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Embedix Graphical Remote Process Analyzer 2.0 User's Guide

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Embedix Graphical Remote Process Analyzer 2.0 User's Guide
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PREFACE

About This Guide

Conventions Used in This Document

The style conventions used in the printed and PDF format of this document do not necessarily apply to other formats. During conversion to HTML, some of these conventions may be lost.

This document uses the following graphical and typographical conventions:

- Admonitions
- Key combinations
- Special fonts and capitalization

Admonitions

Note, Tip, and Warning paragraphs draw your attention to additional information which may help you avoid losing data or time.

Note: Notes contain additional information about the current topic.

Tip: Tips contain suggestions that may save you time or effort.

Warning: Warnings contain critical information that you need to understand before proceeding. Ignoring information in a warning may cause loss of data or time.

Key Combinations

Key combinations (such as Ctrl+O) are presented throughout this document and should be used in the following way:

1. Press and hold the first key.
2. Press the second key.
3. Release both keys.

Special Fonts and Capitalization

Two special fonts have been used to distinguish between user input and computer output:

- **Command**

  All commands or data to be entered on an on-screen data entry line appear in bolded **`Courier`** font. This may include commands used with options, paths to directories or files, or other simple input, such as filenames.

- **Code**

  Any code sample, including command output, is shown in `Courier` font.

The following capitalization rules apply to Linux filenames, Linux commands, and English names of on-screen buttons and keyboard keys.

- Linux filenames and commands are case-sensitive. In most instances, they are lowercase. When you enter a filename or command, use the same case that appears in your instructions or examples.
- When procedures refer to a particular on-screen button, the name of the button appears in uppercase (such as in SAVE), regardless of how it appears on the screen.
- When procedures refer to a particular key on a keyboard, only the initial key is capitalized (such as the Tab key), just as it appears on a U.S. standard keyboard. This also applies to key combinations.

Additional Resources

The following resources are available to provide you with additional support.

- *Embedix SDK Getting Started*
- *Embedix SDK Target Wizard User Guide*
- *Embedix SDK Reference Manual*
- *Embedix RealTime Programming Guide*
- Lineo™ Support Web site

  http://www.lineo.com/support

Note: Most printed manuals that ship with Lineo products are also available in PDF and HTML formats on the product CD-ROM and the Lineo Web site.

CHAPTER 1

Installing and Running the Analyzer

This chapter covers the following topics:

Introduction

Graphical Remote Process Analyzer 2.0 provides a tool named LTOP, which is a monitor that displays the status of the processes currently in existence. It is much like the Linux utilities top or ps, but with a graphical user interface.

LTOP can be used to monitor either the host system or a target system running the `ltop_target` client software. The graphical user interface uses the Qt toolkit.

Requirements

In order to monitor both host and target Linux systems, meet the following requirements:

- **Host:** Must be a Linux machine that is running Embedix SDK 2.0 or higher.
- **Target:** Must have a properly set up ethernet connection.

Installing LTOP

These instructions assume that you have already installed Linux and Lineo® Embedix® SDK 2.0 (or higher) on your host machine and have a basic understanding of the GNOME desktop environment.

Note: If you are using this tool only to analyze your host system, you do not need Embedix SDK installed.

1. Start your computer and run Xwindows as the root user.

   Most Linux desktop distributions will automatically run Xwindows on startup and allow you to select the user account.

2. Start an Xterm.

   Most Linux desktop distributions provide an Xterm launch icon in the system menu bar you can click to start the Xterm. The icon usually looks like a small computer terminal.

3. Insert the Graphical Remote Process Analyzer CD-ROM into the CD-ROM drive.

   Some systems automatically mount the CD-ROM when inserted. If your CD-ROM is automounted, skip to Step 5.

4. Mount the CD-ROM by entering the following command:

   ```
   mount /mnt/cdrom -o exec
   ```

   If you set up your Linux system CD-ROM drive with a different device name, use that device name in place of "cdrom" in the command above.

