CHAPTER 14

Logging and Reporting

Introduction

TrafficDirector provides comprehensive logging and reporting tools. You can set up and generate a variety of reports using the Report Generator, which you launch from the Domain Manager **Tools** menu.

This chapter describes the available reports and how to create them. It also tells you how to generate reports directly from the command line.

You can enter report data directly into spreadsheets such as Excel and Lotus 1-2-3, and then create charts of your reports. The process for doing this with Excel is described in the section "Creating Charts of Reports in Microsoft Excel" later in this chapter.

Logging and reporting consist of the following general steps:

Step 1 Make sure the logging function is enabled to gather the data for your report. The TrafficDirector logging function gathers information from the agents and stores that historical information on log files.

You may have already enabled logging when you set up your domains in the Domain Manager. If you did not do so then, you can enable logging using the Install Domain feature from the Domain Manager.

Step 2 Wait a minimum of twice the specified logging interval.

Step 3 If you plan to run the Billing or Multi-Domain reports, make sure you have created the additional files those reports require.

Step 4 Create reports from the logged data using the Report Generator.

Types of Reports and What They Tell You

Table 14-1 summarizes the types of reports that TrafficDirector can provide using Report Generator, what those reports can tell you, and when to use them.

Table 14-1 Types of Reports

Report type (type parameter)	What it gives you	Why you use it
Segment Statistics (**seg-stats**)	A summary of segment traffic for the selected segment and domain during the report period.	To get an overview of network traffic for the specified agent and domain.
Segment Details (**seg-details**)	One line of output for each pair of log files available for the selected period.	To get more detail about the specified agent and domain, and to create a comma- or tab-delimited CSV data file that you can use as input to a word processor, database, or spreadsheet.
Conversation Statistics (**conv**)	A summary, for the selected agent and domain, of traffic between each pair of hosts that have talked during the report period.	To see both halves of each conversation listed together, sorted according to the metric you select and including either all conversations or only the top N conversations.
Host Summary (**host**)	A summary of host traffic for the selected agent and domain during the report period, sorted according to the metric you select. You can choose to include one host or only the top N hosts.	To get an overview of host traffic for the selected agent and domain.
Host-Verbose (**host-verbose**)	A tabular-format report, identical to the Host (summary) report, with the information for each host expanded.	To view the details of the host traffic for the selected agent and domain for the selected hosts, sorted according to the metric you select and including either all hosts or only the top N hosts.
Host-Outbound (**host-outbound**)	A report similar to the Host-Verbose report listing only outbound statistics.	To view the details of the outbound host traffic for the selected agent and domain for the selected hosts, sorted according to the metric you select and including either all hosts or only the top N hosts.
Multi-Domain (**multi-domain**)	Comparative segment statistics for a hierarchy of domains for a specified agent, based on a tree of domains that you define.	Since domains often correspond to protocol layers, use this report to provide a Protocol Distribution showing traffic at multiple protocol layers.
Billing (**billing**)	A report on the amount and cost of inter-subnet traffic over a LAN/WAN segment during the report period.	To analyze traffic flow between the specified subnets of your network and to determine the cost of that traffic.

The following sections tell you how to use TrafficDirector's reporting functions to create these reports.

Enabling Logging

Before you configure and generate a report for a particular domain or domains, you should verify that you enabled logging when you installed the domains, and that the logging intervals are set the way you want them. *If logging is not enabled for a domain, no information is recorded and you cannot generate reports for that domain.* If you have not enabled logging, you must do so before you can generate reports for that domain.

To verify that logging is enabled for a specific domain, to enable logging, or to change the existing logging settings for a domain:

Step 1 From TrafficDirector window, select the Agent or Agent Group for which you want to verify or enable logging.

Step 2 Select **Domain Manager** from the TrafficDirector Main window. The Domain Manager window appears .

Step 3 Select the agent and domain combination for which you want to verify or enable logging.

Step 4 Select **Install**. The Install Domain window appears.

Step 5 Verify that logging is enabled for the reports you will want to generate:

- **Statistics** must be enabled for the Segment Statistics, Segment Details, and Multi-Domain reports.
- **Host** must be enabled for the Host, Host-Verbose, and Host-Outbound reports.
- **Conversation** must be enabled for the Conversation and Billing reports.

Note When you enable any of the logging options for a domain, the resulting log file occupies increasing disk space in the TrafficDirector directory tree as time goes by. It is good practice, therefore, not to enable logging options for domains for which you're certain you'll never need a report. On the other hand, if you don't create a log file for a given time period, the information is lost and you can never generate a report for that time period.

If you're not certain you'll need a report for a given domain, a useful compromise is to set the logging interval to the maximum value. This minimizes the amount of disk space taken up by logged data.

Step 6 Verify or change the logging intervals for the enabled log files. The logging mechanism records the specified data only at certain times. The logging interval is the amount of time that must elapse between data recording. The default logging intervals are 15 minutes for Statistics, 2 hours for Host, and 8 hours for Conversation.

Step 7 Select **OK** to return to the Domain Manager window or **Cancel** to quit.

When logging is enabled and the desired logging intervals are set, TrafficDirector automatically initiates logging. Logging continues until you disable it from the Install Domain or Deinstall Domain window, regardless of whether reports are generated. When you generate reports, you create them from information that was previously logged and stored.

Understanding Log Files

Logs are stored in log files in subdirectories under **$NSHOME/db**. The program **dvlogd** creates all subdirectories as required.

Each log file is an independent snapshot of certain network statistics. Log files have a binary format. The reporting program reads and processes log files to produce reports.

The pathname for each log file is:

```
$NSHOME/db/agentname/domainname/YYMMDDHH.mmT
```

where:

YY = year (95, 96,...)
MM = month (01 - 12)
DD = day of month (01 - 31)
HH = hour of day (00 - 23)
mm = minute (00 - 59)
T = statistics type:
- E = Ethernet segment statistics
- T = Token Ring segment statistics
- H = Host statistics
- C = Conversation statistics

For example, log file **$NSHOME/db/agent101/TCP/95013016.15E** is the log of Ethernet segment statistics for agent agent101, domain TCP, taken at 4:15 PM, January 30, 1995.

Logging Status Messages

The logging daemon (dvlogd) also writes status messages to the file **$NSHOME/usr/dvlog.log**. You can examine this file periodically to ensure that the daemon is functioning properly.

A sample excerpt from a status log (**dvlog.log**) is:

```
Jul 30 15:04: New logging daemon started, pid = 8368
Jul 30 15:15: Logging daemon exiting, pid = 6668
Jul 30 15:15: logging segment statistics for agent:probe204, domain: ALL
Jul 30 15:15: logging host statistics for agent:probe204, domain: ALL
```

The Logging Control FileL

The file **$NSHOME/usr/dvlog.ctl** serves as a keep-alive control file shared by **dvlogd** and **tdir**. It ensures that exactly one logging daemon is active at each logging interval.

Creating Reports

TrafficDirector's Report Generator lets you create reports interactively based on a wide variety of statistical and other information gathered by SwitchProbes and IOS RMON agents. In order to generate reports, you must first use the log function to gather historical information from the agents, and store that information in log files. The report function obtains information from the log files, formats it, and provides either display, printed, or file output.

You can also create reports from the command line. This is described in the section "Creating Reports from the Command Line" later in this chapter.

You can view and print graphical representations of four types of reports directly from the Report Generator main window. The reports that you can graph are:

- Segment Statistics
- Segment Details
- Conversations
- Host

Creating a Report Using Report Generator

This section provides an overview of how to set up, configure, and generate a report. Instructions for specific reports are covered in the sections that follow.

To generate a report:

Step 1 Select **Domain Manager** from the TrafficDirector Main window. The Domain Manager main window appears.

Step 2 Select the agent and domain combination for which you want to generate a report.

Step 3 Verify that logging is enabled for the domain you selected (see "Enabling Logging").

Step 4 Wait a minimum of *two* logging intervals after you enable logging, to ensure that you have valid data. For example, if you enable Statistics logging with a 15-minute logging interval you have to wait at least 30 minutes before you generate a report that requires Statistics information.

Step 5 On the **Tools** menu**,** select **Report Generator**. The Report Generator main window appears.

The Report Generator window contains a **File** menu, which lets you exit the Report Generator, and two selection buttons:

- **Configure** lets you configure your report as described in the next section. When you configure a report, you modify the default format parameters you specified when you created the configuration file. You can configure all the reports except the Segment-Statistics and Segment-Details reports.
- **Generate** generates the report. It is stored in the file you specify in the file name field under Output.

Step 6 Fill in the fields in the Report Generator window as appropriate for the report you want to generate.

These fields are:

Field	What it Does
Start Time/End Time	Specifies the starting and ending times for the report, in DD MMM YY HH:mm format. For example, 11:00 PM, January 14, 1995 is represented as 14 Jan 95 23:00. Both start and end time are mandatory.

Field	What it Does
	You can pop up a selection list showing available times by clicking on the ellipsis button (indicated by ...) following the entry field. Click on one of the times in the selection box. The actual time base for the report corresponds to the logs taken on or after the starting time you specify.
Lines Per Page	For paginated reports, this specifies the number of lines on each page, including headers and footers, if any. The default is 66. If you specify the value 0, the report is not paginated. There is no upper limit.
Header/Footer	Lets you specify a customized header or footer for the report. No defaults are provided. You can use any characters and make the header or footer as long as you like, or you can omit them entirely.
Output	Directs the report to be output to a file, a printer, or to an e-mail address. The File Name parameter beneath the output selections can specify the name of a file to contain ASCII or comma-separated values (CSV) output. For example, you could specify the file **my_report.txt**, to be created in the **$NSHOME/reports s** directory. If you direct the output to a printer or to an e-mail address, you must use the correct format in the output file name, as shown in the examples below. If the output parameter value is enclosed in square brackets, for example, **"[lpr -Dprinter2 %]"**, it is interpreted as a hard-copy command that operates on a temporary file. The character **%** stands for the name of the temporary file. Note that the command need not actually result in a printed hard copy. Examples of output specifications: **"[lpr %]"** -- print on default printer **"[cat % | rsh somehost enscript]"** -- convert to PostScript on remote host and print. **"[mail -s Monday-Report someone < %]"** -- Enclose the report in a mail message to someone.
Report Type	Select the type of report to be generated. Each report type is described in Table 14-1. The report types are:

Segment-Statistics

Segment Details

Conversation

Host

Host-Verbose

Host-Outbound

Multi-Domain

Billing

Report Format — Select the format in which you want the report:

ASCII. Generates the report in standard ASCII format.

CSV. Generates the report in comma-separated format. Use this format if you want to import the report into a spreadsheet such as Excel. This procedure is described in the section “Creating Charts of Reports in Microsoft Excel” later in this chapter.

GRAPH. Generates a graphical view of the report data. Available only for Segment Statistics, Segment Details, Converstions and Host reports.

The Segment Statistics and Billing reports can be generated only in ASCII format, and the Segment-Details report can be generated only in CSV format. All other reports can be generated in either format. The only delimiter available for CSV-format reports is the comma.

Step 7 Click on **Generate** to generate the report.

Configuring Your Report

All reports except the Segment Statistics report use a Report Configuration file. You can accept the default configuration parameters contained in the report configuration file, or you can modify them.

To modify the default configuration of these reports:

Step 1 Bring up the Report Generator window as described in the previous section.

Step 2 Select the Report Type that you want to configure. The current configuration for the Report Type you’ve selected appears.

Step 3 From the Report Generator window, click on **Configure**. The Report Configuration window appears.

The Report Configuration Window consists of four subwindows:

Sort Hosts

This subwindow is available for Host (summary), Host-Verbose, and Host-Outbound report configuration.

Determines the field on which host data is sorted in the report. The default is Outbound Utilization.

The selections are:

- MAC Address Order. Sorts hosts in order of their MAC addresses.
- Discovery Order. Sorts by the time that each host was discovered.
- Outbound Packets. Sorts by total (absolute) outbound packets from each host.
- Inbound Packets. Sorts by total (absolute) inbound packets to each host.
- Inbound Utilization. Sorts by the percent of inbound bandwidth (10 Mbits/sec) to each host.
- Outbound Utilization. Sorts by the percent of outbound bandwidth (10 Mbits/sec) to each host.
- Outbound Bcasts. Sorts by the number of outbound broadcasts from each host.
- Outbound Errors. Sorts by the total (absolute) number of errors outbound from each host.
- Top N Hosts. Sorts in the order of Top N hosts. The entry box following this field lets you enter the number of hosts to include in the report's statistics. The default value is 20.

Sort Conversations

This subwindow is available for Conversations report configuration.

Determines the field on which host conversation data is sorted in the report. The default is Total Utilization.

