Linux Administration II:

Linux System Monitoring

This material is based on work supported by the National Science Foundation under Grant No. 0802551

National Science Foundation
WHERE DISCOVERIES BEGIN

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author (s) and do not necessarily reflect the views of the National Science Foundation

Lesson Overview

Linux Computer systems are very reliable and dependable once they are properly configured and regularly maintained. However, network and data systems must be monitored regularly to ensure they are working at peak performance and to address any potential data bottlenecks, data corruption, or system difficulties before small problems lead to system failure or data loss.

In this lesson, you will explore and evaluate various software tools and utilities that administrators use to monitor computer systems. You will also demonstrate use of one tool to perform required monitoring.

It is important that you understand this lesson because the knowledge you will gain will help you become a better administrator equipped with the required tools to monitor critical network systems, improve your company's data throughput, reduce the risk of data loss or reduced performance, and ultimately, keep your clients' data systems healthy and at peak performance.

Objective

You should know what will be expected of you when you complete this lesson. These expectations are presented as objectives. Objectives are short statements of expectations that tell you what you must be able to do, perform, learn, or adjust after reviewing the lesson.

Lesson Objective:

Given a configured UNIX/Linux system requiring attention, a student will evaluate popular system monitoring tools, and use one tool to monitor systems as per industry standards. Students will also make use of command line utilities in order to gather specific system information.

Lesson Outline

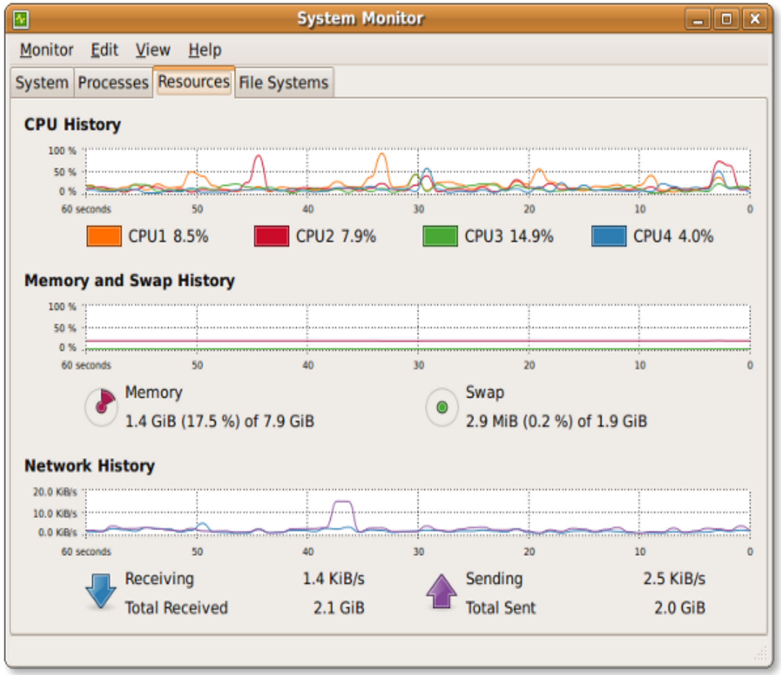
In this lesson, you will explore:

- System Monitoring
  - Definition
  - Purpose of monitoring
- Command Line Utilities for Monitoring
  - top
  - df
  - netstat
  - ifconfig
  - uptime
- System Monitoring Software
  - nagios
  - zenoss
  - gnome – system monitor
- Choosing the Right Tool

What is System Monitoring?

System monitoring tools are command line utilities and/or software applications used to monitor computers, services, and network activity. Monitoring tools allow users to monitor availability, inventory, configurations, performance, and events of both local and remote systems and their resources.

System monitoring tools are vital to the maintenance of a modern networked system. They allow system administrators to see events in real time and decide on appropriate reactions to avoid loss of performance or system failure.



🟧 CPU1 8.5% 🟥 CPU2 7.9% 🟩 CPU3 14.9% 🟦 CPU4 4.0%

Memory 1.4 GiB (17.5 %) of 7.9 GiB

Swap 2.9 MiB (0.2 %) of 1.9 GiB

Receiving	1.4 KiB/s	Sending	2.5 KiB/s
Total Received	2.1 GiB	Total Sent	2.0 GiB

Gnome system monitor interface with “Resources” category displayed

Why Monitor Systems?

System monitors are used to check the status and/or operations of a given computer system. Information critical to the performance and function of a system can be seen in real time. Resources, performance, activity, and other relevant data is viewable as output in the system monitor's interface (screen).

The goals of system monitoring are:

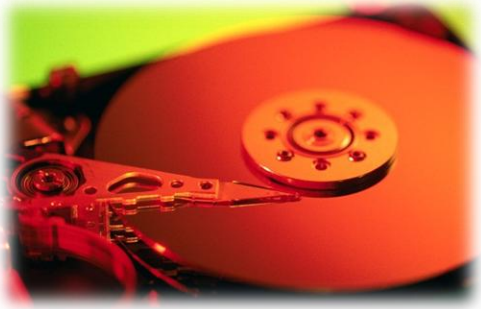
- Prevent or reduce downtime and failure
- Optimize system performance
- Identify and reduce performance bottlenecks
- Diminish unpredictable system behavior

System monitors can alert technical staff of a systems issue which allows them to react accordingly before the decrease in performance affects system users.

Monitored Resources

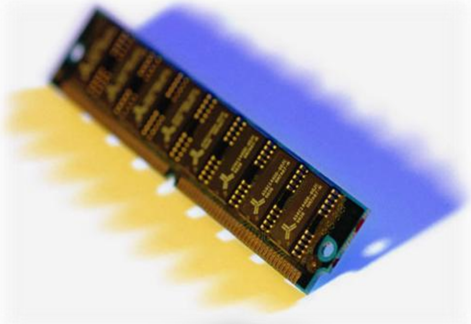
Monitoring services are used for three important assets:

- Resources
- Performance
- Activities

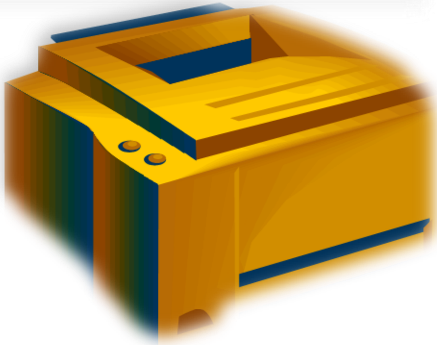


Resources

Monitored resources include available RAM, remaining storage space, disk usage, and attached peripheral devices . The process of monitoring may also be used to provide a dynamic inventory list which includes the components of a system as well as their availability to provide resources for processes.



Resources are also monitored to plan for eventual replacement and/or upgrade. In other words, computer parts do not last forever and will need replacing periodically. Monitoring your system can help you determine when components have reached their useful end. As such, capacity planning allows organizations to plan appropriately for infrastructure upgrades.