5. Change your directory location to the /mnt/cdrom directory by entering the following command:

   ```
   cd /mnt/cdrom
   ```

6. Run the installation script by entering the following command:

   ```
   ./install.sh
   ```

   A wizard launches and guides you through installation options.

7. After selecting your desired options, click FINISH.

   LTOP will be installed on your computer. When the installation is complete, you are returned to the Xterm command line.

Adding LTOP Functionality to an Existing Project

To add LTOP functionality to a Target Wizard project that was created before LTOP was installed, modify the bsp_config file located in your project directory as outlined in the following steps.

1. With root permission, open the **bsp_config** file located in:

   ```
   ~/project/<project_name>/config-data/
      buildcontrol/board
   ```

2. In the **%ecdlist** field, add the following entry to the end of the list:

   ```
   ltop_target.ecd
   ```

3. Save your changes.
4. Restart Target Wizard to see this addition.

Adding LTOP Functionality to a BSP Add-on

To add LTOP functionality to a BSP that was installed after LTOP was installed, modify the bsp_config file located in the BSP (or board) directory as outlined in the following steps:

1. With root permission, open the **bsp_config** file located in:

   ```
   /opt/Embedix/bsp/<boardname_dir>/config-data/
      buildcontrol
   ```

2. In the **%ecdlist** field, add the following entry to the end of the list:

   ```
   ltop_target.ecd
   ```

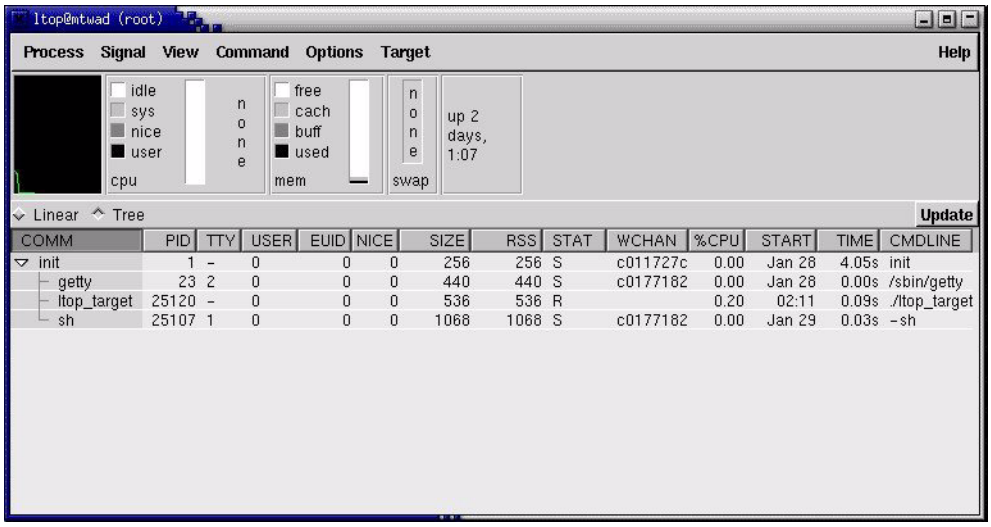
3. Save your changes.
4. Restart Target Wizard to see this addition.

Running LTOP on the Host Machine

After you have installed LTOP on your host system, you can run the tool in the host mode immediately. As a root user, simply open an Xterm window and enter the following command:

```
ltop
```

The tool will launch (much like the sample screenshot below) and allow you to investigate processes on the host machine.



The source code is included on the CD, but is not installed. You may copy the host source code to a directory if you desire.

For an orientation to the user interface and use instructions, refer to Chapter 2, “Using the Analyzer.”

Syntax

You can start LTOP from the command line using the following syntax:

```
ltop [OPTIONS]
```

Enter **`ltop -help`** to view command-line options and then return to the command-line prompt. Refer to the Table 1-1 on page 5 for additional startup options.

