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June 11-14, 2013
Boston, MA
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Managing SELinux in the Enterprise

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Jun 12 2013

How to manage SELinux in a large environment?

- Move blobs of data to remote machines.
- Execute commands on the remote machine.
- Centralize logging.

Any questions?

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SELinux four things

1. Labeling
2. SELinux needs to know
   - booleans
   - semanage commands
3. Custom policy modules
4. You've been hacked!

http://danwalsh.livejournal.com/30837.html

SELinux is a Labeling System

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Every process has a label

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Every file/directory/object has a label

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Policy rules define how process access objects via labels

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SELinux is a Labeling System

Every process has a label

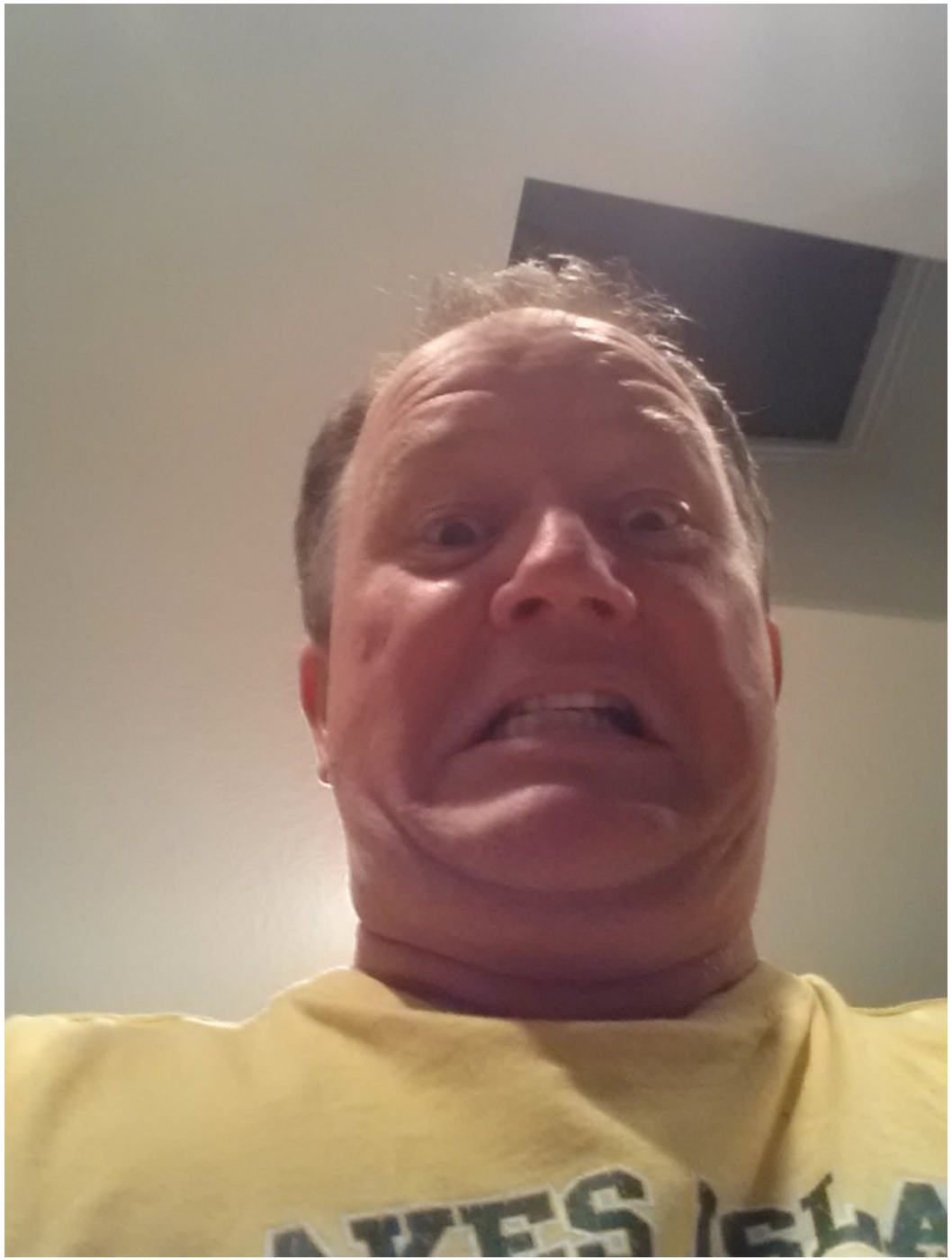
Every file/directory/object has a label

Policy rules define how process access objects via labels

The Kernel enforces the rules

If a file object is mislabeled

you will get errors?



