SSH Mastery

OpenSSH, PuTTY,
Tunnels and Keys

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About Me

- Author
- BSD pusher
- irremediable smartass

About You

- How many OpenSSH clients?
- How many PuTTY clients?

- name?
- your goals here?

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- Encryption 101
- OpenSSH Server
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Security Warning

- SSH is a tool
- Tools can be used for good or evil
- SSH can help you save your company
- SSH can help you destroy your company
- MWL is not responsible for reasonable or unreasonable damages caused by your use/abuse of SSH

SSH Overview

- What is SSH?
- What is OpenSSH?
- SSH Servers
  - OpenSSH – most popular
  - SSH.com -- commercial
- SSH Clients
  - OpenSSH – Unix-like
  - PuTTY -- Windows

SSH Protocol Versions

- SSH-1, original SSH
  - created in 1995 by one guy, Tatu Ylönen, for his own uses
  - can be decrypted by packet sniffers
  - do not use SSH-1
- SSH 1.3, 1.5, 1.99 = SSH-1
- SSH-2, modern SSH
  - only use SSH-2

Encryption 101

- plain text = readable
- ciphertext = unreadable
- algorithm = method for transforming plaintext to ciphertext & back
- key = secret string used as algorithm seed

Encryption Algorithms

- Symmetric
  - same method & key used to encrypt & decrypt
  - A=1, B=2, etc
  - Fast
- Asymmetric
  - different methods to encrypt or decrypt
  - one key for encryption
  - different key for decryption
  - slow

Public Key Encryption

- Asymmetric algorithm
- give one key away
- keep one key secret
- used for SSH, HTTPS, PGP, etc
- Many different asymmetric public key algorithms – RSA, DSA, Blowfish, etc
- Use recommended algorithms

How SSH Uses Encryption

- Public key for initial session setup
- Agree on temporary symmetric secret
- symmetric for most of session
- occasional rekeys

Cool Is Not Secure

- The algorithms used, and the order they are tried in, are chosen for a reason
- Do NOT change them

Configuration Files

- all in /etc/ssh

- ssh_config – host-wide client config
- ssh_host_*_key.pub – private keys
- ssh_host_*_key – public keys
- sshd_config – server config

The OpenSSH Server

- Included by default in any server OS at this conference
- Also available for Windows, via Cygwin, sshforwindows, etc.

Testing sshd

- /etc/ssh/sshd_config
- /usr/sbin/sshd -f sshd_config_test -p 222
  - test alternate configuration
- /usr/sbin/sshd -f sshd_config_test -p 222 -ddd
  - run in foreground
  - one connection only
  - useful for weird debugging

Config File Syntax

- Boring option-then-value syntax

```
#Port 22
#AddressFamily any
#ListenAddress 0.0.0.0
#ListenAddress ::
```

Network & Protocol Options

```
Port 22
AddressFamily any (inet | inet6)
ListenAddress 0.0.0.0 | ::
```

`Protocol 2` – no excuses for your servers!

Banner & motd

- Banners appear before auth, but might not work for all clients & can interfere with automation

```
Banner /etc/ssh/ssh-banner
```

- motd always displays, after auth

```
PrintMotd yes
```

Verify clients against DNS

```
UseDNS yes
```

- makes sure forward & reverse DNS match
- subject to DNS attacks
- IPv6
- Conclusion: don't bother

Restricting Access by User or Group

- Processed in order listed in config file
- first-match basis
- {Deny,Allow}Users – user list
- {Deny,Allow}Groups – group list

Restrict by User or Group II

- Demo system:

```
wheel: mwlucas
staff: mwlucas, pkdick, jgballard
support: pkdick, mwlucas
billing: jgballard
```

Deny Billing People

- OK:

  ```
  DenyUsers jgballard
  ```

- Better:

  ```
  DenyGroup billing
  ```

Allow only admins

- Presence of an Allow* option tells sshd to deny logins by default

```
AllowGroups wheel
```

Deny one user in group

- Users and groups distributed via LDAP. One admin is forbidden access to this server.

```
DenyUsers pkdick
AllowGroups support
```

Automation

- rsync user from one machine

```
AllowUsers backup@192.0.2.0/25
AllowGroups support, wheel
```

- List hosts by network or hostname, but beware DNS

Wildcards

- ? matches exactly one character
- * matches zero or more characters

- `*.blackhelicopters.org` – any host
- `?????.blackhelicopters.org` – matches sloth & wrath, not envy or gluttony.

