



A look into

LCSEE SYSTEMS

Linux Based Infrastructure Management

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Writes docs
for fun

ABOUT ME

Knows Erlang
(and likes it!)

Cool
Dude

Grocks regular
expressions

Worked at Systems
since 2007

Emacs guru

His username is also
his domain name!

Credited in multiple
open source projects





INTRODUCTION

Examine the LCSEE Linux infrastructure from two different points of view.



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We'll call them:



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I. "Things you see"



INTRODUCTION

Examine the LCSEE Linux infrastructure from two different points of view.

We'll call them:

1. "Things you see"
2. "Things you don't see"

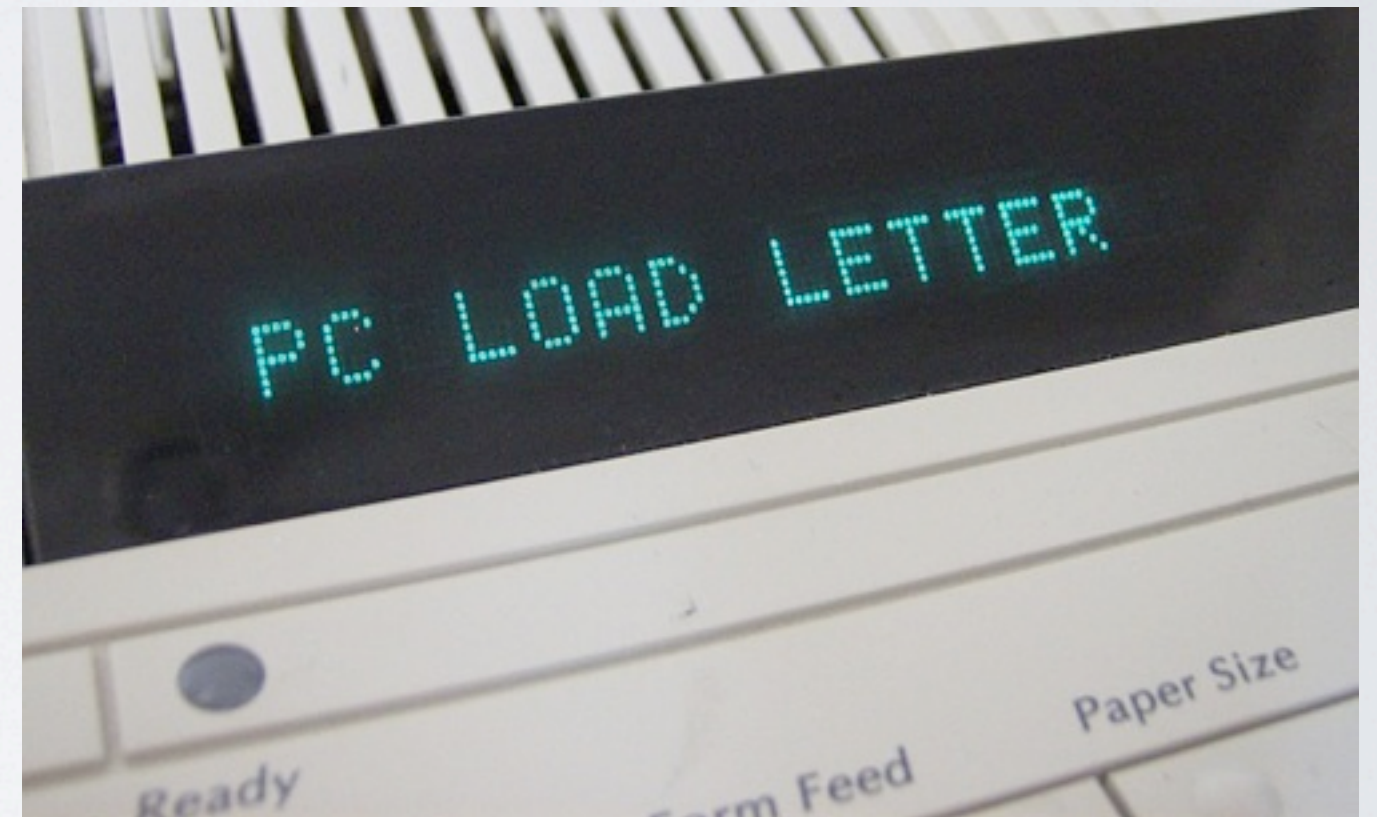


THE TAKE-AWAY (PART I)

What you should get from this discussion

The guys in 701 do more than:

1. Create accounts
2. Reset passwords
3. Fix paper jams



They're all actually quite skilled technicians.



THE TAKE-AWAY (PART II)

...in addition to that....

You will become insanely jealous of your peers working for systems as you realize:



THE TAKE-AWAY (PART II)

...in addition to that....

You will become insanely jealous of your peers working for systems as you realize:

Working for Systems is the best job opportunity you'll **ever** have if you're going into the IT field after college.



THE TAKE-AWAY (PART III?)





WHAT NOT TO EXPECT/ REJECTED TITLES FOR THIS PRESENTATION

I like to call this slide “**Questions I will not be answering.**”

- ▶ *Why can't I login to Shell?*
- ▶ *Can you reset my password?*
- ▶ *Is the server down?*
- ▶ *Why does 756 ESB suck?*
- ▶ *Will you recommend me for systems?*



Thursday, November 4, 2010

Beginning of "Things you see" discussion

Things
you
see.



Thursday, November 4, 2010

Beginning of “Things you see” discussion



CSEE ACCOUNT CREATION



Account creation/maintenance is handled by a software packaged called **python-accounts**.

- Creates the user account, group, and home directory entries in our directory
- Creates the home directory on the remote file server
- Generates and prints the new account information form
- And more...



USING 756 FOR CS110 LAB



Lab machines, shell servers, they both have quite a bit of software installed on them. Most of that software has to be configured to work correctly.

Problem: Configuring machines by hand is a slow and error-prone process, what's the solution? A common answer is to set up a Configuration Management System.

What does LCSEE do for configuration management?



SYSTEM CONFIGURATION



SVN + Debian Packaging = LOUD

- Packages available on mirror
- Install with apt
- SVN holds package sources
- New packages automatically verified by mirror
- Instant notification of changes via e-mail & IRC

More on LOUD later!



VISITING YOUR PROFESSORS WEB PAGE



- The Helpdesk website, LOUD Email Guide^[1], and Internal Staff Docs are saved in packages. Everything else is on one of our 5 file servers.
- **Problem:** Data is stored all over the place! How does the web server access it all?
- Solution: Proxying internet-facing web server

[1] - <http://www.csee.wvu.edu/helpdesk/userdocs/loud-email-guide.html>



VISITING YOUR PROFESSORS WEB PAGE



- Internet-facing web server generates list of addressable content each hour from our LDAP directory

- Example:

```
ProxyPass /~hayhurst http://fileserver005:8000/~hayhurst
```

```
ProxyPassReverse /~hayhurst http://fileserver005:8000/~hayhurst
```



VISITING YOUR PROFESSORS WEB PAGE



In-browser example using:

<http://www.csee.wvu.edu/~tbielawa/systemstalk>



USING THE SHELL “POOL”



- We have 8 shell servers allocated to our “pool”
- Some times you end up on shell001
- ...and other times on shell004?
- “Dead” shells are kicked out of the pool
- Recovered shells come back automatically