The selections are:

- MAC Address Order. Sorts conversations in order of each host's MAC address.
- Total Packets. Sorts conversations by the absolute number of packets for a conversation interval.
- Total Bytes. Sorts conversations by the absolute number of bytes for a conversation interval.
- Total Utilization. Sorts conversations by the total percent of bandwidth (10 Mbits/sec) for a conversation interval.
- Total Errors. Sorts conversations by the total number of errors for a conversion interval.
- Top N Hosts. Sorts in the order of Top N hosts. The entry box following this field lets you enter the number of hosts to include in the report's statistics. The default value is 20.

Segment Details — **S**pecifies the interval at which report data is presented. For example, if you select an interval of 30 minutes, the report will present data collected at 30-minute intervals. The default is 15 minutes. This subwindow is available only for the Segment Details report configuration.

Files — Specifies the file names containing information needed for Multi-Domain and Billing reports. This subwindow is available only for those two reports.

The fields are:

- Distance File. Default is **distance.act.**
- Location File. Default is **iploc.**
- Tariff File. Default is **tariff.act.**
- Tree File. Default is **tree.cfg.**

The first three fields are active only for the Billing report type. They specify data used in calculating billing statistics. The Tree file is active only for the Multi-Domain report. It describes the hierarchy of domains for the specified agent. These files are described in detail in the sections that describe these reports.

Each of these fields is mandatory for its respective report type.

Note Only the subwindows relevant to the report type you specified in the Report Generation window are active in the Report Configuration Window. The others are grayed out.

Step 4 When you have completed your selections and entries on the Report Configuration Window, click on **OK** to confirm your choices or **Cancel** to revoke them. In either case, you return to the Report Generation window.

Step 5 Select **Generate** to generate your report using the configuration you specified.

The following sections describe each of the report types and list the report configuration parameters specific to the report type.

Creating a Graphical Report

You can view a graphical version of the Segment Statistics report, the Segment Details report, the Conversations Report, and the Host (summary) report.

To view a graphical report:

Step 1 Select **GRAPH** in the **Report Format** subwindow of the Report Generator window.

Step 2 Click on **View in** the Report Generator window. The graphical report appears.

Selecting Graph Properties

You can customize your graph using the **Properties** menu. Not all properties are available for all graph types. See the sections on the individual graph types for details on the selections available for each graph type. The selections are:

Property Selection	What it Does
Bar Chart	Presents the report in the form of a bar chart. This is the default for the Segment Statistics report, the Conversations report, and the Host report.
Plot Chart	Presents the report in the form of a plot chart. This is the default for the Segment Details report.
Stack Bar Chart	Presents the report in the form of a stacked bar chart.
Pie Chart	Presents the report in the form of a pie chart.
Transpose	Transposes the variables for the type of chart you selected. The default is off (non-transposed).
Invert	Inverts the axes for bar chart graphs. The default is off (non-inverted).
3D	Presents bar chart graphs in 3-D format. The default is off (2-D representation).

Selecting Graphed Parameters

For all reports except Segment Statistics, you can use the View menu to select the parameters to be displayed in the graph. Not all parameters are available for all graph types. See the sections on the individual graph types for details on the selections available for each graph type. The selections are:

View Selection	What it Does
Utilization	Graphs percent utilization. This is the default for all reports.
Packets	Graphs the total number of each type of packet sent. The packet types are represented in two graphs. The packet types displayed depend on the type of report.
Packet Size	Graphs the total number of each size packet. This is available only for the Segment Details report.

Generating a Segment Statistics Report

The Segment Statistics report provides a summary of segment traffic for the selected agent and domain during the report period. An example of this report is:

```
                                                                Page 1
Segment Traffic Statistics Report

Agent:  probe206                      From: Thu Jan  5, 1995 10:15
Domain: ALL                             To: Wed Jan 11, 1995 09:45


Agent interface: 10 Mbit Ethernet


Traffic this Period
-------------------
Average Utilization: 1.186%
Average Packet Size: 182.64 bytes


Total Packets:     40,183,742   Average rate:     77.79 per second
Total Bytes:    7,339,194,500   Average rate:  14206.73 per second


Packet Type               Total    Per Second       % Total Packets
-----------   -----------------   -----------       ---------------
Unicast              39,942,572         77.32            99.40%
Multicast               175,479          0.34             0.44%
Broadcast                65,691          0.13             0.16%


Packet Size                Total    Per Second     % Total Packets
-----------    ------------------  ------------     ---------------
64 bytes              27,836,235         53.88            69.27%
65..127                2,477,486          4.80             6.17%
128..255               4,029,173          7.80            10.03%
256..511               3,008,358          5.82             7.49%
512..1023                763,461          1.48             1.90%
1024..1518             2,067,818          4.00             5.15%


Errors                     Total    Per Second     % Total Packets
-----------    ------------------    ----------     ---------------
CRC/Align                  1,488          0.00             0.00%
Undersize                      0          0.00             0.00%
Oversize                       0          0.00             0.00%
Fragments                  1,210          0.00             0.00%
Jabbers                        1          0.00             0.00%
Collisions               433,567          0.84             1.08%
```

To generate a Segment Statistics report, follow these steps:

Step 1 From the TrafficDirector Main window, select **Domain Manager**. The Domain Manager window appears.

Step 2 Click on Install to verify that logging is enabled for this report. (See “Enabling Logging”.)

Step 3 Wait a minimum of **two** logging intervals after you enable logging to ensure that you have valid data. For example, if you enable Statistics logging with a 15-minute logging interval, you have to wait at least 30 minutes after enabling logging before generating a report that requires Statistics information.

Step 4 On the Domain Manager window, select the agent and domain for which you want a report.

Step 5 From the **Tools** menu on the Domain Manager window, select Report Generator. The Report Generator window appears.

Step 6 Fill in or change the fields needed for this report:

- In the Report Type subwindow, select **Segment Statistics**.
- Fill in the **Start Time** and **End Time** fields. You can either enter a start and end time manually or pop up a selection window by clicking on the ellipsis (...) at the end of the field entry box.
- If you want your report to be paginated, fill in the number of lines per page, including header and footer, if any. The default is 66. If you want an un-paginated report, enter 0.
- If you want a header or footer, enter the text you want in the Header and Footer fields. The default is no header or footer.
- In the **Output** subwindow, select the device to which you want the output sent:

  File. Send the report to the file name you specify.

  Printer. Send the report to your default printer.

  Mail to. Mail the report to the user you specify.

  The entry field following these selections initially shows the default file name, printer, or e-mail address to which the output will be sent. Either accept this value or supply a new one. Examples of the formats for each type of output are presented in the section “Creating a Report Using Report Generator” earlier in this chapter.

Caution If you are capturing several intervals of logging data to a file, be sure to change the file name for each interval; otherwise, you will overwrite the previous file with the same name.

- In the **Report Format** subwindow, select one of the following:

  ASCII. Generates the report in standard ASCII format.

  CSV. Generates the report in comma-separated format. Use this format if you want to import the report into a spreadsheet such as Excel.

  GRAPH. Creates a graphical report. See the next section.

Step 7 If you selected either ASCII or CSV, click on **Generate**. TrafficDirector generates your report.

If you selected GRAPH, click on View to display the graphical report.

Creating a Graphical Segment Statistics Report

You can view a graphical version of the Segment Statistics report.

To view a graphical Segment Statistics report, follow the steps to generate:

Step 1 Select **GRAPH** in the **Report Format** subwindow in the Report Generator window.

Step 2 Click on **View in** the Report Generator window. The graphical report appears.

Segment Statistics Graph Properties

You can customize your Segment Statistics graph using the **Properties** menu. (The **View** menu is not available in the Segment Statistics graph). The selections available for a Segment Statistics graph are:

Property Selection	What it Does
Bar Chart	Presents the report in the form of a bar chart. This is the default.
Stack Bar Chart	Presents the report in the form of a stacked bar chart.
Pie Chart	Presents the report in the form of a pie chart.
Transpose	Transposes the variables for the type of chart you selected. The default is off (non-transposed).
Invert	Inverts the axes for bar chart graphs. The default is off (non-inverted).
3D	Presents bar chart graphs in 3-D format. The default is off (2-D representation).

Generating a Segment Details Report

The Segment Details report provides more information than does the Segment Statistics report. This report is in comma-separated form (CSV) so you can use it as input to a spreadsheet, database, or word-processing program.

The following is an example of a Segment Details report.

```
Type,Agent,Domain,From Date,To Date
Segment Details Report,probe206,ALL,01/05/1995 10:15,01/05/1995 12:45
Start Time,End Time,Elapsed Seconds,Util%,
DropEvents,Octets,Pkts,BroadcastPkts,MulticastPkts,CRCAlignErrors,UndersizePkts,OversizePkts
Fragments,Jabbers,Collisions,Pkts64,Pkts65,Pkts128,Pkts256,Pkts512,Pkts1024,Filler
01/05/1995 10:15,01/05/1995
10:30,900,1.136,0,12465484,38891,190,570,0,0,0,0,0,117,7241,3155,18178,4904,1452,3961,0
01/05/1995 10:30,01/05/1995
10:45,901,4.399,0,48457911,136149,195,572,0,0,0,139,0,1419,11770,36128,51642,12170,4434,
19866,0
01/05/1995 10:45,01/05/1995
11:00,900,4.232,0,46577551,129638,197,573,0,0,0,0,0,1705,32862,25943,29172,13886,10741,
17034,0
01/05/1995 11:00,01/05/1995
11:15,899,1.291,0,14256728,31875,154,572,0,0,0,0,0,70,5187,1693,11271,6745,1192,5787,0
01/05/1995 11:15,01/05/1995
11:30,900,2.875,0,31770101,71052,152,571,0,0,0,0,0,524,9500,7196,28712,8388,3902,13354,0
01/05/1995 11:30,01/05/1995
11:45,900,2.745,0,30391677,60845,159,571,1,0,0,0,0,547,7247,7457,22274,7610,2005,14252,0
01/05/1995 11:45,01/05/1995
12:00,901,1.859,0,20593228,43017,223,578,1,0,0,0,0,330,10139,4697,11488,5488,2011,9194,0
01/05/1995 12:00,01/05/1995
12:15,899,0.968,0,10627108,31937,164,575,0,0,0,0,0,88,11356,3469,7169,5189,864,3890,0
01/05/1995 12:15,01/05/1995
12:30,901,2.464,0,27033242,90257,182,572,0,0,0,0,0,303,6394,15944,50315,5672,3139,8793,0
01/05/1995 12:30,01/05/1995
12:45,899,5.883,0,64807515,163420,156,573,0,0,0,0,0,1686,3111,37166,84400,5496,5589,27658,0
```

The first several lines of this report are headings for the data that follows. Each data record (which may extend over more than one line) begins with the date and time of the logged record.

To create a Segment Details report, follow these steps:

Step 1 From the TrafficDirector Main window, select **Domain Manager**. The Domain Manager window appears.

Step 2 Verify that logging is enabled for this report. (See “Enabling Logging”.)

Step 3 Wait a minimum of **two** logging intervals after you enable logging to ensure that you have valid data. For example, if you enable Statistics logging with a 15-minute logging interval, you have to wait at least 30 minutes after enabling logging before generating a report that requires Statistics information.

Step 4 From the Domain Manager window, select the agent and domain for which you want a report.

Step 5 From the **Tools** menu on the Domain Manager window, select Report Generator. The Report Generator window appears.

Step 6 In the Report Generator Main Window, fill in the fields as appropriate for this report.

- In the **Report Type** subwindow, select Segment Details.
- **Fill in the Start Time** and **End Time** fields. You can either enter a start and end time manually or pop up a selection window by clicking on the ellipsis (...) at the end of the field entry box.
- In the **Output** subwindow, select the device to which you want the output sent:

  File. Send the report to the file name you specify.

  Printer. Send the report to your default printer.

Mail to. Mail the report to the user you specify.

The entry field following these selections initially shows the default file name, printer, or e-mail address to which the output will be sent. Either accept this value or supply a new one. Examples of the formats for each type of output are presented in the section "Creating a Report Using Report Generator" earlier in this chapter.

Caution If you are capturing several intervals of logging data to a file, be sure to change the file name for each interval; otherwise, you will overwrite the previous file with the same name.

- In the **Report Format** subwindow, select one of the following:

  CSV. Generates the report in comma-separated format. Use this format if you want to import the report into a spreadsheet such as Excel.

  GRAPH. Creates a graphical report. See the next section.

Note Since Segment-Details reports are not paginated, the lines per page, header, and footer fields are grayed out. All Segment-Details reports are in CSV format, so the ASCII selection in the **Report Format** subwindow is also grayed out.

Step 7 If you want to change the interval at which report data is presented, select the **Configure** button. The Configuration window appears. The available intervals are:

- 15 minutes (the default)
- 30 minutes
- 1 hour
- 2 hours
- 4 hours
- 8 hours
- 1 day

Step 8 Click on **OK** to change the report interval to the value you've selected, or **Cancel** to leave the Report Configuration window without changing the interval. You return to the Report Generator window.

Step 9 From the Report Generator window, select **Generate**. TrafficDirector generates your report.

If you selected GRAPH, click on View to display the graphical report.

