OpenSSH, PAM and AFS.

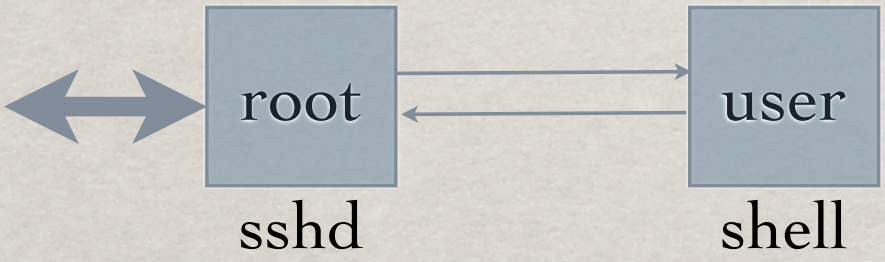
AN UNHOLY TRINITY?

Overview

- Lots of people have issues with getting AFS and OpenSSH working together
- Quickly cover the causes of these
- Not a general AFS & PAM talk - Russ will do that tomorrow!

Basic ssh Architecture

- Incoming connections are answered by a process
- That process forks off a shell, and forwards network connections to the shell

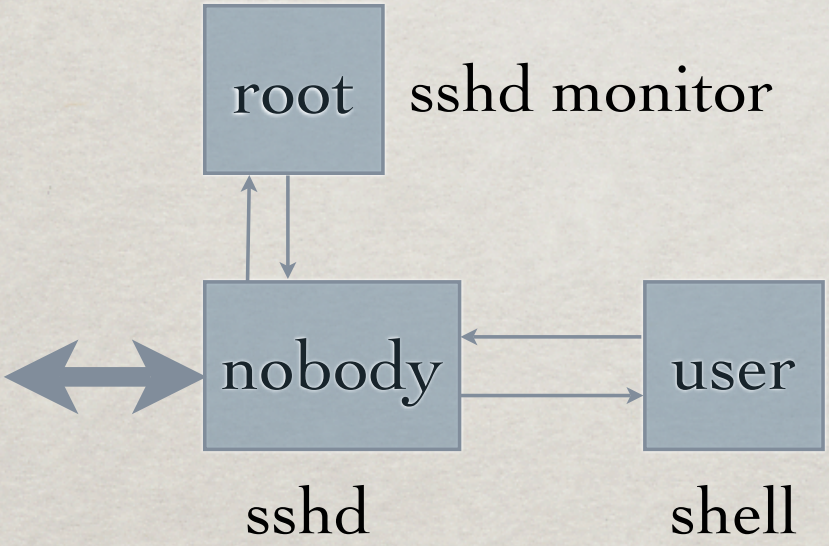


Complication 1: Privsep

- This model has a root owned process answering and handling all network traffic
- Buffer overflows & other bugs in any part sshd result in machine compromise
- OpenSSH's solution is privsep
- Have a minimal state machine to perform trusted acts. Everything else (especially network actions) in an untrusted process