Wildcards in Networks

- `192.0.2.1?` - 192.0.2.10 through 192.0.2.19
- `192.0.2.*` - any host in 192.0.2.0/24
- `192.0.2.0/24` – by netmask

- Separate multiple entries with commas.

Negation

- `!*.blackhelicopters.org` – everything that's not under this domain.
- Excludes blackhelicopters.org itself
- Best with exclusions
- `!lust.blackhelicopters.org,*.blackhelicopters.org`
- djm describes as "a little fiddly"

Conditional Configuration

- Match by user, group, network, etc
- Example, X11 forwarding

```
Match User mwlucas
  X11 Forwarding Yes
```

More User Matches

```
Match Group wheel
  X11Forwarding yes

Match User mwlucas,jgballard
  X11Forwarding yes
```

Match by Host

```
Match Address 192.0.2.0/29, 192.0.2.64/27
   X11Forwarding yes

Match Host *.blackhelicopters.org
   X11Forwarding yes
```

Multiple Matches

```
Match Address 192.0.2.8 User mwlucas
   X11Forwarding yes
```

Permitted Matches

- Can only match on certain items
- see sshd_config(5) for full list
- In short, can change auth methods, chroot, access, key locations, maximums, etc.
- Cannot change things like `UsePAM`, `ChallengeResponseAuthentication`, etc.

Placing Matches

- All configuration that follows a Match belongs to that Match, until next Match or EOF.
- Place Matches at end

Sample Matches

```
X11Forwarding no
PasswordAuthentication no
…
Match Group wheel
     X11Forwarding yes
Match Address 192.0.2.0/29, 192.0.2.128/27
     PasswordAuthentication yes
```

Root SSH Access

- Do not allow logging in as root
- Use sudo, pfexec, other tools

Chrooting Users

- Useful for Web servers, other multi-user servers with individual cells

- Must populate chroot (varies by OS)
  - set permissions on chroot
  - create home dir for imprisoned user
  - create device nodes
  - install shell

Permissions & Directory

- chroot directory owned by root, just like system home dir
- User's $HOME from /etc/passwd relative to jail. If $HOME is /home/pkdick, and chroot is /prison/, directory is /prison/home/pkdick
- $HOME owned by user, contains dotfiles, etc
- static-linked shell

Device Nodes

- Varies by OS, devfs or MAKEDEV
- expect /dev/urandom, /dev/null, /dev/stderr, /dev/stdin, /dev/stdout, /dev/tty, /dev/zero

Assign chroot

- Specify user's root directory as the Chroot Directory. Dumps everyone together in one chroot.

```
ChrootDirectory /prison
```

- %h = user's home directory in /etc/passwd. Locks user into their own directory

```
ChrootDirectory %h
```

More chroot

- %u expands to username. Lots of unique users in shared chroot area.

```
ChrootDirectory /prison/home/%u
```

Choosing users

```
ChrootDirectory none

…

Match Group billing
    ChrootDirectory /prison/billing
```

- If most users chrooted, reverse & allow wheel shell

Protecting sshd

- Hail Mary Cloud
- privilege separation
- packet filter, TCP wrappers
- disable passwords, allow only keys
- change port?

Verifying Server Keys

- Long strings of text
- Many users dismiss verifying keys as impossible
- Is entirely possible, you can make it easier
- Automated distribution is best

Get the Server Fingerprint

```
# ssh-keygen -lf ssh_host_rsa_key.pub
2048
99:8c:de:5d:59:b9:af:e7:ce:c6:20:92:9
4:e1:ce:04
/etc/ssh/ssh_host_rsa_key.pub (RSA)
```

- Capture all keys to file
- Can also use ssh-keyscan, requires you verify all keys yourself

Make Keys Available

- Must get fingerprints to users
- access must be easy & secure
- easiest: secure Web site
- don't use email or unencrypted public site

- Later: how to do this for your users

Verifying Clients

- Both OpenSSH client & PuTTY present host key fingerprint for verification upon first connection

Changed Host Keys

- User gets a warning upon connection that the key has changed. Possibilities:
  - Sysadmin oops!
  - Client is wrong. Desktop security? Corrupt cache?
  - Server upgrade? Get new fingerprint
  - round-robin DNS?
  - Intruder controls server
- DO NOT CONNECT UNTIL YOU KNOW WHY

SSH Clients

- How many PuTTY users in the room?
- How many OpenSSH client users in the room?