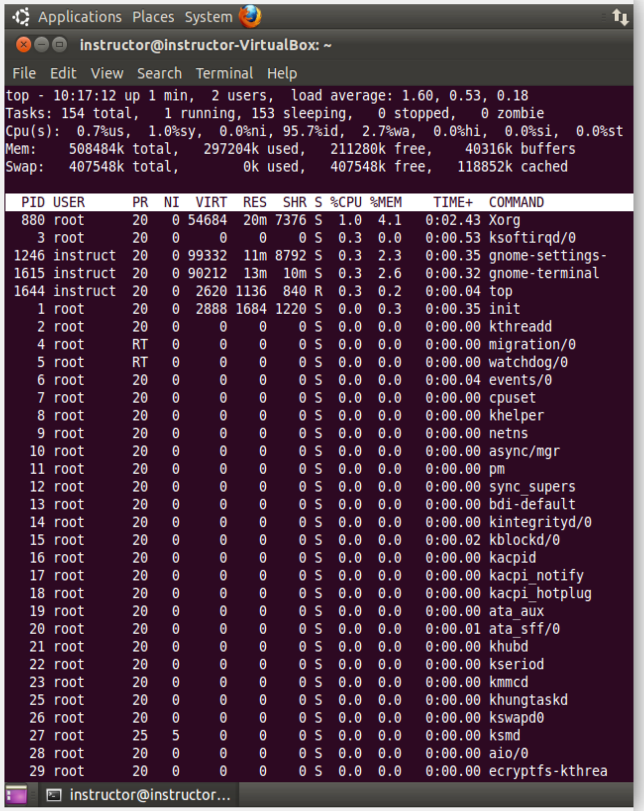
Monitored Resources (Contd)

Performance

In addition to checking resources, the overall performance of the system is monitored in real time (as it is occurring). In other words, how effectively is the system using the available resources?

Performance monitoring also keeps tabs on the physical state of critical components including devices that control temperature within systems. (Are cooling fans spinning and at what speed? What is the current temperature within the system?) If the temperature of a component increases significantly, this would be an obvious indication of a problem and require immediate attention.

Monitors maintain a historical record of all performance events. This recording allows the System Administrator to identify specific events which may have caused a loss in performance and the related system data. A good administrator would use the information to located the source of the problem and prevent a recurrence.



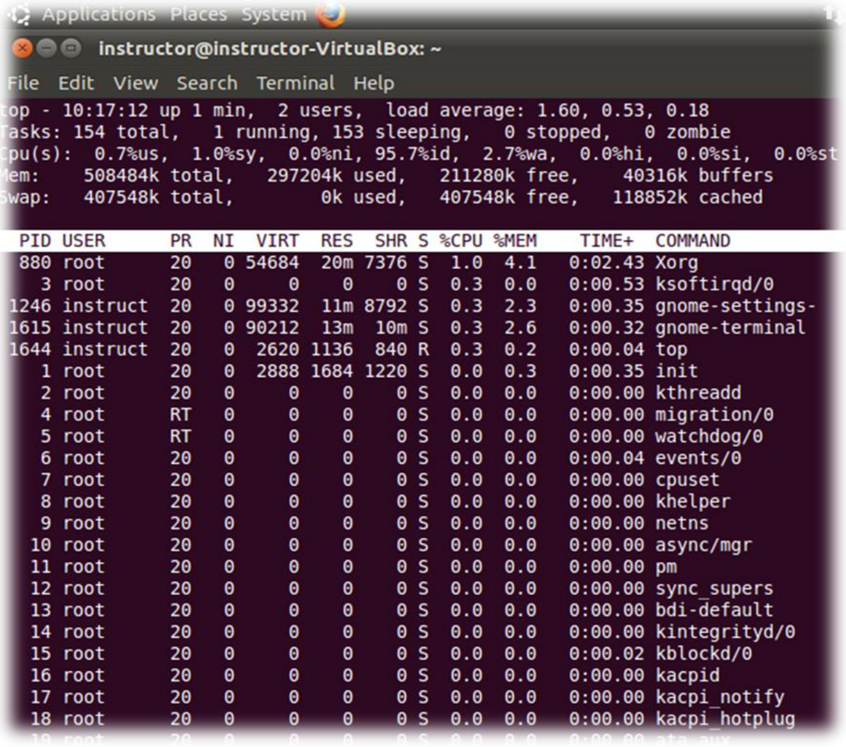
```
top - 10:17:12 up 1 min,  2 users,  load average: 1.60, 0.53, 0.18
Tasks: 154 total,   1 running, 153 sleeping,   0 stopped,   0 zombie
Cpu(s):  0.7%us,  1.0%sy,  0.0%ni, 95.7%id,  2.7%wa,  0.0%hi,  0.0%si,  0.0%st
Mem:    508484k total,   297204k used,   211280k free,    40316k buffers
Swap:   407548k total,        0k used,   407548k free,   118852k cached

  PID USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+  COMMAND
  880 root      20   0 54684  20m 7376 S  1.0  4.1   0:02.43 Xorg
    3 root      20   0     0    0    0 S  0.3  0.0   0:00.53 ksoftirqd/0
 1246 instruct  20   0 99332  11m 8792 S  0.3  2.3   0:00.35 gnome-settings-
 1615 instruct  20   0 90212  13m  10m S  0.3  2.6   0:00.32 gnome-terminal
 1644 instruct  20   0  2620 1136  840 R  0.3  0.2   0:00.04 top
    1 root      20   0  2888 1684 1220 S  0.0  0.3   0:00.35 init
    2 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kthreadd
    4 root      RT   0     0    0    0 S  0.0  0.0   0:00.00 migration/0
    5 root      RT   0     0    0    0 S  0.0  0.0   0:00.00 watchdog/0
    6 root      20   0     0    0    0 S  0.0  0.0   0:00.04 events/0
    7 root      20   0     0    0    0 S  0.0  0.0   0:00.00 cpuset
    8 root      20   0     0    0    0 S  0.0  0.0   0:00.00 khelper
    9 root      20   0     0    0    0 S  0.0  0.0   0:00.00 netns
   10 root      20   0     0    0    0 S  0.0  0.0   0:00.00 async/mgr
   11 root      20   0     0    0    0 S  0.0  0.0   0:00.00 pm
   12 root      20   0     0    0    0 S  0.0  0.0   0:00.00 sync_supers
   13 root      20   0     0    0    0 S  0.0  0.0   0:00.00 bdi-default
   14 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kintegrityd/0
   15 root      20   0     0    0    0 S  0.0  0.0   0:00.02 kblockd/0
   16 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kacpid
   17 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kacpi_notify
   18 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kacpi_hotplug
   19 root      20   0     0    0    0 S  0.0  0.0   0:00.00 ata_aux
   20 root      20   0     0    0    0 S  0.0  0.0   0:00.01 ata_sff/0
   21 root      20   0     0    0    0 S  0.0  0.0   0:00.00 khubd
   22 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kseriod
   23 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kmmcd
   25 root      20   0     0    0    0 S  0.0  0.0   0:00.00 khungtaskd
   26 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kswapd0
   27 root      25   5     0    0    0 S  0.0  0.0   0:00.00 ksmd
   28 root      20   0     0    0    0 S  0.0  0.0   0:00.00 aio/0
   29 root      20   0     0    0    0 S  0.0  0.0   0:00.00 ecryptfs-kthrea
```

Monitored Resources (Contd)

Activity

System monitors can also record users' activities.