Options

LTOP has several startup options to choose from that allow you to customize the way the user interface displays on your screen..

Table 1-1. LTOP Options

Option	Description
`-display` *<display>*	Sets the X display (default is $DISPLAY)
`-geometry` *<geometry>*	Sets the geometry of the main window of ltop
`-background` *<color>*	Sets the default background color and an application palette (light and dark shades are calculated). This may not function with all colors.
`-foreground` *<color>*	Sets the default foreground color. This has limited use as well.
`-target` *<name>*	Start ltop with "name" target for information source.
`-title` *<title>*	Sets the application title (caption).
`-style` *<style>*	Sets the application GUI style. Possible styles are motif and windows. (If you are using Qt 2.x, the styles cde and platinum are also available.)
`-font` *<font>*	Sets the application font
`-iconic`	Starts the application iconified.
`-version`	Prints the version of ltop and the Qt library, and exits.
`-help`	Prints a summary of command-line options and exits.

Running LTOP on a Remote Target

In order to analyze a target system, build the target software into a project before deploying the image to the target. You can do this by completing the following steps.

1. Build the target software into the project:

   1a. On the host system, initiate a Target Wizard session as regular user (not root): At the shell prompt, enter: **`tw`**

   1b. Create or open a project.

   1c. In the project's tree view, navigate to `/Embedix/Programming/Debugger/ltop_target`

   1d. Enable the `ltop_target` node and then rebuild your project.

2. Deploy the target image to the target board. Use a deployment method that allows you to access a shell prompt on the target.

3. At your target shell prompt, enter the following:

   ```
   /usr/sbin/ltop_target
   ```

   After a log message displays, you should see the following:

   ```
   : Success
   ```

4. If you haven't already launched LTOP on your host machine, do so now by entering the following command at the host's shell prompt:

   ```
   ltop
   ```

5. From the LTOP menu bar, choose Target and then enter the IP address or target name in the box provided.

   The tool should display process information about the target.

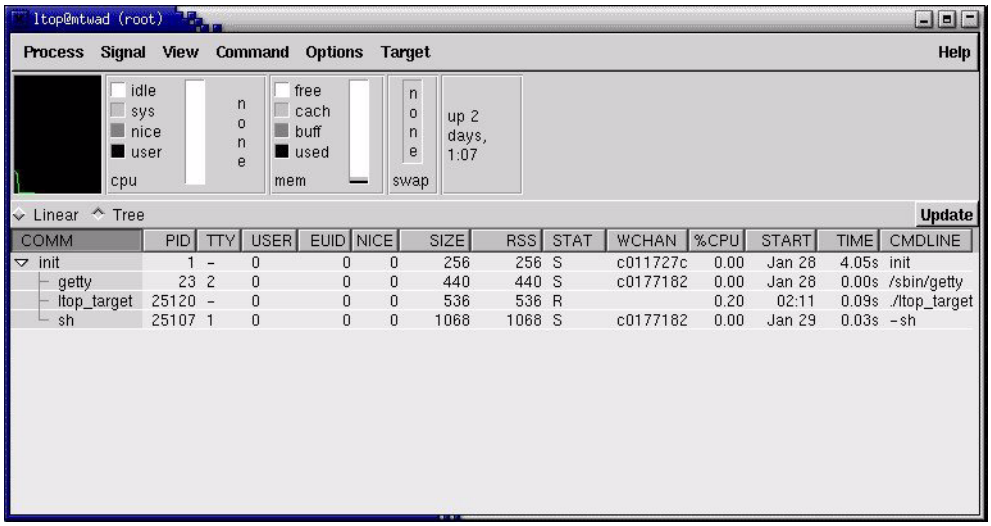
CHAPTER 2

Using the Analyzer

This chapter covers the following topics:

Exploring the User Interface

When you launch LTOP from a host command line, the LTOP main window appears (much like the following screenshot).