Creating a Graphical Segment-Details Report

You can view a graphical version of the Segment-Details report.

To view a graphical Segment-Details report:

Step 1 Select **GRAPH** in the **Report Format** subwindow in the Report Generator window.

Step 2 Click on **View** in the Report Generator window. The graphical report appears.

Segment Details Graph Properties and Parameters

You can customize your graph using the **Properties** menu. The selections available for a Segment Details Graph are:

Property Selection	What it Does
Plot Chart	Presents the report in the form of a plot chart. This is the default.
Bar Chart	Presents the report in the form of a bar chart.
3D	Presents bar chart graphs in 3-D format. The default is off (2-D representation).

You use the View menu to select the parameters to be displayed in the Segment Details graph. The selections are:

View Selection	What it Does
Utilization	Graphs percent utilization in the segment. This is the default.
Packets	Graphs the total number of each type of packet sent. The packet types are represented in two graphs. The packet types are: • Graph 1: Packets Unicast Multicast Broadcast • Graph 2: CRC Alignment Errors Fragments Undersize Jabbers Oversize Collisions
Packet Size	Graphs the total number of each size packet. The sizes graphed are: 64, 65, 128, 256, 512, and 1024 bytes.

Generating a Conversation Statistics Report

The Conversation Statistics report provides a summary of traffic between hosts for the selected agent and domain during the report period. Each pair of hosts that have talked during the period is included. The list is sorted according to the sort metric you specified. You can elect to include all conversations, or only the top N conversations according to the sort metric.

The list provided by this report is collated, with statistics for both halves of each conversation listed together.

For the Conversation report, you can specify one of the following as the field to use as the Sort metric:

- Total packets (the default)
- MAC address order
- Total utilization
- Total bytes
- Total errors
- Top N. The number of top conversations to be included in the report, for example, 10 or 50, to be sorted according to the sort metric you select. If this field is blank, TrafficDirector lists all conversations.

You specify the sort metric from the Report Configuration window.

Note If you specify the sort metric MAC Address Order, each conversation is listed twice so that it can be located by either host.

Each conversation is listed in this format:

	Util %	Pkts/sec	Avg	Size	Pkts	Bytes	Errors
Host A	1.94%	24.14	998.53	348K	347M	0	
Host B	0.04%	7.15	65.08	103K	6.7M	0	
Total	1.99%	31.29	785.23	451K	354M	0	

The first line shows traffic from Host A to Host B; the second line shows traffic from Host B to Host A. The Total line shows total traffic in both directions.

The following example shows an actual Conversation report in CSV format for all domains associated with the agent probe206, for the period from 4:00 P.M. on 12/16/94 through 4:00 P.M. on 01/06/95, sorted by Utilization percentage.

```
Type,Agent,Domain,From Date,To Date,Sorted By
Conversation Report,probe206,ALL,12/16/1994 16:00,01/06/1995 16:00,Utilization
Host A,Host B,Util % A->B,Util % B->A,Pkts A->B,Pkts B->A,Bytes A->B,
Bytes B->A,Errors A->B,Errors B->A
FrnSof -10-00-12,FrnSof   -10-00-12,0.000,0.079,0,24863689,0,1591275968,0,9
Tatung  -f2-0a-35,DEC    -1e-3c-95,0.013,0.009,353463,326799,286108817,207618706,0,1
Tatung -f2-04-4b,Tatung  -f2-0a-35,0.011,0.011,292269,288317,240239408,236950606,0,5
Tatung  -f2-04-4b,DEC    -bc-34-8e,0.004,0.008,226053,284074,81778803,168429508,0,0
Tatung -f2-0a-35,FrnSof  -01-00-2a,0.005,0.005,357700,357441,107229151,120090383,0,0
Eagle  -3a-48-8b,MICInt  -11-2e-58,0.004,0.004,93528,82313,93543118,79370442,0,0
FrnSof  -01-00-2a,DEC    -bc-34-8e,0.004,0.004,248350,251144,89115768,77966043,0,1
Tatung -f2-04-4b,MICInt  -0f-6a-77,0.004,0.003,220360,220477,93718247,64860193,0,0
Eagle    -3a-48-8b,00-00-92-82-0c-97,0.006,0.001,218955,144828,141348082,13116530,0,0
Eagle  -3a-48-8b,MICInt  -11-2d-92,0.004,0.001,304215,288930,87986490,28442550,0,0
```

To create a Conversation Statistics report, follow these steps:

Step 1 From the TrafficDirector Main window, select **Domain Manager**. The Domain Manager window appears.

Step 2 Verify that logging is enabled for this report. (See “Enabling Logging”.)

Step 3 Wait a minimum of **two** logging intervals after you enable logging to ensure that you have valid data. For example, if you enable Conversation logging with an 8-hour logging interval, you have to wait at least 16 hours after enabling logging before generating a report that requires Conversation information.

Step 4 From the Domain Manager window, select the agent and domain for which you want a report.

Step 5 From the Tools menu on the Domain Manager window, select Report Generator. The Report Generator window appears.

Step 6 Fill in or change the fields needed for this report:

- In the Report Type subwindow, select Conversation.
- Fill in the **Start Time** and **End Time** fields. You can either enter a start and end time manually or pop up a selection window by clicking on the ellipsis (...) at the end of the field entry box.
- If you want your report to be paginated, fill in the number of lines per page, including header and footer, if any. The default is 66. If you want an un-paginated report, enter 0.
- If you want a header or footer, enter the text you want in the Header and Footer fields. The default is no header or footer.
- In the **Output** subwindow, select the output device:

  File. Send the report to the file name you specify.

  Printer. Send the report to your default printer.

  Mail to. Mail the report to the user you specify.

  The entry field following these selections initially shows the default file name, printer, or e-mail address to which the output will be sent. Accept this value or supply a new one. Examples of the formats for each type of output are presented in the section “Creating a Report Using Report Generator” earlier in this chapter.

Caution If you are capturing several intervals of logging data to a file, be sure to change the file name for each interval. If you don't, you will overwrite the previous file with the same name.

- In the **Report Format** subwindow, select one of the following:

  ASCII. Generates the report in standard ASCII format.

  CSV. Generates the report in comma-separated format. Use this format if you want to import the report into a spreadsheet such as Excel.

  GRAPH. Creates a graphical report. See the next section.

Step 7 To specify the method of sorting for your report, select **Configure**. The Report Configuration Window appears.

Step 8 Select the sort metric for your report. You can also select the number of conversations to include in the report. The default is the top 20 conversations. If you leave this field blank the report includes *all* conversations in the specified time period.

Step 9 Click on **OK** to update the configuration, or **Cancel** to quit without changing the existing values. You return to the Report Generator window.

Step 10 If you selected either ASCII or CSV, click on **Generate**. TrafficDirector generates your report.

If you selected GRAPH, click on View to display the graphical report.

Creating a Graphical Conversation Statistics Report

You can view a graphical version of the Conversation Statistics report.

To view a graphical Conversation Statistics report:

Step 1 Select **GRAPH** in the **Report Format** subwindow in the Report Generator window.

Step 2 Click on **View** in the Report Generator window. The graphical report appears.

Conversation Graph Properties and Parameters

You can customize your Conversation graph using the **Properties** menu. The selections available for a Conversation graph are:

Property Selection	What it Does
Bar Chart	Presents the report in the form of a bar chart. This is the default.
Stack Bar Chart	Presents the report in the form of a stacked bar chart.
Pie Chart	Presents the report in the form of a pie chart.
Transpose	Transposes the variables for the type of chart you selected. The default is "off" (non-transposed).
3D	Presents bar chart graphs in 3-D format. The default is "off" (2-D representation).

You can select the parameters to be displayed in the Conversation Statistics graph using the **View** menu. The selections are:

View Selection	What it Does
Utilization	Graphs percent utilization in the segment. This is the default.
Packets	Graphs the total number of each type of packet sent. The packet types are represented in two graphs. The packet types are: • Graph 1: Packets Unicast Multicast Broadcast • Graph 2: CRC Alignment Errors Fragments Undersize Jabbers Oversize Collisions

Generating a Host Summary Report

The Host report provides a summary of host traffic for the selected agent and domain during the report period, sorted according to the sort metric you specify. You can include all hosts, or only the top N hosts. Hosts are listed one per line. The Sort metric can be one of the following:

- MAC address order
- Outbound packets
- Inbound packets
- Inbound utilization
- Outbound utilization (the default)
- Outbound multicasts
- Outbound broadcasts
- Outbound errors
- Top N. The number of top hosts to be included in the report; for example, 10 or 50, sorted according to the sort metric.The default is to include all hosts.

You specify the sort metric from the Report Configuration window.

The following example shows a Host summary report in ASCII format.

```
                                                                        Page 1
header1
header2
Host Report
Sorted by: Outbound Utilization (Top 5)
Agent:  New_York                                  From: Wed Jan 18, 1995 11:00
Domain: IP-MAC                                      To: Wed Jan 18, 1995 13:30


                           --------------OUTBOUND-------------  ----INBOUND---
Host                        Util% Pkt/sec Error% Mcast% Bcast%   Util% Pkt/sec
--------------------------- ------ ------- ------ ------ ------  ------ -------

Tatung  -f2-04-4b           1.93%   52.78  0.00%   0.0%   0.0%   1.64%   49.64
DEC     -1e-3c-95           0.85%   21.71  0.00%   0.0%   0.0%   0.40%   20.68
Tatung  -f2-0a-35           0.80%   32.98  0.00%   0.0%   0.0%   1.03%   32.13
DEC     -bc-34-8e           0.74%   21.03  0.00%   0.1%   0.0%   0.72%   21.11
Eagle   -3a-48-8b           0.63%   26.38  0.00%   0.0%   0.4%   0.24%   23.91

'*' indicates that host is new this period.


footer line
```

The next example shows a Host summary report in CSV format.

```
Type,Agent,Domain,From Date,To Date,Sorted By
Host Report,probe206,ALL,01/05/1995 12:00,01/11/1995
08:00,Outbound Utilization
Host,Host MAC,Util% Out,Bytes Out,Packets Out,Errors
Out,Multicasts Out,Broadcasts Out,Util% In,Bytes In,Packets In
FrnSof  -10-00-12,00-80-8c-10-00-
12,0.284,1591275520,24863680,10,0,0,0.284,1591275520,24863680
Tatung  -f2-04-4b,00-80-3f-f2-04-
4b,0.171,1055452421,2545811,0,0,1193,0.189,1169924803,2677558
Eagle   -3a-48-8b,00-00-1b-3a-48-
8b,0.146,902837288,1938212,0,0,25440,0.044,263552430,1601025
Tatung  -f2-0a-35,00-80-3f-f2-0a-
35,0.142,879923810,1513676,5,0,241,0.139,863614404,1507898
DEC     -1e-3c-95,08-00-2b-1e-3c-
95,0.086,534537676,896769,2,513,6,0.067,413803802,770688
DEC     -bc-34-8e,08-00-2b-bc-34-
8e,0.056,346696472,695384,2,4974,1693,0.041,252104097,615193
FrnSof  -01-00-2a,00-80-8c-01-00-
2a,0.055,336924715,980480,0,0,808,0.049,297707422,985723
MICInt  -0f-6a-77,02-07-01-0f-6a-
77,0.021,131704263,448409,0,0,157,0.030,186382018,447635
MICInt  -0f-c9-6c,02-07-01-0f-c9-
6c,0.016,99898981,322386,0,0,32,0.018,110734372,321010
MICInt  -11-2d-92,02-07-01-11-2d-
92,0.014,79661018,776439,0,0,74,0.039,240450312,824456
MICInt  -11-2e-58,02-07-01-11-2e-
58,0.013,79649588,137890,0,0,29,0.032,198833822,199267
IBM     -0d-59-e1,08-00-5a-0d-59-
e1,0.013,76990725,464679,0,0,242,0.026,161116985,581981
Sun     -0d-a6-12,08-00-20-0d-a6-
12,0.009,58685085,45335,0,0,27,0.001,5940491,39032
FrnSof  -01-05-3d,00-80-8c-01-05-
3d,0.009,55970814,157229,0,0,4044,0.008,48086746,153607
Sun     -0b-c2-d0,08-00-20-0b-c2-
d0,0.009,54912466,227125,0,0,456,0.010,62611470,202996
MICInt  -0f-b2-85,02-07-01-0f-b2-
85,0.008,46904659,175035,1,0,113,0.010,60411743,167897
MICInt  -11-21-56,02-07-01-11-21-
56,0.008,47547994,53919,0,0,44,0.005,30335460,52197
FrnSof  -01-06-5a,00-80-8c-01-06-
5a,0.007,43700241,127197,0,0,376,0.006,38029608,127128
HP      -70-b1-8c,08-00-09-70-b1-
8c,0.006,38995687,197401,0,106,223,0.008,47698360,213770
MICInt  -11-20-57,02-07-01-11-20-
57,0.006,36859927,117277,0,0,96,0.010,59115070,116810
```

To create a Host report, follow these steps:

Step 1 From the TrafficDirector Main window, select **Domain Manager**. The Domain Manager window appears.

