18).

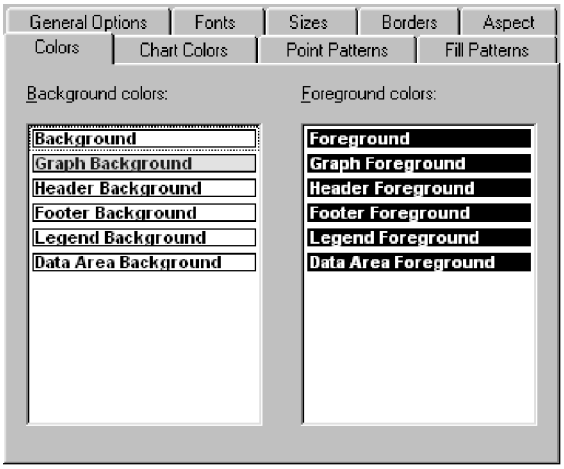


Figure 8.18 *Graph Options dialog box: Colors tab*

3 In the **Colors** tab, double-click a **Background** or **Foreground Color** item. The **Color** dialog box will display.

4 Select a new color or create a custom color and click **OK** to close the **Color** dialog box. Click **Apply**.

5 Repeat Steps 3 and 4 as needed to modify additional colors.

6 Click **OK** to apply the change(s) and return to the **Main Program** window, or click another tab within the **Graph Options** dialog box.

Chart Colors Options

The **Chart Colors** options affect the color assigned to each data line or data point in a chart. To modify the **Chart Colors** options:

1 On the **Options** menu, click **Graph Options**.

2 In the **Graph Options** dialog box, click the **Chart Colors** tab (Figure 8.19).

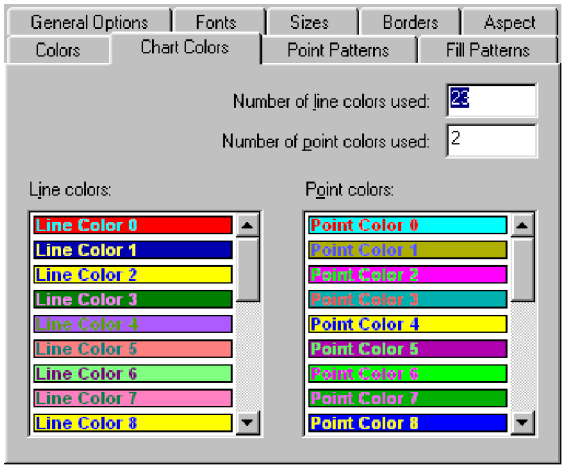


Figure 8.19 *Graph Options dialog box: Chart Colors tab*

3 In the **Chart Colors** tab, enter or select new options as described in Table 8.8.

4 Click **OK** to apply the change(s) and return to the **Main Program** window, or click another tab within the **Graph Options** dialog box.

Table 8.8 *Chart Colors options*

Option	Instructions
Number of line colors used	Enter the number of sequential line colors to apply to data lines.
Number of point colors used	Enter the number of sequential line colors to apply to data points.
Line colors	Scroll to view the sequence of line colors.
Point colors	Scroll to view the sequence of data point colors.

Point Patterns Options

The **Point Patterns** options affect the identifying character assigned to each data point within a chart. To modify the **Point Patterns** options:

1 On the **Options** menu, click **Graph Options**.

2 In the **Graph Options** dialog box, click the **Point Patterns** tab (Figure 8.20).

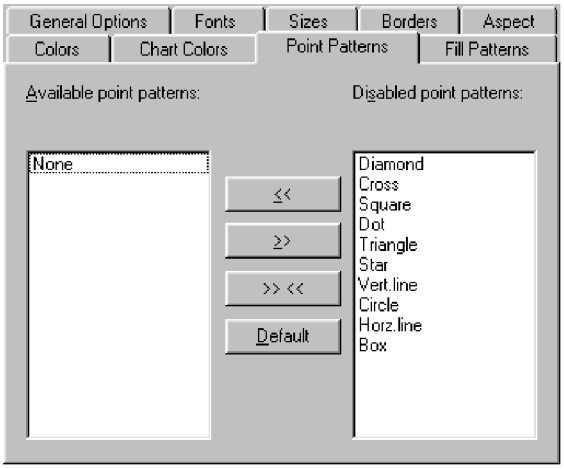


Figure 8.20 *Graph Options dialog box: Point Patterns tab*

- The **Available** list box contains a sequential list of data point patterns that will be applied to the data items within a graph.
- The **Disabled** list box contains a list of data point patterns that have been disabled.

3 In the **Point Patterns** tab, exchange or transfer items between the **Available** and **Disabled** list boxes:

a To exchange an item in the **Available** list with an item in the **Disabled** list, select both items, then click the **>> <<** button.

b To move an item from the **Available** list to the **Disabled** list (or vice versa), select the item, then click the **>>** (or **<<**) button.

4 Click **OK** to apply the change(s) and return to the **Main Program** window, or click another tab within the **Graph Options** dialog box.

Fill Patterns Options

The **Fill Patterns** options affect the identifying pattern assigned to each data line within a black and white chart, (The **Black and White** check box in the **General** graph options tab (see "General Graph Options" on page 84) must be selected to enable fill patterns.) To modify the **Fill Patterns** options:

1 On the **Options** menu, click **Graph Options**.

2 In the **Graph Options** dialog box, click the **Fill Patterns** tab (Figure 8.21).

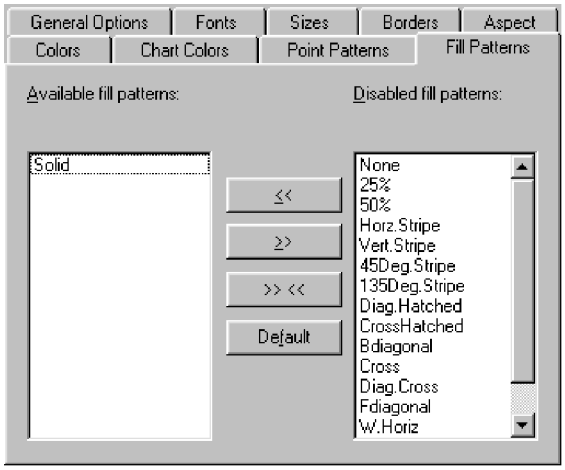


Figure 8.21 *Graph Options dialog box: Fill Patterns tab*

- The **Available** list box contains a sequential list of fill patterns that will be applied to the data items within a black and white graph.
- The **Disabled** list box contains a list of fill patterns that have been disabled.

3 In the **Point Patterns** tab, exchange or transfer items between the **Available** and **Disabled** list boxes.

a To exchange an item in the **Available** list with an item in the **Disabled** list, select both items, then click the **>> <<** button.

b To move an item from the **Available** list to the **Disabled** list (or vice versa), select the item, then click the **>>** (or **<<**) button.

4 Click **OK** to apply the change(s) and return to the **Main Program** window, or click another tab within the **Graph Options** dialog box.

Resources

CPUs Options

From the **CPUs** tab in the **Resources** dialog box, you can:

- **Add** a new CPU to the model resources. This concatenates the new resource to the end of the list.
- **Insert** a new CPU to the model resources. This inserts a new resource above the existing, selected resource.
- **Edit** an existing CPU resource.
- **Delete** an existing CPU resource.
- **Undo** or **Redo** the most recent change to the CPU resources (prior to closing the dialog box.)

Add a CPU

To add a CPU to the existing resources:

1 On the **Options** menu, click **Resources**.

2 In the **CPUs** tab, select a CPU to edit from the list box (only one CPU may be selected at a time). Notice the statistics for that particular CPU is displayed in the lower portion of the **CPUs** tab (Figure 8.22).

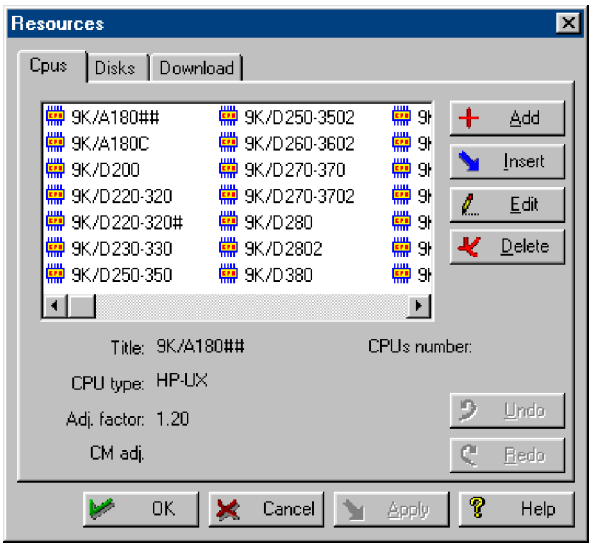


Figure 8.22 *Resources dialog box: CPUs tab*

3 Click **Add**.

4 From the **CPU** dialog box (Figure 8.23), enter the following information about the CPU:

- CPU title
- CPU type (MPE/iX or MPE/V)
- Number of processors (for example, 1, 2, or 4)
- Resources adjustment factor
- Resource compatibility mode adjustment factor (MPE only)

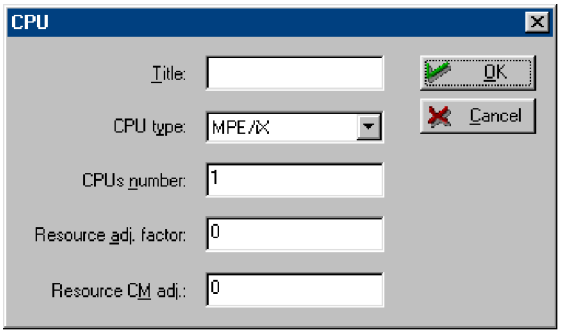


Figure 8.23 *CPU dialog box*

5 Click **Apply** and continue to modify the resources, or click **OK** to save the change(s) and return to the **Main Program** menu.