The main window these sections, which are discuss in this section:

System Summary Area

This portion of the interface is a dynamic summary of all processes on your system. It is set to a graphical display by default, but you can change it to a text format (see the menu item Options > Preferences).

When the System Summary has the graphical display enabled, four types of informaton are displayed here:

- **CPU status** (shown in a status bar)
- **CPU usage breakdown** (a legend helps you deciphers the shading for the bar chart readout)
- **Memory usage breakdown** (a legend helps you deciphers the shading for the bar chart readout)
- **Swap usage** (shown in a bar chart)

Process Table

The following topics related to the Process Table are discussed in this section:

Linear View or Tree View

At the top of process table, you can choose to view the process list in the Linear view or the Tree view (the default is Tree view).

Show or Hide Portions of the Tree View

In the Tree view, the parent-child relationships between processes is shown in an obvious way. Click on the triangles to show or hide an entire subtree. Sorting affects only siblings; the tree structure imposes the global order.

Column Headers

If you hover the mouse cursor over one of the column headers, a short description of that column is displayed after a few seconds. Most of the column descriptions are self-explanatory. The exceptions that required more discussion are USER and WCHAN, which are described in greater detail here.

- The **USER** column shows the real user ID. If the effective user ID of a process is different from its real user ID, a plus sign (+) is appended to the user name; if it is the super-user, an asterisk (*) is appended.
- For displaying the **WCHAN** column as symbols on the host machine, the kernel symbol file System.map is needed. LTOP will search for it in the following locations:

  /boot/System.map-RELEASE
  /boot/System.map
  /lib/modules/RELEASE/System.map
  /usr/src/linux-RELEASE/System.map
  /usr/src/linux/System.map
  /usr/local/src/linux-RELEASE/System.map
  /usr/local/src/linux/System.map

  where RELEASE is the kernel release number, for instance "2.0.29". If the System.map file isn't found or is unreadable, hexadecimal addresses will be displayed instead. The prefixes "sys_" and "do_" are stripped from the symbols before they are displayed. The target symbol names are currently not supported and hexadecimal addresses will always be shown.

Sorting the List

The process list in the process table is sorted by the selected column heading. Click on another heading to change the sort; click the same column heading again to reverse the sorting order.

Customizing Columns

Rearrange the columns as you like by dragging and dropping the heading. To add/remove a column to/from the display, click on the process title bar and choose an add or remove column option.

Selecting Processes

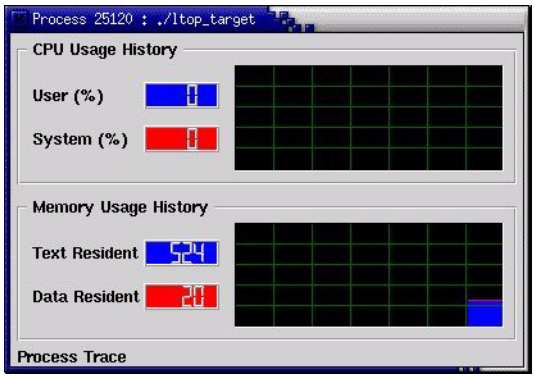
Click on a process in the list to select or deselect it. Shift+click to select multiple processes.

Context-sensitive Menus

Right-click on a selected process to open a context-sensitive menu (or shortcut menu), which duplicates some functions from the main menu for convenience. It works both on processes and on the column headings.

