

CSE 265: System and Network Administration

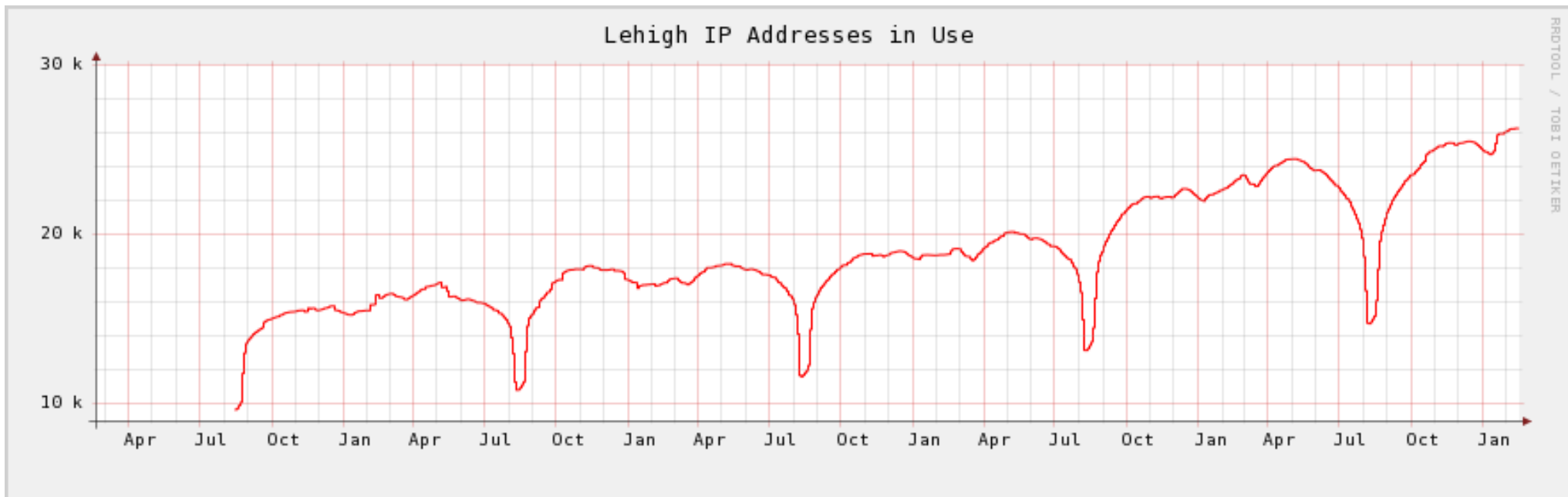
If you aren't measuring it, you aren't managing it.

- Service Monitoring
 - Historical data
 - Real-time monitoring
 - Alerting
 - Active monitoring systems
 - End-to-end tests
 - Application response time monitoring
- Syslog and Log files
 - Logging policies – what do you do with logs?
 - Linux log files
 - Logrotate: Manage log files
 - Syslog: system event logger
 - Condensing log files

Motivation for monitoring

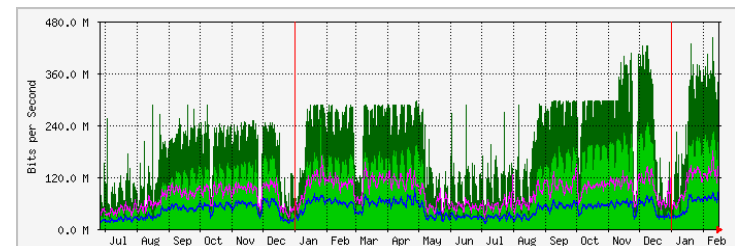
Motivation for monitoring

- Rapidly detect and fix problems
- Identify the source of problems
- Predict and avoid future problems
- Provide data on SA's achievements



Historical data

- Historical availability
 - record long-term uptime statistics
 - show improvements (99.99% uptime vs 99.9%)
- Utilization data useful for capacity planning
- Process
 - Poll systems at regular intervals
 - Collected, often graphed
 - Example: network status
 - <https://ss.cc.lehigh.edu/public/mrtg/internett.html>