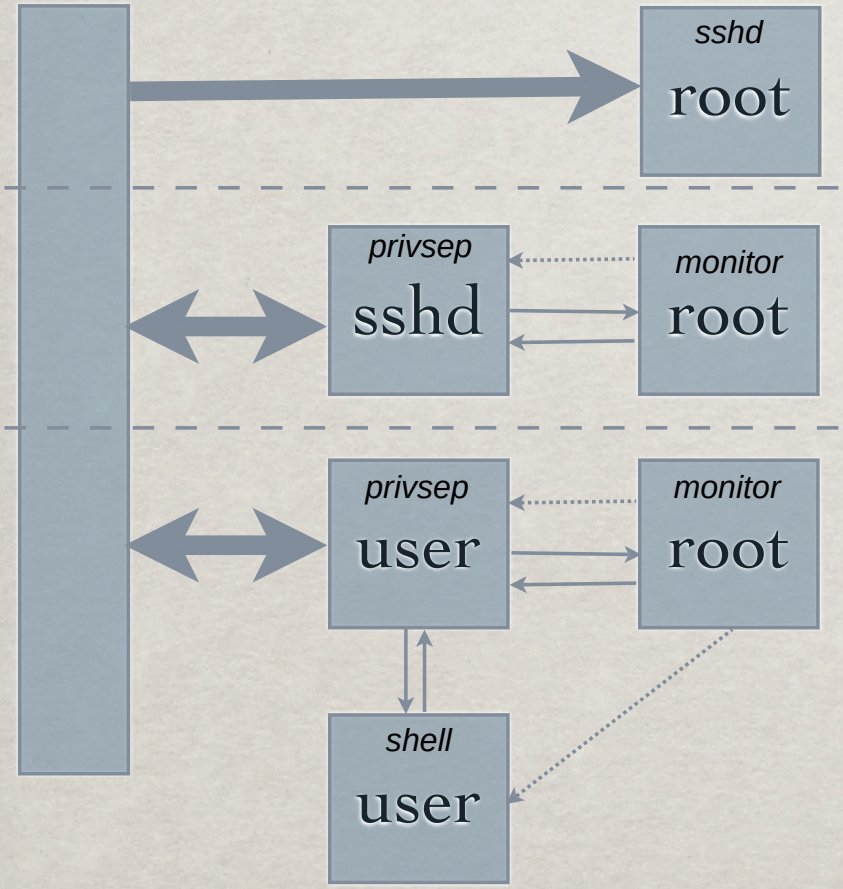
Privsep

- Rough model for an authenticated connection is:



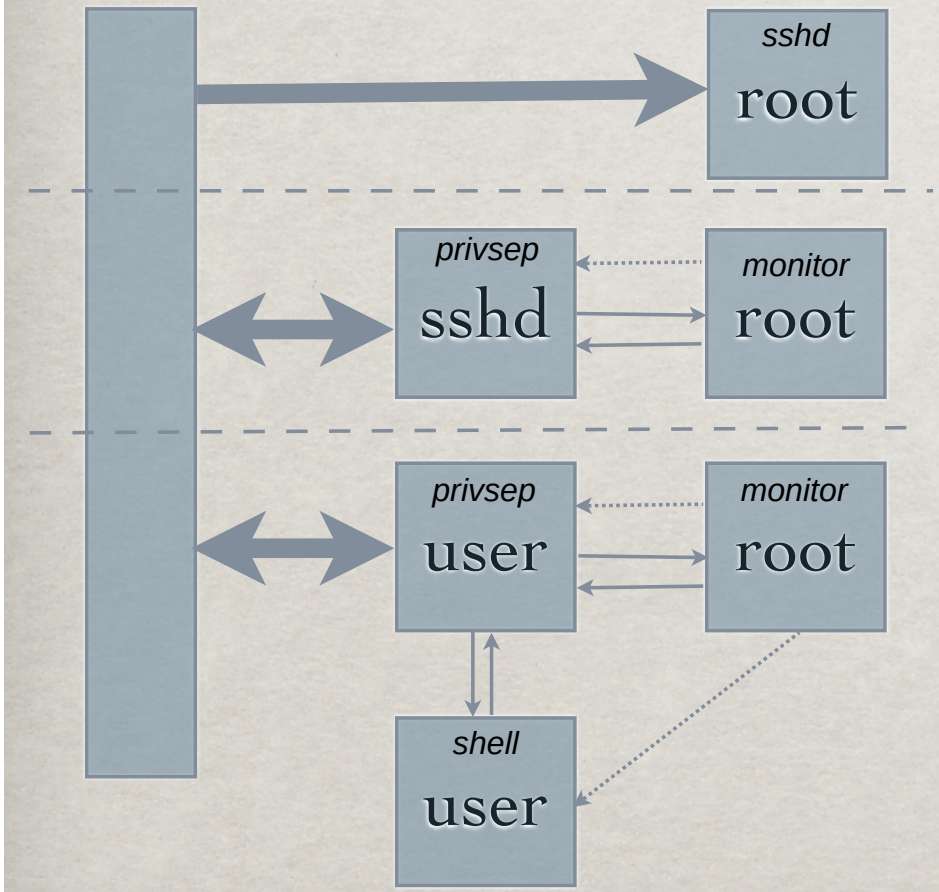
- Not quite so simple, unfortunately ...