Insert a CPU

To insert a CPU in the list of CPU resources:

1 In the **CPUs** tab, select the CPU to edit from the list box (only one CPU may be selected at one time).

2 Click **Insert**.

3 From the **CPU** dialog box, enter the following information about the CPU:

- CPU title
- CPU type (MPE/iX or MPE/V)
- Number of processors (for example, 1, 2, or 4)
- Resources adjustment factor
- Resource compatibility mode adjustment factor (MPE only)

4 Click **Apply** and continue to modify the resources, or click **OK** to save the change(s) and return to the **Main Program** menu.

Edit a CPU

To edit an existing CPU resource:

1. In the **CPUs** tab, select the CPU to edit from the list box (only one CPU may be selected at one time).
2. Click **Edit**.
3. From the **CPU** dialog box, enter modify any of the following statistics:
   - CPU title
   - CPU type (MPE/iX or MPE/V)
   - Number of processors (for example, 1, 2, or 4)
   - Resources adjustment factor
   - Resource compatibility mode adjustment factor (MPE only)
4. Click **Apply** and continue to modify the resources, or click **OK** to save the change(s) and return to the **Main Program** menu.

Delete a CPU

To delete a CPU from the list of CPU resources:

1. In the **CPUs** tab, select the CPU to edit from the list box (only one CPU may be selected at one time).
2. Click **Delete**.
3. Click **Yes** to save the change(s) and return to the **Main Program** menu, or click **No** to cancel the command.

Disks Options

From the **Disks** tab in the **Resources** dialog box, you can:

- **Add** a new disk drive to the model resources.
- **Insert** a new disk drive to the model resources.
- **Edit** an existing disk drive resource.
- **Delete** an existing disk drive resource.
- **Undo** or **Redo** the most recent change to the disk drive resources (prior to closing the dialog box).

Add a Disk

To add a disk drive to the existing resources:

1 On the **Options** menu, click **Resources**.

2 In the **Disks** tab, select the disk drive to edit from the list box (only one disk drive may be selected at one time). Notice that the statistics for that particular disk drive is displayed in the lower portion of the **Disks** tab.

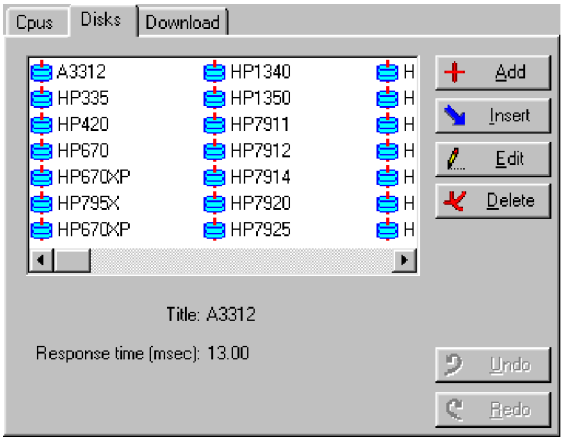


Figure 8.24 *Resources dialog box: Disks tab*

3 Click **Add**.

4 From the **Disk** dialog box (Figure 8.25), enter the following information about the disk drive:

- Disk drive title
- Disk drive response time

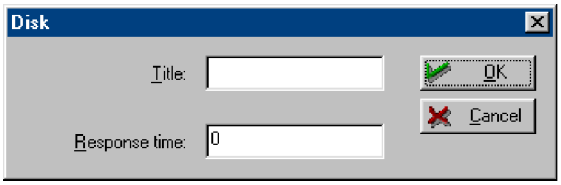


Figure 8.25 *Disk dialog box*

5 Click **Apply** and continue to modify the resources, or click **OK** to save the change(s) and return to the **Main Program** menu.

Insert a Disk

To insert a disk drive in the list of disk resources:

1. In the **Disks** tab, select the disk drive to edit from the list box (only one disk drive may be selected at one time).
2. Click **Insert**.
3. From the **Disk** dialog box, enter the following information about the disk drive:
   - Disk drive title
   - Disk drive response time
4. Click **Apply** and continue to modify the resources, or click **OK** to save the change(s) and return to the **Main Program** menu.

Edit a Disk

To edit an existing disk drive resource:

1. In the **Disks** tab, select the disk drive to edit from the list box (only one disk drive may be selected at one time).
2. Click **Edit**.
3. From the **Disk** dialog box, enter modify any of the following statistics:
   - Disk drive title
   - Disk drive response time
4. Click **Apply** and continue to modify the resources, or click **OK** to save the change(s) and return to the **Main Program** menu.

Delete a Disk

To delete a disk drive from the list of disk drive resources:

1. In the **Disks** tab, select the disk drive to edit from the list box (only one disk drive may be selected at one time).
2. Click **Delete**.
3. Click **Yes** to save the change(s) and return to the **Main Program** menu, or click **No** to cancel the command.

Download Options

From the **Download** tab in the **Resources** dialog box, you can download a current **Resources.dat** file into your Forecast Capacity Planner program files. This file is updated periodically by Lund Performance Solutions.

To download a current **Resources.dat** file:

1 On the **Options** menu, click **Resources**, then click the **Download** tab.

Figure 8.26 *Resources dialog box: Download options*

2 In the **Download** tab, enter the following information or accept the default as described in Table 8.9.

3 Click **Apply** and continue to modify the resources, or click **OK** to save the change(s) and return to the **Main Program** menu.

Table 8.9 *Resources.dat file download options*

Option	Default	Instructions
Change download page address	www.lund.com/Resources.dat	Enter the address of the appropriate FTP download page. If you do not have this address, please contact Lund Performance Solutions tech support for assistance.
Click here if you want to go to the download page	N/A	Click this button to load the default Browser and go to the download page.
Change direct download address	www.lund.com/Resources.dat	Enter the address of your download site.

Option	Default	Instructions
Press the button if you want to download the resources directly.	N/A	Click this button to automatically download the **Resources.dat** file to the default Forecast Capacity Planner program files location.
Use Proxy	disabled	Select this check box to download using a proxy server.
Proxy server	N/A	Enter the proxy server address.
Port number	5060	Enter the proxy port number.

Thresholds

Forecast and validation thresholds are explained in "Thresholds" on page 100.

Prompt for all disks

The **Prompt for all disks** command sets the program to prompt the user for every disk encountered during the loading process that does not match a disk type in the resource file.

To enable this prompt, click **Prompt for all disks** on the **Options** menu.

To disable this prompt, click to deselect **Prompt for all disks** on the **Options** menu.

Prompt for titles

The **Prompt for titles** command sets the program to prompt the user for graph titles (headers and footers) when a new graph is created.

To enable this prompt, click **Prompt for titles** on the **Options** menu.

To disable this prompt, click to deselect **Prompt for titles** on the **Options** menu.

Change titles

The **Change titles** command allows you to change the graph titles (headers and footers) when the **Prompt for titles** command is enabled.

Forecast Menu and Commands

Use the **Forecast** menu in the **Main Program** window to access most of the forecasting and graphing options for unvalidated and validated models in Forecast Capacity Planner. The **Forecast** menu is not available from the **Logo** screen.

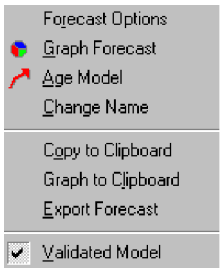


Figure 8.27 *Forecast menu*

Forecast Options

The **Forecast Options** command opens the **Forecast Options** dialog box, which contains two tabs: **Options** and **Rates**. For information about the options available in these tabs, see “Setting Forecast Options” on page 130.

Graph Forecast

The **Graph Forecast** command creates a forecast graph from your model and opens the graph window.

Generating a Forecast Graph

To generate a forecast graph:

1. Ensure the **Main Program** window contains the data for a validated model.
2. On the **Forecast** menu, click **Graph Forecast**. A forecast graph will display in the **Main Program** window.

Closing a Forecast Graph

To close the currently-open forecast graph and return to the data for the model, click **Graph Forecast** from the **Forecast** menu.

Age Model

The **Age Model** command opens the **Age Model** dialog box.

The aging function of Forecast Capacity Planner offers a quick and easy way to generate forecasting information about your model. The aging function enables you to *fast forward* to a future date and view the effects of workload group growth rates on the model. The aged model is based on the growth rates assigned to your workload groups in the validated model. (See "Editing a Workload Group" on page 122 for more information about changing workload group growth rates.)

To age the model:

1 On the **Forecast** menu, click **Age Model**.

2 In the **Age Model** dialog box (Figure 8.28), enter the number of months to age the model.

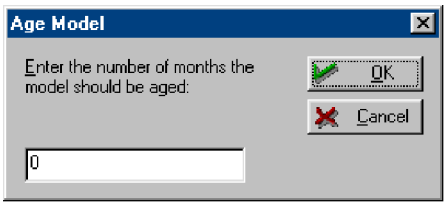


Figure 8.28 *Age Model dialog box*

3 Click **OK** to apply the change.

To return to a non-aged model (the original model), click **Undo** from the **Edit** menu. This can be done even if you saved the aged model.

Change Name

The **Change Name** command opens the **Model Name** dialog box.

To change the **Model** name:

1 On the **Forecast** menu, click **Change Name**.

2 In the **Model name** dialog box (Figure 8.29), enter the desired model name.

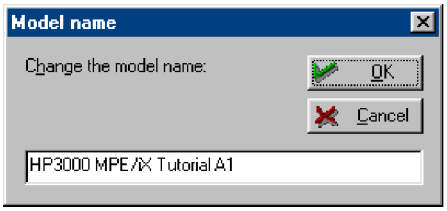


Figure 8.29 *Model name dialog box*

3 Click **OK** to save the change.

Copy to Clipboard

The **Copy to Clipboard** command copies the current model or selected item to the Clipboard.

Graph to Clipboard

The **Graph to Clipboard** command creates a forecast graph and copies it to the Clipboard.

To copy the current forecast graph to the Clipboard:

1 On the **Forecast** menu, click **Graph to Clipboard**.

2 In the **Copy Graph to Clipboard As** dialog box (Figure 8.30), select the file format in which to save the graph:

- **Bitmap**. Enter the width and height of the bitmap image (pixels) in the **Width** and **Height** fields, or accept the default dimensions.
- **Windows Metafile**.
- **Enhanced Metafile**.