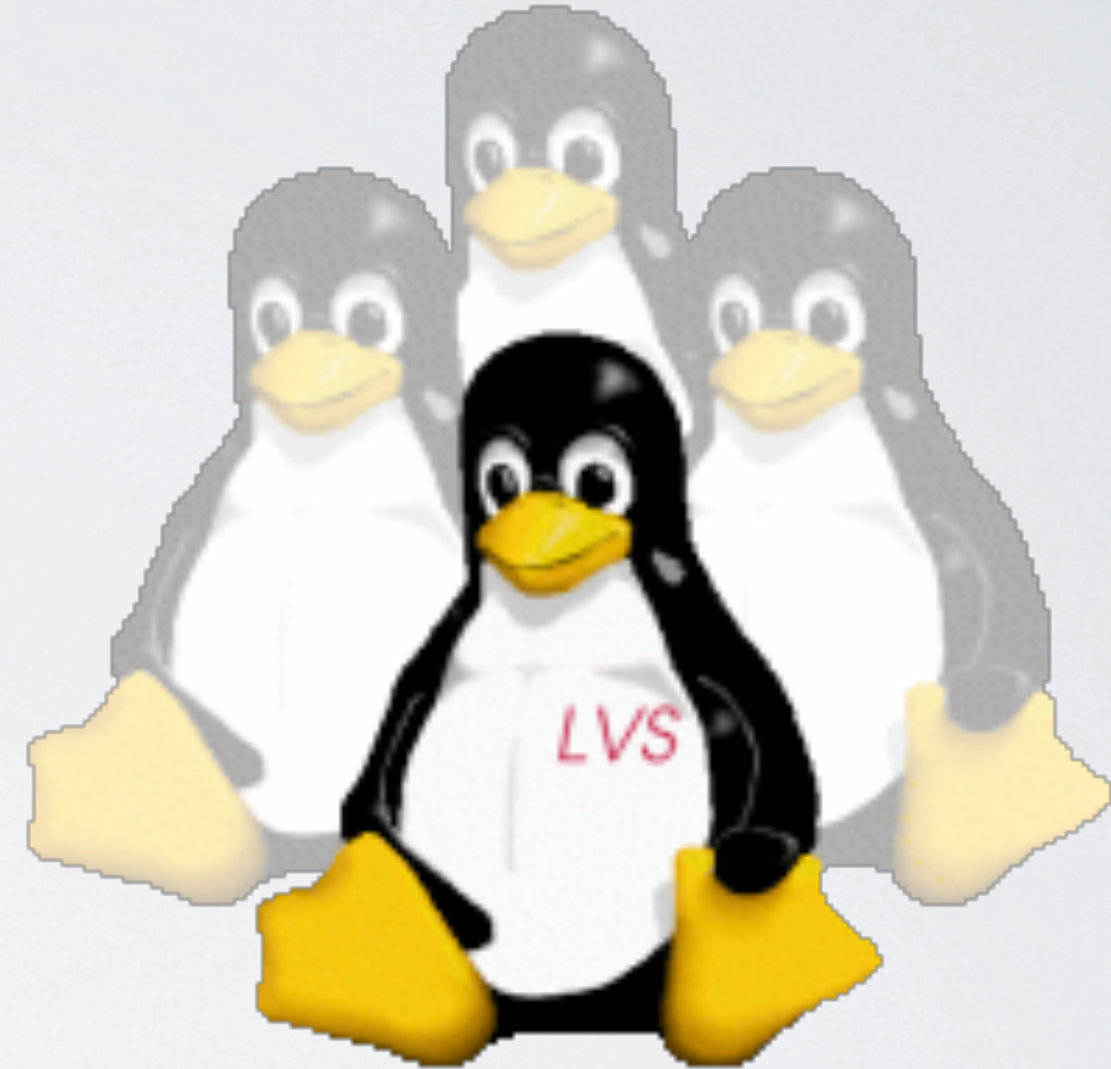


ARE WE WIZARDS?





USING THE SHELL “POOL”





USING THE SHELL “POOL”



*Command line example:
ipvsadm usage*



Thursday, November 4, 2010

19

Beginning of "Things you don't see section": LDAP. Software Requests. Monitoring. Data Center. Backups. Issue Tracking. Giving Back. Documentation. System Provisioning (LOUD).



Things
you
don't see.



INTERESTING NUMBERS***TEXT**

- File Servers: 5
- File Server Capacity: 1.8 TiB
- Virtual Hosts (Production): 20
- Virtual Guests (Production): 44
- Base-Images: 9 (77 GiB total)
- User/Class Data: 1 TiB
- Server Data: 120 GiB
- Shell Servers: 8
- DHCP Servers: 2
- Lab Machines: 138
- Configuration Packages: 166
- User Accounts: 2,700
- Networked Printers: 36
- SVN Servers: 3
- SVN Repositories: 79
- Wikis: 30
- Issue Tracker Tickets: >95,000
- Student Workers: 6

*Sampled on 2010/10/26



LDAP



What's that I hear you saying?



LDAP



What's that I hear you saying?

“Please Tim, tell me about LDAP!”



LDAP



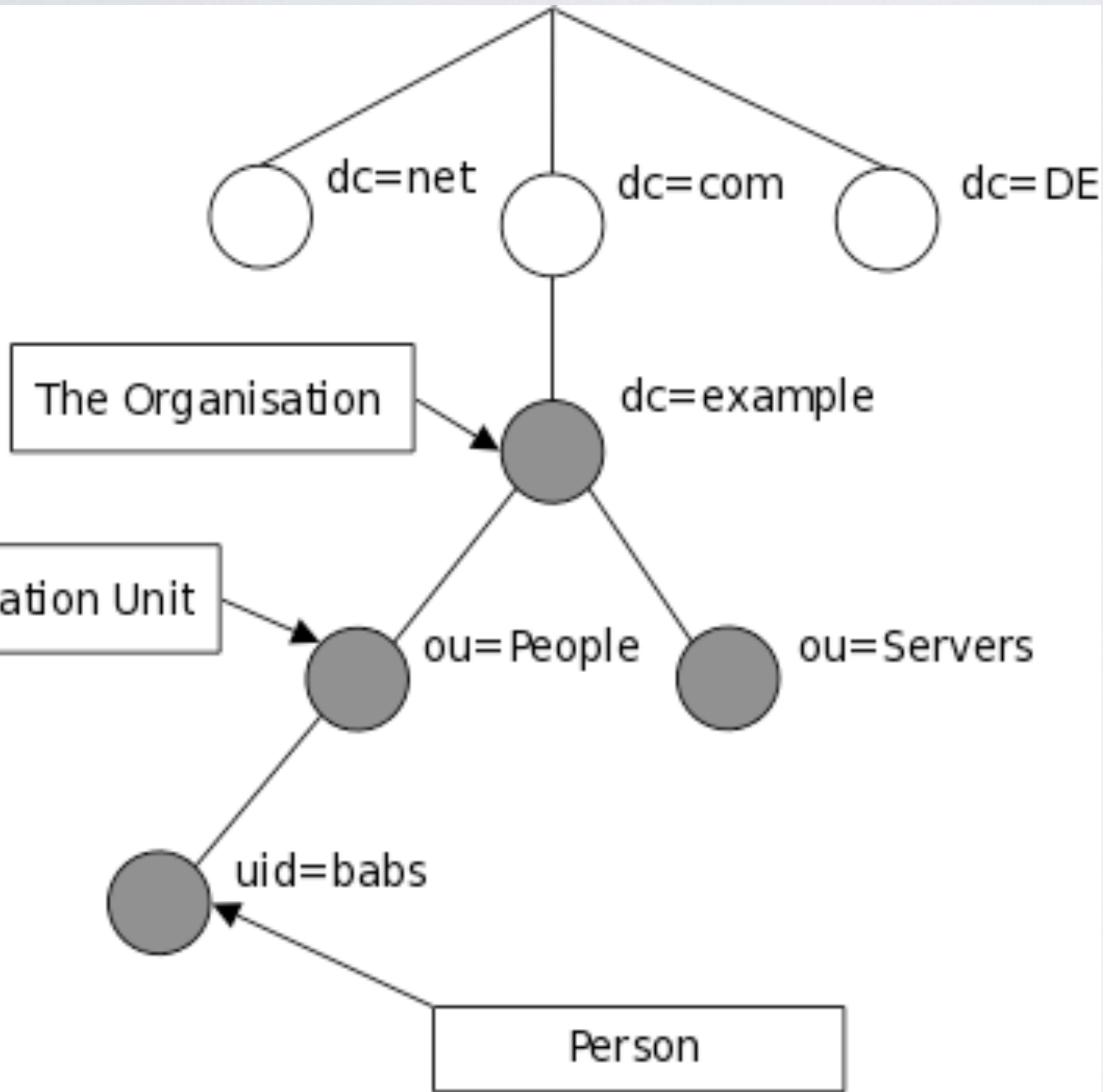
What's that I hear you saying?

“Please Tim, tell me about LDAP!”

Gladly!



LDAP



Directories are easy to visualize.

They look just like the directed graphs you're already familiar with from your data structures courses.



LDAP IMPLEMENTATIONS



Survey: Can anyone name some (not OpenLDAP) LDAP implementations?



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- Microsoft Active Directory (AD)



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LDAP IMPLEMENTATIONS



Survey: Can anyone name some (not OpenLDAP) LDAP implementations?