Real-time monitoring

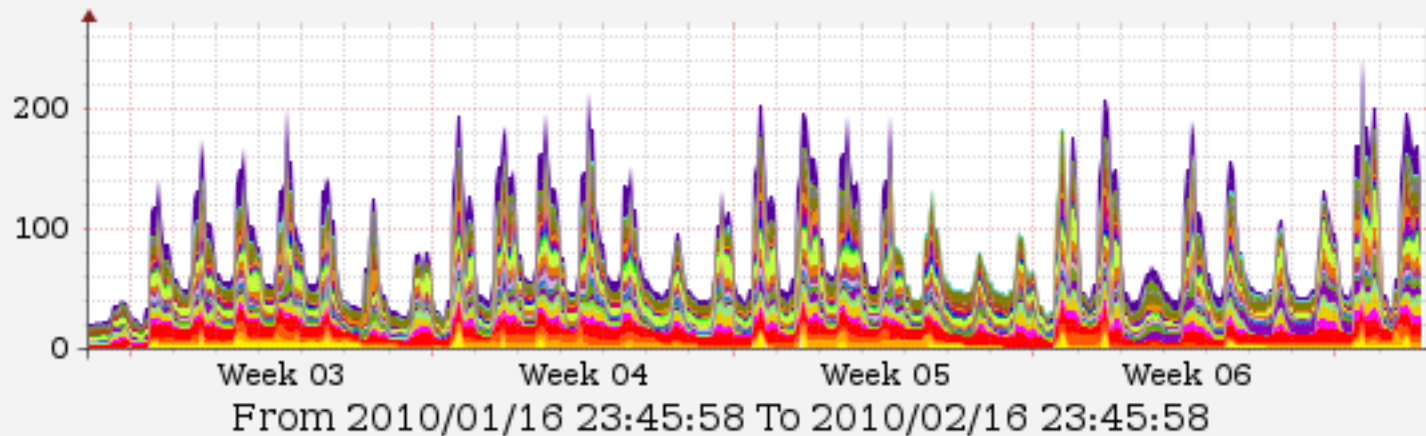
- Alert SA immediately about a failure
- Want to notice outage before customer does
 - maintain reputation
 - minimize downtime
- Two components
 - Monitoring (polling) systems to check status, watching error messages, checking subsystems
 - Alerting – recognize problems and notify SAs

Monitoring

- Want to monitor everything that can indicate a problem
- Availability monitoring
 - Host/network/application failures
- Capacity monitoring
 - Approaching or past overload