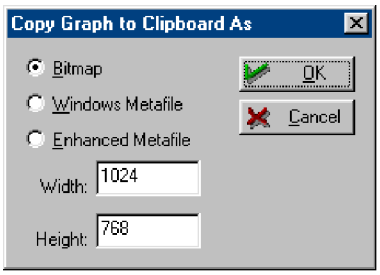


Figure 8.30 *Copy Graph to Clipboard As dialog box*

3 Click **OK** to copy the graph to the Clipboard.

Export Forecast

The **Export Forecast** command exports a forecast graph as a separate file.

To export the current forecast graph:

1 On the **Forecast** menu, click **Export Forecast**.

2 In the **Save As** dialog box:

   a Name the file.

   b Select the file type.

   c Select the directory location.

3 Click **OK** to save the file.

Validated Model

The **Validated Model** command validates the current unvalidated model. A check mark next to the command in the **Forecast** menu indicates that the model is validated.

View Menu and Commands

Use the **View** menu in the **Main Program** window (Figure 8.31) to enable and disable the toolbar, format bar, and status bars.

Figure 8.31 *View menu*

Toolbar

The Forecast toolbar (Figure 8.32) displays a set of buttons used to carry out common menu commands. Toolbar buttons can change, depending on which window or view is currently selected. The toolbar can be moved or docked at any edge of the **Main Program** window.

Figure 8.32 *Toolbar*

To hide the toolbar, deselect the **Toolbar** option from the **View** menu. The absence of the check mark next to the menu item indicates the option is disabled.

To move the toolbar to another location within the program window, click the frame surrounding the toolbar, then drag and drop it to a new location within the **Main Program** window.

Floating Toolbar Window

When the toolbar is placed near the center of the **Main Program** window, it becomes a floating **Toolbar** window (Figure 8.33). A floating **Toolbar** window has a title bar and can be resized and repositioned anywhere in the **Main Program** window.

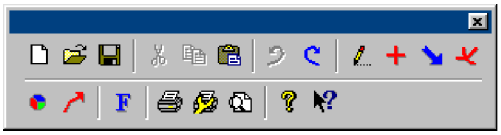


Figure 8.33 *Toolbar window*

To return the toolbar to its original size and location, double-click the **Toolbar** window.

To close the **Toolbar** window, click the **Close** button in the upper-right corner of the window.

Format Bar

The format bar (Figure 8.34) displays a set of buttons used to carry out formatting commands. Format bar buttons can change, depending on which window or view is currently selected. Available formatting options, from left to right, are:

- Font Type
- Font Size
- Bold
- Italic
- Underline
- Font Color
- Justified left
- Centered
- Justified right
- Insert bullet

Figure 8.34 *Format Bar*

To hide the format bar, deselect the **Formatbar** option from the **View** menu. The absence of the check mark next to the **Formatbar** menu item indicates the option is disabled.

To move the format bar to another location within the **Main Program** window, click the frame surrounding the format bar, then drag and drop it to a new location within the program window.

Floating Format Bar Window

When the format bar is placed near the center of the Main Program window, it becomes a floating **Format Bar** window. A floating **Format Bar** window has a title bar and can be resized and repositioned anywhere in the **Main Program** window.

To return the format bar to its original size and location, double-click the **Format Bar** window.

To close the **Format Bar** window, click the **Close** button in the upper-right corner of the window.

Main Status Bar

The **Main Status Bar** command switches the main status bar on or off. A check mark next to the command indicates the main status bar is displayed in the **Main Program** window.

Figure 8.35 *Main Status Bar*

Child Status Bar

The **Child Status Bar** command switches the child status bar on or off. A check mark next to the command indicates that the child status bar is displayed in the **Main Program** window.

Figure 8.36 *Child Status Bar*

Window Menu and Commands

The **Window** menu options are standard Windows-based options that improve the viewing arrangement of multiple charts. These arrangements can be saved as default settings in a desktop file. The **Window** menu (Figure 8.37) is not available from the **Logo** screen.

Figure 8.37 *Window menu*

Cascade

The **Cascade** command arranges the open windows in an overlapping fashion from the upper left to the lower right of the screen. Windows are arranged in chronological order with the most recently accessed window in the top position in the lower-left portion of the screen.

Tile Horizontally

The **Tile Horizontally** command arranges all open windows horizontally in “tiles” of proportionate size, using the full extent of the screen.

Tile Vertically

The **Tile Vertical** option will arrange all open windows vertically in "tiles" of proportionate size, using the full extent of the screen.

Next Pane

The **Next Pane** command sets the focus to the next window pane.

Previous Pane

The **Previous Pane** command sets the focus to the previous window pane.

Arrange Icons

The **Arrange Icons** command restores the icons (minimized windows) to their default (chronological) order (left to right) across the bottom of the **Main Program** window.

Current Window

The **Window** menu contains a list of all open windows in the current session. Click on a window name to switch to that window.

Help Menu and Commands

The **Help** menu (Figure 8.38) contains commands to display the Tip of the Day, load the online Help system, and view information about the Forecast Capacity Planner application.

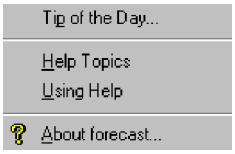


Figure 8.38 *Help menu*

Tip of the Day...

The **Tip of the Day** command opens the **Tip of the Day** dialog box (Figure 8.39).

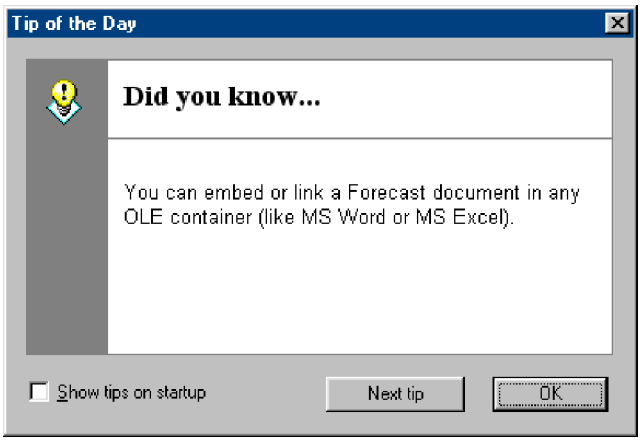


Figure 8.39 *Tip of the Day dialog box*

To set the program to automatically display the Tip of the Day, click the **Show tips on startup** check box. To disable this option, click to deselect the check box.

To view each of the Tips, click the **Next tip** button.

To close the **Tip of the Day** dialog box, click **OK**.

Help Topics

The Forecast Help system is a quick-reference of helpful topics. These topics are indexed and can be recalled by performing a keyword search. To access the indexed Help system, click **Help Topics** in the **Help** menu.

Context-sensitive Help

To get context-sensitive Help on a specific dialog box, click the **Help** button in the dialog box. Help about the dialog box will display in a separate window.

To get context-sensitive Help elsewhere in Forecast, do either of the following:

- Position your mouse over the item in question and press the F1 function key. This is especially helpful for open dialog boxes that do not contain a **Help** button, as the Help Toolbar button will not open dialog boxes and cannot be selected if a dialog box is already open.

  OR

- Select the Help toolbar button  for use with toolbar buttons or menu items. This will change the cursor to a question mark. Move the question mark pointer over an item and click to get Help for that item.

Using Help

The **Using Help** command opens the **Help Topics: Windows Help** dialog box. Select the desired tab (**Contents**, **Index**, or **Find**) to search for help associated with Windows.

About Forecast

The **About forecast...** command opens the **About Forecast** dialog box. The dialog box contains information regarding the version of Forecast Capacity Planner installed on your system.

Shortcut Menu

A shortcut menu is a context-sensitive menu containing commands that apply to a selected item. The shortcut menu in Forecast Capacity Planner contains the commands found on the **Edit** menu on the menu bar. You can access this menu by right-clicking an item.

Figure 8.40 *Shortcut menu*

9

MODEL CREATION AND VALIDATION

The model creation and validation process creates an accurate model of your system based on the data collected on your host system for throughput, CPU utilization, and other workload values. The key to accurate forecasting is to ensure that your calculated values accurately reflect the actual values on the host system.

The procedures in this chapter assume:

- Forecast Capacity Planner is installed and running on your PC. The product logo is displayed in the **Main Program** window (this display will be referred to as the **Logo** screen.)
- The data collection process on the host system is complete and the collection file (*.col) is transferred to your PC.

Setting Thresholds

Before loading and validating a new model, review the default forecast and validation thresholds to determine if they are suitable for your model. In some instances, you may want to set the threshold CPU utilization limits higher or lower than the default.

Forecast Thresholds

The default CPU utilization values in the **Thresholds** dialog box are based on typical utilization limits for MPE/iX and MPE/V CPUs. Generally, system performance is compromised at higher utilization levels.

To change the CPU utilization threshold:

1. On the **Options** menu, click **Thresholds**.
2. In the **Thresholds** dialog box, click the **Forecast** tab.

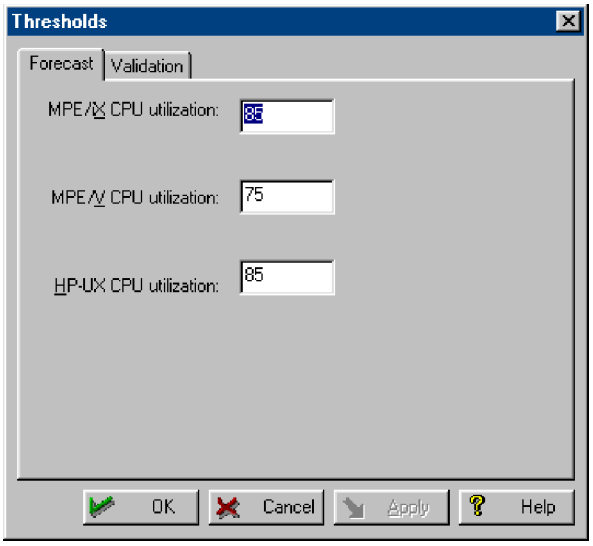


Figure 9.1 *Thresholds dialog box: Forecast tab*

3 Click in the appropriate text box for your CPU.

4 Enter the desired CPU value.

5 Click the **Apply** button to apply the change to the current session. This change will not be saved until you validate the model.