- Microsoft Active Directory (AD)
- The Domain Name System (DNS)
- Network Information Service (NIS)
- OpenLDAP



LDAP



- Command line
- Libraries for scripting



LDAP



*Command line example:
Some basic LDAP queries*

Show an account

Locate a real machine

Locate a virtual machine

Identify a users file server



LDAP



Here's how we use some of the information stored for one of our load balancers.

LDAP ENTRY FOR LVS002

dn: cn=lvs002,ou=Hosts,dc=csee,dc=wwu,dc=edu
macAddress: C0:FF:EE:09:50:87
cn: lvs002
cn: LVS_ESB_DIRECTOR
cn: VIPBACKUP
cn: SERVER
cn: MONITORED
ipHostNumber: 157.182.36.70
l: G40AESB
l: law

Autoinstall knows this means to install the lcsee-esb-lvs-director package.

Used in the lcsee-esb-lvs-director package to configure as a backup.

Autoinstall knows this means to install the lcsee-server package.

Nagios will monitor this host.

Virtual "host" this guest lives on.

Physical room virtual machine is located in.



LDAP



If any of this seems overwhelming to you, it's worth mentioning that LDAP is one of the *first* things you learn when working for systems.



SOFTWARE REQUESTS



SOFTWARE REQUESTS





SOFTWARE REQUESTS





MONITORING

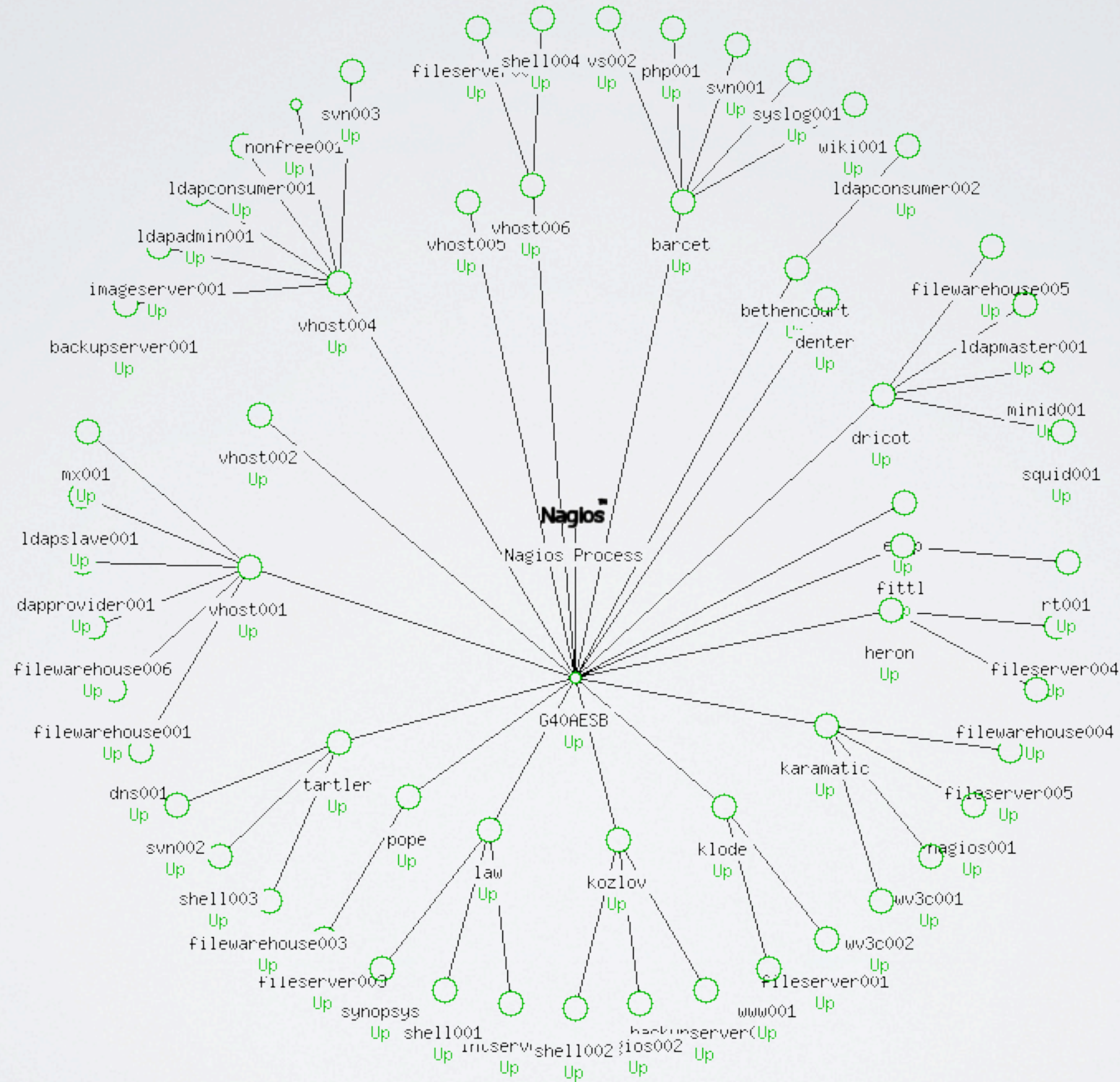
Nagios[®]

- Real time status reports from anywhere via the web interface
- Email and IRC notification of state changes automatically
- Configs generated hourly from LDAP
- One Nagios instance monitors servers exclusively
- The other instance monitors lab machines exclusively