Step 2 Verify that logging is enabled for this report. (See “Enabling Logging”.)

Step 3 Wait a minimum of **two** logging intervals after you enable logging to ensure that you have valid data. For example, if you enable Host logging with a 2-hour logging interval, you have to wait at least 4 hours after enabling logging before generating a report that requires Host information.

Step 4 From the Domain Manager window, select the agent and domain for which you want a report.

Step 5 From the Tools menu on the Domain Manager window, select Report Generator. The Report Generator window appears.

Step 6 Fill in or change the fields needed for this report:

- In the Report Type subwindow, select Host.
- Fill in the **Start Time** and **End Time** fields. You can either enter a start and end time manually or pop up a selection window by clicking on the ellipsis (...) at the end of the field entry box.
- If you want your report to be paginated, fill in the number of lines per page, including header and footer, if any. The default is 66. If you want an un-paginated report, enter 0.
- If you want a header or footer, enter the text you want in the Header and Footer fields. The default is no header or footer.
- In the **Output** subwindow, select the output device:

  File. Send the report to the file name you specify.

  Printer. Send the report to your default printer.

  Mail to. Mail the report to the user you specify.

  The entry field following these selections initially shows the default file name, printer, or e-mail address to which the output will be sent. Accept this value or supply a new one. Examples of the formats for each type of output are presented in the section "Creating a Report Using Report Generator" earlier in this chapter.

Caution If you are capturing several intervals of logging data to a file, be sure to change the file name for each interval. If you don't, you will overwrite the previous file with the same name.

- In the **Report Format** subwindow, select one of the following:

  ASCII. Generates the report in standard ASCII format.

  CSV. Generates the report in comma-separated format. Use this format if you want to import the report into a spreadsheet such as Excel.

  GRAPH. Creates a graphical report. See the next section.

Step 7 To specify the method of sorting for your report, select **Configure**. The Report Configuration Window appears.

Step 8 In the Sort Hosts subwindow select the parameter you want to use to sort your report. The default is Outbound Utilization. You can also select the number of hosts (Top N Hosts) to include in the report. If the Top N field is blank, the report will include all hosts.

Step 9 Click on **OK** to update the configuration, or **Cancel** to quit without changing the existing values. You return to the Report Generator window.

Step 10 If you selected either ASCII or CSV, click on **Generate**. TrafficDirector generates your report.

If you selected GRAPH, click on View to display the graphical report.

Creating a Graphical Host-Statistics Report

You can view a graphical version of the Host Statistics report.

To view a graphical Host Statistics report:

Step 1 Select **GRAPH** in the **Report Format** subwindow in the Report Generator window.

Step 2 Click on **View** in the Report Generator window. The graphical report appears.

Host Statistics Graph Properties and Parameters

You can customize your graph using the **Properties** menu. The selections are:

Property Selection	What it Does
Bar Chart	Presents the report in the form of a bar chart. This is the default.
Stack Bar Chart	Presents the report in the form of a stacked bar chart.
Pie Chart	Presents the report in the form of a pie chart.
Transpose	Transposes the variables for the type of chart you selected. The default is “off” (non-transposed).
3D	Presents bar chart graphs in 3-D format. The default is “off” (2-D representation).

You can select the parameters to be displayed in the Conversation Statistics graph using the **View** menu. The selections are:

View Selection	What it Does
Utilization	Graphs percent utilization for each host. This is the default.
Packets	Graphs the total number of each type of packet sent for each host. The packet types are represented in two graphs. The packet types are: • Packets in • Packets out • Broadcasts in • Broadcasts out • Errors out • Multicasts out

Generating a Host-Verbose Report

Like the Host Statistics report, the Host-Verbose report lists the host traffic for the selected agent and domain during the report period. These are sorted according to the sort metric you specify. The Host-Verbose report provides more information, using multiple report lines per host. The report is in tabular form.

You can include all hosts, or only the top N hosts. Hosts are listed one per line. The Sort metric can be one of the following:

- MAC address order
- Outbound packets
- Inbound packets
- Inbound utilization
- Outbound utilization (the default)
- Outbound multicasts
- Outbound broadcasts
- Outbound errors
- Top N. The number of top hosts to be included in the report; for example, 10 or 50, sorted according to the sort metric.The default is to include all hosts.

Figure 14-1 Logging and ReportinThe following example shows a Host-Verbose report in ASCII format.

```
                                                                    Page 1
header1
header2
Host Report
Sorted by: Outbound Utilization (Top 4)
Agent:  New_York                                  From: Wed Jan 18, 1995 11:00
Domain: IP-MAC                                      To: Wed Jan 18, 1995 13:45


Host: Tatung  -f2-04-4b  00-80-3f-f2-04-4b

    Utilization:          1.85% (out)         1.56% (in)
    Bytes/sec:        22709.82  (out)     19072.34  (in)
    Packets/sec:         50.70  (out)        47.32  (in)
    Errors/sec:           0.00  (out)
    Average pkt size:   447.97  (out)       403.02  (in)
    Unicasts Out:        99.99%
    Multicasts Out:       0.00%
    Broadcasts Out:       0.01%
    Errors Out:           0.00%

Host: DEC     -1e-3c-95  08-00-2b-1e-3c-95

    Utilization:          0.80% (out)         0.37% (in)
    Bytes/sec:         9896.34  (out)      4415.38  (in)
    Packets/sec:         20.18  (out)        19.00  (in)
    Errors/sec:           0.00  (out)
    Average pkt size:   490.34  (out)       232.39  (in)
    Unicasts Out:        99.99%
    Multicasts Out:       0.01%
    Broadcasts Out:       0.00%
  Errors Out:             0.00%

Host: Tatung  -f2-0a-35  00-80-3f-f2-0a-35

    Utilization:          0.73% (out)         0.94% (in)
    Bytes/sec:         8855.26  (out)     11513.84  (in)
    Packets/sec:         30.10  (out)        29.35  (in)
    Errors/sec:           0.00  (out)
    Average pkt size:   294.17  (out)       392.31  (in)
    Unicasts Out:       100.00%
    Multicasts Out:       0.00%
    Broadcasts Out:       0.00%
    Errors Out:           0.00%

Host: Eagle   -3a-48-8b  00-00-1b-3a-48-8b

    Utilization:          0.59% (out)         0.23% (in)
    Bytes/sec:         7143.53  (out)      2675.54  (in)
    Packets/sec:         24.67  (out)        22.38  (in)
    Errors/sec:           0.00  (out)
    Average pkt size:   289.53  (out)       119.53  (in)
    Unicasts Out:        99.59%
    Multicasts Out:       0.00%
    Broadcasts Out:       0.41%
    Errors Out:           0.00%

footer line
```

The next example is the same Host-Verbose report in CSV format.

```
header1,header2,footer line
Type,Agent,Domain,From Date,To Date,Sorted By
Host Report,New_York,IP-MAC,01/18/1995 11:00,01/18/1995 13:45,Outbound Utilization
Host Name/Host MAC,Util% Out,Bytes/Sec Out,Packets/Sec Out,Errors/Sec Out,Average Pkt Size
(out),Unicast% Out,Multicasts% Out,Broadcasts% Out,Errors% Out,Util% In,Bytes/Sec In,Packets/
Sec In,Average Pkt Size (In)
Tatung  -f2-04-4b  00-80-3f-f2-04-
4b,1.85,22709.82,50.70,0.00,447.97,1.00,0.00,0.00,0.00,1.56,19072.34,47.32,403.02
DEC     -1e-3c-95  08-00-2b-1e-3c-
95,0.80,9896.34,20.18,0.00,490.34,1.00,0.00,0.00,0.00,0.37,4415.38,19.00,232.39
Tatung  -f2-0a-35  00-80-3f-f2-0a-
35,0.73,8855.26,30.10,0.00,294.17,1.00,0.00,0.00,0.00,0.94,11513.84,29.35,392.31
Eagle   -3a-48-8b  00-00-1b-3a-48-
8b,0.59,7143.53,24.67,0.00,289.53,1.00,0.00,0.00,0.00,0.23,2675.54,22.38,119.53
```

To create a Host-Verbose report, follow these steps:

Step 1 From the TrafficDirector Main window, select **Domain Manager**. The Domain Manager window appears.

Step 2 Verify that logging is enabled for this report. (See “Enabling Logging.)

Step 3 Wait a minimum of **two** logging intervals after you enable logging to ensure that you have valid data. For example, if you enable Host logging with a 2-hour logging interval, you have to wait at least 4 hours after enabling logging before generating a report that requires Host information.

Step 4 From the Domain Manager window, select the agent and domain for which you want a report.

Step 5 From the Tools menu on the Domain Manager window, select Report Generator. The Report Generator window appears.

Step 6 Fill in or change the fields needed for this report:

- In the Report Type subwindow, select **Host-Verbose**.
- Fill in the **Start Time** and **End Time** fields. You can either enter a start and end time manually or pop up a selection window by clicking on the ellipsis (...) at the end of the field entry box.
- If you want your report to be paginated, fill in the number of lines per page, including header and footer, if any. The default is 66. If you want an un-paginated report, enter 0.
- If you want a header or footer, enter the text you want in the Header and Footer fields. The default is no header or footer.
- In the **Output** subwindow, select the output device:

  File. Send the report to the file name you specify.

  Printer. Send the report to your default printer.

  Mail to. Mail the report to the user you specify.

The entry field following these selections initially shows the default file name, printer, or e-mail address to which the output will be sent. Accept this value or supply a new one. Examples of the formats for each type of output are presented in the section “Creating a Report Using Report Generator” earlier in this chapter.

Caution If you are capturing several intervals of logging data to a file, be sure to change the file name for each interval. If you don't, you will overwrite the previous file with the same name.

- In the **Report Format** subwindow, select one of the following:

  ASCII. Generates the report in standard ASCII format.

  CSV. Generates the report in comma-separated format. Use this format if you want to import the report into a spreadsheet such as Excel.

Step 7 To specify the sort metric (method of sorting hosts) for your report, select **Configure**. The Report Configuration window appears.

Step 8 In the Sort Hosts subwindow select the parameter you want to use to sort your report. The default is the outbound utilization. You can also select the number of hosts (Top N Hosts) to include in the report. If the Top N field is blank, the report will include *all* hosts.

Step 9 Click on **OK** to update the configuration, or **Cancel** to quit without changing the existing values. You return to the Report Generator window.

Step 10 Click on **Generate**. TrafficDirector generates your report.

Generating a Host-Outbound Report

The Host-Outbound report lists the outbound host traffic for the selected agent and domain during the report period, sorted according to the sort metric you specify. You can elect to include all hosts, or only the top N hosts. Hosts are listed one per line. The Sort metric can be one of the following (the default is Outbound Utilization):

- MAC address order
- Outbound packets
- Inbound packets
- Inbound utilization
- Outbound utilization (the default)
- Outbound multicasts
- Outbound broadcasts
- Outbound errors
- Top N. The number of top hosts to be included in the report; for example, 10 or 50, sorted according to the sort metric.The default is to include all hosts.

The following example shows a Host-Outbound report in ASCII format.

```
                                                                        Page 1
header1
header2
Host Report
Sorted by: Outbound Utilization (Top 5)
Agent:  New_York                                    From: Wed Jan 18, 1995 11:00
Domain: IP-MAC                                        To: Wed Jan 18, 1995 13:45


Host                          Total Packets Out   Total Octets Out  Utilization%
--------------------------- ------------------ ------------------  ------------

Tatung  -f2-04-4b                       501,831        224,804,516     1.85%
DEC     -1e-3c-95                       199,786         97,963,894     0.80%
Tatung  -f2-0a-35                       297,988         87,658,236     0.73%
DEC     -bc-34-8e                       191,900         83,166,070     0.68%
Eagle   -3a-48-8b                       244,238         70,713,812     0.59%

'*' indicates that host is new this period.


footer line
```

The next example is the same Host-Outbound report in CSV format.

```
header1,header2,footer line
Type,Agent,Domain,From Date,To Date,Sorted By
Host Report,New_York,IP-MAC,01/18/1995 11:00,01/18/1995 13:45,Outbound
Utilization
Host,Total Packets Out,Total Octets Out,Utilization%
Tatung  -f2-04-4b,501831,224804516,1.85
DEC     -1e-3c-95,199786,97963894,0.80
Tatung  -f2-0a-35,297988,87658236,0.73
DEC     -bc-34-8e,191900,83166070,0.68
Eagle   -3a-48-8b,244238,70713812,0.59
```

To generate a Host-Outbound report, follow these steps:

Step 1 In the TrafficDirector Main window, select **Domain Manager**. The Domain Manager window appears.

Step 2 Verify that logging is enabled for this report. (See “Enabling Logging”.)

Step 3 Wait a minimum of **two** logging intervals after you enable logging to ensure that you have valid data. For example, if you enable Host logging with a 2-hour logging interval, you have to wait at least 4 hours after enabling logging before generating a report that requires Host information.