Validation Thresholds

The validation thresholds limit the variability allowed between your model and the actual data. If the value predicted by the model, based on measured data values, differs from the actual values by more than the set percentage, either a warning message will display or the validation process will fail as described in Table 9.2 on page 117.

To view or edit the validation thresholds:

1 On the **Options** menu, click **Thresholds**.

2 In the **Thresholds** dialog box, click the **Validation** tab.

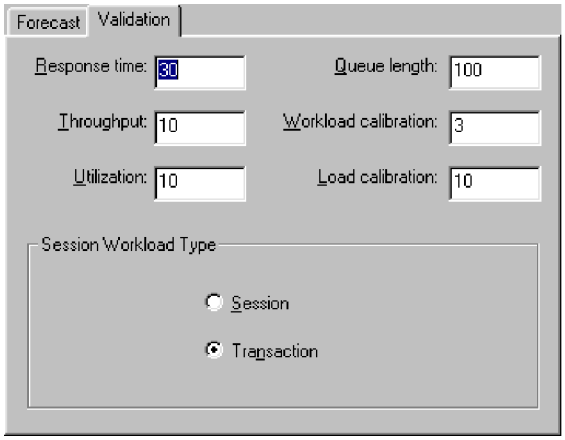


Figure 9.2 *Thresholds dialog box: Validation tab*

3 Click in the appropriate box and type the desired values. Each validation threshold is explained in Table 9.1.

4 Click the **Apply** button to apply the change to the current session. The change will not be saved until you validate the model.

Table 9.1 *Validation thresholds*

Validation Threshold	Description
Response time	The acceptable percentage discrepancy between the response times predicted by the model and the actual response times observed. Validation will fail when this limit is exceeded.
Throughput	The acceptable percentage discrepancy between the throughput predicted by the model and the actual throughput observed. Validation will fail when this limit is exceeded.
Utilization	The acceptable percentage discrepancy between the CPU or disk utilization predicted by the model and the actual utilization observed. Validation will fail when this limit is exceeded.
Queue length	The acceptable percentage discrepancy between the CPU or disk queue lengths predicted by the model and the actual queue lengths observed. Validation will fail when this limit is exceeded.

Validation Threshold	Description
Workload calibration	This threshold value is used during the workload calibration phase of model validation. A warning message is generated when this limit is exceeded.
Load calibration	When a new model is constructed from a load sample interval, a warning message is generated if the predicted CPU utilization or disk IO rate for any disk differs from the actual values by more than the set **Load calibration** threshold.
Session Workload Type	Click the appropriate button to select session type or transaction type for interactive workloads: • **Session type workloads** allow specification and throughput calculation of the user count and think times. • **Transaction type workloads** allow specification and throughput calculation of the user count.

Loading a New Collection File

To load a new model:

1 On the **File** menu, click **Load/Validate Model**. The **Open** dialog displays.

2 In the **Files of type** list, click **Collections (*col)**.

3 Click once on the collection file to select it.

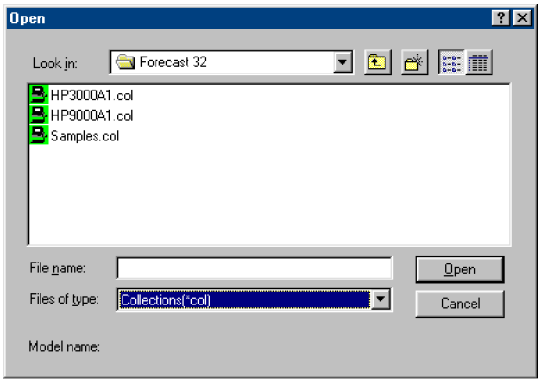


Figure 9.3 *Open dialog box*

4 Click **Open** to load the collection file.

Validation Messages

As the loading process runs, a list of warnings and informational messages appear in the **Validation Messages** dialog box. These messages provide information about workloads that may violate one or more modeling algorithm assumptions (see “Queuing Model Algorithm Assumptions” on page 118 for information).

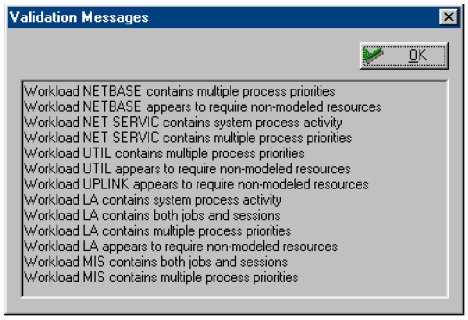


Figure 9.4 *Validation Messages dialog box*

Review the messages presented in the **Validation Messages** dialog box and decide what, if any, influence they have on your model. Consider the following examples from the validation messages listed in Table 9.2.

Table 9.2 *Example validation messages*

Validation Message	Description
Workload group NETBASE contains multiple process priorities	"Multiple process priorities" means that there are processes defined in the NETBASE workload group with different queues. Therefore, the NETBASE workload group may not be homogeneous. (See “Identifying and Characterizing Workload Groups” on page 14 for information on homogeneous workloads.)
Workload group LA contains both jobs and sessions	The workload group LA contains both jobs (batch processes) and sessions (interactive processes). Batch and interactive processes use system resources differently. (See “Identifying and Characterizing Workload Groups” on page 14 for information on mixing batch and interactive processes in single workloads.)

In both validation message examples, it may or may not be necessary to redefine the workloads and repeat the collection and reduction processes on the host system. For instance, if the workload group NETBASE accounts for only a small percentage of total CPU utilization on the host system, the effect on the model and your forecast may be negligible.

To print the contents of the **Validation Messages** box:

1 On the **File** menu, click **Print**.

2 From the **Print** submenu, click **Notes**.

Select the desired print options in the Windows **Print** dialog box. (Refer to your Windows documentation for information on print options.)

Once you are satisfied that the messages in the **Validation Messages** dialog box will not affect the model, click **OK** to close the box and complete the loading process.

Validating the Model

To validate the baseline model:

1 On the **Forecast** menu, click **Validated Model**.

2 In the message box, click **Yes** to begin the validation process. The file name extension of the document changes to the model format (*.mdl).

3 On the **File** menu, click **Save Model**.

4 In the **Save As** dialog box, click **Save** to save the model to the default location on your computer.

Validation Failures

On a rare basis, the validation process fails when the calibrated model and the actual data values violate the validation thresholds in your model. To understand these assumptions, review the basic queuing model algorithm assumptions (see "Queuing Model Algorithm Assumptions" on page 118).

- Making the appropriate modifications will allow you to proceed with the forecast process.

Queuing Model Algorithm Assumptions

The validation process is based on assumptions regarding the workloads and hardware resources on your host system. If repeated attempts to validate the model fail, call the Lund Performance Solutions technical support team for help. (See "Lund Performance Solutions Technical Support Team" on page 4.)

Violation of the following assumptions may cause validation to fail.

CPU and disk demands are accurately calculated for each workload transaction

Verify the identity of your CPU and disk types in the model before repeating the validation process.

Although rarely violated, this assumption is critical to successful validation.

No multi-threading of individual transactions occurs

An individual transaction uses only one resource at a time (either CPU or disk drive). In general, this assumption is violated in one of two ways:

- By applications that perform no-wait terminal I/O or use multiple threads to perform simultaneous activity for one transaction.
- By applications that perform a significant number of disk writes. Disk caching and the operating system can each allow a transaction to continue to execute while its disk writes are being performed. During validation, the workload group shows a predicted response time that is higher than actually observed, while the CPU and disk utilization statistics are accurate. The difference between the observed and predicted transaction response times is approximately equal to the number of disk-write requests that the transaction performs, multiplied by the disk access time.

All workload requests for disk service and all CPU requests are satisfied in non-preferential order within each priority queue—requests, once they reach the CPU, are handled on a first-in-first-out (FIFO) basis

- The first request in a queue is honored before the second request in that queue.
- MPE/iX systems fine tune some of the process priorities within sub queues.
- Workloads performing long, CPU-intensive transactions—CPU "hogs"—tend to have a lower priority than other workloads. In this case, the FIFO rule does not apply.

For MPE systems, you can fix the problem by manually setting CPU-intensive workloads to a two-digit priority code to distinguish them from regular workloads. When the workload group is identified, assign it a different queue specification within the queue. For example, a CPU-intensive workload group in the C queue is prioritized as C2. Forecast Capacity Planner will look at that queue separately. C2 is prioritized higher than D, but lower than C.

HP-UX systems have what is called a ***nice*** system call. With ***nice,*** a process is able to influence its own scheduling to a degree. To provide a process with less CPU time, assign a larger ***nice*** value. The following equation explains how priorities are calculated:

priority = ("recent CPU usage" / constant) + (base priority) + (nice value)

For more information regarding the ***nice*** system call, read Chapter 6 of Taming UNIX, Volume I, by Robert A. Lund.

No workload group is spending a significant amount of time waiting for any resource other than the CPU, a disk drive, or a terminal read

Validation failure in this case results in relatively accurate throughput and utilization values, but significantly negative workload response time variances.

Use a performance monitoring tool (such as SOS Performance Advisor by Lund Performance Solutions) to determine if workload transactions are spending too much time waiting for such things as SIRs, file locks, or database locks. Transactions requesting tape I/O or multi-applications (LANS) that pass all of their processing through a single-threaded resource may cause this problem.

Transaction requests arrive in a random order

Validation failure in this case results in generally accurate throughput and utilization values, but significant workload response time variances.

There is no synchronizing effect causing transactions to request CPU and disk resources at the same time. This could happen when think times are the same. For example, two people doing file transfers and their think time is always 10 seconds.

Workload Groups

Workload definition is critical to successful validation of your model. Review your workloads for compliance with the following rules. (For more information about workload definitions, see "Identifying and Characterizing Workload Groups" on page 14.)

- Avoid mixing jobs and sessions in workloads. If you have mixed workloads and your model validation fails, refine your workload definitions and repeat the data collection and reduction processes described in "MPE/iX Host Data" on page 15 or "HP-UX Host Data" on page 22.
- When possible, break work groups down by user logon rather than program name.