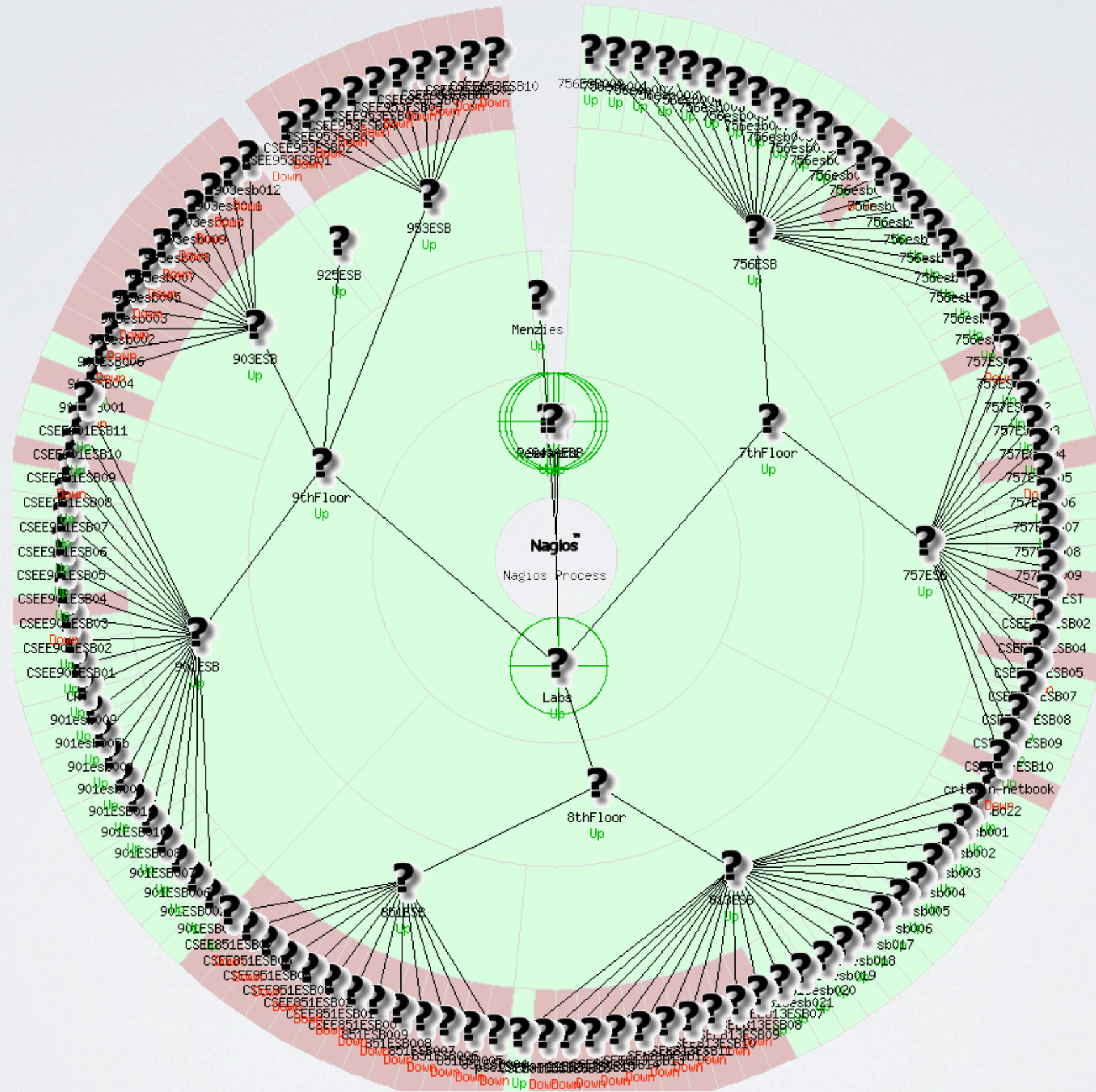
SERVER MONITORING

Nagios®





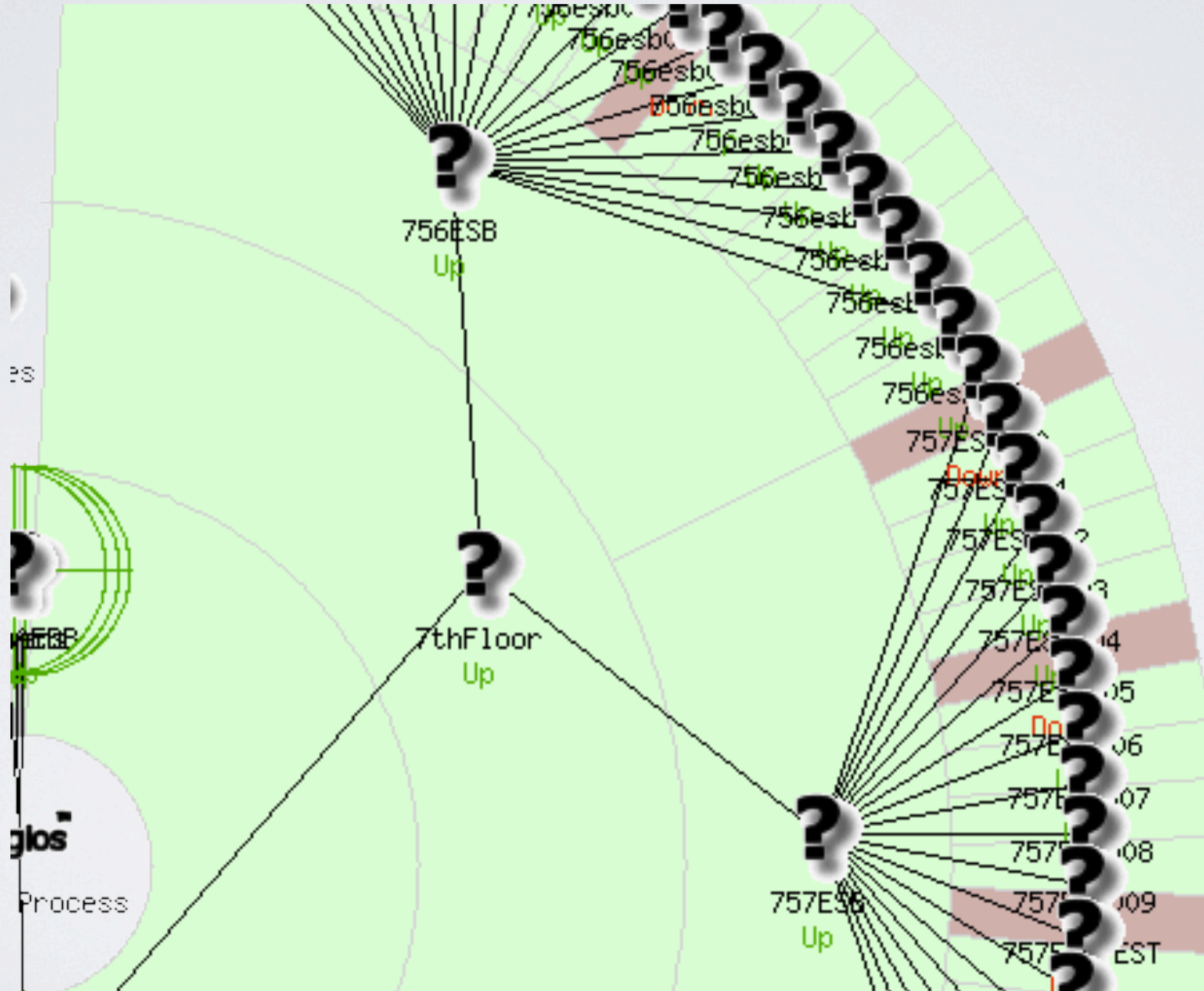
LAB MONITORING





LAB MONITORING CLOSE UP

Nagios[®]





LAB MONITORING CLOSE UP

Nagios®

*In-Browser example:
Nagios & Lab Nagios*



OLD DATA CENTER





OLD DATA CENTER



NEW DATA CENTER



NEW DATA CENTER





DATA CENTER

2008-02-22



Thursday, November 4, 2010

February 2008: ~42 servers. 4 Racks used



DATA CENTER

2008-08-07



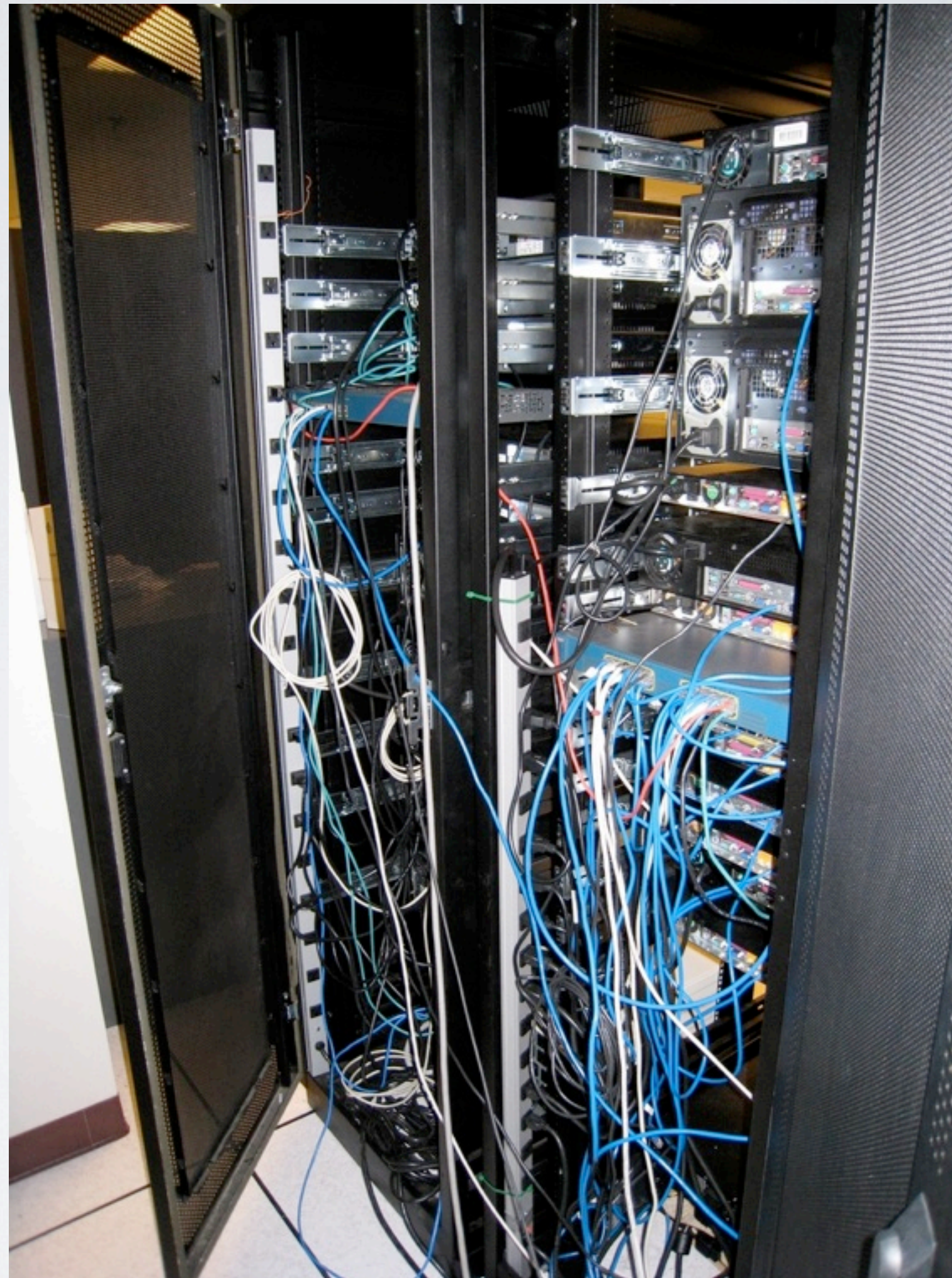
Thursday, November 4, 2010

August 2008: ~43 servers. 4 racks



DATA CENTER

2008-08-07



Thursday, November 4, 2010

August 2008: Wiring was very much getting out of hand at this point.