Public Site Usage

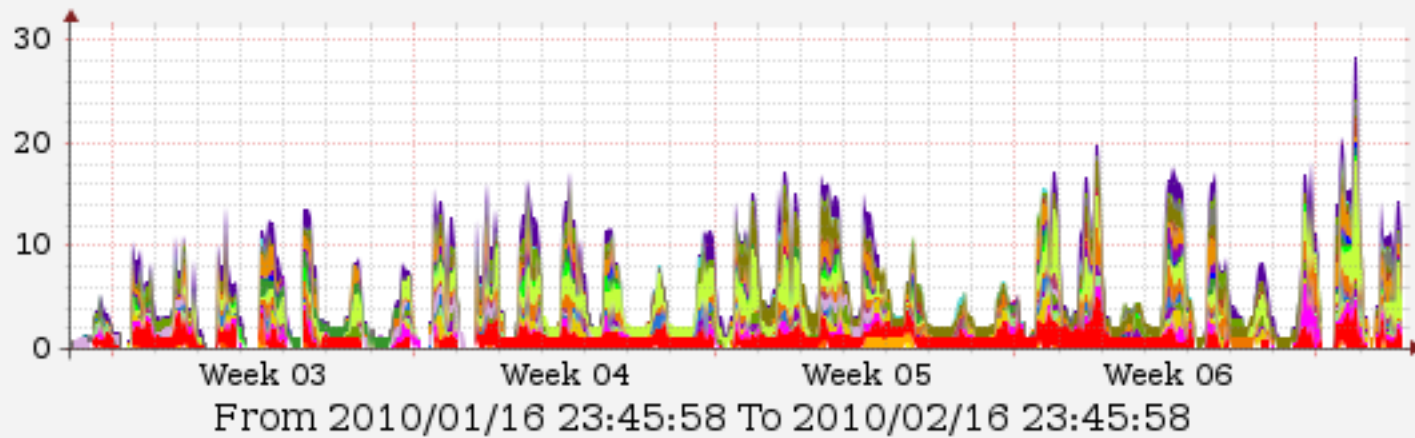
RADPOOL / TOBI OETIKER



coppee103	Current:	1	Average:	2	Maximum:	18
drown10	Current:	4	Average:	3	Maximum:	18
drown20	Current:	6	Average:	3	Maximum:	18
fm400	Current:	13	Average:	9	Maximum:	14
fm449	Current:	4	Average:	3	Maximum:	10
fm550	Current:	9	Average:	4	Maximum:	13
fm650	Current:	8	Average:	2	Maximum:	10
fmexp	Current:	1	Average:	1	Maximum:	4
fr605	Current:	3	Average:	3	Maximum:	19
gr28	Current:	5	Average:	3	Maximum:	28
iha122	Current:	1	Average:	2	Maximum:	12
ihd109	Current:	0	Average:	2	Maximum:	9
l132w	Current:	6	Average:	3	Maximum:	10
l302	Current:	6	Average:	3	Maximum:	23
m180	Current:	7	Average:	8	Maximum:	37
m292	Current:	3	Average:	1	Maximum:	12
mg470	Current:	2	Average:	1	Maximum:	5
mg485	Current:	0	Average:	1	Maximum:	9
ml210	Current:	1	Average:	1	Maximum:	17
ml444	Current:	6	Average:	2	Maximum:	17
mu464	Current:	2	Average:	2	Maximum:	17