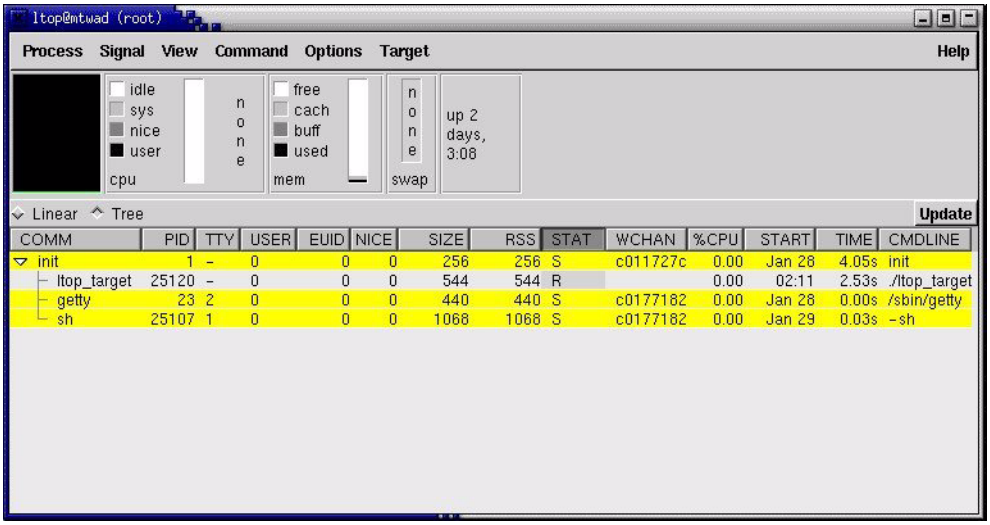
Monitor a Single Task

One feature unique to the context-sensitive menus is the Monitor Task option. Choose this option to open a seperate display of memory and CPU usage of that process, as seen in the following sample.



Identify Processes with a Common Value

Ctrl+Shift+click on a table cell to select all processes with the same displayed value in the particular column. For instance, to select all processes with the "S" status, press and hold the Control and Shift buttons, then click on one instance of "S" in the STAT column. All processes in the list with the "S" status are highlighted. In the following sample screen, **getty** and **sh** would be highlighted as well as their parent, **Init**.



Keyboard Shortcuts

Alt+W: Close the active window (except the main window)

Q or **Alt+Q:** Quit ltop.

Space Bar: Force an update of the displayed tables.

Crtl+Z: Iconify ltop.

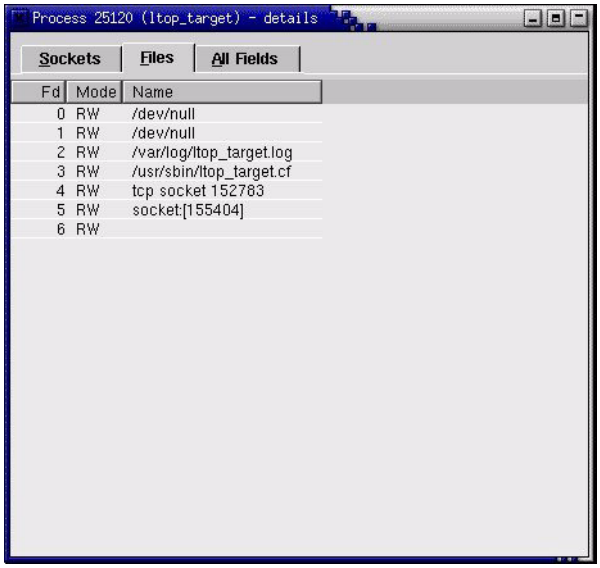
Menu Bar

The menu bar consists of the following menus: Process, Signal, View, Command, Options, Target, and Help. For more information on these menus, see the following pages:

Process Menu

The Process menu provides the following options:

- **Renice:** To change the time-sharing priority of the selected processes, enter the new priority in the Renice... dialog. The new nice value should be in the range -20 to 20; 0 is the default. A larger number means that the process gets less CPU time. Only the super-user may decrease the nice value. The nice value can only be changed on the host, not the target.
- **Change Scheduling:** The Change Scheduling... dialog allows the super-user to change the scheduling policy of the selected processes (using Posix.1b scheduling control). Normal processes are set to SCHED_OTHER and have static priority 0; (soft) real-time processes have the policy SCHED_FIFO or SCHED_RR and a static priority in the range of 1 to 99. (See sched_setscheduler(2).) This option also only functions on host processes, not target.
- **View Details:** The View Details menu item opens a window that shows different aspects of the selected processes (similar to the screenshot below). Double-clicking on a process has the same effect.