Step 4 From the Domain Manager window, select the agent and domain for which you want a report.

Step 5 From the Tools menu on the Domain Manager window, select Report Generator. The Report Generator window appears.

Step 6 Fill in or change the fields needed for this report:

- In the Report Type subwindow, select **Host-Outbound**.
- Fill in the **Start Time** and **End Time** fields. You can either enter a start and end time manually or pop up a selection window by clicking on the ellipsis (...) at the end of the field entry box.
- If you want your report to be paginated, fill in the number of lines per page, including header and footer, if any. The default is 66. If you want an un-paginated report, enter 0.
- If you want a header or footer, enter the text you want in the Header and Footer fields. The default is no header or footer.
- In the **Output** subwindow, select the output device:

  File. Send the report to the file name you specify.

  Printer. Send the report to your default printer.

  Mail to. Mail the report to the user you specify.

  The entry field following these selections initially shows the default file name, printer, or e-mail address to which the output will be sent. Accept this value or supply a new one. Examples of the formats for each type of output are presented in the section "Creating a Report Using Report Generator" earlier in this chapter.

Caution If you are capturing several intervals of logging data to a file, be sure to change the file name for each interval. If you don't, you will overwrite the previous file with the same name.

- In the **Report Format** subwindow, select one of the following:

  ASCII. Generates the report in standard ASCII format.

  CSV. Generates the report in comma-separated format. Use this format if you want to import the report into a spreadsheet such as Excel.

Step 7 To specify the sort metric (method of sorting hosts) for your report, select **Configure**. The Report Configuration window appears.

Step 8 In the Sort Hosts subwindow select the parameter you want to use to sort your report. The default is the outbound utilization. You can also select the number of hosts (Top N Hosts) to include in the report. If the Top N field is blank, the report will include *all* hosts.

Step 9 Click on **OK** to update the configuration or **Cancel** to quit without changing the existing values. You return to the Report Generator window.

Step 10 Click on **Generate**. TrafficDirector generates your report.

Generating a Multi-Domain Report

The Multi-Domain report lets you compare segment statistics for a hierarchy of domains for a specified agent, based on a user-specified tree of domains. Because domains typically correspond to protocol layers, you can use this report to provide a Protocol Distribution showing proportional traffic at multiple protocol layers.

The domain ALL is always considered the root of the domain tree. Log files for domain ALL must exist in order to generate a Multi-Domain report. The log files for the other domains to be included in the report must be available for the same time period (within the same start/end times) as the log files for the ALL domain.

The Report Generator gets the user-specified tree of domains from the "Tree file." This file specifies the tree structure to be used in the report. You must create this file, and provide its name to the Report Generator before you can generate any Multi-Domain reports.

The following example shows a complete Multi-Domain report in ASCII format. The analysis that follows the complete report looks at individual areas of the report.

The following is an example of a Multi-Domain report.

.

```
Multi-Domain Report

Agent:  probe206                                  From: Thu Jan  5, 1995 10:15
Domain tree: tree.cfg                               To: Wed Jan 11, 1995 09:45


ALL
                   Total Packets Utilization  Pkts/Sec    %Total   Avg Pkt Size
                   ------------- -----------  --------   -------   ------------
            IP         7,503,287       0.44%     14.58    18.67%         372.02
        NOVELL           382,268       0.03%      4.83     0.95%         460.72
         Other        32,298,187       0.72%     62.52    80.38%         135.36
                   ------------- -----------  --------   -------   ------------
         Total        40,183,742       1.19%     77.79   100.00%         182.64


IP
                   Total Packets Utilization  Pkts/Sec    %Total   Avg Pkt Size
                   ------------- -----------  --------   -------   ------------
         Other         7,503,287       0.44%     14.58   100.00%         372.02
                   ------------- -----------  --------   -------   ------------
         Total         7,503,287       0.44%     14.58   100.00%         372.02
```

To generate a Multi-Domain report, follow these steps:

Step 1 Use a text editor to create a Tree file if you have not previously done so. You must set up a Tree file before you can generate any Multi-Domain reports. To create a Tree file, see "Creating a Tree File" following this procedure.

Step 1 In the TrafficDirector Main window, select **Domain Manager**. The Domain Manager window appears.

Step 2 Verify that logging is enabled for this report. (See "Enabling Logging".)

Step 3 Wait a minimum of **two** logging intervals after you enable logging to ensure that you have valid data. For example, if you enable Host logging with a 2-hour logging interval, you have to wait at least 4 hours after enabling logging before generating a report that requires Host information.

Step 4 From the Domain Manager window, select the agent and domain for which you want a report.

Step 5 From the Tools menu on the Domain Manager window, select Report Generator. The Report Generator window appears.

Step 6 Fill in or change the fields needed for this report:

- In the Report Type subwindow, select **Multi-Domain**.
- Fill in the **Start Time** and **End Time** fields. You can either enter a start and end time manually or pop up a selection window by clicking on the ellipsis (...) at the end of the field entry box.
- If you want your report to be paginated, fill in the number of lines per page, including header and footer, if any. The default is 66. If you want an un-paginated report, enter 0.
- If you want a header or footer, enter the text you want in the Header and Footer fields. The default is no header or footer.
- In the **Output** subwindow, select the output device:

  File. Send the report to the file name you specify.

  Printer. Send the report to your default printer.

  Mail to. Mail the report to the user you specify.

  The entry field following these selections initially shows the default file name, printer, or e-mail address to which the output will be sent. Accept this value or supply a new one. Examples of the formats for each type of output are presented in the section “Creating a Report Using Report Generator” earlier in this chapter.

Caution If you are capturing several intervals of logging data to a file, be sure to change the file name for each interval. If you don’t, you will overwrite the previous file with the same name.

- In the **Report Format** subwindow, select one of the following:

  ASCII. Generates the report in standard ASCII format.

  CSV. Generates the report in comma-separated format. Use this format if you want to import the report into a spreadsheet such as Excel.

Step 7 To specify the Tree configuration file for your report, select **Configure**. The Report Configuration window appears.

Step 8 In the **Tree File** field of the **Files** subwindow, enter the name of the ASCII file that contains the tree configuration description. This file must reside in the **$NSHOME/usr/** directory. It is described below. **This field is required for this report**.

Step 9 Click on **OK** to update the configuration, or **Cancel** to quit without changing the existing values. You return to the Report Generator window.

Step 10 Click on **Generate**. TrafficDirector generates your report.

Creating a Tree File

Before you can generate a Multi-Domain report, you must create a Tree file. You then enter the name of this file in the Report Configuration window so that TrafficDirector knows the desired domain tree structure for the report. The name of the file can be anything, but it must end with a **.cfg** extension.

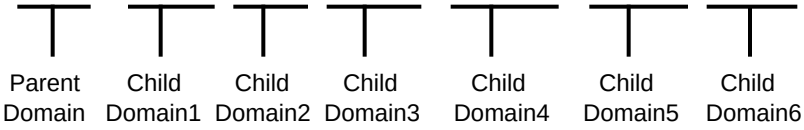
The tree configuration file specifies a hierarchy of domains. Each line of the file has the format:

```
parent-domain:child-domain1 child-domain2 child-domain3...
```

where each of the child domains is a subset of the parent domain, and the child domains do not overlap.

A sample tree configuration file is:

```
ALL:    ARP     IP      NOVELL     DECNET    DECMOP   DECLAT
IP:     UDP     TCP     ICMP       RIP
UDP:    SNMP    RPC     TFTP       NFS
TCP:    TELNET  MOUNT   RLOGIN     FTP       XWINDOW
```



Note that:

- For each parent domain included in the report, an “Other” category is used to categorize traffic that does not fit in any of the child domains.
- The parent domain ALL is always considered the root of the domain tree. A report can only be produced if log files for the ALL domain are present.
- For each parent domain, the Report Generator looks for log files corresponding to each of the listed child domains, and produces a report section such as the following:

```
   Multi-Domain Report

Agent:  probe206                                  From: Thu Jan  5, 1995 10:15
Domain tree: tree.cfg                               To: Wed Jan 11, 1995 09:45


ALL
                  Total Packets Utilization  Pkts/Sec    %Total   Avg Pkt Size
                  ------------- -----------  --------   -------   ------------
            ARP             368       0.00%      0.03     0.05%         67.03
             IP         681,767       2.34%     47.34    97.74%        610.40
         DECNET           1,440       0.00%      0.10     0.21%         64.00
         DECMOP             176       0.00%      0.01     0.03%         67.82
          Other          13,802       0.01%      0.96     1.98%         64.06
```

A domain that is a child at one level of the domain tree may itself also be a parent to other domains. Report Generator produces a report section for every domain that is listed as a parent, even if it is a child of a higher-level domain. For example, domain IP is a child of ALL, but also a parent of UDP, TCP, and ICMP, so the Report Generator produces a report section as follows:

```
IP
                  Total Packets Utilization  Pkts/Sec    %Total   Avg Pkt Size
                  ------------- -----------  --------   -------   ------------
            UDP         196,801       0.33%     13.67    28.87%         295.04
            TCP         484,405       2.01%     33.64    71.05%         738.69
           ICMP             224       0.00%      0.02     0.03%         101.88
          Other             337       0.00%      0.02     0.05%         705.10
                  ------------- -----------  --------   -------   ------------
          Total         681,767       2.34%     47.34   100.00%         610.40
```

This process is repeated recursively until the entire tree of domains is traversed.

Note A domain is included in this report only if it is installed on the specified agent, and if logging is enabled for the domain's segment statistics. Any domains in the tree that do not meet these conditions are not included in the report. To install a domain see Chapter 6, "Installing, Deinstalling, and Monitoring Domains Using Domain Manager."

Statistics for a child domain are included in the report only if log files are available for the same start and end times as for the ALL domain. This is necessary to provide proper alignment of statistics.

In the example above, note that the NOVELL domain is not reported as a child of ALL, even though it is listed as such in the tree file. This can be for one of the following reasons:

- Domain NOVELL is not installed at the agent.
- NOVELL is installed, but is not enabled for logging.
- NOVELL is being logged, but log files time-aligned with ALL are not available.

Note Any NOVELL traffic is included in the Other category.

Generating a Billing Report

The Billing report generates reports on the amount of inter-subnet traffic over a LAN or WAN segment. You can use the Billing report to determine:

- The amount of inter-subnet traffic on the LAN/WAN.
- The amount of WAN link utilization by different subnets.
- The amount of traffic between the network server and different hosts.
- The different protocols generating the router traffic.

To implement the Billing report, you must first provide necessary network parameters such as the location of each subnet, the distance between subnets, and a proxy tariff for sending 1KB of data for a distance of one user-definable distance unit. You can define the distance between any two nodes as one unit. You define these parameters in three files, the Distance, Location, and Tariff files.

Billing is calculated as a multiple of the number of units. This gives you greater flexibility to adapt to local tariff and metric differences. For example, if you typically send a large volume of data over a dedicated line between a node in Boston and one in New York, you can define that distance as one unit, and calculate accordingly. Alternatively, you can define one unit as one mile, if that metric better suited your network traffic.

The Billing report is generated through the normal Report Generator function. However, you must create the Distance, Location, and Tariff files prior to creating the report.

Note To use the Billing report you must first install the domain with SUBNET mode, with the Hosts and conversations groups enabled. To install a domain, see Chapter 6, “Installing, Deinstalling, and Monitoring Domains Using Domain Manager.”

The following is a typical Billing report:

.

```
                                                                        Page 1
Billing Report

Agent:  PbEt38                                  From: Fri Dec 30, 1994 09:31
Domain: IP                                        To: Fri Dec 30, 1994 09:45


Workgroup A     Workgroup B       Bytes  Bytes       --Billing Amount in US $--
and subnet      and subnet         A->B   B->A       A->B       B->A      Total
--------------- ---------------   ----- ------      ----- ----------  ---------

132.20.10.0      "NY Sales"        6976   7752       0.00       0.00       0.00
[132.20.10.0]    [45.20.10.0]

128.20.20.0      "Chg Sales"         14K   1943       0.00       0.00       0.00
[128.20.20.0]    [45.80.0.0]

"LA Sales"      125.20.70.0         6367   7765       0.00       0.00       0.00
[132.17.50.0]   [125.20.70.0]

"LA Sales"       "Chg Sales"        940    980      53.24      55.51     108.75
[132.17.50.0]    [45.80.0.0]

"Bst Sales"      125.20.70.0         32K    39K       0.00       0.00       0.00
[128.10.10.0]    [125.20.70.0]

"Bst Sales"      "NY Sales"         27K    40K     107.25     156.55     263.80
[128.10.10.0]    [45.20.10.0]

"NY Sales"      "Chg Sales"        3.0M   321K   52438.36    5638.36   58076.72
[45.20.10.0]    [45.80.0.0]
```

To create a Billing report, follow these steps:

Step 1 If you have not done so previously, use a text editor to create three separate ASCII files in the directory **$NSHOME/usr/**:

- Distance file
- Location file
- Tariff file

For details on creating these files, see the section “Creating the Files for a Billing Report” following this section.