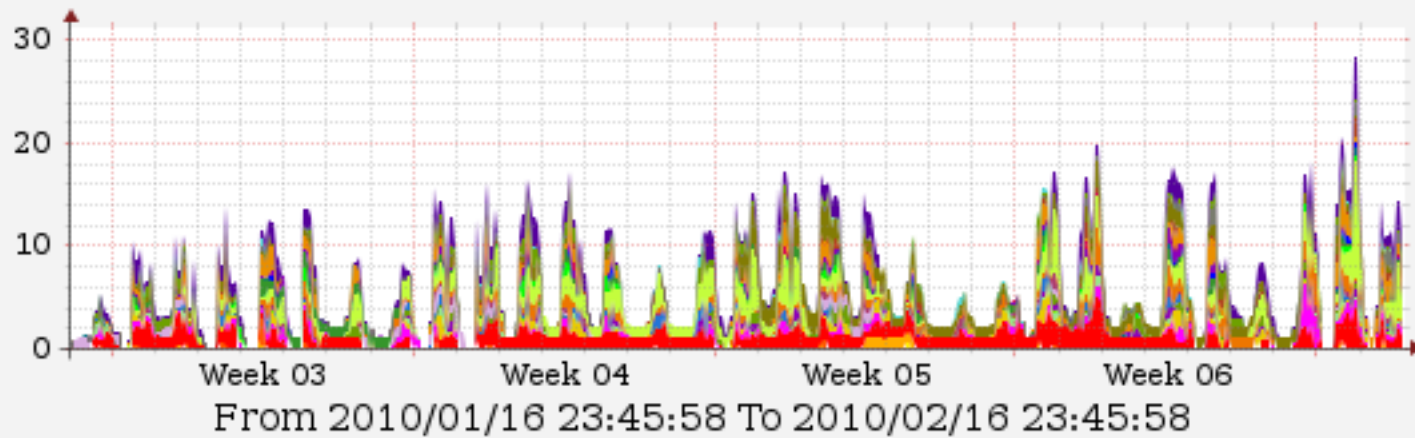
Pubsite -Firefox

RRDPPOOL / TOBI OETIKER

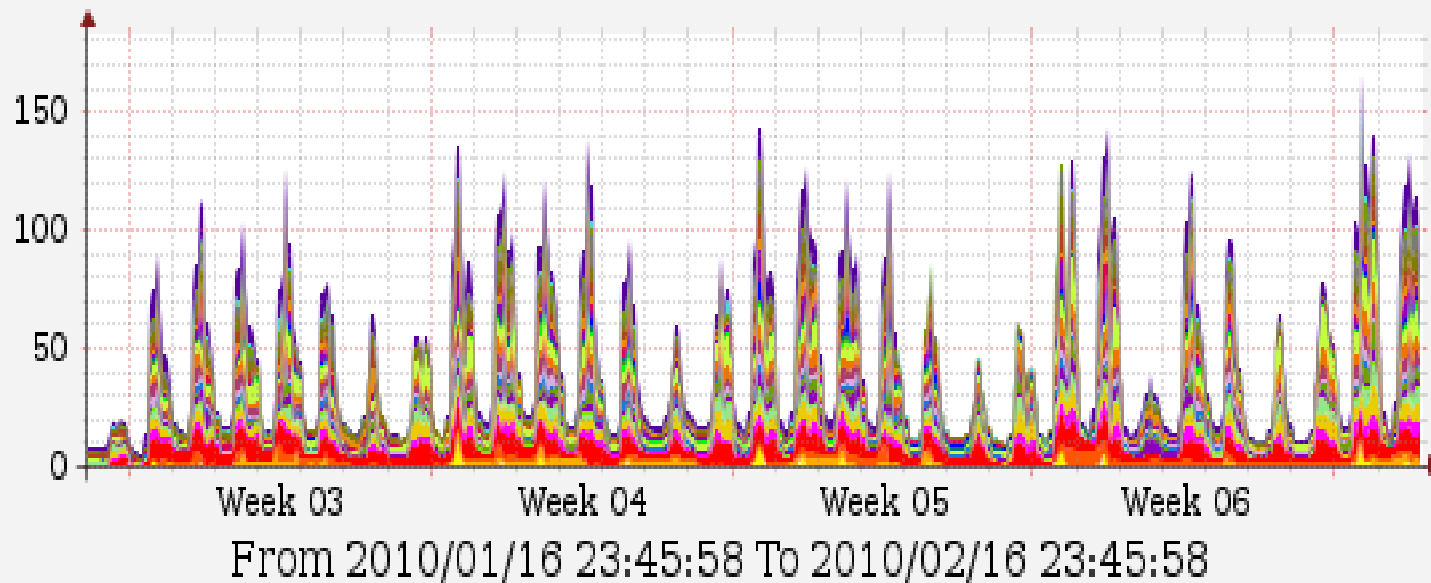


coppee103	Current: 0	Average: 0	Maximum: 1
drown10	Current: 0	Average: 0	Maximum: 2
drown20	Current: 0	Average: 0	Maximum: 4
fm400	Current: 1	Average: 1	Maximum: 7
fm449	Current: 1	Average: 0	Maximum: 5
fm550	Current: 0	Average: 0	Maximum: 5
fm650	Current: 0	Average: 0	Maximum: 3
fmexp	Current: 0	Average: 0	Maximum: 2
fr605	Current: 0	Average: 0	Maximum: 3
gr28	Current: 0	Average: 0	Maximum: 3
iha122	Current: 0	Average: 0	Maximum: 2
ihd109	Current: 0	Average: 0	Maximum: 2
l132w	Current: 0	Average: 0	Maximum: 4
l302	Current: 0	Average: 0	Maximum: 5
m180	Current: 2	Average: 1	Maximum: 13
m292	Current: 0	Average: 0	Maximum: 3
mg470	Current: 1	Average: 0	Maximum: 3
mg485	Current: 0	Average: 0	Maximum: 2
ml210	Current: 0	Average: 0	Maximum: 2
ml444	Current: 0	Average: 0	Maximum: 3
mu464	Current: 1	Average: 0	Maximum: 2