A workload group appears too slow

If a workload group appears too slow, you can isolate that workload group by running another reduction from the original collection file. Choose the optimum time (the maximum period for that workload group) and repeat the collection, transfer, loading, and validation processes. If the validation process fails, review the original workload group definition file.

An actual resource variable is greater/less than the modeled resource variable

To analyze variables other than transaction type, such as average response time, set transactions per hour as a constant by changing all workloads to the TRANSACTION type. For example, actual response time may be greater than the modeled response time because of a network delay for a workload group. Modifying the average delay time for that workload group may eliminate the problem.

The Trans/Hr variance is greater than +/- 15 percent

Change the average delay for your workloads. Start with the highest priority. Small errors in high-priority jobs have a greater impact on lower-priority jobs. Change only one workload group at a time and limit the amount of change to, perhaps, 10 percent. This changes the arrival rate of transactions and response time.

Changing the Model

Forecast Capacity Planner allows you to change the baseline data in your model to try out different what-if scenarios. Observe what happens, for example, if you alter the model by:

- Replacing the current CPU with a larger model.
- Adding growth rates and aging.
- Changing the parameters for one or more workload groups.

You can edit, add, insert, or delete items associated with workloads or resource in your validated model directly from the **Main Program** window. Some of these menu options are unavailable for some items.

Editing a Workload Group

To edit a workload group:

1 Select the workload group from either the **global validated workloads** or **file manger** pane in the **Main Program** window.

2 On the **Edit** menu, click **Edit** or press the Enter key.

3 Type or select the new workload group parameters in the **Edit Workload** dialog box.

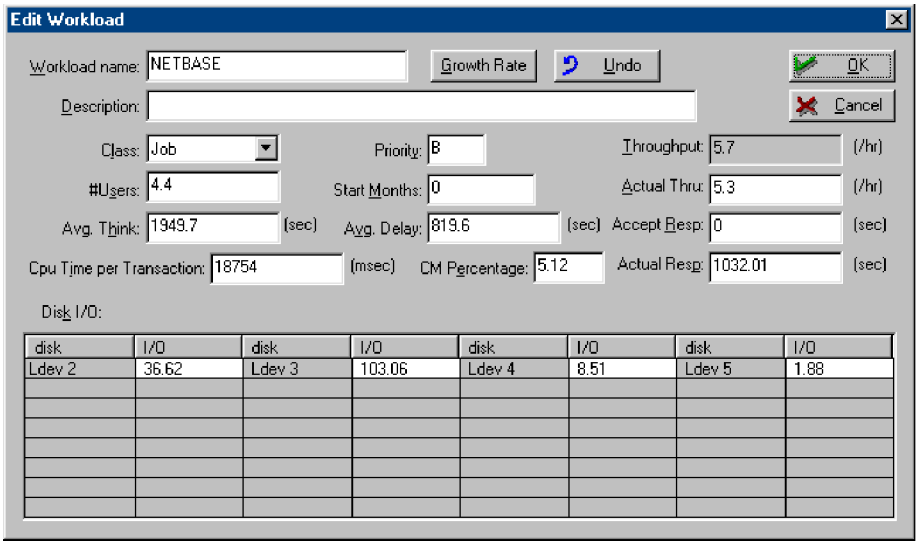


Figure 9.5 *Edit Workload dialog box*

Table 9.3 *Edit Workload parameters*

Workload Parameter	Instructions to Edit the Workload Parameter
Workload Group Name	Enter the workload group name.
Description	Enter the description used to describe the workload group in forecast graph legends and in the results display.
Class	Select either Transaction, Session, or Job. Session and job workloads are those for which the transaction throughput is calculated based on the number of users and average user think time. • Transaction workloads are those for which the transaction throughput is known in advance.
Users	Enter the number of users in this workload group.
Avg think time	Enter the average user think time in seconds. For job workloads, this parameter should be 0 (zero).
CPU time per transaction	Enter the CPU time in milliseconds required to process one transaction. For job workload groups, this parameter should be the CPU time required to process the entire job.
Growth rate	1 In the Edit Workload dialog box, click the Growth Rate button. 2 In the Growth Rate dialog box, choose the monthly, quarterly, or yearly rate of growth for this workload group. 3 Click OK to save the change and return to the Edit Workload dialog box. **Note:** Multiple growth rate periods (split rates) can be entered. You can also set a tiered rate and choose a growth type for the workload group (linear, compound, or tiered).
Priority	Enter the workload group priority. This can be any one- or two-character alphanumeric code.

Workload Parameter	Instructions to Edit the Workload Parameter
Start months	If the workload group will be continuously active during the forecast interval, enter 0 (zero). If the workload group will not activate for a specific time, enter a positive number representing the number of months. If the workload group is initially active but will terminate after a specific time, enter a negative number that represents the number of months.
Avg delay time	Enter the extra delay time associated with this workload group. This can be used to represent any load-independent, average delay time, such as might be required to represent network delays, or flushing terminal output buffers.
CM percentage	Enter the percent of total CPU time that this workload group spends executing in compatibility mode.
Throughput	Enter the total transaction throughput for this workload group.
Actual throughput	• Enter the actual transaction throughput, if known, for this system configuration. This value is used to adjust the predicted model transaction throughput to provide a more accurate forecast result. • To reset the parameter to the unadjusted predicted transaction throughput, enter 0 (zero) or leave the box empty.
Accept response time	Enter the maximum acceptable response time in seconds for this workload group, or 0 (zero) if no limit should be specified.
Actual response time	• Enter the actual response time, if known, for this system configuration. This value will be used to adjust the predicted model response time to provide a more accurate forecast result. • To return the field to the unadjusted predicted transaction throughput, enter 0 (zero) or leave the box empty.
Disk IO per transaction	Enter the number of disk accesses on this disk drive required to process one transaction. For job workloads, this should be the number of disk accesses required to process the entire job.

Adding, Inserting, and Deleting Workload Groups

Add, insert, or delete workload groups to observe the effects of usage changes on the model.

- The **Add** menu option adds a new workload group to the end of the workload group list.
- The **Insert** menu option inserts a new workload group immediately below the selected workload group on the workload group list.
- The **Delete** menu option removes the selected workload group from the workload group list.

Adding a Workload Group

1. In the **global validated workloads** pane or the **file manger pane**, select any workload group.
2. On the **Edit** menu, click **Add**.
3. In the **Edit Workload** dialog box, enter or select the desired values as described in Table 9.3.
4. Click **OK** to save your changes and return to the **Main Program** window.

Inserting a Workload Group

1. In the **global validated workload** pane or the **file manager pane**, select the workload group immediately above the position where you want the new workload group to appear.
2. On the **Edit** menu, click **Insert**.
3. In the **Edit Workload** dialog box, enter or select the desired values as described in Table 9.3.
4. Click **OK** to save your changes and return to the **Main Program** window.

Deleting a Workload Group

1. In the **global validated workload** pane or the **file manger** pane, select the workload group to delete.
2. On the **Edit** menu, click **Delete**. A message box will display and ask you if you want to delete the workload group.
3. Click **Yes** to delete the object, or **No** to cancel the process.

Editing Resources

Editing a Disk Drive

1 In the **global validated centers** pane or the **file manger** pane, select the disk drive to edit.

2 On the **Edit** menu, click **Edit**.

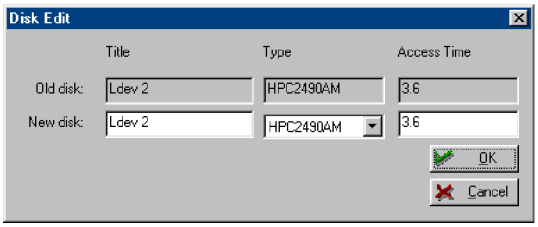


Figure 9.6 *Disk Edit dialog box*

3 In the **New disk** area of the **Disk Edit** dialog box, enter or select the new parameters for the disk drive as described in Table 9.4.

Table 9.4 *Disk Edit parameters*

Disk Parameter	Instructions to Edit the Disk Parameter
Title	Enter a new disk drive name.
Type	Select a new disk drive type from the list.
Access Time	Enter a new access time for the selected disk drive.

4 Click **OK** to save your changes and return to the **Main Program** window.

Editing a CPU

1 In the **global validated centers** pane or the **file manger** pane, select the CPU to edit.

2 On the **Edit** menu, click **Edit**.

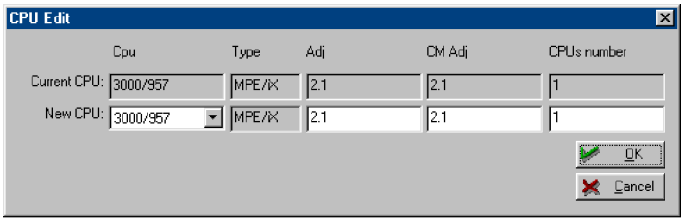


Figure 9.7 *CPU Edit dialog box*

3 In the **CPU Edit** dialog box, enter or select the new parameters for the CPU as described in Table 9.5.

Table 9.5 *CPU parameters*

CPU Parameter	Instructions to Edit the CPU Parameter
CPU	Enter a new CPU name.
Type	Select a new CPU type from the list.
Adj	Enter a new CPU adjustment factor.
CM Adj	Enter a new compatibility mode adjustment factor.

4 Click **OK** to save your changes and return to the **Main Program** window.

Adding, Inserting, and Deleting Resources

Add, insert, or delete disk drives to observe the effects of usage changes on the model. You cannot add or delete the CPU.

- The **Add** menu option adds a new disk drive to the end of the list.
- The **Insert** menu option inserts a new disk drive immediately below the selected disk in the list.
- The **Delete** menu option removes the selected disk drive from the model.

Adding a Disk Drive

1 In the **global validated centers** pane or the **file manger pane**, select any disk.

2 On the **Edit** menu, click **Add**.

3 In the **Edit Workload** dialog box, enter or select the desired values as described in Table 9.4.

4 Click **OK** to save your changes and return to the **Main Program** window.

Inserting a Disk Drive

1 In the **global validated centers** pane or the **file manager pane**, select the disk drive immediately above the position where you want the new disk to appear.