DATA CENTER

2008-12-01



Thursday, November 4, 2010

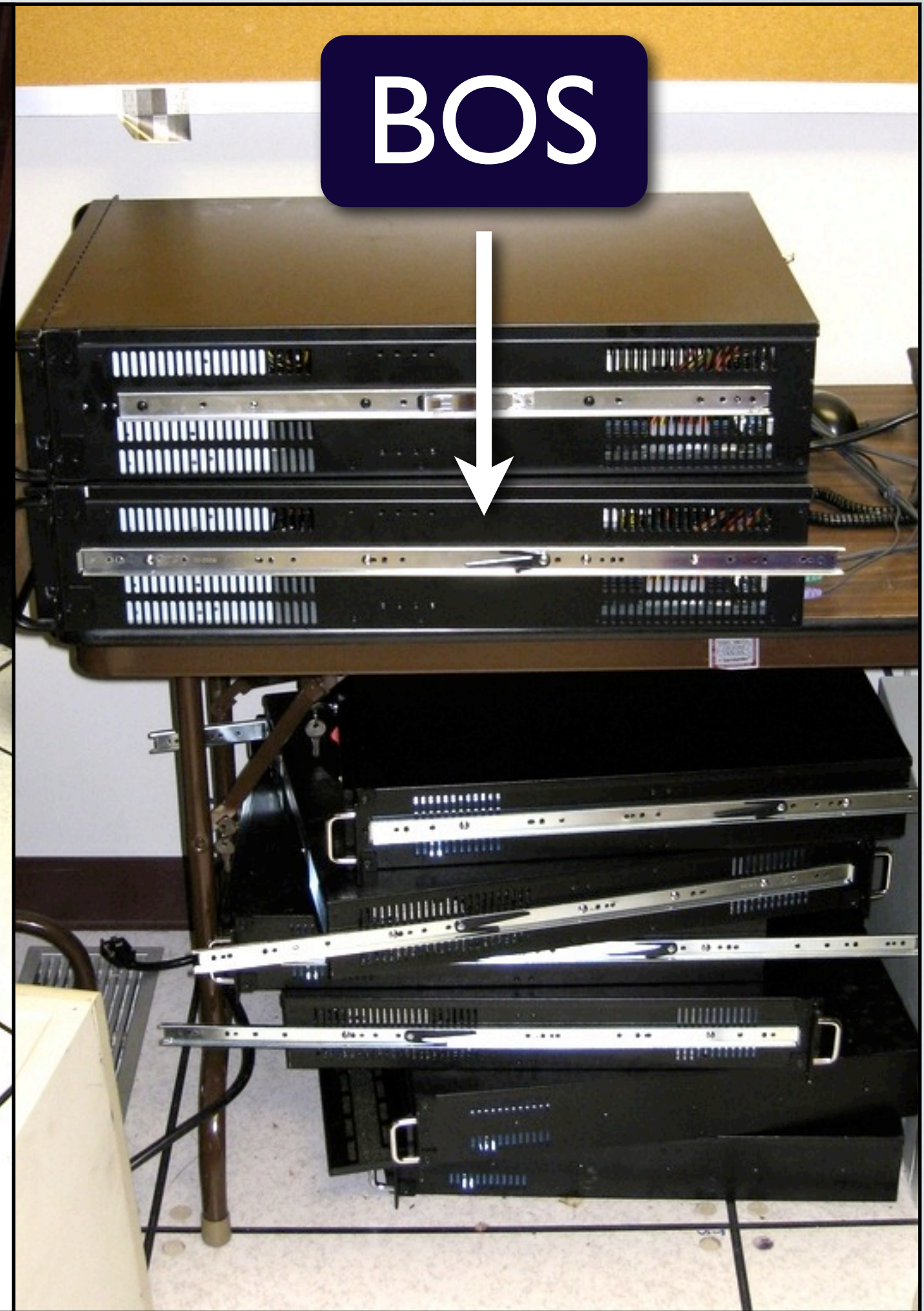
40

December 2008: Removed ~20 machines. Virtualization full swing. We've begun accumulating stacks of unused servers. Second from top is 'Bos', our old mail warehouse. Wouldn't power on in the racks.



DATA
CENTER

2008-12-01



Thursday, November 4, 2010

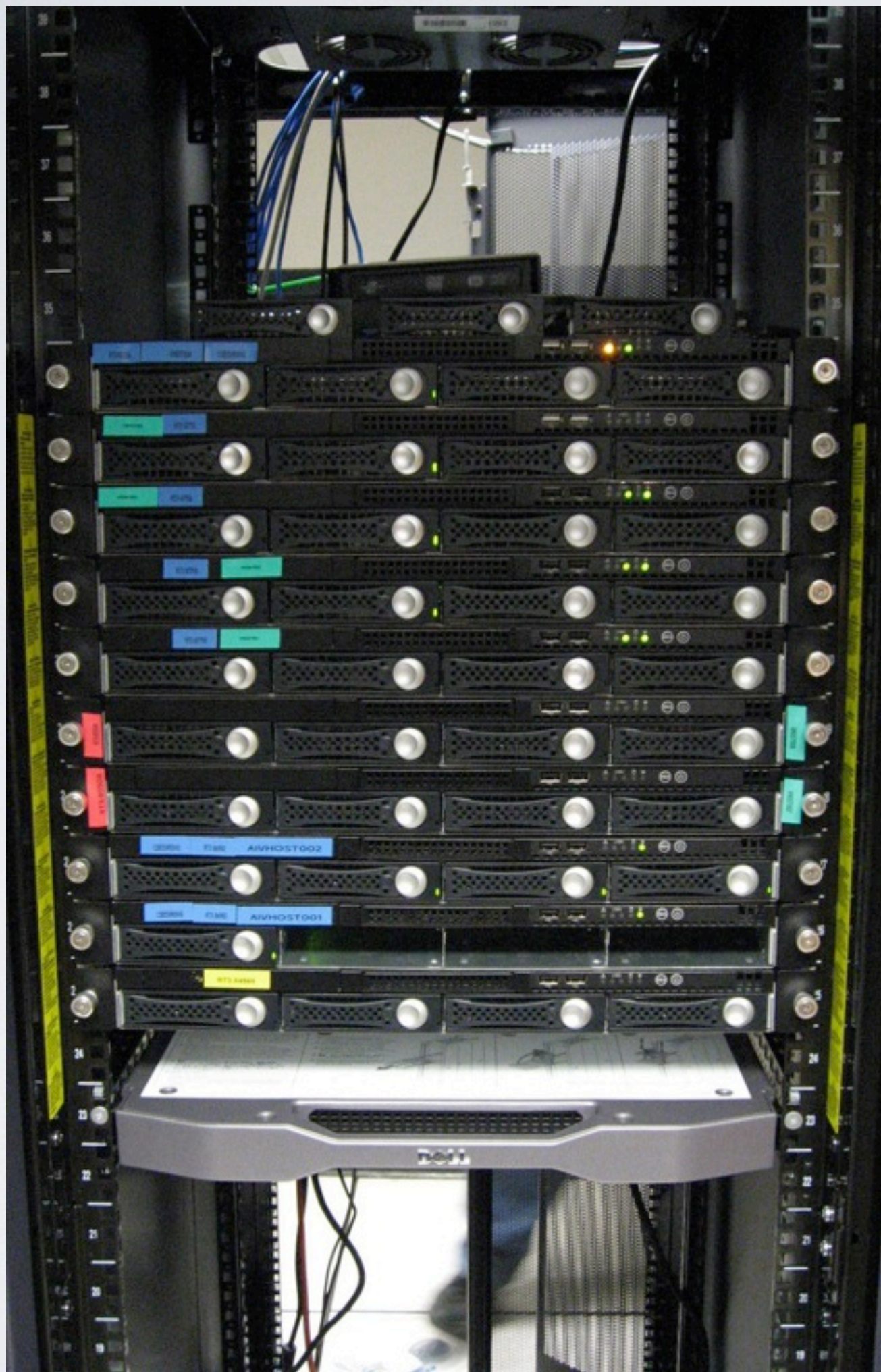
40

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DATA CENTER

2010-10-26



Thursday, November 4, 2010

October 2010: Now fully moved into G40A ESB for quite some time. 25 steel & silicon machines in two racks with room to expand.