Pubsite - Firefox

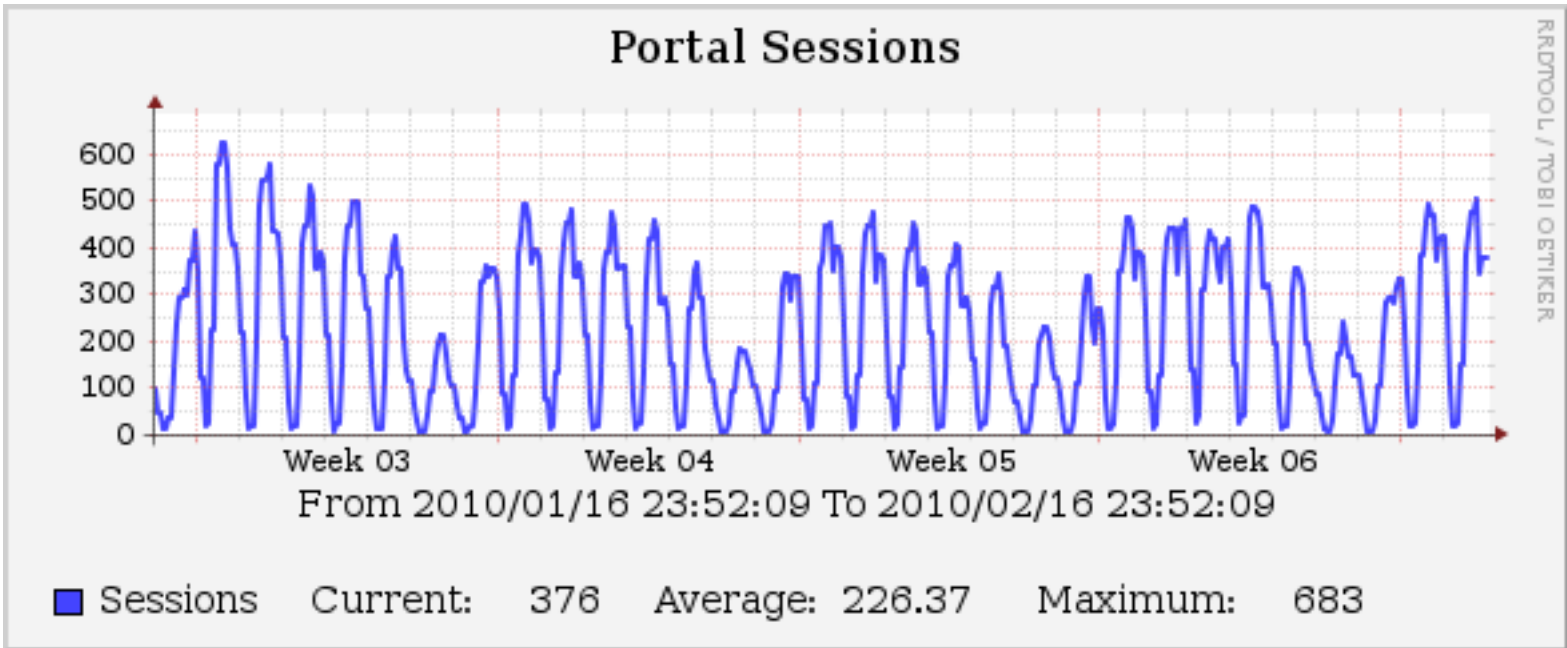


Pubsite - Internet Explorer



coppee103	Current: 0	Average: 0	Maximum: 13
drown10	Current: 3	Average: 1	Maximum: 17
drown20	Current: 1	Average: 2	Maximum: 18
fm400	Current: 11	Average: 5	Maximum: 14

Portal Sessions



Alerting

- Monitoring useless without alerting system
- Should not depend on system being monitored
 - e.g., don't depend on e-mail if network is down
- Who gets alerts? What if failure persists?
- Need to test alerting system
 - Funny story about an alerting system that called the SA saying “I'm hot! I'm wet!” (wife of SA did not approve)

Active monitoring

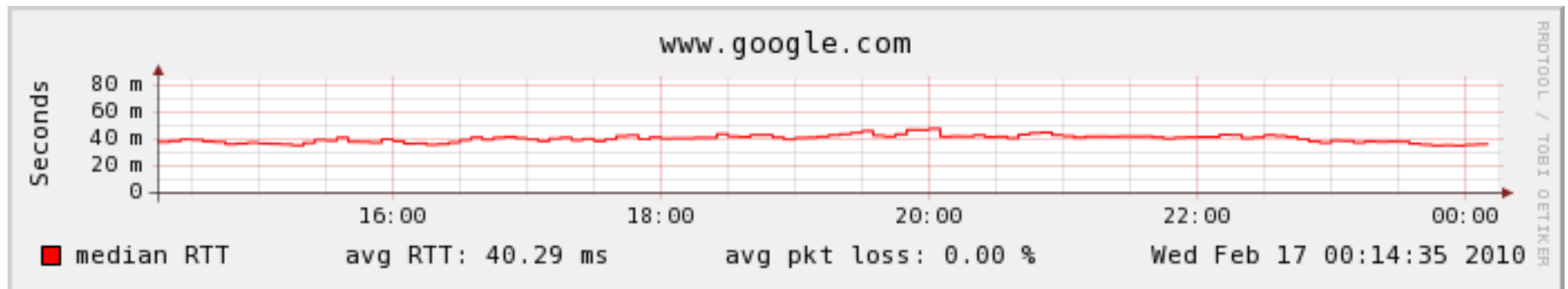
- Don't just monitor and alert, do something!
- Respond quickly/automatically
- Temporary solutions
 - Still need a permanent fix
- Can be a security risk (often requires privileges)

End-to-end tests

- Test entire transactions as a simulated customer
 - Send email through a server
 - Log in, select an item, check-out, get receipt
- Find problems before customers
- Find systemic problems, even when individual components are working

Application response time monitoring

- Even when everything works, if it is too slow, it is a failure
 - Loss of productivity
 - Loss of sales
 - Resentment
- Use historical monitoring, too