All information is available to the owner of the process (and to superuser). (If you start LTOP as a regular user [not root], a warning is displayed, but no other indication is given during tool operation. It is best to start LTOP and run it as superuser.)

When you choose View Details, you may have as many as five tabs display, which are all described here:

- The **Sockets tab** shows the currently used TCP and UDP sockets. If Host Name Lookup is checked in the Preferences dialog, a host name lookup will be done for each IP address. This is done by a background process and can take a while for difficult cases (once looked up, addresses are cached).
- The **Memory Maps tab** shows the process's memory mappings. In Linux 2.0.x the file names are not given. Anonymous mappings (allocated memory not bound to a file or device) are marked (anonymous).
- The **Files tab** shows the process's open files. In Linux 2.0.x, the files are given on the form [AABB]:inode, where AA and BB are the device major/minor numbers in hexadecimal.

- The **Environment tab** shows the process's environment variables. Note: this is the environment with which the process was started, not necessarily incorporating later changes. Some processes that modify their command line, notably sendmail(8) and ftpd(8), may use the environment space for this, showing nonsense in this tab.
- The **All Fields tab** shows the value for all the variables that could be displayed in the main LTOP window. It is useful for seeing the entire process setting without enabling all fields in the main window.

- **Find Parent** and **Find Children** will select the parent/children of the selected processes, and center the table on the first of them.
- **Find Descendants** will select the tree of all children of the selected processes.

Signal Menu

The Signal menu allows the user to send many different types of signals to the process. It issues these signals via the **`kill(pid, signal)`** command.

The menu contains the most common signals, but you can easily access other signal options by choosing the menu item Other.

The Signal menu items are:

- Terminate (SIGTERM)
- Hangup (SIGHUP)
- Stop (SIGSTOP)
- Kill (SIGKILL)
- Other

The additional signal options are listed in Table 2-1 and a key for its Action column can be found in Table 2-2.

Table 2-1. Signal Options

Signal	Value	Action (Table 2-2)	Comment
SIGTERM	15	A	Termination signal
SIGHUP	1	A	Hangup detected on controlling terminal or death of controlling process
SIGSTOP	17,19,23	D,E,F	Stop process
SIGKILL	9	A,E,F	Kill signal
SIGINT	2	A	Interrupt from keyboard
SIGCONT	19,18,25		Continue if stopped
SIGQUIT	3	C	Quit from keyboard
SIGILL	4	C	Illegal Instruction
SIGABRT	6	C	Abort signal from abort(3)
SIGFPE	8	C	Floating point exception
SIGSEGV	11	C	Invalid memory reference
SIGPIPE	13	A	Broken pipe: write to pipe with no readers
SIGALRM	14	A	Timer signal from alarm(2)
SIGUSR1	30,10,16	A	User-defined signal 1
SIGUSR2	31,12,17	A	User-defined signal 2
SIGCHLD	20,17,18	B	Child stopped or terminated
SIGTSTP	18,20,24	D	Stop typed at tty

Table 2-1. Signal Options

Signal	Value	Action (Table 2-2)	Comment
SIGTTIN	21,21,26	D	tty input for background process
SIGTTOU	22,22,27	D	tty output for background process

Table 2-2. Signal Options Action Key

Action Key	
A	Default action is to terminate the process.
B	Default action is to ignore the signal.
C	Default action is to terminate the process and dump core.
D	Default action is to stop the process.
E	Signal cannot be caught.
F	Signal cannot be ignored.

View Menu

The View menu allows the user to change the characteristics of the Process Table.

You have two groups of view options to choose from:

- The first group includes: **All Processes**, **Your Processes**, **None-Root Processes**, and **Running Processes**.