DATA
CENTER

2010-10-26



Thursday, November 4, 2010

October 2010: Successful in-rack test of new deployment method.



BACKUPS





BACKUPS



FILE WAREHOUSE



ISSUE TRACKING





ISSUE TRACKING

LCSEE Systems
RT for csee.wvu.edu

Logged in as tbielawa | Preferences | Logout

Search administrative

[Home](#) · [Simple Search](#) · [Tickets](#) · [Tools](#) · [Configuration](#) · [Preferences](#) · [Approval](#)

RT at a glance Edit

^ **15 highest priority tickets I own** Edit

#	Subject	Priority	Queue	Status
94617	Push acroread-9.3.3-1lucid1 to stable	700	internal	open
83873	Books for LCSEE	700	administrative	open
95068	DNS server is slow	100	internal	open

^ **15 newest unowned tickets** Edit

#	Subject	Queue	Status	Created	
95924	Services down?	helpdesk	new	6 hours ago	Take
95923	Services down?	helpdesk	new	6 hours ago	Take
95921	Services down?	lcseehelpdesk	new	7 hours ago	Take
95920	take a look at denter	special forces	new	7 hours ago	Take
95919	Services down	internal	open	26 hours ago	Take
95918	Develop an LDAP-New auth migration plan	special forces	(pending other Collection)	29 hours ago	Take
95916	Access 2007 Product Key	msdnaa	new	33 hours ago	Take
95914	833 Copier is Broken	internal	open	39 hours ago	Take
95910	Fw: CS230 - Need access to PHP	operations	new	2 days ago	Take
95909	Some machines unable to authenticate	internal	open	2 days ago	Take
95908	Dr java	helpdesk	new	2 days ago	Take
95907	Better monitoring of printer up time	internal	open	2 days ago	Take
95906	New Computers in ERB 214	operations	open	2 days ago	Take
95905	Today's 756 issues	helpdesk	open	2 days ago	Take

^ **Reminders**

^ **Quick search** Edit

Queue	new	open	stalled
administrative	19	41	4
CEMR	0	0	0
computers	124	97	1
external	11	56	2
helpdesk	3	1	0
internal	6	52	1
lcsee-cemr	1	0	0
lcseehelpdesk	4	5	0
matlab	9	5	0
operations	2	52	1
special forces	5	22	0

Don't refresh this page. Go!

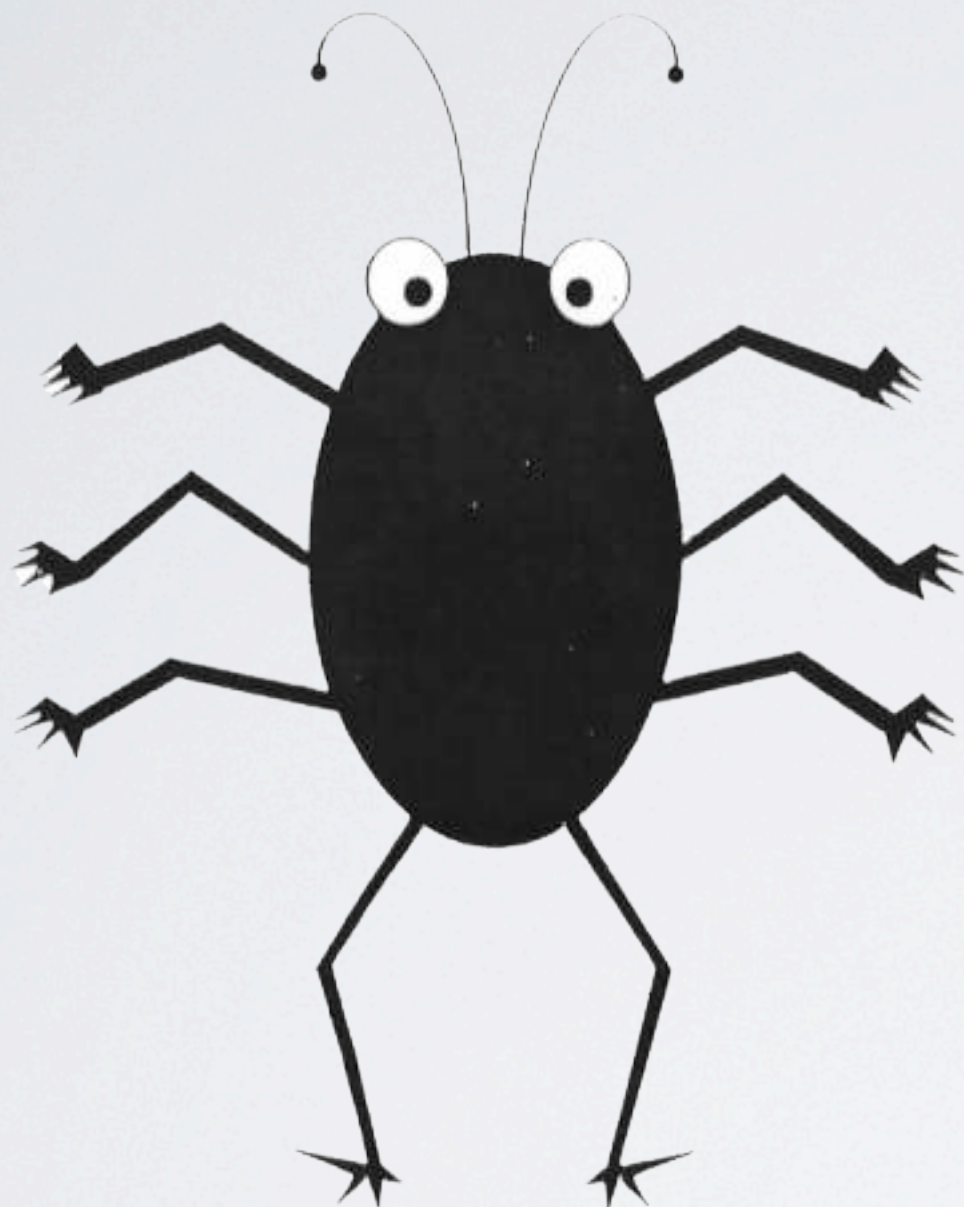


GIVING BACK (OPEN SOURCE CONTRIBUTIONS)