2 On the **Edit** menu, click **Insert**.

3 In the **Edit Workload** dialog box, enter or select the desired values as described in Table 9.4.

4 Click **OK** to save your changes and return to the **Main Program** window.

Deleting a Disk Drive

1. In the **global validated centers** pane or the **file manger** pane, select the disk drive to delete.
2. On the **Edit** menu, click **Delete**. A message box will display and ask you if you want to delete the disk drive.
3. Click **Yes** to delete the object, or **No** to cancel the process.

Saving and Reusing Desktops

At any time during the validating and forecasting processes, you can save and rename the current desktop to preserve any changes to the model. This can be useful if you plan to generate multiple-performance projections from your baseline model. The Save **Desktop** command saves all of your current settings, links to currently-opened files, and window layout options.

Saving the Active Desktop

To save the active desktop:

1. On the **File** menu, click **Save Desktop**.
2. In the **Save As** dialog box:
   a. Enter the name of the desktop in the **File name** box.
   b. Click the **Save** button to save the desktop (*.dsk).

Reloading a Saved Desktop File

To reload a saved desktop (*.dsk) file:

1. On the **File** menu, click **Load Desktop**.
2. In the **Open** dialog box:
   a. Locate and select the desired desktop file.
   b. Click **OK** to open the desktop file in Forecast Capacity Planner.

Restoring the Current Desktop

To restore the current desktop to the last saved version:

1. On the **File** menu, click **Restore Layout**.
2. In the **Open** dialog box:
   a. Locate and select the last saved version of the desktop.
   b. Click **OK**.

10

MODEL FORECASTING

The model creation and validation processes presented in the previous chapter, provide an accurate snapshot of your host system. The procedures in this chapter allow you to add the dimension of time to your model to accurately predict the future performance of your host system.

The procedures in this chapter assume:

- Forecast Capacity Planner is installed and running on your PC.
- The data collection process on the host system is complete and the collection file (*.col) is transferred to your PC.
- The loading and validation process is complete and you have a validated model (*.mdl) on your PC.

Configuring the Forecast Model

Before graphing a performance projection from your validated model, decide what you hope to achieve with your projection. For example:

- What do you want your performance projection graph to show?
  - How fast do you expect utilization to increase on your system in the next quarter or the next year?
  - Do you expect utilization to increase uniformly on the system, or do you expect some workloads to grow faster?
  - How far into the future do you want to look?
- How do you want the information presented?
  - Do you want to group all workloads and resources as a single line?
  - Do you want to graph some workloads or resources separately?

The answers to these questions and other questions are figured into your performance projection. Use the **Forecast Options** to set the values on which your projection is based.

Setting Forecast Options

To set forecast options:

1 On the **Forecast** menu, click **Forecast Options**.

2 From the **Options** tab in the **Forecast Options** dialog box (Figure 10.1), enter or select new options as described in Table 10.1.

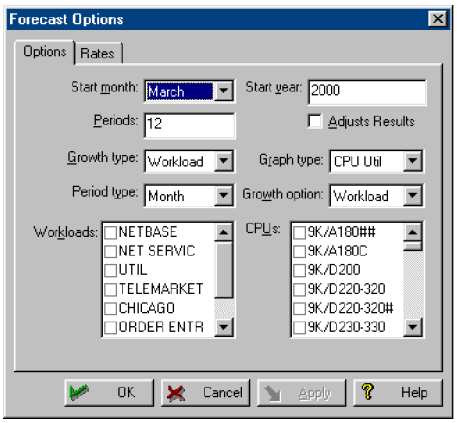


Figure 10.1 *Forecast Options dialog box: Options tab*

3 Click **OK** to apply the change(s) and return to the **Main Program** window, or click the **Rates** tab to change the forecast growth rates.

Table 10.1 *Forecast options*

Forecast Option	Instructions to Set Forecast Options
Start month	Verify the starting month for your performance projection.
Periods	Enter the number of periods (months, quarters, or years) to be shown on the graph.

Forecast Option	Instructions to Set Forecast Options
Growth type	Select the global growth type: • Select Workload to apply the growth type specified in your validated model for each workload to your forecast graph. • Select Linear to apply the linear growth type for all workloads, regardless of the growth type specified for that workload in your validated model. • Select Compound to apply the compound growth type for all workloads, regardless of the growth type specified for that workload in your validated model. • Select Tiered to apply the tiered growth type for all workloads, regardless of the growth type specified for the workloads in your validated model.
Period type	Select the period type: months, quarters, or years.
Workloads	Select individual workloads to chart during the performance projection. Selecting All Workloads reports the total of all unselected workloads as a single line in the graph.
Start year	Verify the starting year for your performance projection.
Adjusts Results	Select the Adjusts Results check box to adjust forecast results to match the observed system values.
Graph type	Select the graph type: • Resp Time • Throughput • CPU Util • Disk I/O • Disk Util

Forecast Option	Instructions to Set Forecast Options
Growth option	Select the global growth option: • Select Workload to apply the growth rate specified in the Edit window of the individual workload groups. • Select Override to apply the growth rate in the Forecast Options window Rates tab to the model globally. This setting will override the individual settings. • Select Add to apply the sum of the global growth rate and the individual workload growth rate in your validated model. • Select Rep Zero to apply the global growth rate only if the individual rate is zero.
CPUs	Select the CPU models to chart in the performance projection.
Disks (only visible when Graph Type is set to a disk chart)	Select individual disks to chart in the performance projection. Selecting All Disks reports the total of all unselected disks as a single line in the graph.

Setting Forecast Growth Rates

To set forecast growth rates:

1 On the **Forecast** menu, click **Forecast Options**.

2 In the **Forecast Options** dialog box, click the **Rates** tab (Figure 10.2).

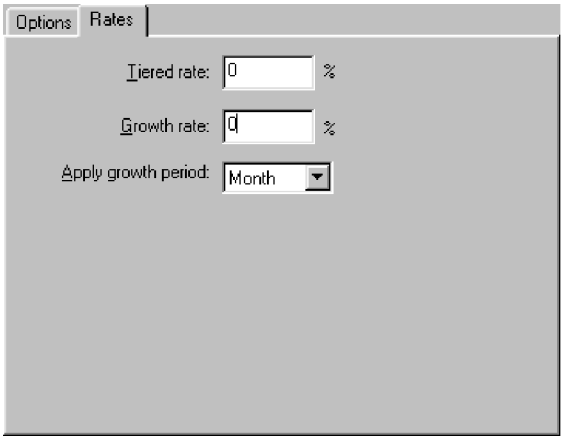


Figure 10.2 *Forecast Options dialog box: Rates tab*

3 Enter or select new options as described in Table 10.2.

4 Click **OK** to apply the change(s) and return to the **Main Program** window.

Table 10.2 *Rates options*

Rates Option	Instructions to Set Rates Options
Tiered rate	1 In the Options tab, ensure Tiered is selected as the Growth type option. 2 In the Rates tab, enter the Tiered rate (the percentage of the growth rate that will remain after it is applied).
Growth rate	Enter the global growth rate for your performance projection.
Apply growth period	Select Month, Quarter, or Year. The growth period determines how frequently the growth rate is applied in the performance projection.

Based on the information in your validated model and the options set in the **Forecast Options** dialog box, Forecast Capacity Planner creates a dynamic model of your system. You can view, print, or export that model in either a graphic format or a report format.

Aging the Forecast Model

The aging function of Forecast Capacity Planner offers a quick and easy way to generate forecasting information about your model. The aging function enables you to *fast forward* to a future date and view the effects of workload growth rates on the model. The aged model is based on the growth rates assigned to your workloads in the validated model. (See "Editing a Workload Group" on page 122 for more information about changing workload growth rates.)

To age the model:

1 On the **Forecast** menu, click **Age Model**.

2 In the **Age Model** dialog box, enter the number of months to age the model.

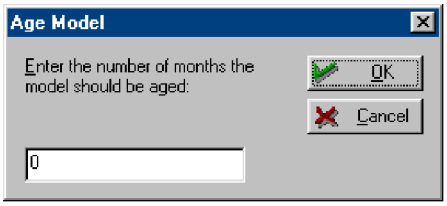


Figure 10.3 *Age Model dialog box*

3 Click **OK** to apply the change.

To return to a non-aged model (the original model), click **Undo** from the **Edit** menu. This can be done even if you saved the aged model.

Creating Forecast Reports

Use the **Report Fonts** and **Report Options** commands to change the appearance of your printed reports.

Setting Report Fonts

1 On the **Options** menu, click **Report Fonts**.

2 In the **Font** dialog box, specify the following:

- **Font**
- **Font** style
- **Size**
- **Sample**
- **Script**

3 Click **OK** to save the change(s) and return to the **Main Program** menu.

Setting Report Options

1. On the **Options** menu, click **Report Options**.
2. From the **Page Setup** tab in the **Report Options** dialog box (Figure 10.4), enter or select new options as described in Figure 10.4.
3. In the **Measure units** field, select **Inches** or **Centimeters**. This field determines the unit of measurement for the rest of the options in this tab:
   - Field minimum size
   - Field maximum size
   - Distance between fields
   - Distance between rows (row height)

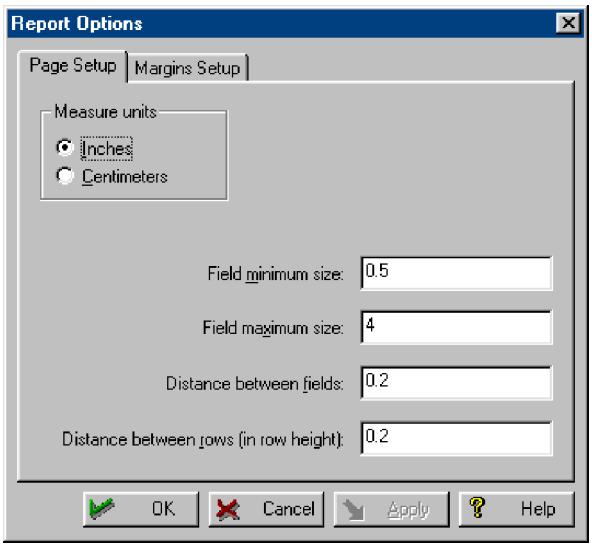


Figure 10.4 *Report Options dialog box: Page Setup tab*

4. Click **OK** to apply the change(s) and return to the **Main Program** window, or click the **Margins Setup** tab to change the report margins.
5. In the **Report Options** dialog box, click the **Margins Setup** tab (Figure 10.5).