Whether it is the pattern of a particular user, a history of which users have logged on, network history, or a record of changes to the system configuration, system monitors are constantly working to capture data and create a reviewable history of all activities.


Applications Places System
instructor@instructor-VirtualBox: ~
File Edit View Search Terminal Help

```
op - 10:17:12 up 1 min,  2 users,  load average: 1.60, 0.53, 0.18
asks: 154 total,   1 running, 153 sleeping,   0 stopped,   0 zombie
pu(s):  0.7%us,  1.0%sy,  0.0%ni, 95.7%id,  2.7%wa,  0.0%hi,  0.0%si,  0.0%st
em:    508484k total,   297204k used,   211280k free,    40316k buffers
wap:   407548k total,        0k used,   407548k free,   118852k cached

  PID USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+  COMMAND
  880 root      20   0 54684  20m 7376 S  1.0  4.1   0:02.43 Xorg
    3 root      20   0     0    0    0 S  0.3  0.0   0:00.53 ksoftirqd/0
 1246 instruct  20   0 99332  11m 8792 S  0.3  2.3   0:00.35 gnome-settings-
 1615 instruct  20   0 90212  13m  10m S  0.3  2.6   0:00.32 gnome-terminal
 1644 instruct  20   0  2620 1136  840 R  0.3  0.2   0:00.04 top
    1 root      20   0  2888 1684 1220 S  0.0  0.3   0:00.35 init
    2 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kthreadd
    4 root      RT   0     0    0    0 S  0.0  0.0   0:00.00 migration/0
    5 root      RT   0     0    0    0 S  0.0  0.0   0:00.00 watchdog/0
    6 root      20   0     0    0    0 S  0.0  0.0   0:00.04 events/0
    7 root      20   0     0    0    0 S  0.0  0.0   0:00.00 cpuset
    8 root      20   0     0    0    0 S  0.0  0.0   0:00.00 khelper
    9 root      20   0     0    0    0 S  0.0  0.0   0:00.00 netns
   10 root      20   0     0    0    0 S  0.0  0.0   0:00.00 async/mgr
   11 root      20   0     0    0    0 S  0.0  0.0   0:00.00 pm
   12 root      20   0     0    0    0 S  0.0  0.0   0:00.00 sync_supers
   13 root      20   0     0    0    0 S  0.0  0.0   0:00.00 bdi-default
   14 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kintegrityd/0
   15 root      20   0     0    0    0 S  0.0  0.0   0:00.02 kblockd/0
   16 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kacpid
   17 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kacpi_notify
   18 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kacpi_hotplug
   19 root      20   0     0    0    0 S  0.0  0.0   0:00.00 ata_aux
```

The 'top' utility displays a list of the processes currently running on a system. In the image displayed above, the utility provides useful information including CPU usage, processing power and memory. This information enables an administrator to determine at a glance which processes are consuming the most resources.

Prevention

Monitoring computer systems is important to prevent:

- Down time
- System failure
- Poor performance

In this day and age, when computer systems fail, the affected organization screeches to a halt. Therefore, any system considered mission critical must be kept up and running at all times, if possible. System monitors help administrators keep tabs on critical items that may indicate a serious problem or worse, a system failure.

One measure of ‘high availability’ is the idea of the five nines which refers to a 99.999% system uptime over a calendar year. Effective system monitoring is an essential part of reaching that goal.

Complete failure and the resulting downtime of computer systems are serious concerns for administrators. Similarly, unplanned decreases in system performance can also have a drastic impact on a business’s ability to capitalize on opportunities and can prevent an IT service provider from meeting its service level agreements.

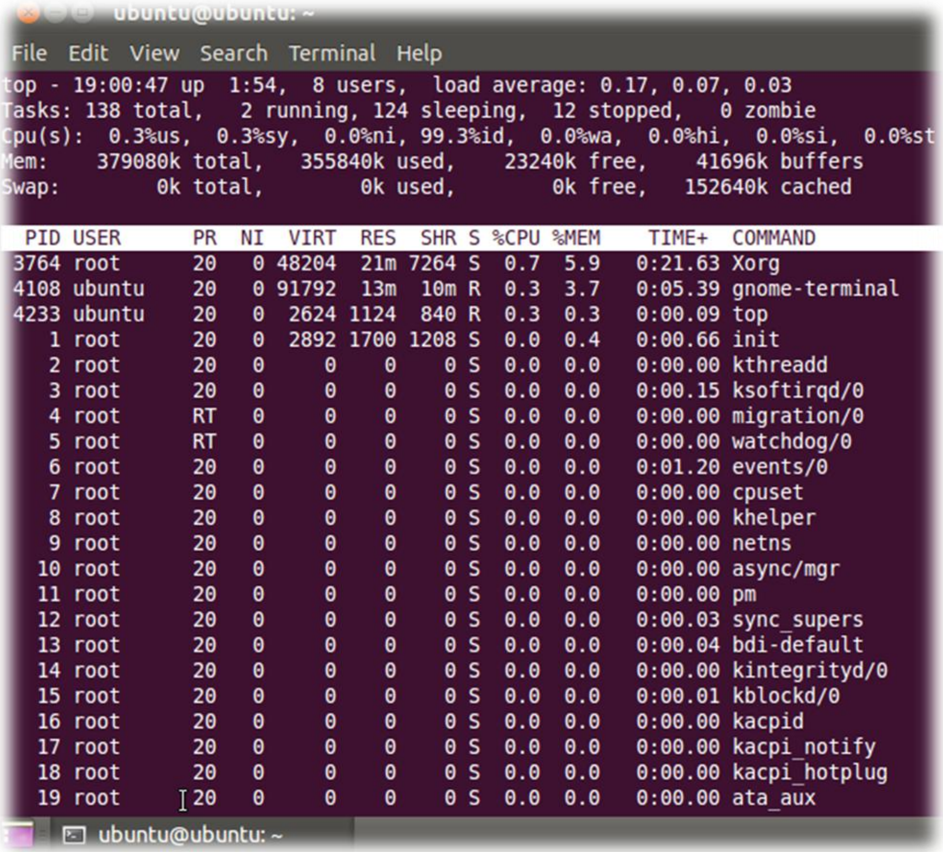
Command Line Utilities

There are several useful command line utilities that allow you to monitor system resources, configuration, processes, and activity.

These are run in the UNIX/Linux Shell and output valuable information for analysis.