  The **All Processes** selection will display all processes on the selected machine. The **Your Processes** selection determines who involked ltop and will display only those processes owned by user. **None-Root** Processes display only those processes which

are not being executed with root permissions. **Running Processes** displays the processes that are currently executing.

- The second group includes: **User Fields**, **Job Fields**, **Memory Fields**, **Select Fields**, and **Save Settings Now**.

  These determine a predefined set of columns that can be displayed. Depending on the information required at the moment you can select the **User Fields**, **Jobs Fields**, or **Memory Fields**. Each option will display or undisplay columns that are pertinent to the selected Field. Use the **Select Fields** option to add or subtract from the defaults above. The **Save Settings Now** option in the Options menu will save your choices after you have the tool setup with your preferences.

Command Menu

The Command menu has an Edit Commands... option as well as a list of customized commands.

The **Edit Commands...** option launches another window that allows you to customize the Command menu for your use. You can choose to add, edit, or delete menu items.

There are three default commands listed here besides the Edit Command option: gdb, strace, and remote strace.

The **gdb command** allows the user to open a debugger on a process currently running on the host machine. This option is not available for remote processes.

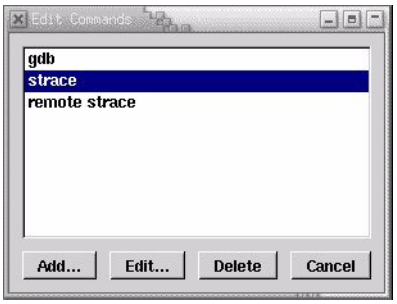
The **strace** and **remote strace** commands start an Xterm with the process selected being the system traced. Strace must exist in order for these options to function.

Customize the Command Menu

To customize the Command menu, complete the applicable steps below:

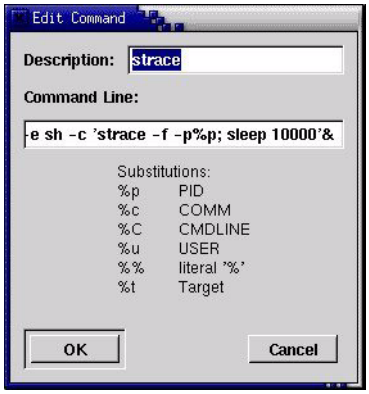
1. From the menu bar, choose Command > Edit Commands...

A list of the current menu items appears, as in the following example:



2. To add a command to the menu, click ADD, add your entry to the Command Line box, and then click OK.
3. To delete a command from the menu, highlight the command in the and then click DELETE.
4. To edit a command in the menu, highlight the command in the list, click EDIT, edit the Command Line box as needed, and then click OK.

   For example, if you were to choose to edit the strace command, the following Edit Command dialog box would appear:



Notice the Substitutions listed on the screen.

Tip: Use existing commands as a guide to get you started. It usually works best to spawn another window to display information in.

The "Description" of each command is what appears in the menu; the "Command Line" is a shell command (executed with /bin/sh). Before the command is passed to the shell, the following substitutions are made:

%p	with the PID (Process ID) of the selected process
%c	with the short command name of the process
%C	with the complete command line of the process
%u	with the name of the (real) owner of the process
%%	with a literal '%'.

Any other % + letter combination is removed. The command line will be run once for each selected process (in unspecified order).

Options Menu

The Options menu contains the selections that can be used to set the display. These settings are saved in:

```
~/.ltop-settings
```

The Option menu items are:

Update Period...
Hide/Show Status Bar
Hide/Show Control Bar
Hide/Show Command Path
Include Child Times
Preferences

By default, the process display updates every 5 seconds. To change the host update rate, type the new update period in the **Update**