Privsep Complexities



- Initial incoming connection
- Unpriviledged process forked to handle incoming network traffic
- Existing process remains as root owned 'monitor', and handles user authentication
- Following authentication, unpriviledged 'sshd' user process exits
- Root owned 'monitor' forks user owned process to handle continued network access
- Monitor forks process to own user's cell
- Child sets up session
- Shell is exec'd

Adding Pam to The Mix

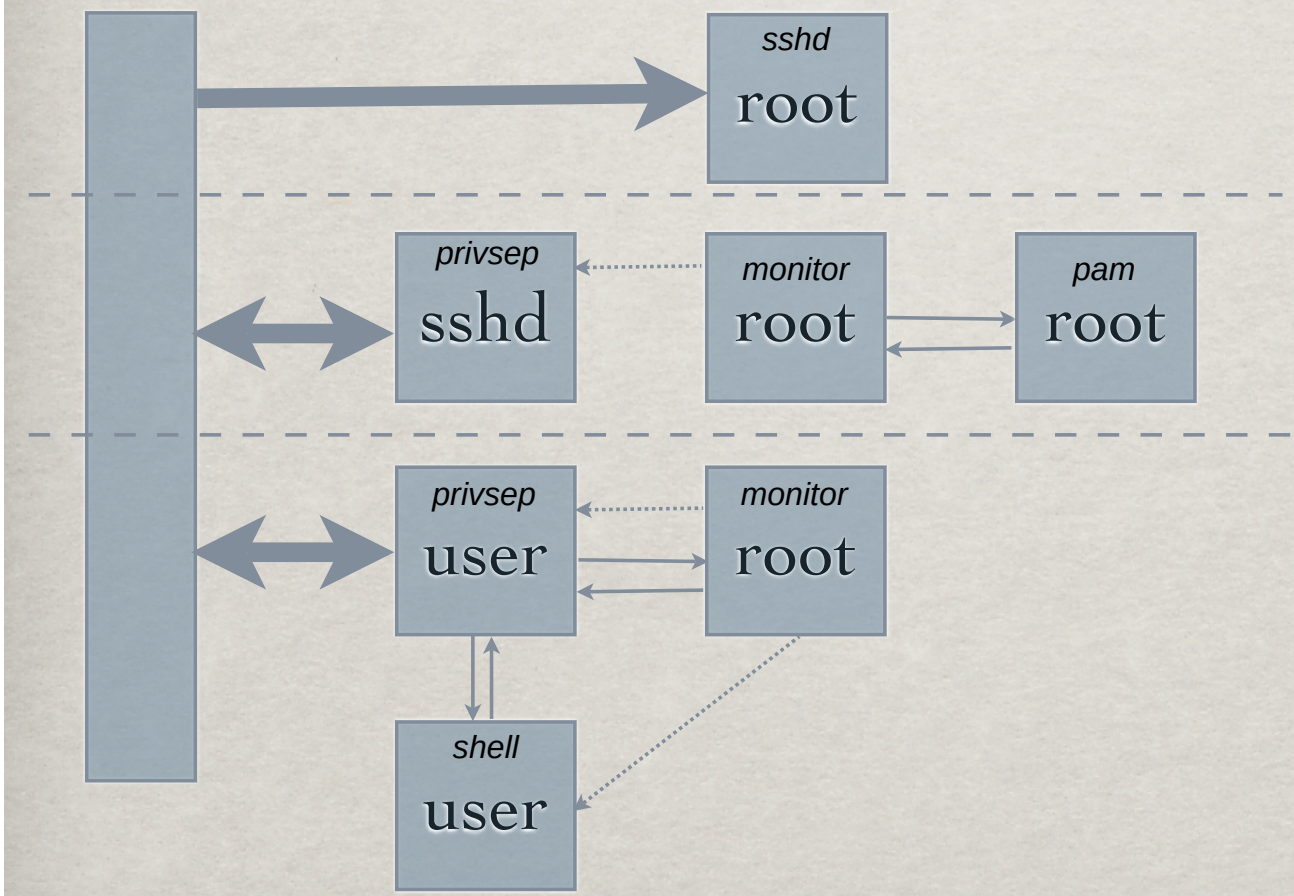


- Authentication happens in one process
- Credentials storage happens in another

Challenge response

- PAM interaction doesn't play well with the OpenSSH monitor system.
- ChallengeResponse means that another process appears in the mix
- This process isn't related in anyway to the login process.