Debugging OpenSSH Client

- ssh -v hostname
- increase number of -vs for more detailed debugging
- actually read the output

ssh Configuration

- /etc/ssh/ssh_config – global
- $HOME/.ssh/ssh_config – individual
- Documented in ssh_config(5)
- Use alternate with -f filename
- All config options work in both
- Can use patterns just like sshd

Per-Server Configuration

```
Host *.blackhelicopters.org
  Port 2222
```

- Matches

```
ssh avarice.blackhelicopters.org
```

- does not match

```
ssh avarice
```

- Can also use IP, netmask, patterns

Changing Username

- on command line

```
$ ssh jerkface@server.customer.com
$ ssh -l jerkface server.customer.com
```

- In config file

```
Host server.customer.com server
   User jerkface
```

Changing Port

- On command line

```
$ ssh -p 2222 gluttony
```

- In config file

```
Host gluttony
    Port 2222
```

Options on Command Line

- Anything in ssh(1) can be specified on command line with `-o`

```
$ ssh -o BindAddress=192.0.2.5 gluttony
```

- You can use multiple `-o`
- Use the config file

Updating Host Key Cache

- Keys cached in $HOME/.ssh/known_hosts
- Update policy option: StrictHostKeyChecking
- Only update by hand? Set to **yes**.
- Auto-add new hosts? Set to **no**. Daft.
- Ask user to verify, then add? Set to **ask**.

Hashing known_hosts

- Hash hostnames in known_hosts, so intruder doesn't know your network

  ```
  HashKnownHosts yes
  ```

- Use ssh-keygen -H to hash unhashed entries

PuTTY Client

- Windows SSH, telnet, serial, rlogin <cough> client
- Download from http://www.chiark.greenend.org.uk/~sgtatham/putty/
- Not by the OpenSSH paranoids, still pretty good
- Download the full installer

Saving PuTTY Defaults

- Example: set default username
- Beneath "Connection," select "Data."
- In "auto-login," put username
- Save as Default Settings

Saving PuTTY Sessions

- Add server hostname, protocol, port, etc.
- Enter session name
- click Save
- Can also save other settings, such as X11 forwarding, as sessions, e.g., "dns1-x11"
- Saved defaults not propagate to saved sessions!

PuTTY Management

- Upper left hand corner drop-down menu.
- Useful tricks:
  - Duplicate Session
  - Saved Sessions
  - New Sessions
  - Change Settings

PuTTY Configuration

- In Windows Registry, under *HKEY_CURRENT_USER\Software\SimonTatham*
- Can copy from machine to machine
- Can distribute valid configs via Active Directory

Debugging PuTTY

- Event Log, in upper left drop-down menu
- serious debugging, use Session Log.
  - Before opening new session, go to Session -> Logging
  - Choose log type. I usually use All session output.
  - Give directory and name for debug file

Copy Files over SSH

- FTP predates TCP/IP. It's an appalling protocol.
- apps like rsync travel over SSH
- Two SSH-based protocols, SFTP and SCP
  - SCP: rcp with SSH backend. Basically unmaintained
  - SFTP: newer copy program, maintained

SCP

- copies individual files

  `$ scp source-host:file dest-host:file`

- Copy data1 to host server1:

  `$ scp data1 server1:`

- Without the colon, I securely copy file data1 to local file server1. Probably not right.

SCP II

- Copy remote file to local:

```
$ scp data1:server1 .
```

- Change filename

```
$ scp data1 server1:data2
```

- Change location:

```
$ scp data1 server1:/tmp/
```

SCP III

- Change usernames

  ```
  $ scp data1 jerkface@server1:
  ```

- Recursive scp

  ```
  $ scp -rp /home/mwlucas server1:
  ```

SFTP

- More modern, interactive
- looks awfully like FTP

```
$ sftp server1
sftp> put data1
sftp> get data2
sftp> lcd /tmp
sftp> cd /var/db/postgres
```

Per-Host Configuration

- Both read ssh_config
- ssh command-line options don't always map to scp/sftp, e.g., use -P to change port

Windows SCP/SFTP

- Command-line apps like pscp.
- Use WinSCP for GUI app
- Free for personal use, restrictions to redistribute
- transparently switches between SFTP and SCP protocols depending on what server supports
- Looks like any other Windows app

WinSCP tips

- Import PuTTY key cache: Saved Sessions -> Tools->Import.
- Turn off SSHv1: select SSH, set Preferred SSH protocol version to 2. Select Stored Sessions, then Save defaults...
- Defaults do not propagate to saved sessions
- Explorer-style window: Preferences, choose Explorer.