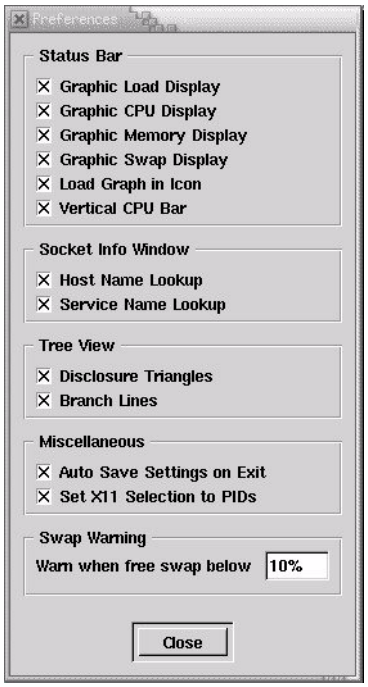
Period... dialog. The units min, s and ms may be used (if none, seconds are assumed). You can force an update by pressing the space bar or clicking the Update button. LTOP will consume a lot of CPU time if the update period is short or zero. If iconified, however, LTOP will use very little CPU time. The target update rate is set to 5 seconds and cannot be changed, however the update button does force an update manually.

The **Hide/Show Status Bar**, **Hide/Show Control Bar** will turn on or off parts of the main display.

The **Hide/Show Command** Path turns the path information on or off in the CMDLINE column.

If **Include Child Times** is selected in the Options menu, the TIME field will show the sum of the CPU times used by the process and all of its children.

The **Preferences** selection brings up another window that has various selections. There are several options that are are pretty much self-explainatory. (See the following screenshot.)



The main window is automatically updated when you select an option here so you can the effects of your selections immediately. The following is a description of some of the options in this window.

The load, CPU, memory and swap displays in the status bar can be toggled between graphic and text representations by clicking on them, or by settings in the Preferences...dialog. The load numbers shown are the number of jobs in the run queue averaged over 1, 5 and 15 minutes. On SMP (multi-CPU) machines running Linux 2.1.x or later, the CPU stats will be shown for each processor in vertical mode, and the average of all CPUs in horizontal mode.

The swap bar will turn red if free swap space falls below a certain value, which can be changed in the Preferences... dialog. The number can be entered in K, M (megabytes) or % (percent of total swap space). The default is 10%.

Target Menu

The Target menu is used to switch back and forth from viewing details about the host machine (Local) to a target machine (Target). The default view is Local. To view the target, you may need to enter the IP address. Occasionally garbage will displayed until the next update occurs. You can click the UPDATE button (at the top-right of the Process Table) to force an update.

Help Menu

The Help menu provides standard help menu options.

Using the Analyzer on a Remote Target

The LTOP client software must be running on the remote machine in order to use the remote information display part of the tool.

The `ltop_target` executable installs to the /usr/sbin directory during deployment. There is a configuration file called `ltop_target.cf` in the same directory. The configuration file defines the port number, logfile, authorized users, and daemon flag. Default settings work under most conditions. The entries in the `ltop_target.cf` file are explained in the following list:

- The **tcp port number** is 5123.
- The **daemon flag** can be set to "y" or "n". If it is set to "n" the process will not background itself and will remain in the foreground of the window where it was started. This is useful if ltop_target is not functioning properly.
- The **logfile** may contain some debugging messages. The default path is /var/log/ltop_target.log.
- **host_users** should contain localhost and root. You can add your username if you want to run the tool with your own permissions. This tool must be executed as root.

General Information

This section contains some general information about the software.

Authors

Mattias Engdegard and Matt Waddel (mattw@lineo.com)

License

The host portion of LTOP is open-source software and may be redistributed under certain conditions. See the GNU General Public License for details.

The target portion of LTOP is Lineo proprietary software and requires compliance to the end user license agreement (EULA) that ships with the software.

Known Issues

After using the Target menu to switch from remote target mode to local (or host) mode (or vice versa), the commandline field may display garbage. Clicking the UPDATE button will refresh the fields with the proper display.

The CPU indicator in the status bar will display nonsense in SMP systems running Linux 2.0.x due to a kernel bug.