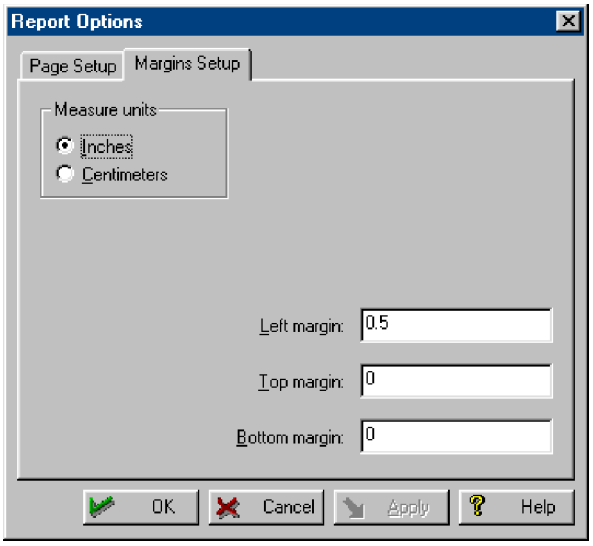


Figure 10.5 *Report Options dialog box: Margins Setup tab*

6 Enter or select new options as described in Figure 10.5.

7 In the **Measure units** field, select **Inches** or **Centimeters**. This field determines the unit of measurement for the rest of the options in this tab:

- Left margin
- Top margin
- Bottom margin
- Distance between rows (row height)

8 Click **OK** to apply the change(s) and return to the **Main Program** window.

Printing Forecast Reports

Performance Gallery Gold uses a standard Windows-based **Print** menu.

Setting Print Parameters

To specify the parameters for your print request, such as the paper size and orientation:

1 On the **File** menu, click **Print Setup**.

2 Set the print parameters.

3 Click **OK** to save the print parameters and return to the **Main Program** window.

Previewing Forecast Reports

To preview the print job prior to printing:

1. From the **file manager** pane in the **Main Program** window, select the Model icon.
2. On the **File** menu, click **Print Preview**.
   - Click **Zoom In** to examine the page in closer detail.
   - Click **Zoom Out** to view the entire page.
   - Click **Next Page** to view the next page.
   - Click **Previous Page** to view the previous page.
   - Click **Two Page** to view two consecutive pages, side by side.
3. After previewing the print job, either click **Close** to return to the **Main Program** window, or select the **Print...** command button to send the chart(s) to the printer.

Printing Forecast Reports

To send a forecast report to the printer:

1. From the **file manager** pane in the **Main Program** window, select the Model icon.
2. On the **File** menu, click **Print**.
3. From the **Print** submenu, click **Model**.
4. Before the report is actually sent to the printer, the **Print** dialog box will prompt you to check the print settings. Click **OK** to send the print request.

Exporting Forecast Reports

To export a forecast report to another application:

1. From the **file manager** pane in the **Main Program** window, select the Model icon.
2. On the **Forecast** menu, click **Copy to Clipboard**.
3. Paste the report into your document or presentation application.

A

KEYBOARD COMMANDS

Alternate Key Commands

Using the keyboard commands to access frequently-used commands can enhance your productivity while working in Forecast Capacity Planner.

To access any command on the menu bar from the keyboard:

1. Press and hold down the **Alt** key.
2. Press and hold the key corresponding to the underlined letter in the menu name.
3. If applicable, press and hold the key corresponding to the underlined letter in the submenu name.
4. Press the key corresponding to the underlined letter in the command name.

For example, the keyboard equivalent for the **Delete Model** command on the **File** menu is:

Alt + F + D + M

Two-key and Function Key Commands

Some commonly-used commands are also assigned to a two-key or function key equivalent as described in the following tables (grouped according to menu).

File Menu Command Shortcuts

Menu Command	Toolbar Button	Keyboard Equivalent(s)	
New Model		Alt + F + N	Ctrl + N
Load/Validate model		Alt + F + O	Ctrl + O
Save Model		Alt + F + M	Ctrl + S
Save Model As		Alt + F + S	
Close		Alt + F + C	
Delete Model		Alt + F + D + M	
Delete Collection		Alt + F + D + C	
Delete Desktop		Alt + F + D + D	
Delete Resources		Alt + F + D + R	
Print Setup		Alt + F + R	Ctrl + P
Print Preview		Alt + F + V	
Print Model		Alt + F + P + M	
Print Graph		Alt + F + P + G	
Print Notes		Alt + F + P + N	
Print Screen		Alt + F + P + S	
Print Resources		Alt + F + P + R	
Send		Alt + F + D	

Menu Command	Toolbar Button	Keyboard Equivalent(s)	
Load Resources		Alt + F + L	
Save Resources		Alt + F + U	
Save Resources As		Alt + F + A	
Load Desktop		Alt + F + T	
Save Desktop		Alt + F + K	
Restore Layout		Alt + F + E	
Recently Accessed Files		Alt + F + the underlined file number to the left of the file name	
Exit		Alt + F + X Alt + F4	

Edit Menu Command Shortcuts

Menu Command	Toolbar Button	Keyboard Equivalent(s)	
Undo		Alt + E + U	Ctrl + Z
Redo		Alt + E + R	Ctrl + Y
Cut		Alt + E + T	Ctrl + X
Copy		Alt + E + C	Ctrl + C
Copy to Clipboard		Alt + E + P	Ctrl + V
Edit		Alt + E + E	Enter key
Add		Alt + E + A	
Insert		Alt + E + I	
Delete		Alt + E + D	

Options Menu Command Shortcuts

Menu Command	Toolbar Button	Keyboard Equivalent(s)	
Report Fonts		Alt + O + F	
View Options		Alt + O + V	
Report Options		Alt + O + E	
Graph Options		Alt + O + G	
Resources		Alt + O + R	
Thresholds		Alt + O + T	
Prompt for all disks		Alt + O + O	
Prompt for titles		Alt + O + P	
Change titles		Alt + O + C	

Forecast Menu Command Shortcuts

Menu Command	Toolbar Button	Keyboard Equivalent(s)	
Forecast Options		Alt + R + R	
Graph Forecast		Alt + R + G	
Age Model		Alt + R + A	
Change Name		Alt + R + C	
Copy to Clipboard		Alt + R + O	
Graph to Clipboard		Alt + R + L	
Export Forecast		Alt + R + E	

Menu Command	Toolbar Button	Keyboard Equivalent(s)	
Validated Model		Alt + R + V	

View Menu Command Shortcuts

Menu Command	Toolbar Button	Keyboard Equivalent(s)	
Toolbar		Alt + V + T	
Formatbar		Alt + V + F	
Main Status Bar		Alt + V + S	
Child Status Bar		Alt + V + C	

Window Menu Command Shortcuts

Menu Command	Toolbar Button	Keyboard Equivalent(s)	
Cascade		Alt + W + C	
Tile Horizontally		Alt + W + T	
Tile Vertically		Alt + W + V	
Next Pane		Alt + W + N	
Previous Pane		Alt + W + P	
Arrange Icons		Alt + W + A	
Current Window		Alt + W + the underlined window number to the left of the window name	

Help Menu Command Shortcuts

Menu Command	Toolbar Button	Keyboard Equivalent(s)	
Tip of the Day		Alt + H + P	
Help Topics		Alt + H + H	F1 key
Using Help		Alt + H + U	
About forecast		Alt + H + A	

B

PROGRAM MESSAGES

Confirmation Messages

Message	Cause	Corrective Action
Are you sure you want to delete all centers?	The user attempted to delete the **Centers** header on the tree view.	Click **Yes** to save changes or No to clear changes.
Are you sure you want to delete all information from the model?	The user attempted to delete the model on the tree view.	Click **Yes** to save changes or No to clear changes.
Are you sure you want to delete all workloads?	The user attempted to delete the **Workloads** header on the tree view.	Click **Yes** to save changes or No to clear changes.
Are you sure you want to delete the CPU?	The user attempted to delete the CPU.	Click **Yes** to save changes or No to clear changes.
Are you sure you want to delete the notes?	The user attempted to delete **Notes** from the tree view.	Click **Yes** to save changes or No to clear changes.
Are you sure you want to delete the selected center(s)?	The user attempted to delete one or more disk(s) from the model.	Click **Yes** to save changes or No to clear changes.
Are you sure you want to delete the selected disk?	A disk resource was about to be deleted from the Disk tab in the Resources dialog box.	Click **Yes** to save changes or No to clear changes.
Are you sure you want to delete the selected workload(s)?	One or more workload groups was/were about to be deleted.	Click **Yes** to save changes or No to clear changes.
Are you sure you want to validate the model?	The user attempted to validate the model.	Click **Yes** to accept the new model or No to return to the collection data.

Message	Cause	Corrective Action
Do you really want to copy the center(s) here?	The user attempted to either paste or drag-and-drop one or more disks into the model.	Click **Yes** to save changes or No to clear changes.
Do you really want to copy the workload(s) here?	One or more workload groups was/were about to be copied.	Click **Yes** to save changes or No to clear changes.
Do you really want to delete the selected CPU?	A CPU resource was about to be deleted from the CPUs tab in the Resources dialog box.	Click **Yes** to delete the resource or No to abort the deletion process.
Do you want to keep changes to notes?	The user made changes to the contents of the Notes window pane, either by deleting or adding to the text.	Click **Yes** to save changes or No to clear changes.
The current resource file was modified! Do you want to save it?	The user attempted to close the program after resources were modified and not saved.	Click **Yes** to save changes or No to clear changes.