Summary

- Two types of monitoring:
 - Historical data gathering
 - Trends for capacity planning
 - Recognition of long-term improvements
 - Real-time monitoring and alerting
 - Detect problems faster
 - React before failure (e.g., before swap gets full)

Logging policies

- Log files grow and grow
- What do you do with log files? Some options:
 - Throw away all data immediately
 - Reset log files periodically
 - Rotate log files, keeping data for a fixed time
 - Compress and archive files to tape or other media
- Throwing away log files
 - Not recommended!
 - Need evidence of security problems
 - Alert for hardware and software problems
 - Ideally, keep for a month
 - may take that long to notice a problem!
 - Resetting when disk is full isn't good either

Rotating log files

- Keep a fixed set of previous log files
 - Rotate current file into set on a regular basis (daily, weekly, etc.)

- Example:

```
#!/bin/sh
cd /var/log
mv logfile.2 logfile.3
mv logfile.1 logfile.2
mv logfile logfile.1
touch logfile
chmod 600 logfile
```

- May want to add compression, reset server

Archiving log files

- May need to archive all accounting data and log files for policy, potential audits, etc.
- First rotate on disk
 - fast access to recent data
- Then write to tape or other media
- Log files should be part of backup sequence
 - Hackers tend to delete them!

Linux log files



- Most log files are recorded in `/var/log`
 - `/var/adm` may also contain some (distro dependent)
- Most programs send entries to syslog daemon
 - `/etc/rsyslog.conf` usually puts them in `/var/log`
- Sample log files:
 - `messages` – main system log file
 - `maillog` – record of sendmail activity
 - `boot.log` – output of system startup scripts

Other log files

- /var/log/wtmp
 - Record of users' logins and logouts
 - Binary format – use **last** to read
 - Still truncated and rotated
- /var/log/lastlog
 - Record of time of last log in
 - Binary format (is used to say when you last logged in)
 - Constant size – no need to rotate
- /var/log/dmesg
 - Dump of kernel message buffer at end of boot

Logrotate

- Excellent utility to manage log files
- Specifies groups of log files to be managed

```
# Example log rotation
rotate 5
weekly

/var/log/messages {
    postrotate
        /bin/kill -HUP `cat /var/run/syslogd.pid`
    endscript
}
/var/log/samba/*.log {
    notifempty
    copytruncate
    postrotate
        /bin/kill -HUP `cat /var/lock/samba/*.pid`
    endscript
}
```

Syslog

- Comprehensive logging system
 - Frees programmers from needing to write their own
 - Allows sysadmins to control logging
- Flexible
 - Can sort by source or severity level
 - Output to variety of destinations – files, terminals, other machines
- Can centralize logging to a well-controlled machine
- RHEL/CentOS 6 uses rsyslog (improved)

Syslog (continued)

- Three parts
 - syslogd – logging daemon (uses /etc/rsyslog.conf)
 - openlog – library routines
 - logger – shell command to submit log entries
- Apps use library to write to /dev/log
 - UNIX domain socket
- Syslogd reads messages from /dev/log
 - Outputs message depending on /etc/rsyslog.conf

Sample syslog.conf

```
# Emergencies: tell everyone who is logged in
*.emerg;user.none *

*.warning;daemon,auth.info,user.none /var/log/messages
# Forward important messages to the central logger
*.warning;daemon,auth.info @netloghost

# printer errors
lpr.debug /var/log/lpd-errs
```


Sample syslog output

```
Feb 22 04:04:21 wume1 named[2826]: lame server  
  resolving '211.68.246.64.in-addr.arpa' (in  
  '68.246.64.in-addr.arpa?'): 160.79.6.130#53  
Feb 22 13:22:41 wume1 sshd(pam_unix)[16776]: session  
  opened for user brian by (uid=0)  
Feb 22 13:22:44 wume1 su(pam_unix)[16802]: session  
  opened for user root by brian (uid=501)  
Feb 25 20:31:57 wume1 sshd(pam_unix)[28375]: check  
  pass; user unknown  
Feb 25 20:32:00 wume1 sshd(pam_unix)[28375]: 1 more  
  authentication failure; logname= uid=0 euid=0  
  tty=NODEVssh ruser= rhost=dyn032098.cc.lehigh.edu
```

Condensing log files

- Syslog (as well as any other monitoring and logging facility) generates lots of log files
- Need utilities to scan log files and find important entries
 - security-related entries
 - messages about disks full
 - messages repeated many times

Summary

- It is imperative to monitor systems and generate logs
 - For warnings, job performance, trends, etc.
- Logs cannot be permitted to impact proper system operation