Configuring SCP/SFTP server

- For scp, scp(1) must be in default system $PATH.
- SFTP server bundled with sshd, activated with sshd_config

```
Subsystem sftp /usr/libexec/sftp-server
```

- Disabling only removes obvious file copy methods. If you're really concerned, chroot sftp users.

SFTP-Only Users

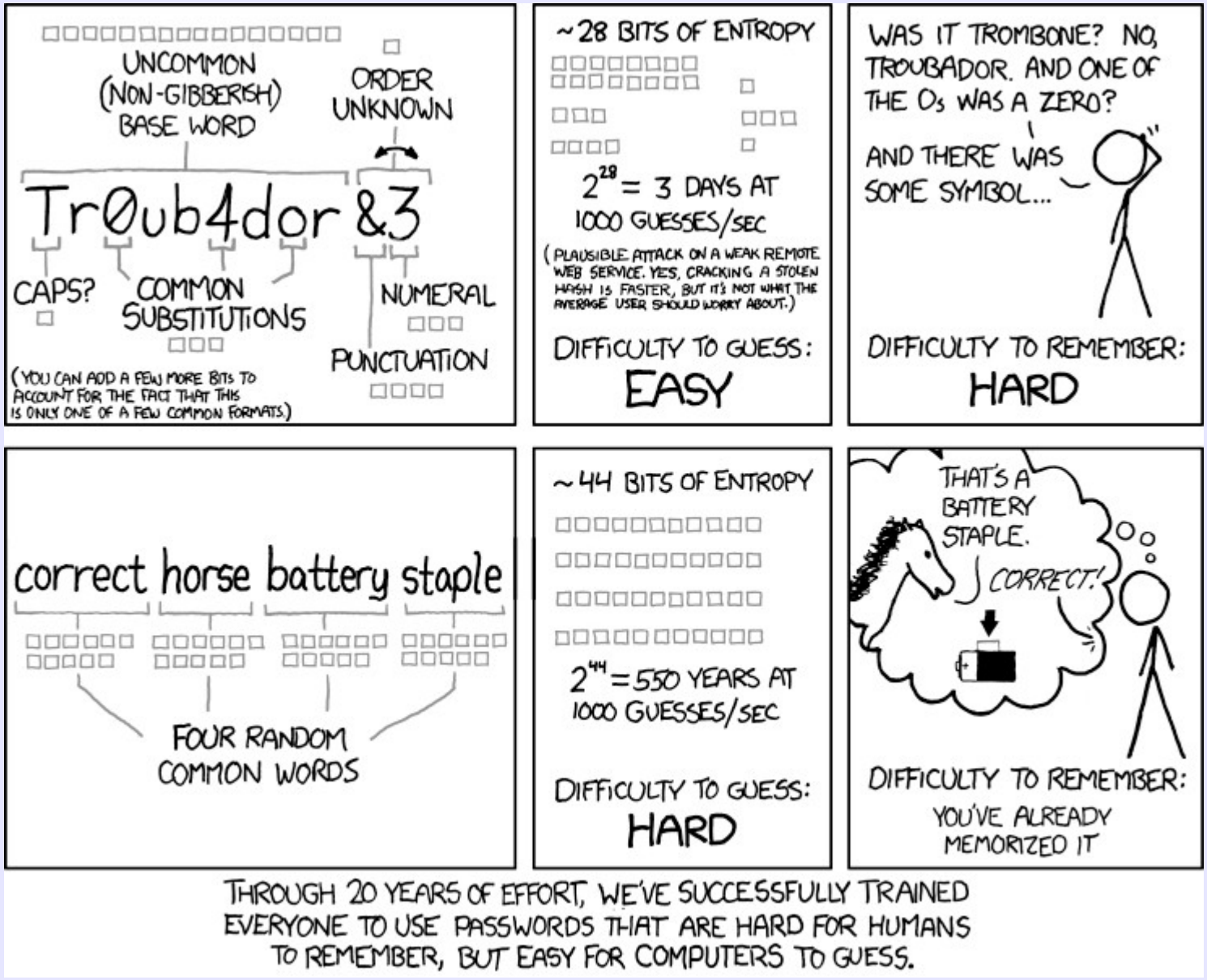
```
Match Group sftponly
   ChrootDirectory %h
   ForceCommand internal-sftp
   AllowTcpForwarding no
```