Someone put Skittles in the M&M dispenser!!!

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Administrators can mess up labeling

- Creating files/directories can cause problems
  - # mkdir /root/.ssh
- Be careful with the mv command
  - # mv ~/index.html /var/www/html/

If you check the Ownership on a new file/directory?

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  - # mkdir /root/.ssh
- Be careful with the mv command
  - # mv ~/index.html /var/www/html/

If you check the Ownership on a new file/directory?

Check the SELINUX LABEL, or just run restorecon

Administrators can mess up labeling

Creating files/directories can cause problems

- # mkdir /root/.ssh
- Be careful with the mv command
- # mv ~/index.html /var/www/html/

restorecon -R -v /root/.ssh /var/www/html

BIG improvements with label creation in RHEL7...

http://danwalsh.livejournal.com/46018.html

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SELinux likes everything to be in the default location

If you change the location of content, FIX the labels.

If you put Apache content in /srv/myweb execute:

- semanage fcontext -a -t httpd_sys_content_t '/src/myweb(/.*)?'

SELinux likes everything to be in the default location

If you change the location of content, FIX the labels.

If you put Apache content in /srv/myweb execute:

- semanage fcontext -a -t httpd_sys_content_t '/src/myweb(/.*)?'

If you put your homedirs in /myhome execute:

- semanage fcontext -a -e /home /myhome

SELinux likes everything to be in the default location

If you change the location of content, FIX the labels.

If you put Apache content in /srv/myweb execute

- semanage fcontext -a -t httpd_sys_content_t '/src/myweb(/.*)?'

If you put your homedirs in /myhome execute

- semanage fcontext -a -e /home /myhome

restorecon -R -v /myhome /src/myweb

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SELinux needs to know?

SELinux Least Privilege

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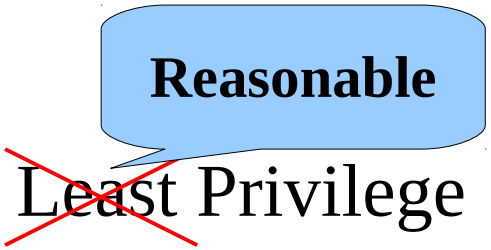
SELinux needs to know?



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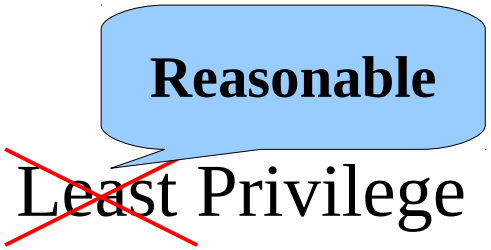
SELinux needs to know?



~~SELinux Least~~ Privilege

Standard configurations should work out of the box.

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Alter Default Configuration?

If you

- Change Apache to send email
  - SELinux needs to know!!!
    - semanage boolean --on httpd_can_sendmail

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Alter Default Configuration?

If you

- Change Apache to send email
  - SELinux needs to know!!!
    - semanage boolean --on httpd_can_sendmail
- Change sshd port to port 500?
  - SELinux needs to know!!!
    - semanage port -a -t sshd_port_t -p tcp 500

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How do I know what types, booleans, port definitions are available?

> 700 man pages added to RHEL6

httpd_selinux(8) SELinux Policy httpd httpd_selinux(8)

NAME

httpd_selinux - Security Enhanced Linux Policy for the httpd processes

DESCRIPTION

Security-Enhanced Linux secures the httpd processes via flexible mandatory access control.

The httpd processes execute with the httpd_t SELinux type. You can check if you have these processes running by executing the ps command with the -Z qualifier.