- top
- df
- netstat
- ifconfig
- uptime

Each will be discussed in turn.



```
top - 19:00:47 up  1:54,  8 users,  load average: 0.17, 0.07, 0.03
Tasks: 138 total,   2 running, 124 sleeping,  12 stopped,   0 zombie
Cpu(s):  0.3%us,  0.3%sy,  0.0%ni, 99.3%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0%st
Mem:    379080k total,   355840k used,    23240k free,    41696k buffers
Swap:        0k total,        0k used,        0k free,   152640k cached

  PID USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+  COMMAND
 3764 root      20   0 48204  21m 7264 S  0.7  5.9   0:21.63 Xorg
 4108 ubuntu    20   0 91792  13m  10m R  0.3  3.7   0:05.39 gnome-terminal
 4233 ubuntu    20   0  2624 1124  840 R  0.3  0.3   0:00.09 top
    1 root      20   0  2892 1700 1208 S  0.0  0.4   0:00.66 init
    2 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kthreadd
    3 root      20   0     0    0    0 S  0.0  0.0   0:00.15 ksoftirqd/0
    4 root      RT   0     0    0    0 S  0.0  0.0   0:00.00 migration/0
    5 root      RT   0     0    0    0 S  0.0  0.0   0:00.00 watchdog/0
    6 root      20   0     0    0    0 S  0.0  0.0   0:01.20 events/0
    7 root      20   0     0    0    0 S  0.0  0.0   0:00.00 cpuset
    8 root      20   0     0    0    0 S  0.0  0.0   0:00.00 khelper
    9 root      20   0     0    0    0 S  0.0  0.0   0:00.00 netns
   10 root      20   0     0    0    0 S  0.0  0.0   0:00.00 async/mgr
   11 root      20   0     0    0    0 S  0.0  0.0   0:00.00 pm
   12 root      20   0     0    0    0 S  0.0  0.0   0:00.03 sync_supers
   13 root      20   0     0    0    0 S  0.0  0.0   0:00.04 bdi-default
   14 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kintegrityd/0
   15 root      20   0     0    0    0 S  0.0  0.0   0:00.01 kblockd/0
   16 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kacpid
   17 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kacpi_notify
   18 root      20   0     0    0    0 S  0.0  0.0   0:00.00 kacpi_hotplug
   19 root      20   0     0    0    0 S  0.0  0.0   0:00.00 ata_aux
```

Command line output from the ‘top’ utility

CLI Utilities: top

The ‘top’ utility is an example of a program that can be launched quickly in the command line terminal and immediately used to provide useful data. The data it provides is real-time, and the display continually updates to reflect the current status. *“top”* also displays system summary information in addition to listing all tasks being managed by the Linux kernel.

The information from *top* includes: load average, total number of tasks, number of running tasks, stopped tasks, the total amounts memory, memory in use, and free memory.

Itemized details for each task includes: process ID, user for each task, nice value, resident size, shared memory size, process status, CPU usage, memory usage, CPU time, and the command for each process.

Select **PLAY** below for a video on the “top” utility:

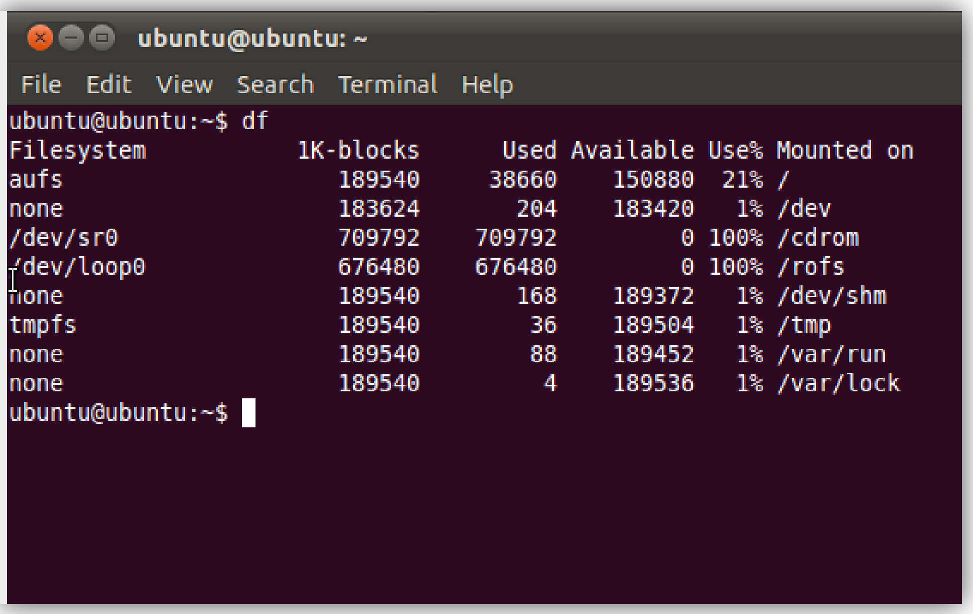
View Video
VideoLesson10Top(C3L9S12).mp4

CLI Utilities: df

The ‘df’ command line utility is a quick way to view the used space and the available space of currently mounted file systems or hard drives.

You can use command line arguments to specify the file name for which you seek information, and you can also limit how much information is displayed about a specific file.

By default, the disk space will be listed by the number of 1K blocks used.



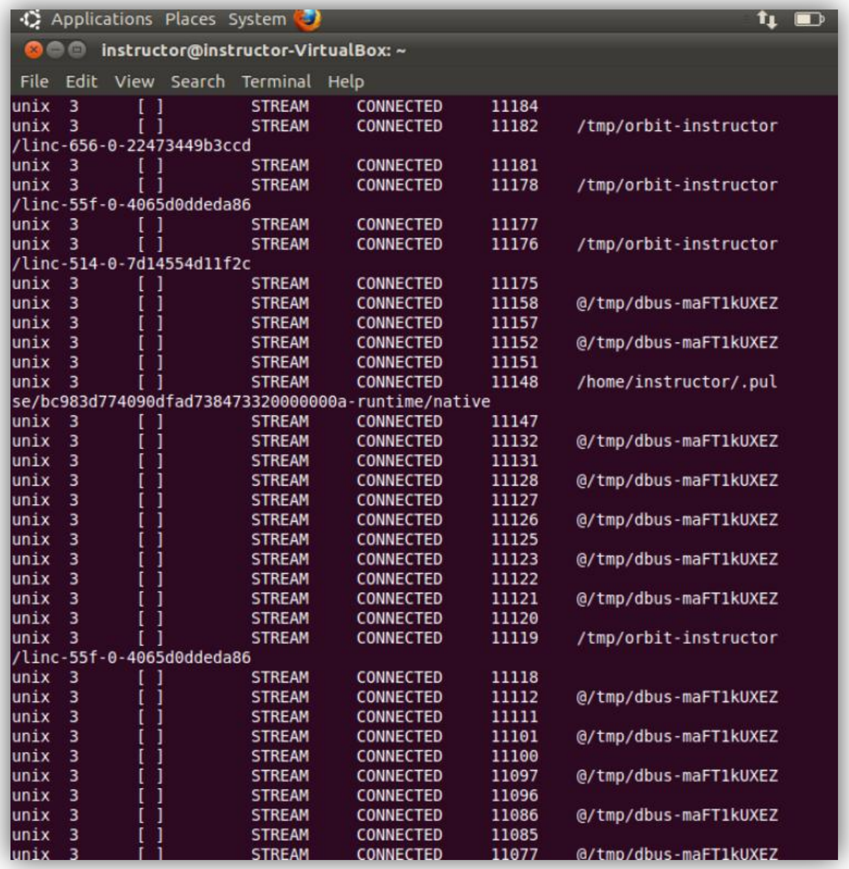
```
ubuntu@ubuntu:~$ df
Filesystem           1K-blocks      Used Available Use% Mounted on
aufs                    189540     38660    150880  21% /
none                    183624       204    183420   1% /dev
/dev/sr0                709792    709792         0 100% /cdrom
/dev/loop0              676480    676480         0 100% /rofs
none                    189540       168    189372   1% /dev/shm
tmpfs                   189540        36    189504   1% /tmp
none                    189540        88    189452   1% /var/run
none                    189540         4    189536   1% /var/lock
ubuntu@ubuntu:~$ 
```

Command line output from ‘df’ utility

CLI Utilities: netstat

The command line utility 'netstat' is a useful tool for viewing, collecting, and analyzing data about network connections and other network interface statistics.