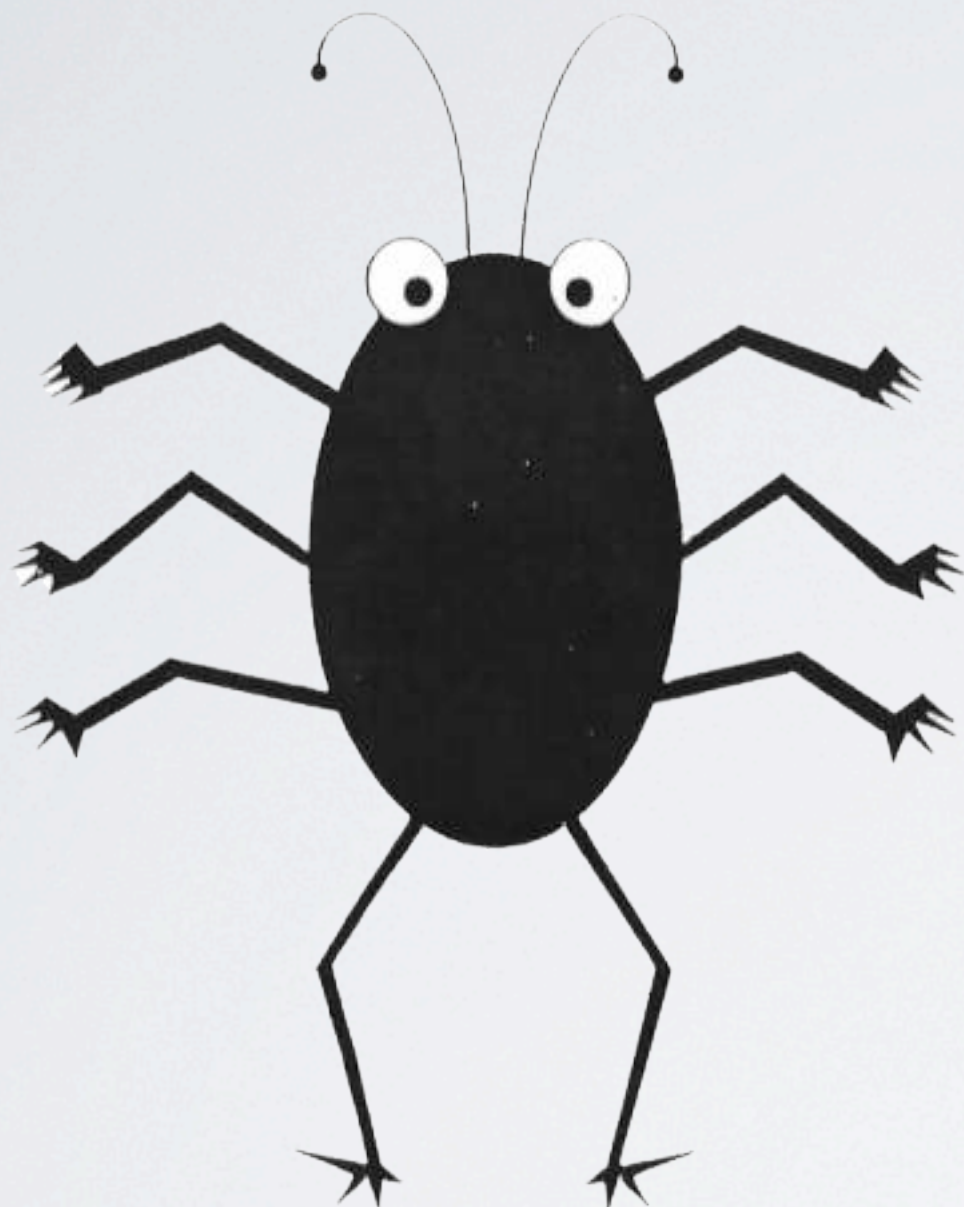
GIVING BACK (OPEN SOURCE CONTRIBUTIONS)



BUG



GIVING BACK (OPEN SOURCE CONTRIBUTIONS)



BUG



FEATURE



DOCUMENTATION



Extensive, constantly growing.

Different formats, different purposes.



DOCUMENTATION



Extensive, constantly growing.

Different formats, different purposes.

I. Comments in our issue tracker



DOCUMENTATION



Extensive, constantly growing.

Different formats, different purposes.

1. Comments in our issue tracker
2. README.LOUD files in our packages



DOCUMENTATION



Extensive, constantly growing.

Different formats, different purposes.

1. Comments in our issue tracker
2. README.LOUD files in our packages
3. The LCSEE Sysstaff Reference



DOCUMENTATION



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1. Comments in our issue tracker
2. README.LOUD files in our packages
3. The LCSEE Sysstaff Reference
4. *command --help*



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4. *command --help*
5. Custom written man pages



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2. README.LOUD files in our packages
3. The LCSEE Sysstaff Reference
4. *command --help*
5. Custom written man pages
6. The Sysstaff Wiki



DOCUMENTATION



DocBook 5 XML



DOCUMENTATION



DocBook 5 XML

See the shirt?



DOCUMENTATION



Highlight: **LCSEE Sysstaff Reference**



DOCUMENTATION



Highlight: **LCSEE Sysstaff Reference**

- Written in 100% validated DocBook 5 XML (13,161 SLOC)



DOCUMENTATION



Highlight: **LCSEE Sysstaff Reference**

- Written in 100% validated DocBook 5 XML (13,161 SLOC)
- 35 Chapters + 1 Example Chapter



DOCUMENTATION



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- 199 Pages total



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- 22 Authors



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- 22 Authors
- 399 Revisions



DOCUMENTATION



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- 199 Pages total
- 22 Authors
- 399 Revisions
- Instantiated 2006/03/14 at 17:36:31 EST



DOCUMENTATION



DocBook

- “Single Source Publishing”
- Only edit the XML
- Transform into:
 - HTML - Single Page
 - HTML - Chunked
 - PDF