...

http://danwalsh.livejournal.com/52156.html

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Custom Policy Modules

Applications and SELinux policy can have bugs

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Custom Policy Modules

Applications and SELinux policy can have bugs

- grep httpd_t /var/log/audit/audit.log | audit2allow -M myhttpd
- semodule -i myhttpd.pp

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Custom Policy Modules

Applications and SELinux policy can have bugs

- grep httpd_t /var/log/audit/audit.log | audit2allow -M myhttpd
- semodule -i myhttpd.pp

You might want to ship your own policies for your own apps

- sepolgen /usr/sbin/myapp
- semodule -i myapp.pp
- RHEL7
  - sepolicy generate ...

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Contribute back

- If you find bugs in applications or SELinux policy
  - Report them
- If you write policy,
  - Contribute it back to Red Hat/Upstream

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You might be hacked

- SELinux is not a intrusion detection tool.
- setroubleshoot can do some detection, you should use it.
  - Confined apps attempting to turn off SELinux, PWND
  - Confined apps attempting to modify kernel, PWND
  - Confined apps attempting to clear log files, PWND
  - mmap_zero? Maybe unless it is whine. (Wine)
- You probably want remote logging setup for this

But how do you manage SELinux in the enterprise.

- How do you configure your remote machines?
- How do you manage your remote content.

But how do you manage SELinux in the enterprise.

- How do you configure your remote machines?
- How do you manage your remote content.
- SELinux customization is just configuration.
  - SELinux should be managed the same as other configuration.

Advanced semanage

Semanage is slooooooow

- Most semanage commands compile/load policy

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Advanced semanage

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- Most semanage commands compile/load policy

Semanage Transactions

- Allows several semanage commands with one command.

```
semanage -S targeted -i - << _EOF
boolean -m --on allow_polyinstantiation
boolean -m --on xguest_connect_network
boolean -m --on xguest_mount_media
boolean -m --on xguest_use_bluetooth
_EOF
```

http://danwalsh.livejournal.com/41593.html

Setting up identical machines with SELinux

Modify one machine the way you like?

Now apply to five other identical machines.

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Setting up identical machines with SELinux

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Now apply to 5 other identical machines.

semanage -o /tmp/selinux.mods
scp /tmp/selinux.mods to remote machine

http://danwalsh.livejournal.com/41794.html

Setting up identical machines with SELinux

Modify 1 machine the way you like?

Now apply to 5 other identical machines.

semanage -o /tmp/selinux.mods
scp /tmp/selinux.mods to remote machine

On remote machine:

semanage -i /tmp/selinux.mods

http://danwalsh.livejournal.com/41794.html

cat selinux.mods

boolean -D

boolean -1 allow_polyinstantiation

boolean -0 authlogin_nsswitch_use_ldap

user -D

fcontext -D

fcontext -a -f 'all files' -t httpd_sys_content_t '/myweb(/.*)?'

fcontext -a -f 'all files' -t public_content_t '/shared(/.*)?'

fcontext -a -f 'all files' -t samba_share_t '/shared/samba(/.*)?'

...

http://danwalsh.livejournal.com/41794.html

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Shipping SELinux commands in RPM

- Run semanage commands in post install
- Packaging SELinux Policy modules within RPM
- In RHEL7
  - “sepolicy generate” will generate an example rpm spec file.

RPM specfile for SELinux

**%define relabel_files() **
**restorecon -R /usr/sbin/rwhod; **

%define selinux_policyver 3.12.1-44

Name: rwhod_selinux
Version: 1.0
Release: 1%{?dist}
Summary: SELinux policy module for rwhod

Group: System Environment/Base
...
Source0:**rwhod.pp**
Source1:**rwhod.if**
Source2: rwhod_selinux.8
...
Requires: policycoreutils, libselinux-utils
Requires(post): selinux-policy-base >= %{selinux_policyver}, policycorutils
Requires(postun): policycoreutils
BuildArch: noarch

%description
This package installs and sets up the SELinux policy security module for rwhod.