Information Messages

Message	Cause	Corrective Action
Cannot copy/cut/paste the CPU center.	The user attempted to copy, cut, or paste the CPU center.	The program does not allow this action, due to the number of variables associated with it.
Couldn't set the minimum size bigger than the maximum one!	The user attempted to set a maximum value that is less than the minimum value.	The dialog will not close unless the proper values are filled or Cancel is pressed, in which case the old values are preserved.
Embedded models will be automatically validated!	The user attempted to embed or link a collection file into an OLE container or an ActiveX container.	Since a collection file cannot be embedded, it is automatically validated. This message informs the user about this fact.
No CPU selected!	The user attempted to insert or delete a CPU resource from the **CPUs** tab in the **Resources** dialog box and there is no CPU selected in the list box.	Select a CPU.

Message	Cause	Corrective Action
No disk selected!	The user attempted to insert or delete a disk resource from the **Disk** dialog box and there is no disk selected in the list box.	Select a disk.
Please enter a non-empty name for the disk!	The user attempted to save changes to the **Disk** dialog box and no disk name was entered.	Enter a disk name or click **Cancel**.
Please enter a signed integer number!	The user entered an invalid number in a dialog box or property page.	Enter a valid number.
Please enter a valid date/ time!	The user entered an invalid date or time value in a dialog box or property page.	Enter a valid date or time.
Please enter a valid number!	The user entered an invalid number in a dialog box or property page.	Enter a valid number.
Resource adjustment shouldn't be 0!	The user attempted to close the **Resources** dialog box and the CPU resource adjustment factor is set to **0** (zero).	Enter a numerical value greater than or less than 0 (zero), or click **Cancel**.
Response time shouldn't be 0!	The user attempted to close the **Resources** dialog box and the disk response time is set to **0** (zero).	Enter a numerical value greater than or less than 0 (zero), or click **Cancel**.
The date/time is too big! Please enter a date/time equal or less than xxx!	The user entered an invalid date or time value in a dialog box or property page.	Enter a valid date or time.
The date/time is too small! Please enter a value equal or bigger than xxx!	The user entered an invalid date or time value in a dialog box or property page.	Enter a valid date or time.
The number is too big! Please enter a number equal or less than xxx!	The user entered an invalid number in a dialog box or property page.	Enter a valid number.
The number is too small! Please enter a number equal or bigger than xxx!	The user entered an invalid number in a dialog box or property page.	Enter a valid number.

Message	Cause	Corrective Action
The value is too big! Please enter a value equal or bigger than xxx!	The user entered an invalid number in a dialog box or property page.	Enter a valid number.
The value is too small! Please enter a value equal or bigger than xxx!	The user entered an invalid number in a dialog box or property page.	Enter a valid number.
There should be at least one disk selection!	The user attempted to open a disk capacity graph and no disks were selected in the **Forecast Options** dialog box.	Enter a disk selection or click **Cancel** to keep the old properties.
There should be at least one workload selection!	The user attempted to open a workload capacity graph and no workload groups were selected in the **Forecast Options** dialog box.	Enter a workload group selection or click **Cancel** to keep the old properties.
To edit a disk center you should select one!	The user attempted to edit a disk center and no disk is selected.	Select a disk.
You cannot add a disk until you validate the model! Please select a disk in order to edit it!	The user attempted to add a disk to an unvalidated model.	Validate the model before adding a disk.
You cannot change the CPU until you validate the model!	The user attempted to edit the CPU in an unvalidated model.	Validate the model before editing the CPU selection.
You cannot delete the CPU if there are disk centers!	The user attempted to delete the CPU and there are disks in the model.	Delete the disk centers first, then delete the CPU.
You cannot drop disks here!	The user attempted to drag-and-drop one or more disk(s) on a list that displays workload groups.	The program does not allow this action.
You cannot drop workloads here!	The user attempted to drag-and-drop one or more workload groups on a list that displays disks.	The program does not allow this action.
You cannot edit the CPU until the model is validated!	The user attempted to edit the CPU in an unvalidated model.	Validate the model before editing the CPU selection.

Message	Cause	Corrective Action
You could not select All Disks for Disk Utilization chart!	The user requested a disk utilization graph type in the **Forecast Options** dialog box and "All disks" is selected.	Deselect **All disks** and select the individual disk types.
You have to select an item in both list boxes in order to move it!	From the **Fill Patterns** or **Point Patterns** tabs in the **Graph Options** dialog box, the user clicked the **>> <<** button to exchange items between the two lists, but only one item (or no items) was selected.	To exchange an item in the **Available** list with an item in the **Disabled** list, select both items, then click the **>> <<** button.
You have to select an item in order to move it!	From the **Fill Patterns** or **Point Patterns** tabs in the **Graph Options** dialog box, the user clicked the **>>** button or the **<<** button to move a list item from one list to the other, but no item was selected.	To move an item from the **Available** list to the **Disabled** list (or vice versa), select the item, then click the **>>** (or <<) button.
You should add a CPU before dropping disk center(s)!	The user attempted to drag-and-drop or paste disks and no CPU is set.	Select a CPU before adding disks.
You should select a CPU type!	The user attempted to close the CPU dialog and no CPU type is selected.	Select a CPU type or click **Cancel**.
You should select the disk type!	The user attempted to close the CPU dialog and no disk type is selected.	Select a disk type or click **Cancel**.
You should validate the model first to be able to add a workload!	The user attempted to add a workload group to an unvalidated model.	Validate the model before adding a workload group.

Warning Messages

Message	Cause	Corrective Action
Invalid resource file!	The resource file is in the wrong format.	File amy have been transferred from host using ASCII rather than binary method. Transfer the file again using Binary transfer method.
Trouble reading the tips file!	The **tips.txt** file cannot be found or the program has not been given the rights to access it.	Add the **tips.txt** file to the Forecast program directory from the original Forecast Capacity Planner install disks or CD.
Warning. There is no definition for forecast CPU model...selection. This selection will be ignored!	Forecast loads a model with a CPU selection that is not found in the resources file.	This occurs when the CPU in question was deleted from the resources, or when another resource file was loaded after the model was saved.

Error Messages

Message	Cause	Corrective Action
(calc_model) did not converge!	An overflow occurs during a model calculation because set values are either too large or too small.	Load another collection with different values, or age the model in smaller time increments, or set smaller growth rates.
(calc_model) did not converge!	The program is loading a collection or model file and the calibration model calculation fails.	Load another collection with different values, or age the model in smaller time increments, or set smaller growth rates.
Cannot process multiple disk lines with multiple CPU selections!	The user selected more than one disk and more than one CPU in the **Forecast Options** dialog, then clicked the **OK** button.	Limit either the number of CPUs or disks to one.
Cannot process multiple disk lines with multiple workload selections!	The user selected more than one disk and more than one workload group in the **Forecast Options** dialog, then clicked the **OK** button.	Limit either the number of disks or the number of workload groups to one.

Message	Cause	Corrective Action
Cannot process multiple workload lines with multiple CPU selections!	The user selected more than one workload group and more than one CPU in the **Forecast Options** dialog, then clicked the **OK** button.	Limit either the number of workload groups or the number of CPUs to one.
Collection file does not contain enough samples to calibrate the workloads!	The program attempted to load a collection file that contains very little data.	Make another (larger) collection file.
Could not evaluate calibration model for workload: insufficient memory!	The program is loading a collection or model file and the calibration model calculation fails.	Close all windows and applications, restart the PC, then restart the Forecast Capacity Planner program.
Could not start print job.	The print job fails.	Check the system printing configuration.
Failed to create empty document!	The program attempted to create a new system model. This is most likely to occur when the program is invoked by Microsoft® Internet Explorer® or another application.	Close all windows and applications, restart the PC, then restart the Forecast Capacity Planner program.
Failed to launch help!	The online Help system failed to launch.	Add the **Forecast.chm** file to the Forecast program directory from the original Forecast Capacity Planner install disks or CD.
Failed to open document!	The program failed to open a collection or model file.	Check the file name.
File error reading collection file!	The program attempted to load a corrupt collection file. File corruption can be due to disk corruption or by performing an ASCII file transfer instead of a binary file transfer.	Delete the file and transfer the file from the host system using binary transfer format.
Insufficient memory to continue!	The program attempted to load or calculate a model and fails due to insufficient memory.	Close all windows and applications, restart the PC, then restart the Forecast Capacity Planner program.

Message	Cause	Corrective Action
Internal error - calc_line_legends missing legend!	The program attempted to generate a forecast graph and encountered an internal error.	Close all windows and applications, restart the PC, then restart the Forecast Capacity Planner program.
Internal workload calibration error of error% for xxx!	The program is loading a collection or model file and the calibration model calculation fails.	Use a different collection file.
Invalid collection file!	The program attempted to load a corrupt collection file. File corruption can be due to disk corruption or by performing an ASCII file transfer instead of a binary file transfer.	Delete the file and transfer the file from the host system using binary transfer format.
Invalid desktop file!	The program attempted to load a corrupt desktop file.	Use another desktop file. Keep in mind that Forecast Capacity Planner cannot read Performance Gallery™ desktop files.
No workloads have been selected for forecast information!	The program attempts to generate a workload graph and no workload groups are selected in the Forecast Options dialog box.	Select a workload group in the Forecast Options dialog box. There must be at least 3 workload groups by default.
OLE initialization failed. Make sure that the OLE libraries are the correct version!	The OLE initialization failed during program startup.	OLE libraries are missing or are the wrong version. Reinstall OLE from the original Forecast Capacity Planner installation disks or CD.
Resource utilization discrepancy of error%!	The program is loading a collection or model file and the calibration model calculation fails.	Use a different collection file.
The default resource file is missing or there are not enough rights to read it!	The program cannot read the Resources.dat file that resides in Forecast's program directory.	Add the **Resource.dat** file to the Forecast program directory from the original Forecast Capacity Planner install disks or CD. Or, reset the rights to the existing Resource.dat file.

Message	Cause	Corrective Action
Unrecognized collection file version!	The program attempts to load an outdated collection file.	Load a current version of SOS Performance Advisor™ on the host machine and repeat the data extraction process. You can request a current version from your account manager.
Validation discrepancy of error% in calibration model for workload group: xxx!	The program is loading a collection or model file and the calibration model calculation fails.	Use a different collection file.

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