DOCUMENTATION



*In-Browser/Preview example:
LSR Single, Paged, and PDF*



DOCUMENTATION



*Command line example:
Build a document*



VIRTUALIZATION

*Command line example:
Begin building a virtual machine*



SYSTEM PROVISIONING: INGREDIENTS



LOUD



SYSTEM PROVISIONING: INGREDIENTS

Directory for storing
configuration data



LOUD



SYSTEM PROVISIONING: INGREDIENTS

Directory for storing
configuration data



Server with:
libvirt, kvm, and qemu





SYSTEM PROVISIONING: INGREDIENTS

Directory for storing
configuration data



Server with:
libvirt, kvm, and qemu

Custom packages
with hooks to
the directory

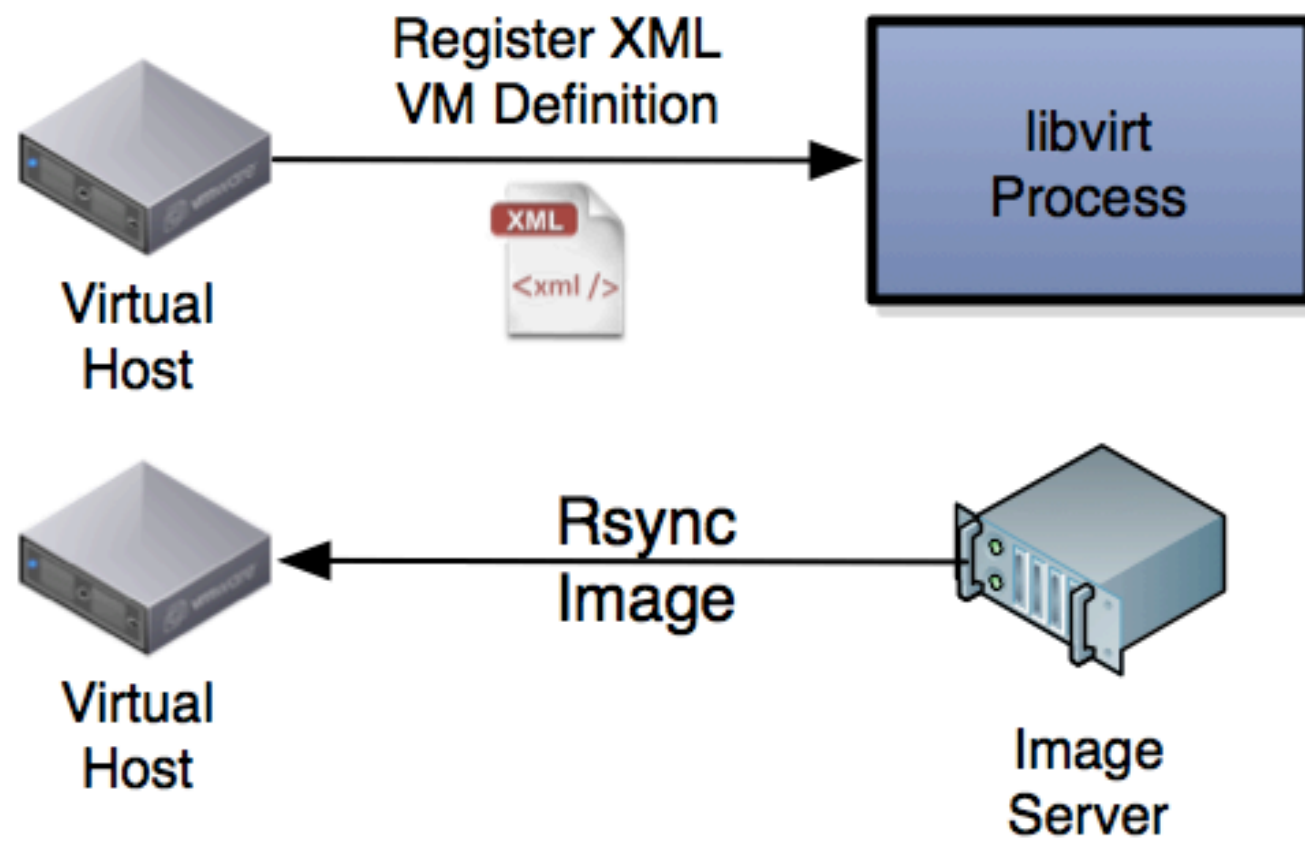


LOUD



VIRTUALIZATION

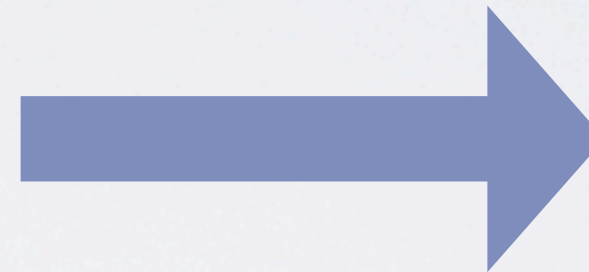
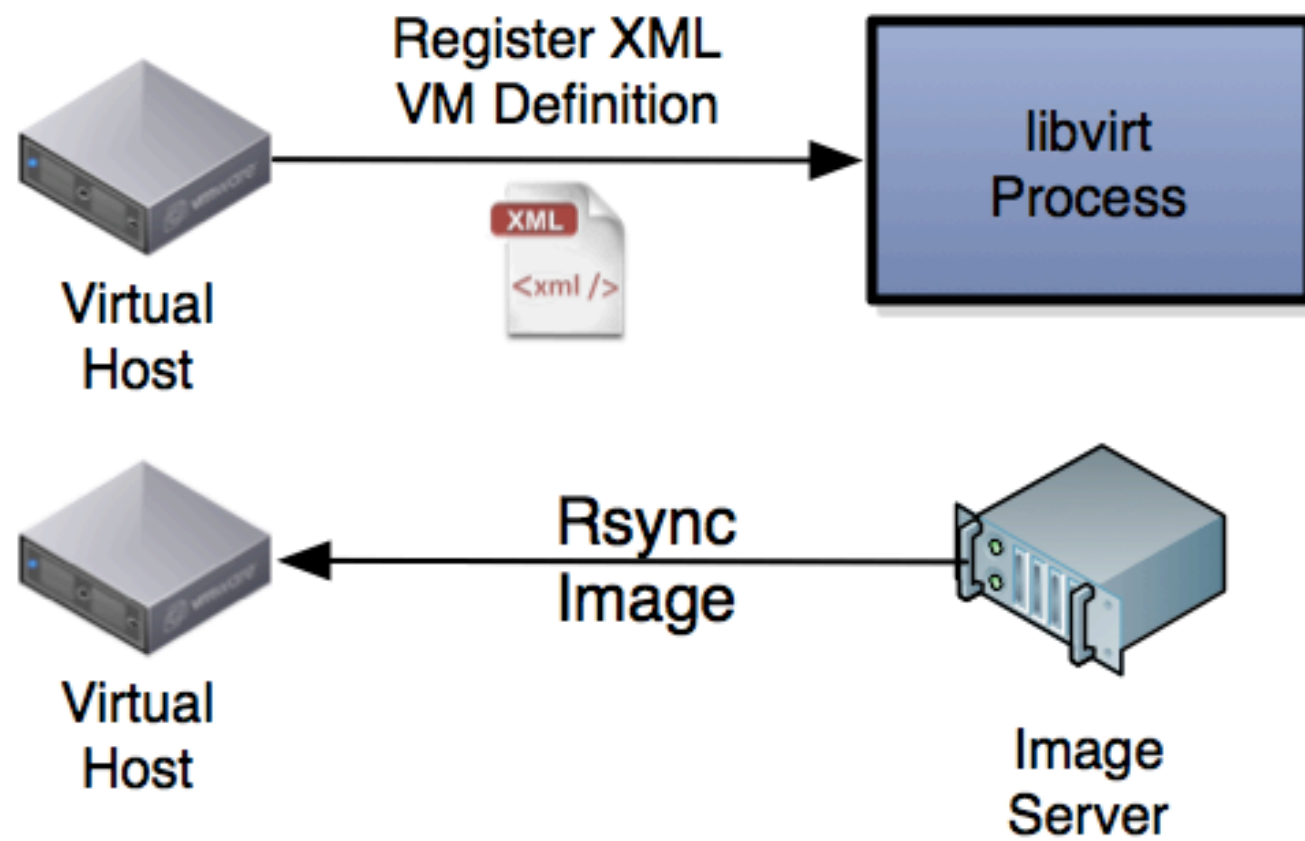
lcsee-kick-starter [hostname] [base-image]





VIRTUALIZATION

lcsee-kick-starter [hostname] [base-image]

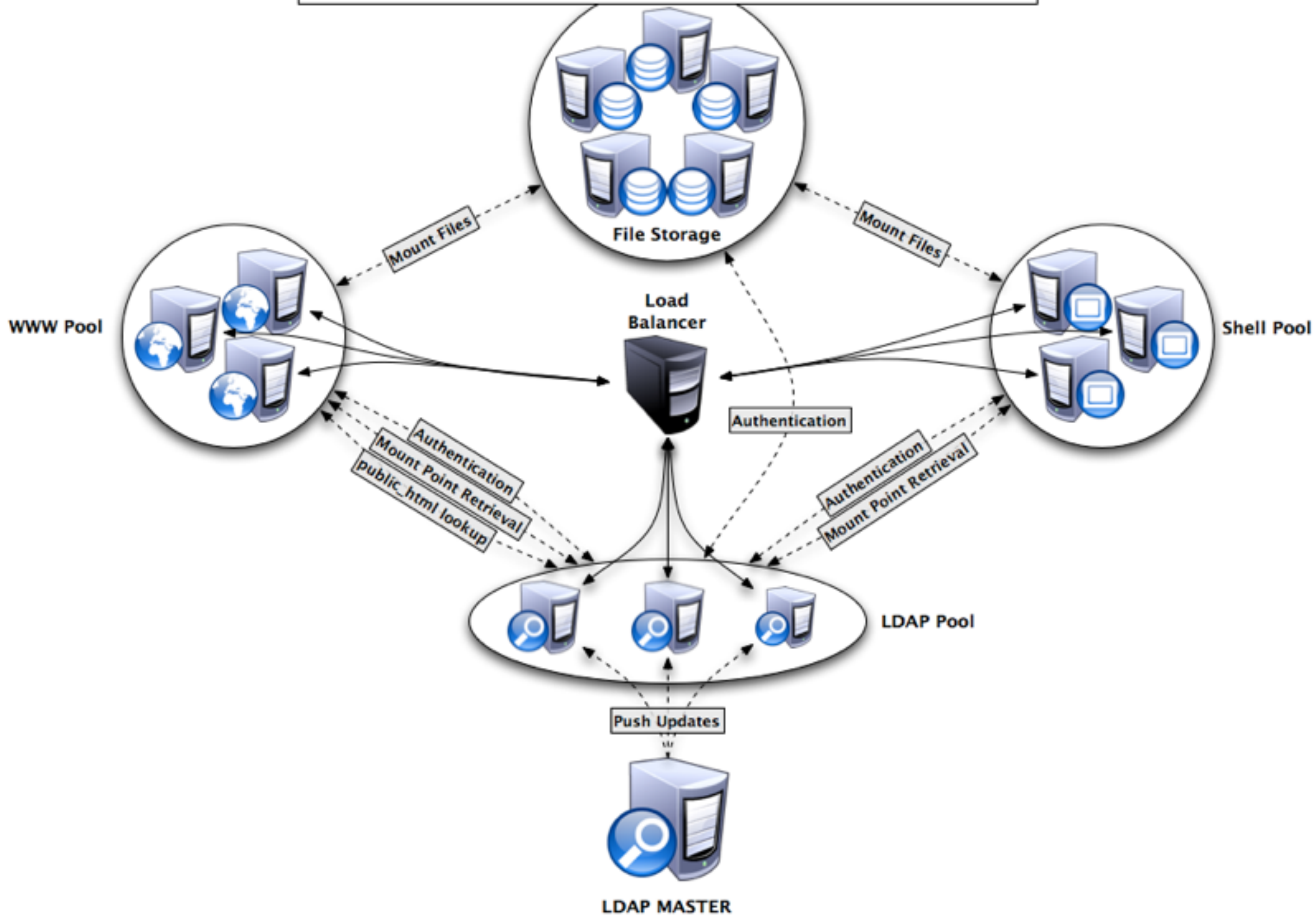




VIRTUALIZATION

*Resume command line example
(new virtual machine)*

LCSEE 2009 SERVICE & DEPENDENCY CHART





ANY QUESTIONS?