%install
install -d %{buildroot}%{_datadir}/selinux/packages
install -m 644 %{SOURCE0} %{buildroot}%{_datadir}/selinux/packages
install -d %{buildroot}%{_datadir}/selinux/devel/include/contrib
install -m 644 %{SOURCE1} %{buildroot}%{_datadir}/selinux/devel/include/contrib/

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RPM specfile for SELinux

```
%post
semodule -n -i %{_datadir}/selinux/packages/rwhod.pp
if /usr/sbin/selinuxenabled ; then
    /usr/sbin/load_policy
    %relabel_files
fi;
exit 0

%postun
if [ $1 -eq 0 ]; then
    semodule -n -r rwhod
    if /usr/sbin/selinuxenabled ; then
       /usr/sbin/load_policy
       %relabel_files
    fi;
fi;
exit 0

%files
%attr(0600,root,root) %{_datadir}/selinux/packages/rwhod.pp
%{_datadir}/selinux/devel/include/contrib/rwhod.if
%{_mandir}/man8/rwhod_selinux.8.*

...
```


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Can I ship the same policies in RHEL5 as RHEL6?

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Can I ship the same policies in RHEL5 as RHEL6?

- No
- Newer Major Version include new access checks
  - open is checked in RHEL6 but not in RHEL5

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Can I ship the same policies in RHEL5 as RHEL6?

- No
- Newer Major Version include new access checks
  - open is checked in RHEL6 but not in RHEL5.
- Policy should be stable for a major version
- Policy should be compiled and on the lowest minor version.

Puppet

- SELinux bindings
  - Builtin restorecon, selinux functions, semanage functions directly.
- Puppet recipes should include SELinux commands
- Shell out to semanage commands
  - A lot of Fedora Infrastructure built on top of Puppet

Puppet Recipe For SELinux

```
class proxy {
    include selinux-enforcing
    selboolean { [
        "httpd_can_network_connect_db",
        "httpd_can_network_relay",
        "httpd_can_network_connect",
        "allow_ypbind",
    ]:
        value      => on,
        persistent => true,
    }
    semanage_port { "8081-8089":
        type  => "http_port_t",
        proto => "tcp",
    }
    semanage_port { "10001-10003":
        type  => "http_cache_port_t",
        proto => "tcp",
    }
    semanage_fcontext { "/srv/cache/mod_cache(/.*)?":
        type => "httpd_cache_t",
    }
}
```


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Ansible – http://www.ansible.cc

- Uses ssh protocol
  - advantage no destination daemon.
- Builtin selinux and seboolean functions.
- Ansible playbooks should include SELinux commands
- Execute semanage, same way administrator would.
  - Newer Fedora Infrastructure moving to Ansible
  - OpenShift infrastructure in Fedora setup using Ansible.

Ansible Playbook For SELinux

```
- name: set selinux bools appropriately
  action: seboolean state=true persistent=yes name=$item
  with_items:
  - httpd_unified
  - httpd_can_network_connect
  - httpd_can_network_relay
  - named_write_master_zones
  - allow_ypbind
 - name: selinux module install - stickshift
  action: command semodule -i /usr/share/selinux/packages/rubygem-stickshift-common/stickshift.pp

- name: selinux module disable - passenger
  action: command semodule -d passenger
  ignore_errors: True

- name: selinux module install - other passenger
  action: command semodule -i /usr/share/selinux/packages/rubygem-passenger/rubygem-passenger.pp

- name: fix up files for selinux
  action: command $item
  with_items:
  - "fixfiles -R rubygem-passenger restore"
  - "fixfiles -R mod_passenger restore"
  - "restorecon -rv /var/run"
  - "restorecon -rv /usr/lib/ruby/gems/1.8/gems/passenger-*"
  - "restorecon -rv /usr/sbin/mcollectived /var/log/mcollective.log /run/mcollective.pid"
```

Other distributed tools for managing SELinux

- cfengine
- pulp
- func
- tivoli?
- openview?
- OpenLMI
  - Were working on it

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Modifying SELinux in kickstart

Example: Configure MLS/LSPP system in RHEL6

```
sed -i 's/SELINUXTYPE=targeted/SELINUX=mls/g' /etc/selinux/config
setenforce 0
load_policy 2>&1 | grep -v no.longer.in.policy
echo "Fixing file labels..."
# FIXME: fixfiles ignores allegedly R/O filesystems due to bad /etc/mtab ?
cat /proc/mounts > /etc/mtab
fixfiles -Ff  restore
restorecon -Fr /root /home
```


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What about You've been hacked?