SSH Key Auth

- Passwords are a weak point in security
- Humans make really bad passwords
- one-time auth (OPIE) annoying
- two-factor auth annoying and introduces additional points of failure
- Give each user a keypair, encrypted with a passphrase

Passphrase

- Text string used to encrypt private key
- If private key is stolen, useless without passphrase
- Make passphrase too long to guess by brute force, too complex to guess, too long to shoulder-surf.
- Numbers, words, letters, symbols and space.



http://xkcd.com/936/

Good Passphrases

- Not a cliche, saying, or media catchphrase
- My passphrase from 1999:
  - "Come closer, my darling child, but not too close, for I, too, cannot be trusted."
  - It's a mingling of two different translations of Lautreamont's *Maldoror (1868).*
  - I can still remember it, you'd have a hard time guessing it.
  - I am not recommending you read the book.
  - My current passphrase is longer & more obscure

Why Kill Passwords?

- Simple two-factor auth (passphrase & file)
- SSH-breaking clouds (Hail Mary)
- Shuts up smart SSH scanners

SSH Agents

- Typing passphrases is more annoying than typing passwords
- SSH agent takes the key file, accepts your passphrase, and stores decrypted private key in memory (never to disk)
- When you SSH to a host, SSH client asks agent for passphrase
- Type passphrase once, use it all day

Agent Risks

- Lock Your Desktop!
- Multiuser Machines
- Sysadmins

Install Public Key on Server

- $HOME/.ssh/authorized_keys
- Should be readable by everyone – it's public
- Should not be writable by anyone but you
- Use SCP/SFTP, not copy & paste
- ssh-copy-id

Create Keypair with OpenSSH

```
$ ssh-keygen

Generating public/private rsa key pair.

Enter file in which to save the key
(/home/mwlucas/.ssh/id_rsa):

Enter passphrase (empty for no passphrase): ...

Enter same passphrase again: ...

Your identification has been saved in
/home/mwlucas/.ssh/id_rsa.

Your public key has been saved in
/home/mwlucas/.ssh/id_rsa.pub.

The key fingerprint is: ...
```

Using SSH Key for Auth

```
client$ ssh sloth
Enter passphrase for key
'/home/mwlucas/.ssh/id_rsa': ...


sloth$
```

OpenSSH Agent

- Varies by desktop GUI, might Just Work
- Command-line:

```
$ ssh-agent /bin/tcsh
$ ssh-add
```

- XDM: use openssh-askpass
- startx: use command-line before starting GUI (WindowMaker), or maybe just ssh-add (cwm)

PuTTY User Auth Keys

- Use PuTTYgen, included with full install
- Very standard Windows GUI; start, click "Generate"
- 1024 bits is minimum, unless you're logging into a VAX
- Save generated key.
- Select Conversions -> Export OpenSSH Key.

Using Auth Keys w/PuTTY

- For first attempt, use key without agent
- On left side of PuTTY, select Connection -> SSH -> Auth. Give full path to private key file.
- Install key on server.
- Log in.
- Should be asked for passphrase.
- Do not save this session

PuTTY Agent: Pageant

- Select Add Key, browse to your key, select, enter passphrase
- Enter passphrase again. Eventually you'll get it right.
- SSH to your server
- PuTTY enable/disable agent: Connection -> SSH -> Auth, "Attempt Authentication using Pageant" checkbox

Pageant at Startup

- Add Pageant shortcut to Startup menu
- Edit Target field to add full path to private key.

```
"C:\Program
Files\PuTTY\pageant.exe"
"C:\Users\mwlucas\keys\work.ppk"
```

Key File Management

- One key per client machine
- Back up private keys to offline media

Disabling Passwords in sshd

- /etc/ssh/sshd_config

```
ChallengeResponseAuthentication no
PasswordAuthentication no
PubkeyAuthentication yes

UsePAM no
```

Selectively Allow Passwords

```
Match Address 192.0.2.0/24
   PasswordAuthentication yes
```

Agent Forwarding

- Servers only allowing login via key, good
- Must copy file from one server to another
- Don't want to copy private key to server
- Solution? Forward agent requests back to desktop
- Forwards requests through $SSH_AUTH_SOCK, back to client.