Step 2 In the TrafficDirector Main window, select **Domain Manager**. The Domain Manager window appears.

Step 3 Verify that logging is enabled for this report. (See “Enabling Logging”.) In addition, verify that the subject domain has been installed in SUBNET mode, with the Hosts and Conversations groups enabled.

Step 4 Wait a minimum of **two** logging intervals after you enable logging to ensure that you have valid data. For example, if you enable Statistics logging with a 1-hour logging interval you have to wait at least 2 hours after enabling logging before you generate a report that requires Host information.

Step 5 From the Domain Manager window, select the agents and domains for which you want a report.

Step 6 From the Tools menu in the Domain Manager window, click on Report Generator. The Report Generator window appears.

Step 7 Fill in or change the fields needed for this report:

- In the Report Type subwindow, select **Billing**.
- Fill in the **Start Time** and **End Time** fields. You can either enter a start and end time manually or pop up a selection window by clicking on the ellipsis (...) at the end of the field entry box.
- If you want your report to be paginated, fill in the number of lines per page, including header and footer, if any. The default is 66. If you want an un-paginated report, enter 0.
- If you want a header or footer, enter the text you want in the Header and Footer fields. The default is no header or footer.
- In the **Output** subwindow, select the output device:

  File. Send the report to the file name you specify.

  Printer. Send the report to your default printer.

  Mail to. Mail the report to the user you specify.

  The entry field following these selections initially shows the default file name, printer, or e-mail address to which the output will be sent. Accept this value or supply a new one. Examples of the formats for each type of output are presented in the section “Creating a Report Using Report Generator” earlier in this chapter.

Caution If you are capturing several intervals of logging data to a file, be sure to change the file name for each interval. If you don’t, you will overwrite the previous file with the same name.

Note The Billing report is available only in ASCII format.

Step 8 Click on **Configure**. The Report Configuration Window appears.

Step 9 In the Files subwindow, enter the names of the ASCII files that contain the appropriate Distance, Location, and Tariff information, respectively. The files must reside in the **$NSHOME/usr/** directory. These fields are required for this report.

If you have multiple location files for different subnet types (for example, **iploc.ip**, **iploc.ipx**, and **iploc.dec**) enter the common portion of their names (**iploc**) into the Location File field.

Step 10 Click on **OK** to continue, or **Cancel** to quit without changing the configuration values. You return to the Report Generation Window.

Step 11 Click on **OK**. TrafficDirector generates the report.

Creating the Files for a Billing Report

Before you can generate a Billing report you have to create three types of files:

- Distance file. Specifies the distance between two sets of locations for which you want billing information.
- Location files. Uniquely identify each billing location.
- Tariff file. Contains the rate, in U.S. dollars, to send 1 KB of data over 1 mile for different daily time periods.

Creating a Distance File

You must create the Distance file in the directory **$NSHOME/usr/.** This file specifies the distance between each two sets of locations for which billing information is required. This information you enter in this file is not case-sensitive. You then enter the name of the Distance file into the Distance File field of the Report Configuration window when you create a Billing report.

In the example Distance file below, notice that the names of cities that include spaces must be enclosed in quotes:

```
# distance.act
# From       To             Distance (miles)
New York     Boston         200
New York     Chicago        900
New York     Miami          1000
New York     ”Los Angeles“  2800
Boston       Chicago        1000
Boston       Miami          1200
Boston       ”Los Angeles“  2900
Chicago      Miami          1200
Chicago      ”Los Angeles“  1900
Miami        ”Los Angeles“  2700
```

TrafficDirector includes a sample distance file, **distance.act**, in the directory **$NSHOME/usr/**.

Creating Location Files

You must create one or more location files in the directory **$NSHOME/usr/.** These files must include the following three identifiers so that each billing location can be uniquely identified:

- The subnet IP address.
- A user-defined location identifier.
- A user-defined department name.

You may have to create multiple location files for different types of subnets present in your network. Currently, TrafficDirector supports the following subnets:

- TCP/IP
- Novell
- DECNET

You create all the files with the same basic name, adding an appropriate extension to identify the subnet type, as illustrated below.

To create the location files needed for your Billing report:

Step 1 If a network under consideration contains one or more TCP/IP subnets, create a location file with the extension **ip** (for example, **iploc.ip**) to provide the locations of the TCI/IP subnet(s), as follows:

```
# iploc.ip
# Subnet      Location          Department
45.20.0.0     “New York”        “Central Sales”
45.20.10.0    “New York”        “Central Support”
128.10.8.0    Boston            “Boston Sales”
128.10.10.0   Boston            “Boston Support”
125.15.6.0    Miami             “Miami Sales”
125.15.10.0   Miami             “Miami Support”
132.17.56.0   “Los Angeles”     “LA Sales”
132.17.50.0   “Los Angeles”     “LA Support”
45.82.0.0     Chicago           “Chicago Sales”
45.82.6.0     Chicago           “Chicago Support”
```

The numbers in the first column give the four-octet IP addresses for different TCP/IP subnets. They are in the form **xxx.xx.xxx.xxx**, where **xxx** is a 3-digit decimal number in the range 0 through 255.

Names that include spaces, such as New York, must be enclosed in quotes.

Step 2 If the network contains one or more Novell subnets, create a location file for these subnets with the **.ipx** extension (for example, **iploc.ipx**), as follows:

```
# iploc.ipx
# Subnet      Location      Department
# 2e20f720    “New York”    “Central Marketing”
# a7004580    “Boston”      “Boston R & D”
```

The numbers in the first column are four octets representing the subnet IPX addresses (the network numbers that identify the subnets). The addresses are in the form xxxxxxxx, where each xx pair represents a hexadecimal number in the range 00 through ff.

Step 3 If the network contains one or more DECNET subnets, create a location file for the subnets with the extension **.dec** (for example, **iploc.dec**), as follows:

```
# iploc.dec
# Subnet      Location      Department
# 32.0        “New York”    “Central Marketing”
# 44.0        “Boston”      “Boston R & D”
```

The numbers in the first column are 16-bit DECNET Internet addresses for subnets. These addresses are in the form xx.0, where xx is a 2-digit decimal number in the range 0 through 63. The node address always 0.

Step 4 You specify these location files in the Report Configuration window by entering the common portion of their names (for example, **iploc**) into the Location File field of the Files subwindow.

You can create multiple location files for different application requirements. Enter the name of the appropriate location file before creating the report file.

Creating a Tariff File

You must create a tariff file which contains the rate, in US dollars, to send 1KB of data over 1 mile for different daily time periods. You can subdivide the daily 24-hour period into any set of contiguous sub-periods to reflect a differing cost structure between business hours and other periods. The time periods must cover the complete 24 hours. A sample tariff file is provided in **$NSHOME/usr/tariff.act**.

For example:

```
# ---------- -------  ---------------------------
# from time  To time  Rate in US $ per 1KByte-Mile
# ---------- -------  ---------------------------

0000         0559      0.01
0600         1159      0.02
1200         1759      0.03
1800         2359      0.01
```

The name of the tariff file is entered into the Tariff File field in the Report Configuration window in order to generate a Billing report.

Creating Reports from the Command Line

TrafficDirector gives you the option of creating reports either interactively or from the command line. In this section you'll learn how to create reports directly from the command line.

The Report Configuration File

If you create your report from the command line, you must provide a report configuration file that contains your particular specifications for your report. The report program, **dvreport**, uses this configuration file to format your report. See "Creating a Report Configuration File" later in this chapter for details on using a text editor to create the appropriate report configuration files.

Note You *must* create a Report configuration file in order to run a report from the command line. If you create a report interactively, using the Report Generator, TrafficDirector creates the report configuration file automatically. However, the configuration information used by the Report Generator is not saved permanently, and is deleted as soon as the interactive report has been run.

Enabling Logging from the Command Line

You initiate logging from the command line by invoking a daemon (background) process, **dvlogd**. When you initiate TrafficDirector (**tdir**), it starts the logging daemon. You can also start it manually using the command:

```
% $NSHOME/bin/dvlogd &
```

Generating a Segment Statistics Report from the Command Line

To create a Segment Statistics report from the command line:

Step 1 Make sure the logging configuration file **dvlog.cfg** exists in the directory **$NSHOME/usr**. This file is normally created when you enable logging in the Domain Manager.

If necessary, create the file as described in the section "Creating the Logging Configuration File" later in this chapter, and initiate logging by entering the command:

```
$NSHOME/bin/dvlogd &
```

Step 2 Wait a minimum of two logging intervals so TrafficDirector can collect sufficient data for a report.

Step 3 If one does not already exist, use a text editor to create an ASCII report configuration file in the directory **$NSHOME/usr**. Give the file a name that will remind you of its contents, and use the suffix **.cfg** (for example, **seg_stat.cfg**). See the section "Creating a Report Configuration File" for detailed instructions on setting up this file.

The **start-time** and **end-time** arguments are optional. You can supply them or override the values in the configuration file with the start-time and end-time arguments in the command line that invokes the **dvreport** program.

Each line of the report configuration file has the format:

```
parameter_name:parameter_value
```

The following example shows a sample report configuration file for a Segment Statistics report. In this example, the mandatory parameters are in bold.

```
#
# Sample Segment-Statistics report configuration file
#
type:       seg-stats
agent:      probe204
domain:     ALL
start-time: 9501261200
end-time:   9501261600
header1:    "Segment Statistics for XYZ Corp. Backbone"
header2:    "Prepared by: J. Random NetMgr"
footer:     "-- XYZ Corp. --  Company Confidential --"
lpp:        66
output:     "[cat % | rsh penguin lpr]"
format:     ASCII
```

This file specifies a printed report of host summary statistics for all domains associated with the agent **probe204** for the period from noon to 4:00 P.M. on January 26, 1995. This ASCII report will be paginated, with a maximum of 66 lines per page, including a 2-line header and a footer.

Note Any parameters that contain spaces (such as the headers and footer in the example) must be contained within quotation marks.

You can specify either ASCII or CSV format for this report. To specify CSV format, use the format parameter, **format: CSV**.

If you would prefer to have the data in your CSV-format report separated by tabs instead of commas, use the delimiter parameter to specify **tab** instead of **comma** (**delimiter: tab**). You must enter the word "tab," not the tab character.

Start-time and end-time parameters are optional in the report configuration file, but if you do not include them here, you must enter them as arguments when you invoke the report program from the command line.

Step 4 Invoke the report program with the following command. Include the start-time and end-time parameters if they are not in the report configuration file, or if you want to override the values in the file.

```
dvreport configuration_file [start-time end-time]
```

where ***configuration_file*** is the name of the ASCII configuration file that you created in **$NSHOME/usr**.

Generating a Segment Details Report from the Command Line

To create a Segment Details report from the command line:

Step 1 Make sure the logging configuration file **dvlog.cfg** exists in the directory **$NSHOME/usr**. This file is normally created when you enable logging in the Domain Manager.

If necessary, create the file as described in the section "Creating the Logging Configuration File" later in this chapter, and initiate logging by entering the command:

```
$NSHOME/bin/dvlogd &
```

Step 2 Wait a minimum of two logging intervals so TrafficDirector can collect sufficient data for a report.

Step 3 If one does not already exist, use a text editor to create an ASCII report configuration file in the directory **$NSHOME/usr**. Give the file a name that will remind you of its contents, and use the suffix **.cfg** (for example, **seg_dtal.cfg**). See the section "Creating a Report Configuration File" for detailed instructions on setting up this file.

The **start-time** and **end-time** arguments are optional. You can supply them or override the values in the configuration file with the start-time and end-time arguments in the command line that invokes the **dvreport** program.

Each line of the report configuration file has the format:

```
parameter_name:parameter_value
```

The following example shows a sample report configuration file for a Segment-Detail report. In this example, mandatory parameters are in bold.

```
#
# Sample Segment-Details report configuration file
#
type:       seg-details
agent:      probe204
domain:     ALL
start-time: 9501261200
end-time:   9501261600
output:     "[cat % | rsh penguin lpr]"
format:     CSV
delimiter:  comma
```

This file specifies a printed report of segment-detail statistics for all domains associated with the agent **probe204** for the period from noon to 4:00 P.M. on January 26, 1995. This CSV report will be un-paginated, with no header or footer. The data fields are separated by commas (the default).

Note Any parameters that contain spaces (such as the headers and footer in the example) must be contained within quotation marks.

The only format for this report is CSV, so the format parameter is optional. If you would prefer to have the data in your report separated by tabs instead of commas, add the delimiter parameter to the configuration file to specify **tab** (**delimiter: tab**). You must enter the word "tab," not the tab character.

Start-time and end-time parameters are optional in the report configuration file, but if you do not include them here, you must enter them as arguments when you invoke the report program from the command line.