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Audit subsystem remote logging

On the clients

- /etc/audisp/plugins.d/au-remote.conf
  - active = yes
- /etc/audisp/audisp-remote.conf
  - remote_server=remote-audit.redhat.com

On the server

- /etc/audit/auditd.conf
  - tcp_listen_port = 60

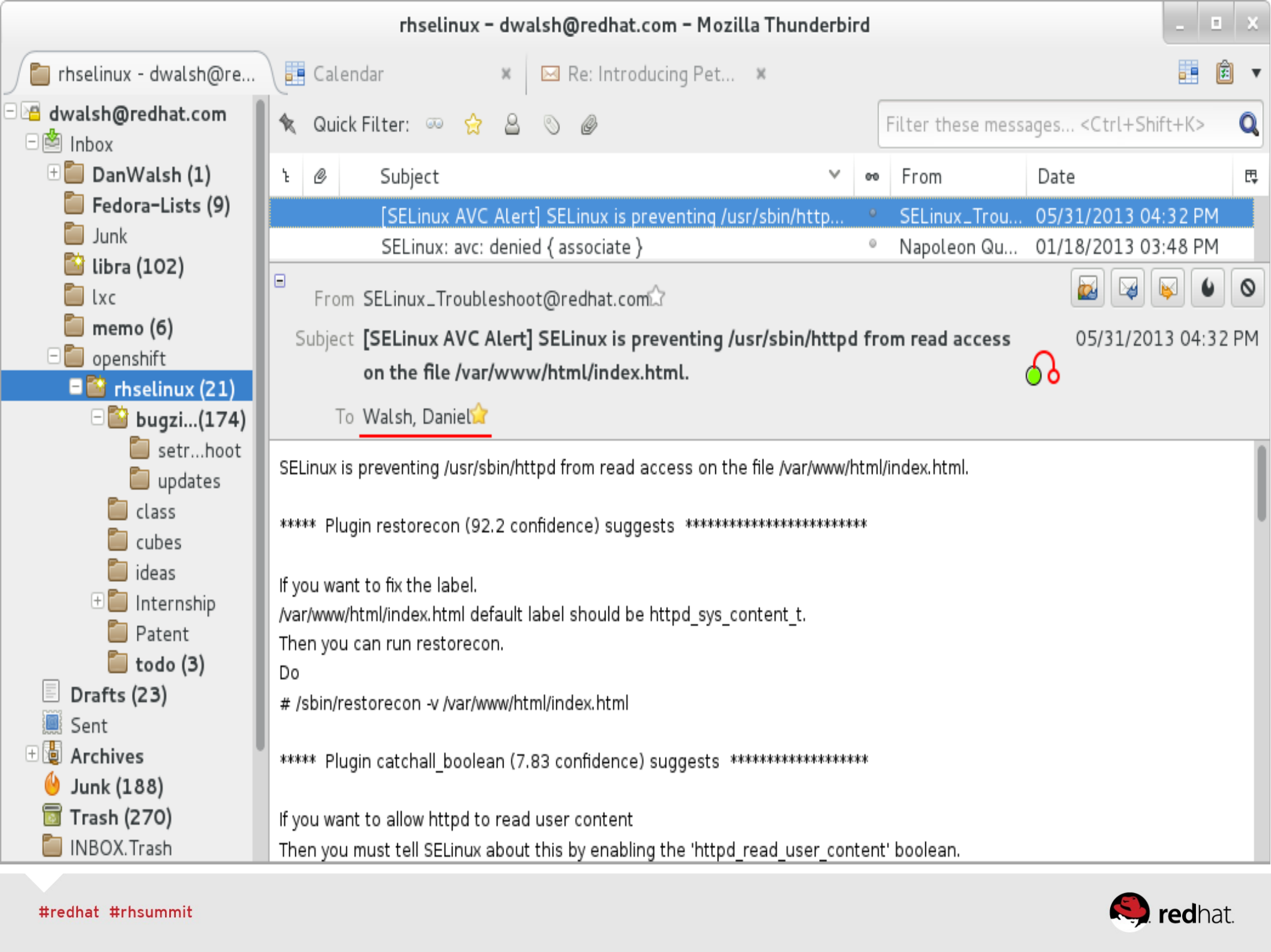
Setroubleshoot Remote Logging

/etc/setroubleshoot/setroubleshoot.conf

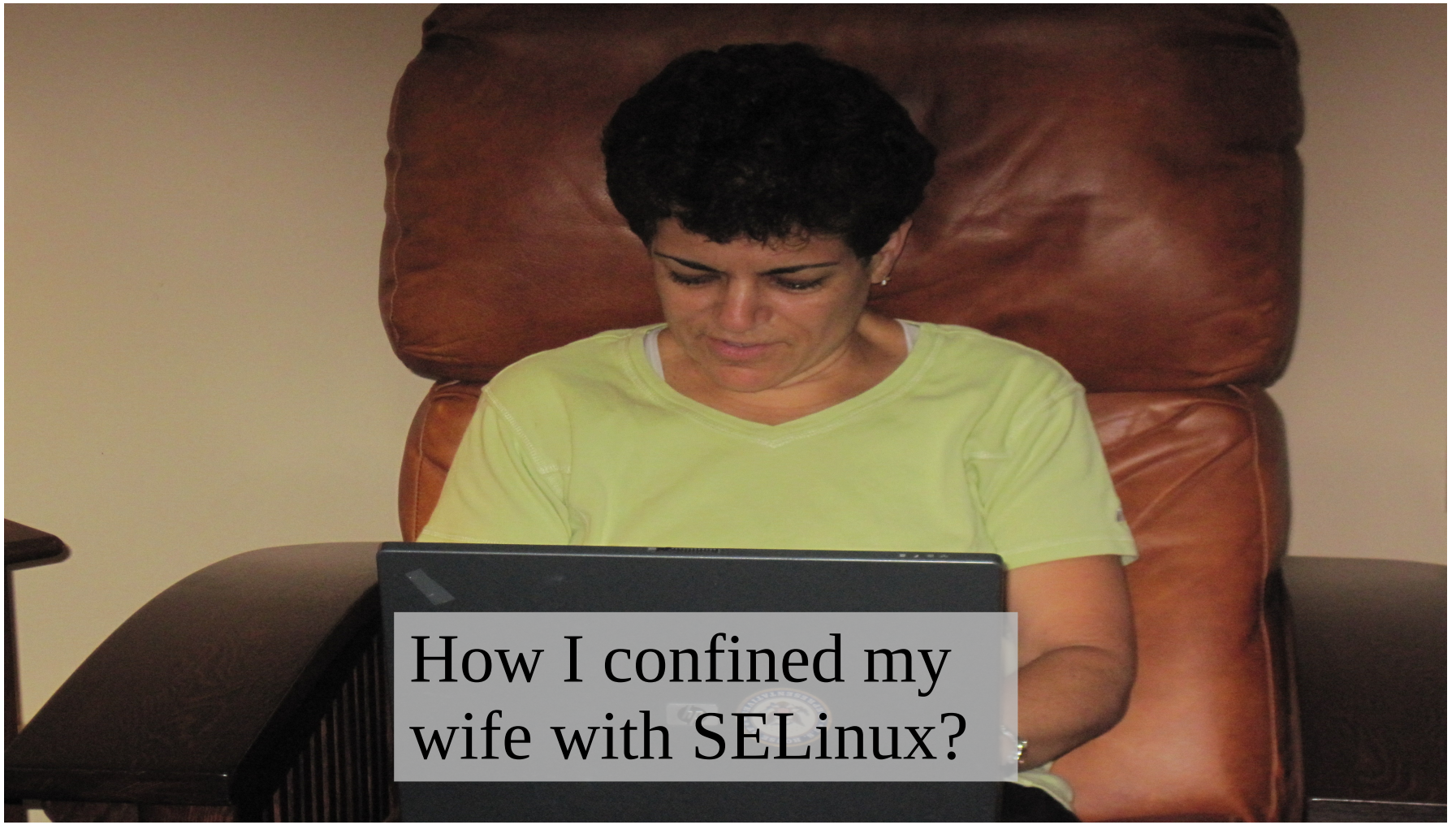
- [email]
- smtp_host = smtp.foobar.redhat.com
- # from_address: The From: email header
- from_address = SELinux_Troubleshoot.HOSTNAME