Agent Forwarding Risks

- Anyone who can access socket can access agent.
- Do you trust root?
- Do you trust machine?

Enable Forwarding

- On server

  `AllowAgentForwarding yes`
- in ssh

  `ForwardAgent yes`
- in PuTTY
  - Connection -> Data -> SSH->Auth.
  - Under Authentication Parameters.
  - Forward Agent check box.

pam_ssh_agent_auth

- auto-auth sudo via your SSH agent
- in sudoers:

```
Defaults env_keep += "SSH_AUTH_SOCK",timestamp_timeout=0
```

- sudo PAM config:

```
auth sufficient \
/usr/local/lib/pam_ssh_agent_auth.so \
file=~/.ssh/authorized_keys

auth required pam_deny.so

account include system

session required pam_permit.so
```

Security Sensitive Topics

- SSH can act as arbitrary wrapper around other protocols
- Network admins love them
- Security managers hate them
- Which one is you?

X11 Forwarding

- Enable on server

  `X11Forwarding yes`
- Enable X11 secure subset on client

  `ForwardX11 yes`
- Enable all of X11 on client

  `ForwardX11Trusted yes`
- Can enable per-host, per-user, etc.

Is X11 Forwarding Working?

- Check $DISPLAY

```
$ echo $DISPLAY
localhost:10.0
```

- Any other result = X not going over SSH!
- Test with xterm, xeyes, etc.

PuTTY X11 Forwarding

- Need X server
- Xming – X.org based – on sourceforge
- PuTTY X11 forwarding = X11Trusted
- On by default
- Connection -> SSH -> X11, first box is Enable X11 Forwarding
- Turn it off by default, on as needed

Port Forwarding

- Wrap arbitrary traffic inside SSH
- Drives corporate security admins insane, because users can bypass access controls
- Network and server guys love it, for the same reason
- Obey corporate security policy

Port Forwarding Types

- Local Port Forwarding
  - grab a port on local machine
  - attach to SSH server
- Remote Port Forwarding
  - grab a port on remote machine
  - attach to SSH client
- Dynamic Port Forwarding
  - forward all traffic to server via SOCKS

Privileged Ports

- On Unix-like systems, ports below 1024 can only be bound by root.
- Affects port forwarding as well.
- Can forward to a privileges port, not just from.
- Can forward any port on Windows-like systems

Local Forwarding

- Attach local port to remote port
- Tunnel insecure protocol over SSH

```
$ ssh -L localIP:localport:remoteIP:remoteport host
```

- If no IP specified, attach to 127.0.0.1; can skip first colon in that case
- Can set permanently in ssh_config

```
LocalForward localIP:localport remoteIP:remoteport
```

ssh: tunnel HTTP over SSH

- connect port 80 on localhost to port 80 on server's localhost
- must run as root

```
$ sudo ssh -L 80:127.0.0.1:80 mwlucas@www
```

- Make /etc/hosts entry pointing host at 127.0.0.1
- To set permanently, use ssh_config entry

```
Match Host www
LocalForward localhost:8080 localhost:80
```

PuTTY: tunnel HTTP over SSH

- Select Connection->SSH->Tunnels
- Set "source port" to 80
- Set Destination to 127.0.0.1:80
- at the bottom, select Local
- To bind network-facing IP locally, select "Local ports accept connections from other hosts"

Remote Port Forwarding

- Attach remote port to local port
- Tunnel insecure protocol over SSH

```
$ ssh -R localIP:localport:remoteIP:remoteport host
```

- If no IP specified, attach to 127.0.0.1; can skip first colon in that case
- Can set permanently in ssh_config

```
RemoteForward localIP:localport remoteIP:remoteport
```

ssh: remote forward SSH

- connect port 2222 on server's localhost to port 22 on client's localhost

```
$ sudo ssh -R 22:127.0.0.1:2222 mwlucas@www
```

- To set permanently, use ssh_config entry

```
Match Host www

RemoteForward localhost:2222 localhost:22
```

PuTTY: remote forward SSH

- Select Connection->SSH->Tunnels
- Set "source port" to 2222
- Set Destination to 127.0.0.1:22
- at the bottom, select Remote
- To bind network-facing IP on server, select "Local ports accept connections from other hosts"