This data can be studied to recognize issues with the network and to identify network traffic patterns.



Applications Places System
instructor@instructor-VirtualBox: ~
File Edit View Search Terminal Help

```
unix  3      [ ]         STREAM     CONNECTED     11184
unix  3      [ ]         STREAM     CONNECTED     11182    /tmp/orbit-instructor
/linc-656-0-22473449b3ccd
unix  3      [ ]         STREAM     CONNECTED     11181
unix  3      [ ]         STREAM     CONNECTED     11178    /tmp/orbit-instructor
/linc-55f-0-4065d0ddeda86
unix  3      [ ]         STREAM     CONNECTED     11177
unix  3      [ ]         STREAM     CONNECTED     11176    /tmp/orbit-instructor
/linc-514-0-7d14554d11f2c
unix  3      [ ]         STREAM     CONNECTED     11175
unix  3      [ ]         STREAM     CONNECTED     11158    @/tmp/dbus-maFT1kUXEZ
unix  3      [ ]         STREAM     CONNECTED     11157
unix  3      [ ]         STREAM     CONNECTED     11152    @/tmp/dbus-maFT1kUXEZ
unix  3      [ ]         STREAM     CONNECTED     11151
unix  3      [ ]         STREAM     CONNECTED     11148    /home/instructor/.pul
se/bc983d774090dfad738473320000000a-runtime/native
unix  3      [ ]         STREAM     CONNECTED     11147
unix  3      [ ]         STREAM     CONNECTED     11132    @/tmp/dbus-maFT1kUXEZ
unix  3      [ ]         STREAM     CONNECTED     11131
unix  3      [ ]         STREAM     CONNECTED     11128    @/tmp/dbus-maFT1kUXEZ
unix  3      [ ]         STREAM     CONNECTED     11127
unix  3      [ ]         STREAM     CONNECTED     11126    @/tmp/dbus-maFT1kUXEZ
unix  3      [ ]         STREAM     CONNECTED     11125
unix  3      [ ]         STREAM     CONNECTED     11123    @/tmp/dbus-maFT1kUXEZ
unix  3      [ ]         STREAM     CONNECTED     11122
unix  3      [ ]         STREAM     CONNECTED     11121    @/tmp/dbus-maFT1kUXEZ
unix  3      [ ]         STREAM     CONNECTED     11120
unix  3      [ ]         STREAM     CONNECTED     11119    /tmp/orbit-instructor
/linc-55f-0-4065d0ddeda86
unix  3      [ ]         STREAM     CONNECTED     11118
unix  3      [ ]         STREAM     CONNECTED     11112    @/tmp/dbus-maFT1kUXEZ
unix  3      [ ]         STREAM     CONNECTED     11111
unix  3      [ ]         STREAM     CONNECTED     11101    @/tmp/dbus-maFT1kUXEZ
unix  3      [ ]         STREAM     CONNECTED     11100
unix  3      [ ]         STREAM     CONNECTED     11097    @/tmp/dbus-maFT1kUXEZ
unix  3      [ ]         STREAM     CONNECTED     11096
unix  3      [ ]         STREAM     CONNECTED     11086    @/tmp/dbus-maFT1kUXEZ
unix  3      [ ]         STREAM     CONNECTED     11085
unix  3      [ ]         STREAM     CONNECTED     11077    @/tmp/dbus-maFT1kUXEZ
```

Command line output from 'netstat' utility

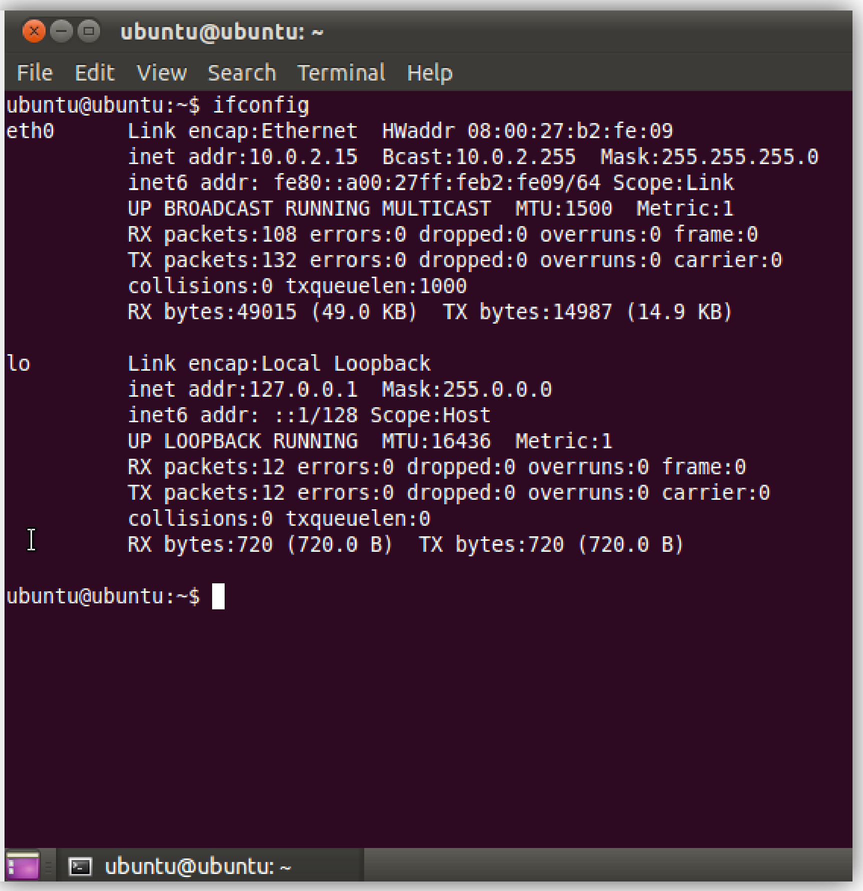
CLI Utilities: ifconfig

The ifconfig command line utility is used to configure the network interface at boot time. Ifconfig can also be used to monitor and display the status of currently active network interfaces and information pertaining to each.

Similar to the df utility, ifconfig can be used with various arguments to narrow the amount of information displayed about a specific interface.

In the image on the right, the default output of this utility includes: the system's name for the interface (etho for the NIC in the example), the MAC address, and ip address information.

Additionally, Ifconfig will list any errors, drops, RX overruns, or packet collisions.