/var/lib/setroubleshoot/email_alert_recipients

- dwalsh@redhat.com


rhselinux – dwalsh@redhat.com – Mozilla Thunderbird
rhselinux - dwalsh@re...
Calendar
Re: Introducing Pet...
dwalsh@redhat.com
Inbox
DanWalsh (1)
Fedora-Lists (9)
Junk
libra (102)
lxc
memo (6)
openshift
rhselinux (21)
bugzi...(174)
setr...hoot
updates
class
cubes
ideas
Internship
Patent
todo (3)
Drafts (23)
Sent
Archives
Junk (188)
Trash (270)
INBOX.Trash
Quick Filter:
Filter these messages... <Ctrl+Shift+K>
Subject
From
Date
[SELinux AVC Alert] SELinux is preventing /usr/sbin/http...
SELinux_Trou...
05/31/2013 04:32 PM
SELinux: avc: denied { associate }
Napoleon Qu...
01/18/2013 03:48 PM
From SELinux_Troubleshoot@redhat.com
Subject [SELinux AVC Alert] SELinux is preventing /usr/sbin/httpd from read access on the file /var/www/html/index.html.
05/31/2013 04:32 PM
To Walsh, Daniel
SELinux is preventing /usr/sbin/httpd from read access on the file /var/www/html/index.html.
***** Plugin restorecon (92.2 confidence) suggests **********
If you want to fix the label.
/var/www/html/index.html default label should be httpd_sys_content_t.
Then you can run restorecon.
Do
/sbin/restorecon -v /var/www/html/index.html
***** Plugin catchall_boolean (7.83 confidence) suggests **********
If you want to allow httpd to read user content
Then you must tell SELinux about this by enabling the 'httpd_read_user_content' boolean.

What about RBAC?



Confined Users

- Terminal user/ssh - guest_t
  - No Network, No setuid, no exec in homedir
- Browser user/kiosk - xguest_t
  - Web access ports only. No setuid, no exec in homedir
- Full Desktop user - User_t
  - Full Network, No SETUID
- Confined Admin/Desktop User - Staff_t
  - Full Network, sudo to admin only, no root password.
  - Usually a confined admin
- Unconfined user - unconfined_t (Default)
    - SELinux does not block access