Step 4 Invoke the report program with the following command. Include the start-time and end-time parameters if they are not in the report configuration file, or if you want to override the values in the file.

```
dvreport configuration_file [start-time end-time]
```

where ***configuration_file*** is the name of the ASCII configuration file that you created in **$NSHOME/usr**.

Generating a Conversation Report from the Command Line

To create a Conversation Statistics report from the command line:

Step 1 Make sure the logging configuration file **dvlog.cfg** exists in the directory **$NSHOME/usr**. This file is normally created when you enable logging in the Domain Manager.

If necessary, create the file as described in the section "Creating the Logging Configuration File" later in this chapter, and initiate logging by entering the command:

```
$NSHOME/bin/dvlogd &
```

Step 2 Wait a minimum of two logging intervals so TrafficDirector can collect sufficient data for a report.

Step 3 If one does not already exist, use a text editor to create an ASCII report configuration file in the directory **$NSHOME/usr**. Give the file a name that will remind you of its contents, and use the suffix **.cfg** (for example, **conv.cfg**). See the section "Creating a Report Configuration File" for detailed instructions on setting up this file.

The **start-time** and **end-time** arguments are optional. You can supply them or override the values in the configuration file with the start-time and end-time arguments in the command line that invokes the **dvreport** program.

Each line of the report configuration file has the format:

```
parameter_name:parameter_value
```

The following example shows a sample report configuration file for a Conversations report. In this example, the mandatory parameters are in bold:

```
#
# Sample Conversations report configuration file
#
type:       conv
agent:      probe204
domain:     ALL
start-time: 9501261200
end-time:   9501261600
header1:    "Top 5 Conversations for XYZ Corp. Backbone"
header2:    "Prepared by: J. Random NetMgr"
footer:     "-- XYZ Corp. --  Company Confidential --"
lpp:        66
output:     "[cat % | rsh penguin lpr]"
format:     ASCII
sort:       util
top:        5
```

This file specifies a printed report, sorted according to utilization of the top five conversations for all domains associated with the agent **probe204** for the period from noon to 4:00 P.M. on January 26, 1995. This ASCII report will be paginated, with a maximum of 66 lines per page, including a 2-line header and a footer.

Note Any parameters that contain spaces (such as the headers and footer in the example) must be contained within quotation marks.

You can specify either ASCII or CSV format for this report. To specify CSV format, use the format parameter, **format: CSV**.

If you would prefer to have the data in your CSV-format report separated by tabs instead of commas, use the delimiter parameter to specify **tab** instead of **comma** (**delimiter: tab**). You must enter the word "tab," not the tab character.

Start-time and end-time parameters are optional in the report configuration file, but if you do not include them here, you must enter them as arguments when you invoke the report program from the command line.

Step 4 Invoke the report program with the following command. Include the start-time and end-time parameters if they are not in the report configuration file, or if you want to override the values in the file.

`dvreport` *`configuration_file`* [*`start-time end-time`*]

where ***`configuration_file`*** is the name of the ASCII configuration file that you created in **$NSHOME/usr**.

Generating a Host-Statistics Summary Report from the Command Line

To create a Host-Statistics Summary report from the command line:

Step 1 Make sure the logging configuration file **dvlog.cfg** exists in the directory **$NSHOME/usr**. This file is normally created when you enable logging in the Domain Manager.

If necessary, create the file as described in the section "Creating the Logging Configuration File" later in this chapter, and initiate logging by entering the command:

```
$NSHOME/bin/dvlogd &
```

Step 2 Wait a minimum of two logging intervals so TrafficDirector can collect sufficient data for a report.

Step 3 If one does not already exist, use a text editor to create an ASCII report configuration file in the directory **$NSHOME/usr**. Give the file a name that will remind you of its contents, and use the suffix **.cfg** (for example, **host_sum.cfg**). See the section "Creating a Report Configuration File" for detailed instructions on setting up this file.

The **start-time** and **end-time** arguments are optional. You can supply them or override the values in the configuration file with the start-time and end-time arguments in the command line that invokes the **dvreport** program.

Each line of the report configuration file has the format:

```
parameter_name:parameter_value
```

The following example shows a sample report configuration file for a Host summary report. In this example, the mandatory parameters are in bold.

```
#
# Sample Host report configuration file
#
type:       host
agent:      probe204
domain:     ALL
start-time: 9501261200
end-time:   9501261600
header1:    "Top 5 Hosts for XYZ Corp. Backbone"
header2:    "Prepared by: J. Random NetMgr"
footer:     "-- XYZ Corp. --  Company Confidential --"
lpp:        66
output:     "[cat % | rsh penguin lpr]"
format:     ASCII
sort:       util-out
top:        5
```

This file specifies a printed report, sorted according to outbound utilization of the top five hosts for all domains associated with the agent **probe204** for the period from noon to 4:00 P.M. on January 26, 1995. This ASCII report will be paginated, with a maximum of 66 lines per page, including a 2-line header and a footer.

Note Any parameters that contain spaces (such as the headers and footer in the example) must be contained within quotation marks.

You can specify either ASCII or CSV format for this report. To specify CSV format, use the format parameter, **format: CSV**.

If you would prefer to have the data in your CSV-format report separated by tabs instead of commas, use the delimiter parameter to specify **tab** instead of **comma** (**delimiter: tab**). You must enter the word "tab," not the tab character.

Start-time and end-time parameters are optional in the report configuration file, but if you do not include them here, you must enter them as arguments when you invoke the report program from the command line.

Step 4 Invoke the report program with the following command. Include the start-time and end-time parameters if they are not in the report configuration file, or if you want to override the values in the file.

```
dvreport configuration_file [start-time end-time]
```

where ***configuration_file*** is the name of the ASCII configuration file that you created in **$NSHOME/usr**.

Generating a Host-Verbose Report from the Command Line

To create a Host summary report from the command line:

Step 1 Make sure the logging configuration file **dvlog.cfg** exists in the directory **$NSHOME/usr**. This file is normally created when you enable logging in the Domain Manager.

If necessary, create the file as described in the section "Creating the Logging Configuration File" later in this chapter, and initiate logging by entering the command:

```
$NSHOME/bin/dvlogd &
```

Step 2 Wait a minimum of two logging intervals so TrafficDirector can collect sufficient data for a report.

Step 3 If one does not already exist, use a text editor to create an ASCII report configuration file in the directory **$NSHOME/usr**. Give the file a name that will remind you of its contents, and use the suffix **.cfg** (for example, **hostverb.cfg**). See the section "Creating a Report Configuration File" for detailed instructions on setting up this file.

The **start-time** and **end-time** arguments are optional. You can supply them or override the values in the configuration file with the start-time and end-time arguments in the command line that invokes the **dvreport** program.

Each line of the report configuration file has the format:

```
parameter_name:parameter_value
```

The following example shows a sample report configuration file for a Host-Verbose report. In this example, the mandatory parameters are in bold.

```
#
# Sample Host-Verbose report configuration file
#
type:       host-verbose
agent:      probe204
domain:     ALL
start-time: 9501261200
end-time:   9501261600
header1:    "Top 5 Hosts for XYZ Corp. Backbone"
header2:    "Prepared by: J. Random NetMgr"
footer:     "-- XYZ Corp. --  Company Confidential --"
lpp:        66
output:     "[cat % | rsh penguin lpr]"
format:     ASCII
sort:       util-out
top:        5
```

This file specifies a printed detail report, sorted according to outbound utilization of the top five hosts for all domains associated with the agent **probe204** for the period from noon to 4:00 P.M. on January 26, 1995. This ASCII report will be paginated, with a maximum of 66 lines per page, including a 2-line header and a footer.

Note Any parameters that contain spaces (such as the headers and footer in the example) must be contained within quotation marks.

You can specify either ASCII or CSV format for this report. To specify CSV format, use the format parameter, **format: CSV**.

If you would prefer to have the data in your CSV-format report separated by tabs instead of commas, use the delimiter parameter to specify **tab** instead of **comma** (**delimiter: tab**). You must enter the word "tab," not the tab character.

Start-time and end-time parameters are optional in the report configuration file, but if you do not include them here, you must enter them as arguments when you invoke the report program from the command line.

Step 4 Invoke the report program with the following command. Include the start-time and end-time parameters if they are not in the report configuration file, or if you want to override the values in the file.

`dvreport` *`configuration_file`* [*`start-time end-time`*]

where ***`configuration_file`*** is the name of the ASCII configuration file that you created in **$NSHOME/usr**.

Generating a Host-Outbound Report from the Command Line

To create a Host-Outbound report from the command line:

Step 1 Make sure the logging configuration file **dvlog.cfg** exists in the directory **$NSHOME/usr**. This file is normally created when you enable logging in the Domain Manager.

If necessary, create the file as described in the section "Creating the Logging Configuration File" later in this chapter, and initiate logging by entering the command:

```
$NSHOME/bin/dvlogd &
```

Step 2 Wait a minimum of two logging intervals so TrafficDirector can collect sufficient data for a report.

Step 3 If one does not already exist, use a text editor to create an ASCII report configuration file in the directory **$NSHOME/usr**. Give the file a name that will remind you of its contents, and use the suffix **.cfg** (for example, **host_out.cfg**). See the section "Creating a Report Configuration File" for detailed instructions on setting up this file.

The **start-time** and **end-time** arguments are optional. You can supply them or override the values in the configuration file with the start-time and end-time arguments in the command line that invokes the **dvreport** program.

Each line of the report configuration file has the format:

```
parameter_name:parameter_value
```

The following example shows a sample report configuration file for a Host-Outbound report. In this example, the mandatory parameters are in bold.

```
#
# Sample Host-Outbound report configuration file
#
type:       host-outbound
agent:      probe204
domain:     ALL
start-time: 9501261200
end-time:   9501261600
header1:    "Top 5 Hosts for XYZ Corp. Backbone"
header2:    "Prepared by: J. Random NetMgr"
footer:     "-- XYZ Corp. --  Company Confidential --"
lpp:        66
output:     "[cat % | rsh penguin lpr]"
format:     ASCII
sort:       util-out
top:        5
```

This file specifies a printed outbound detail report, sorted according to outbound utilization of the top five hosts for all domains associated with the agent **probe204** for the period from noon to 4:00 P.M. on January 26, 1995. This ASCII report will be paginated, with a maximum of 66 lines per page, including a 2-line header and a footer.

Note Any parameters that contain spaces (such as the headers and footer in the example) must be contained within quotation marks.

You can specify either ASCII or CSV format for this report. To specify CSV format, use the format parameter, **format: CSV**.

If you would prefer to have the data in your CSV-format report separated by tabs instead of commas, use the delimiter parameter to specify **tab** instead of **comma** (**delimiter: tab**). You must enter the word "tab," not the tab character.

Start-time and end-time parameters are optional in the report configuration file, but if you do not include them here, you must enter them as arguments when you invoke the report program from the command line.

Step 4 Invoke the report program with the following command. Include the start-time and end-time parameters if they are not in the report configuration file, or if you want to override the values in the file.

```
dvreport configuration_file [start-time end-time]
```

where ***configuration_file*** is the name of the ASCII configuration file that you created in **$NSHOME/usr**.

Generating a Multi-Domain Report from the Command Line

To create a Multi-Domain report from the command line:

Step 1 Make sure the logging configuration file **dvlog.cfg** exists in the directory **$NSHOME/usr**. This file is normally created when you enable logging in the Domain Manager.

If necessary, create the file as described in the section "Creating the Logging Configuration File" later in this chapter, and initiate logging by entering the command:

```
$NSHOME/bin/dvlogd &
```

Step 2 Wait a minimum of two logging intervals so TrafficDirector can collect sufficient data for a report.

Step 3 Use a text editor to create an ASCII tree configuration file in the directory **$NSHOME/usr**. Give the file a name that will remind you of its contents, and use the suffix **.cfg** (for example, **tree.cfg**). The contents of this file are described in detail previously, at the start of the Multi-Domain Report section.

Step 4 If one does not already exist, use a text editor to create an ASCII report configuration file in the directory **$NSHOME/usr**. Give the file a name that will remind you of its contents, and use the suffix **.cfg** (for example, **mult_dom.cfg**). See the section "Creating a Report Configuration File" for detailed instructions on setting up this file.

The **start-time** and **end-time** arguments are optional. You can supply them or override the values in the configuration file with the start-time and end-time arguments in the command line that invokes the **dvreport** program.

Each line of the report configuration file has the format:

```
parameter_name:parameter_value
```

The following example shows a sample report configuration file for a Multi-Domain report. In this example, the mandatory parameters are in bold.

```
#
# Sample Multi-Domain report configuration file
#
type:       multi-domain
agent:      probe204
tree:       tree.cfg
start-time: 9501261200
end-time:   9501261600
header1:    "Top 5 Hosts for XYZ Corp. Backbone"
header2:    "Prepared by: J. Random NetMgr"
footer:     "-- XYZ Corp. --  Company Confidential --"
lpp:        66
output:     "[cat % | rsh penguin lpr]"
format:     ASCII
```

This file specifies a printed report for all domains listed in the file **tree.cfg** that are associated with the agent **probe204** for the period from noon to 4:00 P.M. on January 26, 1995. This ASCII report will be paginated, with a maximum of 66 lines per page, including a 2-line header and a footer.