Now With PAM


sshd
root
privsep
sshd
monitor
root
pam
root
privsep
user
monitor
root
shell
user

ChallengeResponse and Threads

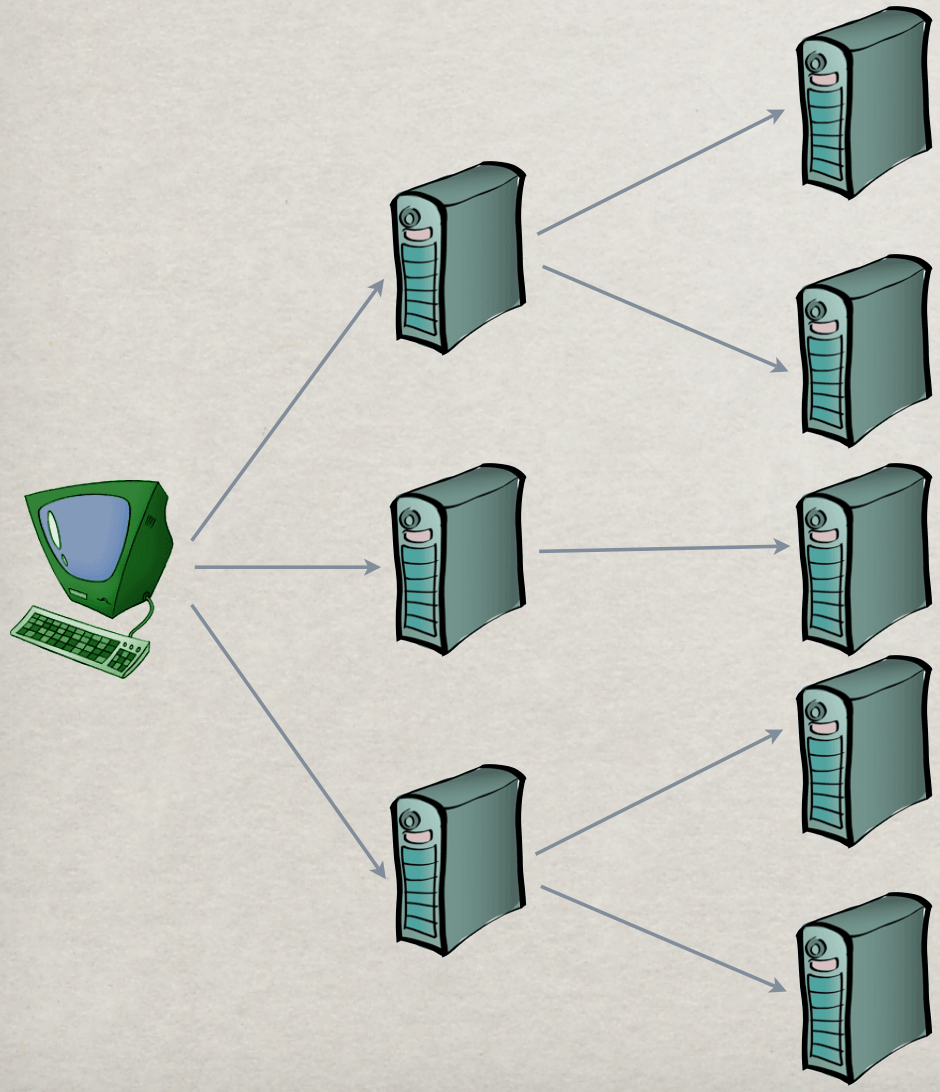
- OpenSSH does support using threads instead of forking a process for ChallengeResponse
- Not well tested, or documented!

Overview

- ChallengeResponse won't work with PAM modules that expect authentication and credentials storage to happen in the same process
- Solution is to use threads, or a pam_krb5 module that is clever

Cascading Credential Renewal

Motivation



- Credentials expire
- Renew on workstation
- Then, have to individually renew everywhere else
- Must be an easier way!

Implementation

- GSSAPI Key exchange lets us delegate credentials as a by-product of keying a connection
- SSH supports (and encourages) regular connection rekeying

Implementation II

- Client watches the credentials cache for renewed credentials
- When credentials have been renewed, and following sanity checks, it initiates a rekey with the server
- Server modified to accept delegated credentials following rekey and, after snatiy checks, store them to disk

Code Availability

- Patch available now
- Two configuration options:
  - `GSSAPIRenewalForcesRekey`
  - `GSSAPIStoreCredentialsOnRekey`