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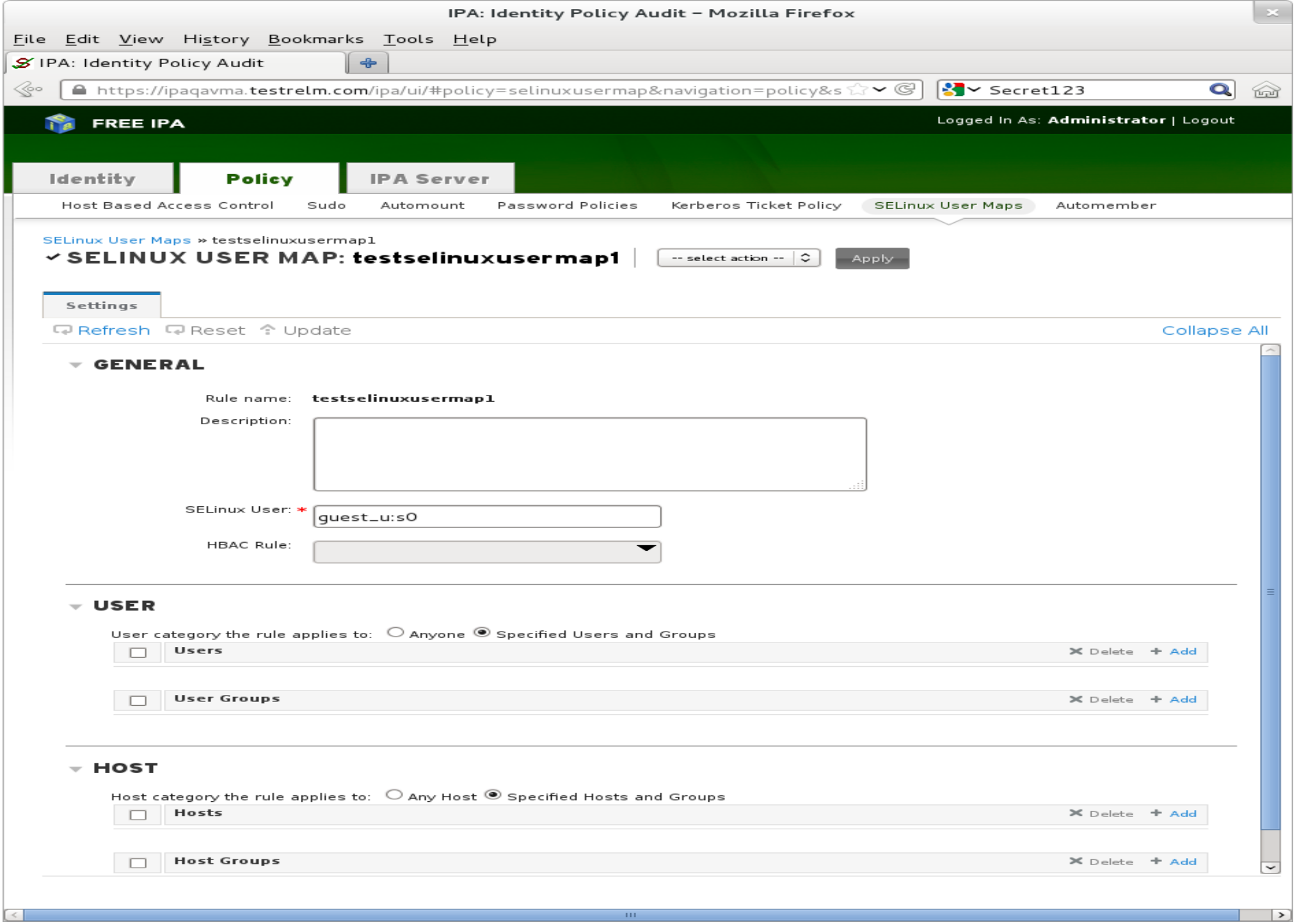
IDM/FreeIPA supports SELinux Confined Users

- At login sssd contacts FreeIPA for user@machine
- Downloads /etc/selinux/targeted/logins

```
cat dwalsh
sshd:staff_u:s0-s0:c0.c1023
*:guest_u:s0-s0:c0.c1023
```

- Sudo be configured by IPA with SELinux Config
  - dwalsh ALL=(ALL) TYPE=webadm_t ROLE=webadm_r ALL


IPA: Identity Policy Audit – Mozilla Firefox
File Edit View History Bookmarks Tools Help
IPA: Identity Policy Audit
https://ipaqavma.testrelm.com/ipa/ui/#policy=selinuxusermap&navigation=policy&s
Secret123
FREE IPA
Logged In As: Administrator | Logout
Identity
Policy
IPA Server
Host Based Access Control
Sudo
Automount
Password Policies
Kerberos Ticket Policy
SELinux User Maps
Automember
SELinux User Maps » testselinuxusermap1
SELINUX USER MAP: testselinuxusermap1
-- select action --
Apply
Settings
Refresh
Reset
Update
Collapse All
GENERAL
Rule name:
testselinuxusermap1
Description:
SELinux User:
guest_u:s0
HBAC Rule:
USER
User category the rule applies to:
Anyone
Specified Users and Groups
Users
Delete
Add
User Groups
Delete
Add
HOST
Host category the rule applies to:
Any Host
Specified Hosts and Groups
Hosts
Delete
Add
Host Groups
Delete
Add

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Confined users using LDAP

- LDAP does not have User-Machine Mapping
  - LDAP could be setup for global mapping
  - /etc/selinux/targeted/seusers

```
system_u:system_u:s0-s0:c0.c1023
root:unconfined_u:s0-s0:c0.c1023
__default__:unconfined_u:s0-s0:c0.c1023
xguest:xguest_u:s0
dwalsh:staff_u:s0-s0:c0.c1023
```


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Confined Users Active Directory

- Being worked on

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Questions?

Improving SELinux Usability

- SELinux UXD usability tests in the GSS booth.
- Added > 700 Man pages for each confined domain
- Adding GUI to be application focused
  - How does SELinux confine domain X?
    - What booleans? What Types? What Network Ports?
    - How can I modify them?