Note Any parameters that contain spaces (such as the headers and footer in the example) must be contained within quotation marks.

Step 5 You can specify either ASCII or CSV format for this report. If you want the report to be in CSV format, you must specify the parameter **format: CSV**. If you would prefer to have the data in your CSV-format report separated by tabs instead of commas, specify the parameter **delimiter: tab** instead of **comma**. You must enter the word "tab," not the tab character.

Step 6 Start-time and end-time parameters are optional in the report configuration file, but if omitted here, they must be entered when the report program is invoked from the command line.

Step 7 Wait a minimum of 2 intervals so TrafficDirector can collect sufficient data for a report.

Step 8 Invoke the report program with the following command. Include the start-time and end-time parameters if they are not in the report configuration file, or if you want to override the values in the file.

```
dvreport configuration_file [start-time end-time]
```

where ***configuration_file*** is the name of the ASCII configuration file that you created in **$NSHOME/usr**.

Generating a Billing Report from the Command Line

To generate a Billing report from the command line:

Step 1 Make sure the logging configuration file **dvlog.cfg** exists in the directory **$NSHOME/usr**. This file is normally created when you enable logging in the Domain Manager.

If necessary, create the file as described in the section "Creating the Logging Configuration File" later in this chapter.

Step 2 Add the following lines to the log file **dvlog.cfg**:

```
# agent domain stats host conv
# agent_name domain_name hh:mm hh:mm hh:mm
```

Step 3 Initiate logging by entering the command:

```
$NSHOME/bin/dvlogd &
```

Step 4 Wait a minimum of two logging intervals so TrafficDirector can collect sufficient data for a report.

Step 5 Use a text editor to create three separate ASCII files, the Distance, Location, and Tariff files, in the directory **$NSHOME/usr**. The contents of these files are described in detail previously in this chapter, in the section "Creating the Files for a Billing Report."

Step 6 If one does not already exist, use a text editor to create an ASCII report configuration file in the directory **$NSHOME/usr**. Give the file a name that will remind you of its contents, and use the suffix **.cfg** (for example, **billing.cfg**). See the section "Creating a Report Configuration File" for detailed instructions on setting up this file.

The **start-time** and **end-time** arguments are optional. You can supply them or override the values in the configuration file with the start-time and end-time arguments in the command line that invokes the **dvreport** program.

Each line of the report configuration file has the format:

```
parameter_name:parameter_value
```

The following example shows a sample report configuration file for a Billing report. In this example, the mandatory parameters are in bold.

```
#
# Sample Billing report configuration file
#
type:       billing
agent:      probe204
domain:     all
distance:   distance.act
location:   iploc
tariff:     tariff.act
start-time: 9501261200
end-time:   9501261600
header1:    "Billing Report for XYZ Corp. Backbone"
header2:    "Prepared by: J. Random NetMgr"
footer:     "-- XYZ Corp. --  Company Confidential --"
lpp:        66
output:     "[cat % | rsh penguin lpr]"
format:     ASCII
```

This file specifies a printed Billing report for all domains associated with the agent **probe204** for the period from noon to 4:00 P.M. on January 26, 1995. The distance, location, and tariff information files are named, respectively, **distance.act**, **iploc**, and **tariff.act**.This ASCII report will be paginated, with a maximum of 66 lines per page, including a 2-line header and a footer.

Note Any parameters that contain spaces (such as the headers and footer in the example) must be contained within quotation marks.

You can specify only ASCII format for this report. Start-time and end-time parameters are optional in the report configuration file, but if you do not include them here, you must enter them as arguments when you invoke the report program from the command line.

Step 7 Invoke the report program with the following command. Include the start-time and end-time parameters if they are not in the report configuration file, or if you want to override the values in the file.

```
dvreport configuration_file [start-time end-time]
```

where ***configuration_file*** is the name of the ASCII configuration file that you created in **$NSHOME/usr**.

Creating a Report Configuration File

All reports except the Segment-Statistics report require a report configuration file. Temporary configuration files are created when you run the Report Generator. However, in order to generate a report from the command line, you must create a permanent report configuration file yourself.

To create a file that specifies the format of your reports:

Step 1 Use a text editor to create an ASCII report configuration file in the directory **$NSHOME/usr**. Give the file a name that will remind you of its contents. You **must** use the suffix **.cfg** (for example, **host_sum.cfg**).

Step 2 Enter the configuration parameters in the format: ***parameter_name:parameter_value***

The parameters **type**, **agent**, and **domain** are required. The remaining parameters are optional. A description of common report parameters is presented in Table 14-2.

The following example shows a sample report configuration file. The mandatory parameters are in bold.

```
#
# Sample report configuration file
#
type:       host
agent:      probe204
domain:     ALL
start-time: 9501261200
end-time:   9501261600
header1:    "Top Talkers List for XYZ Corp. Backbone"
header2:    "Prepared by: J. Random NetMgr"
footer:     "-- XYZ Corp. --  Company Confidential --"
lpp:        66
top:        20
sort:       util-out
output:     "[cat % | rsh penguin lpr]"
format:     ASCII
```

This file specifies a printed report of host summary statistics for the top 20 talkers for all domains associated with the agent **probe204** for the period from noon to 4:00 P.M. on January 26, 1995. The file also specifies that this ASCII report will be paginated, with a maximum of 66 lines per page, including a two-line header and a footer. The statistics will be sorted in order of outbound utilization.

Note You **must** put quotes around parameters that include spaces.

.

Table 14-2 Common Report Parameters

Parameter	Description
type	The type of report to be generated. (Mandatory.) Each report type is described in this chapter. Specify one of the following report type parameters: • seg-stats • seg-details • host • host-verbose • host-outbound • conv • multi-domain • billing
start-time **end-time**	The starting and ending times for the report, in end-time YYMMDDHHmm format; for example, 9507300930 for 9:30 AM, July 30, 1995. You can omit these parameters if they will be supplied on the command line. • The actual time base for the report corresponds to the first logs taken on or after the specified times. • You can omit hour and minute. If you do, they default to 0000 (Midnight).
lpp	Lines per page for paginated reports, including header and footer, if any. The default is 66. **If you specify 0, the report is not paginated**.
header1 **header2** **footer**	Customized headers and footer for the report. The default is no header/footer.
output	Output specification. If omitted, the report goes to **stdout**; this may be useful for previewing a report. The output parameter can specify the name of an ASCII output file; for directory. The default file name is **report.txt**. If the output parameter value is enclosed in square brackets, for example, **"[lpr -Dprinter2 %]**", it is interpreted as a hard-copy command that operates on a temporary file. The character **%** stands for the name of the temporary file. Note that the command need not actually result in a printed hard copy. Examples of output specifications: **"[lpr %]**" -- print on default printer **"[cat % | rsh somehost enscript]"** -- convert to PostScript on remote host and print. **"[mail -s Monday-Report someone < %]"** -- Enclose the report in a mail message to someone. The temporary file is created in directory **$NSHOME/reports**, with filename **tmpxxxxx**, where **xxxxx** is the process ID of **dvreport**. The temporary file is deleted after the hard-copy command is completed.

Table 14-2 Common Report Parameters (Continued)

Parameter	Description
format	The format in which the report will be generated. There are two formats: • ASCII - use this format to create a report in standard ASCII format. • CSV - creates a report in comma-separated format (or in tab format if you generate the report from the command line). You use format to import report data into spreadsheets. Billing reports can be generated only in ASCII format, and Segment-Details reports can be generated only in CSV format. You can generate all other reports in either format.
delimiter	The field delimiter character (separator) for CSV reports. Possible values are: • tab • comma The default is comma. You can specify the delimiter for CSV-format reports only if you generate the reports from the command line.

Creating the Logging Configuration File

The TrafficDirector logging daemon uses a logging configuration file to determine what information to collect and store. The logging configuration file is an ASCII file that specifies what data you want to log and how often you want to log it. This file is normally set up by the TrafficDirector when you enable logging in the Domain Manager. However, there may be times when you need to set up or edit this file manually.

To create a logging configuration file manually, use a text editor to create the ASCII file **dvlog.cfg** and place it in the **$NSHOME/usr** directory. The logging daemon reads the configuration file every fifteen minutes to determine what to log.

Note Any domains for which you want to log network statistics must first be installed on the agent. In addition, the appropriate logging groups must be enabled.

The following example shows a logging configuration file:.

```
#
# Sample logging configuration file
#
agent101  ALL   00:15   02:00   04:00
agent102  ALL   01:00   04:00   -
agent102  TCP   01:00   -       -
```

Agent Name | Domain Name | Segment Interval | Host Interval | Conversation Interval

In this example configuration file, the base time for logging is Midnight. If you specify 24:00 as the logging interval, one log is taken daily at 00:00 (Midnight). If you specify 04:00, logs are taken at 00:00, 04:00, and 08:00, and so on (24-hour time is used in this specification). A dash in any field means that it is not active.

Each line of the configuration file has the format:

```
agentname domainname seg-interval host-interval conv-interval
```

The ***seg-interval***, ***host-interval***, and ***conv-interval*** fields specify the logging interval for segment statistics, host statistics, and conversation statistics respectively. Each interval field must contain one of the values listed in Table 14-3.

Table 14-3 Logging Intervals

Interval	Meaning	Number of Logs per Day
— (dash)	Don't log	None
00:15	Log every 15 minutes	96
00:30	Log every 30 minutes	48
01:00	Log once an hour	24
02:00	Log every two hours	12
04:00	Log every four hours	6
08:00	Log every eight hours	3
24:00	Log every 24 hours	1

Creating Charts of Reports in Microsoft Excel

You can use Microsoft Excel to generate charts of your network activity reports. To create a chart from a report, the report must be in CSV format. Reports you create in ASCII format will **not** work.

This section provides a step-by-step procedure for creating charts from your reports in Microsoft Excel.

Loading the Report Into Microsoft Excel

To load the report into Microsoft Excel:

Step 1 Open the CSV-format report as a spreadsheet (worksheet) in Microsoft Excel by selecting **Open...** from the **File** menu, and selecting the name of the CSV-format file.

Step 2 When the report is imported into Excel, the report data (character strings and numbers) appears in the spreadsheet data cells.

Step 3 To make all the data visible in the spreadsheet, widen the spreadsheet columns by selecting the required range of cells and then selecting the **Autoformat** option from the **Format** menu. If necessary, insert some blank rows at different points in the spreadsheet for clarity.

Creating a Chart From Spreadsheet Data:

Charts are visual representations of spreadsheet data. Microsoft Excel lets you create several chart types, such as bar, line and pie charts. A chart is either embedded directly on a worksheet or it can appear on its own chart sheet. Microsoft Excel automatically updates a chart if the worksheet data on which it is based changes.

To generate an embedded chart:

Step 1 Select the range of cells (report data) from which you want to generate a chart.

Step 2 Click on the **ChartWizard** button. Drag the ChartWizard pointer to the place in the worksheet where you want Microsoft Excel to place the finished chart.

Step 3 The ChartWizard dialog box appears. Since the range of cells from which your graph will be generated is already selected, click on the **Next** button.

Step 4 Select the chart type you want, then click on the **Next** button.

Step 5 Select the chart format you want, then click on the **Next** button.

Step 6 The ChartWizard displays a sample chart using the selected data.

Step 7 Specify the row and column numbers from where the ChartWizard should peak the Category X and Y axis labels, then click on the **Next** button.

Step 8 Type in the Chart Title, X and Y Axis Titles, and select the radio button to add a Legend (if required).

Step 9 Click on **Finish**.

Microsoft Excel creates the chart on the worksheet and displays the chart toolbar. (You can resize, move, hide, and activate the chart toolbar.)

Printing the Chart

You can print either the entire spreadsheet (with the chart), or the chart alone.

To print chart alone:

Step 1 Move the mouse pointer to the chart toolbar and double click the left mouse button. This makes the chart active (places a thick border around the toolbar).

Step 2 Select the **File** menu, then select Print. The Print dialog box appears.

Step 3 Select the **Print Preview** button to see whether the chart fits properly on the page. If it does, then print the chart by selecting **Print**. If the chart does not fit properly on the page, do not select **Print**. Instead, continue to the next steps.

Step 4 If the chart does not fit properly on the page, select **Close** to return to the Print dialog box.

Step 5 Select **Page Setup**. The Page Setup dialog box appears.

Step 6 Select the appropriate values for different configuration parameters and then return to step 3 to preview the chart.

Note You may have to go back and forth between the Setup and Preview dialog boxes several times before you print the chart.

Saving the Chart

To save your report worksheet and chart:

Step 1 Select the **File** menu, then click on **Save As... .**

Step 2 Type the new filename you want to use.

Step 3 Click on **OK**.

Example Charts

This section provides four example charts. These charts were created in Microsoft Excel from TrafficDirector reports as described above.