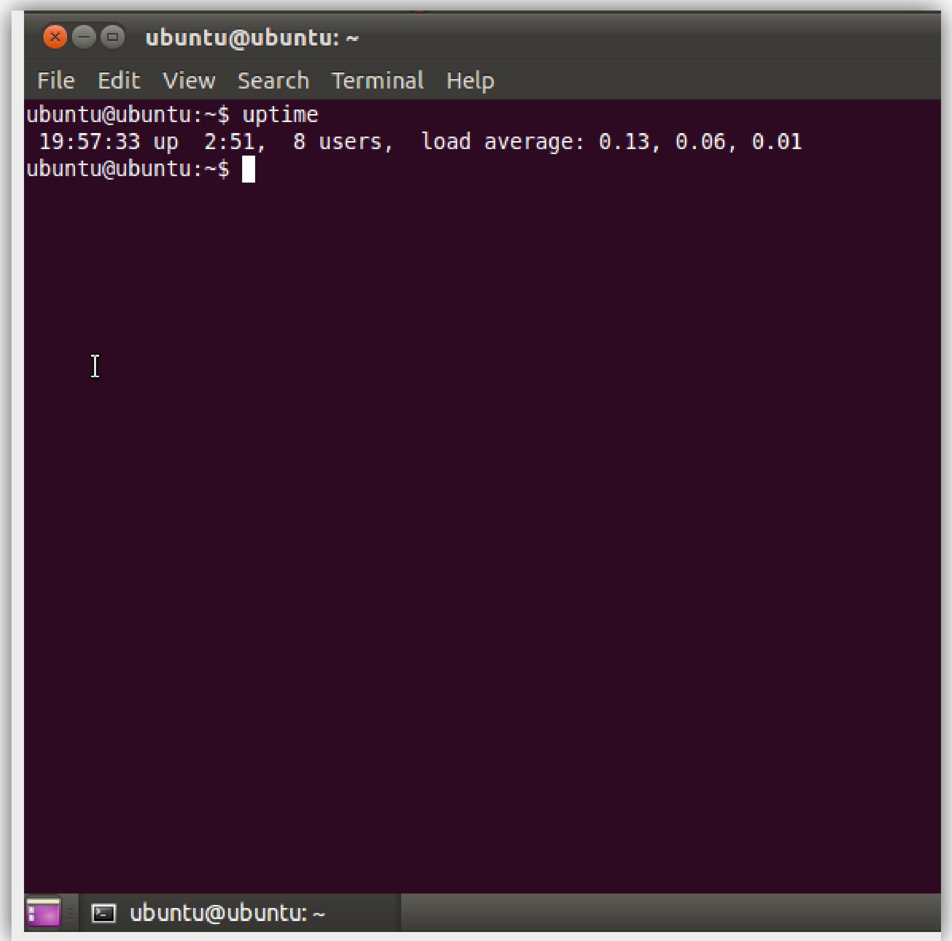
```
ubuntu@ubuntu:~$ ifconfig
eth0      Link encap:Ethernet  HWaddr 08:00:27:b2:fe:09
          inet addr:10.0.2.15  Bcast:10.0.2.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:feb2:fe09/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:108 errors:0 dropped:0 overruns:0 frame:0
          TX packets:132 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:49015 (49.0 KB)  TX bytes:14987 (14.9 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:12 errors:0 dropped:0 overruns:0 frame:0
          TX packets:12 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:720 (720.0 B)  TX bytes:720 (720.0 B)

ubuntu@ubuntu:~$
```

Command line output from 'ifconfig' utility

CLI Utilities: uptime

uptime is a command line utility that allows you to view the length of time a system has been running without interruption.

uptime is a simple one-line output that lists the current time, the length of time the system has been running, the number of users logged on to the system, and the average system load data for the past 1, 5, and 15 minutes of uptime.



```
ubuntu@ubuntu:~$ uptime
 19:57:33 up  2:51,  8 users,  load average: 0.13, 0.06, 0.01
ubuntu@ubuntu:~$ 
```

Command line output from ‘uptime’ utility

System Monitoring GUI Applications

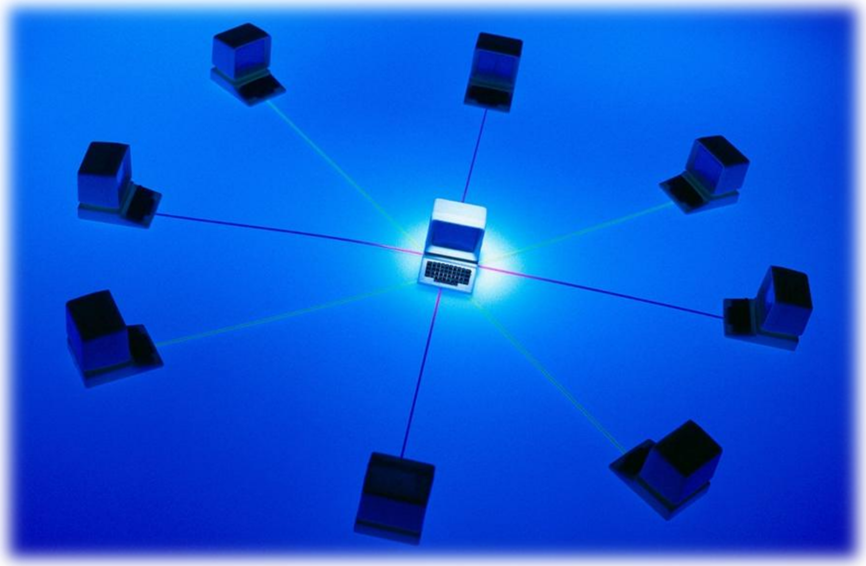
Monitoring Utilities with GUI

In addition to the command line utilities discussed previously, there are several options available which offer a robust configurable GUI and provide access to more detailed information.

Here are a few examples:

- Nagios
- Zenoss
- Gnome System Monitor

Each will be discussed in turn:

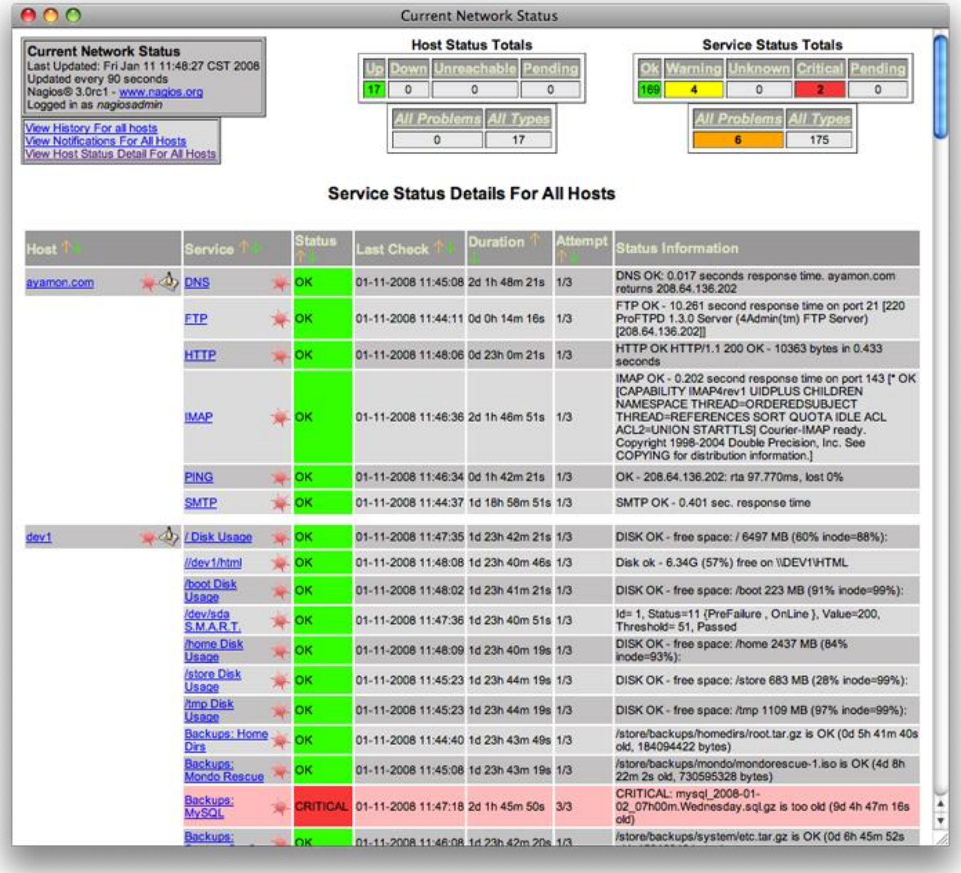


GUI Monitoring: Nagios

Nagios describes itself as the Industry Standard in open source monitoring. The project began in 1999 and is now widely supported by a global community of users and developers.

The plugin support provided by Nagios' design allows it to be highly customizable to the specific needs and infrastructure of an organization. Some Linux distributions, including Fedora, contain Nagios within their repositories.

Nagios' popularity and large community of users allow it to progress and adapt quickly to changes in the technology infrastructure it monitors. Similar to Ubuntu Linux, the large user-base of Nagios allows shortcomings and bugs to discovered and resolved quickly.



Current Network Status
Last Updated: Fri Jan 11 11:48:27 CST 2008
Updated every 90 seconds
Nagios® 3.0rc1 - www.nagios.org
Logged in as *nagiosadmin*

View History For all hosts
View Notifications For All Hosts
View Host Status Detail For All Hosts

Host Status Totals

Up	Down	Unreachable	Pending
17	0	0	0

All Problems	All Types
0	17

Service Status Totals

Ok	Warning	Unknown	Critical	Pending
169	4	0	2	0

All Problems	All Types
6	175

Service Status Details For All Hosts

Host	Service	Status	Last Check	Duration	Attempt	Status Information
ayamon.com	DNS	OK	01-11-2008 11:45:08	2d 1h 48m 21s	1/3	DNS OK: 0.017 seconds response time. ayamon.com returns 208.64.136.202
	FTP	OK	01-11-2008 11:44:11	0d 0h 14m 16s	1/3	FTP OK - 10.261 second response time on port 21 [220 ProFTPD 1.3.0 Server (4Admin(tm) FTP Server) [208.64.136.202]]
	HTTP	OK	01-11-2008 11:48:06	0d 23h 0m 21s	1/3	HTTP OK HTTP/1.1 200 OK - 10363 bytes in 0.433 seconds
	IMAP	OK	01-11-2008 11:46:36	2d 1h 46m 51s	1/3	IMAP OK - 0.202 second response time on port 143 [* OK [CAPABILITY IMAP4rev1 UIDPLUS CHILDREN NAMESPACE THREAD=ORDEREDSUBJECT THREAD=REFERENCES SORT QUOTA IDLE ACL ACL2=UNION STARTTLS] Courier-IMAP ready. Copyright 1998-2004 Double Precision, Inc. See COPYING for distribution information.]
	PING	OK	01-11-2008 11:46:34	0d 1h 42m 21s	1/3	OK - 208.64.136.202: rta 97.770ms, lost 0%
	SMTP	OK	01-11-2008 11:44:37	1d 18h 58m 51s	1/3	SMTP OK - 0.401 sec. response time
dev1	/ Disk Usage	OK	01-11-2008 11:47:35	1d 23h 42m 21s	1/3	DISK OK - free space: / 6497 MB (60% inode=88%):
	//dev1/html	OK	01-11-2008 11:48:08	1d 23h 40m 46s	1/3	Disk ok - 6.34G (57%) free on \\DEV1\HTML
	/boot Disk Usage	OK	01-11-2008 11:48:02	1d 23h 41m 21s	1/3	DISK OK - free space: /boot 223 MB (91% inode=99%):
	/dev/sda S.M.A.R.T.	OK	01-11-2008 11:47:36	1d 23h 40m 51s	1/3	Id= 1, Status=11 {PreFailure , OnLine }, Value=200, Threshold= 51, Passed
	/home Disk Usage	OK	01-11-2008 11:48:09	1d 23h 40m 19s	1/3	DISK OK - free space: /home 2437 MB (84% inode=93%):
	/store Disk Usage	OK	01-11-2008 11:45:23	1d 23h 44m 19s	1/3	DISK OK - free space: /store 683 MB (28% inode=99%):
	/tmp Disk Usage	OK	01-11-2008 11:45:23	1d 23h 44m 19s	1/3	DISK OK - free space: /tmp 1109 MB (97% inode=99%):
	Backups: Home Dirs	OK	01-11-2008 11:44:40	1d 23h 43m 49s	1/3	/store/backups/homedirs/root.tar.gz is OK (0d 5h 41m 40s old, 184094422 bytes)
	Backups: Mondo Rescue	OK	01-11-2008 11:45:08	1d 23h 43m 19s	1/3	/store/backups/mondo/mondorescue-1.iso is OK (4d 8h 22m 2s old, 730595328 bytes)
	Backups: MySQL	CRITICAL	01-11-2008 11:47:18	2d 1h 45m 50s	3/3	CRITICAL: mysql_2008-01-02_07h00m.Wednesday.sql.gz is too old (9d 4h 47m 16s old)
	Backups:	OK	01-11-2008 11:46:08	1d 23h 42m 20s	1/3	/store/backups/system/etc.tar.gz is OK (0d 6h 45m 52s

For Review:

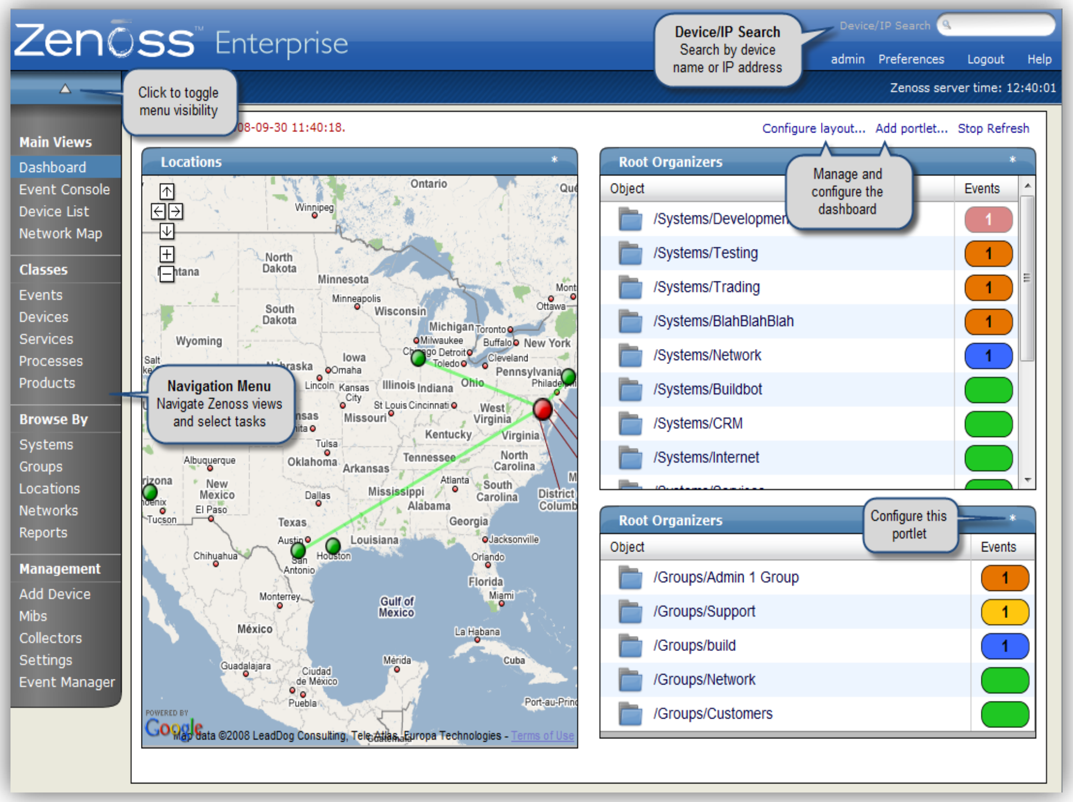
- Nagios 2 on Ubuntu

GUI Monitoring: Zenoss

Zenoss is another widely used system monitoring tool which provides a highly developed GUI and many configuration options. Zenoss can provide detailed real-time and historical data collected from the activities of clients, servers, devices on the cloud, virtual devices, and the networks that connect them.

The motivation for Zenoss's creator Erik Dahl was to eliminate the need for multiple programs to monitor multiple aspects of a system.

He created Zenoss to function as a single interface that would give you access to monitoring data from your network, physical servers, virtual servers, and applications.



Device/IP Search
Search by device name or IP address

Click to toggle menu visibility

Navigation Menu
Navigate Zenoss views and select tasks

Manage and configure the dashboard

Configure this portlet

Root Organizers

Object	Events
/Systems/Developmen	1
/Systems/Testing	1
/Systems/Trading	1
/Systems/BlahBlahBlah	1
/Systems/Network	1
/Systems/Buildbot	🟩
/Systems/CRM	🟩
/Systems/Internet	🟩

Root Organizers

Object	Events
/Groups/Admin 1 Group	1
/Groups/Support	1
/Groups/build	1
/Groups/Network	🟩
/Groups/Customers	🟩

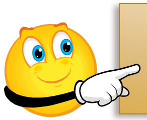
Suggested Reading:

- Zenoss on Ubuntu

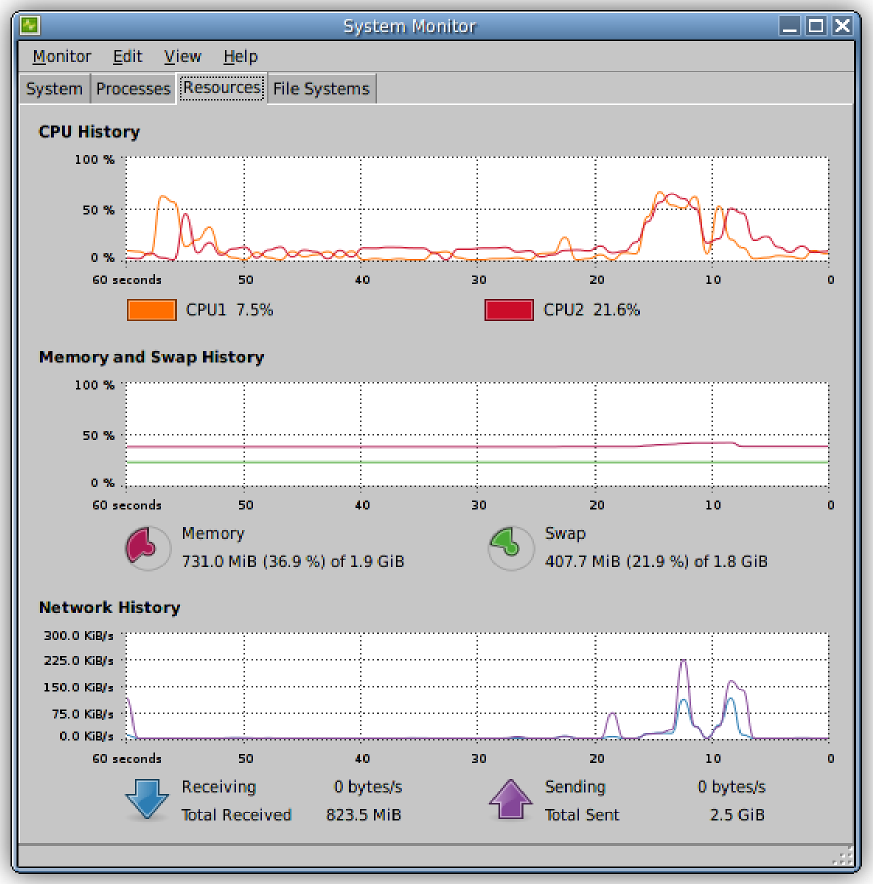
GUI Monitoring: Gnome

System Monitor is included by default in Ubuntu Linux installations using the Gnome desktop. The Gnome Documentation Library states, “It gives users a graphical user interface for monitoring CPU, network, and memory activities as well as a way for viewing and stopping system processes.”

Select **PLAY** below to view a video on Gnome:



View Video VideoLesson10Gnome(C3L10S21).mp4



🟧 CPU1 7.5% 🟥 CPU2 21.6%

Memory 731.0 MiB (36.9 %) of 1.9 GiB

Swap 407.7 MiB (21.9 %) of 1.8 GiB

Receiving 0 bytes/s
Total Received 823.5 MiB

Sending 0 bytes/s
Total Sent 2.5 GiB

Choosing the Right Tool

With the many system monitoring options available, how do you decide which is the right one for you? There are several factors to consider in this decision. Here are a few to get you started:

- How many systems will you be monitoring?
- Do you require a robust GUI or will command line output serve the need?
- Will there be compatibility issues?
- Will you monitor Unix based systems only or will your total system include other types of operating systems?
- What is your budget?

Lesson Summary

In this lesson, you explored system monitoring tools that help you maintain your network and computer system resources.

System monitoring tools are available in two forms—command line utilities and GUI-based applications that provide substantial capabilities.

Command line utilities presented in this lesson include top, df, netstat, ifconfig, and uptime. GUI-based applications include Nagios, Zenoss, and Gnome. Many other open source and commercial tools are available.

System monitoring tools are used to monitor computers, services, and network activities. These tools provide important details about the availability, inventory, configuration, performance, and events of local and remote computer systems, peripherals, and their resources.

System monitoring is a necessary part of an administrator's duties to ensure a healthy computer system and minimize the risk of critical failures, data loss, or disruption. The monitoring options you choose will depend on a number of factors including compatibility needs, system configuration, and size of computer systems to be monitored.

Required Reading:

- 20 Monitoring Tools
- Best Monitoring Tools
- 12 Native Linux Tools