Using Remote Forwarding

- Log into server
- SSH to port 2222
- will be connected to client's SSH daemon
- this is why security admins hate it

Dynamic Port Forwarding

- Attach local port to server
- Local port is SOCKS proxy

```
$ ssh -D localIP:localport server
```

- If no IP specified, attach to 127.0.0.1; can skip colon in that case
- Can set permanently in ssh_config

```
Host servername
   DynamicForward host:port
```

ssh: dynamic forwarding

- connect port 9999 on server's localhost to port 22 on client's localhost

```
$ ssh -D 9999 www
```

- To set permanently, use ssh_config entry

```
Match Host www

RemoteForward workstation:9999
```

PuTTY Dynamic Forwarding

- Select Connection->SSH->Tunnels
- Set "source port" to 9999
- Leave Destination blank
- at the bottom, select Dynamic
- To bind network-facing IP on server, select "Local ports accept connections from other hosts"

Testing Dynamic Forwarding

- Configure Web browser to use SOCKS proxy on localhost, port 9999
- Browse out to Internet, bypassing company security policy
- Impact on company security
  - an illicit SOCKS proxy in a secure environment will get you fired with prejudice.
  - Or you can legitimately use dynamic forwarding to access your secure environment.
  - Po-tay-to, po-tah-to

Choosing IP Addresses

- Bind to local address, only client or server can use the forwarding
- Bind to network-facing address, everyone can use it.

Host Key Distribution

- Your users cannot be trusted.
- You don't want to be bothered by dumb user questions
- If a user sees a warning, it should be scary
- Distribute pre-verified host keys to client machines solves all this

Gather Host Keys

- build your own known_hosts with all algorithms

```
ssh -o HostKeyAlgorithms=ssh-rsa server
ssh -o HostKeyAlgorithms=ssh-dss server
ssh -o HostKeyAlgorithms=ecdsa-sha2-nistp256 server
```

OpenSSH Host Key Distribution

- ssh checks /etc/ssh/ssh_known_hosts as well as $HOME/.ssh/known_hosts
- Automate distribution: rsync, puppet, whatever
- To revoke a key, put string @revoked in front of entry. User will see scary warning.

ssh_known_hosts vs known_hosts

- $HOME/.ssh/known_hosts checked before /etc/ssh/ssh_known_hosts
- Best to move known_hosts to known_hosts_personal
- Don't just erase; user might have legitimate keys not on your network

Distributing known_hosts for PuTTY

- kh2reg.py part of PuTTY distribution

```
$ hk2reg.py known_hosts > puttykids.reg
```

- install reg script via login script / AD

Limiting SSH

- keywords in authorized_keys can limit actions possible over SSH.
- authorized_keys contains single lines, each the contents of a key.pub file.

```
ssh-rsa AAAA.....wC9
mwlucas@blackhelicopters.org
```

Keywords in authorized_keys

- put limiting keywords at beginning of key
- command="/bin/whatever" – this key can only run this command

```
command="sudo ifconfig tun0 inet
192.0.2.2 netmask 255.255.255.252"
ssh-rsa...
```

Limiting Locations

- Restrict which IP addresses a key can be used from:

```
from="192.0.2.0/29" ssh-rsa AAAA....
```

Restrict Forwarding

- Kill various forwardings
  - no-agent-forwarding
  - no-port-forwarding
  - no-X11-forwarding
- Permit certain types of forwarding
  - permitopen="127.0.0.1:25"

Keys for Automated Processes

- rsync, rsnapshot, nagios, etc, can use SSH transport

  ```
  $ ssh-keygen -f nagios-key -N ''
  ```

- Have process use this key with -i flag:

  ```
  $ ssh -i nagios-key server1
  ```

Limiting Automated Processes

- That which is not necessary is forbidden

```
command="dump /home > /backups/`date
+s`.dump",from="192.0.2.8",no-agent-
forwarding,no-portforwarding,no-X11-
forwarding ssh-rsa AAAA......wC9
mwlucas@blackhelicopters.org
```

Avoiding Root

- Use sudo(8) to avoid using root
- Sample /etc/sudoers entry

```
automation ALL=NOPASSWD: /bin/dump
/home > /backups/`date +s`.dump
```

SSH VPN

- You can use SSH as a VPN
- Varies widely by operating system
- We don't have time to cover all of the options
- Don't do this if you have any other choice
- Sometimes, you have no other choice