Crypto Application ‘Secure Shell (SSH)’

Issue Date:

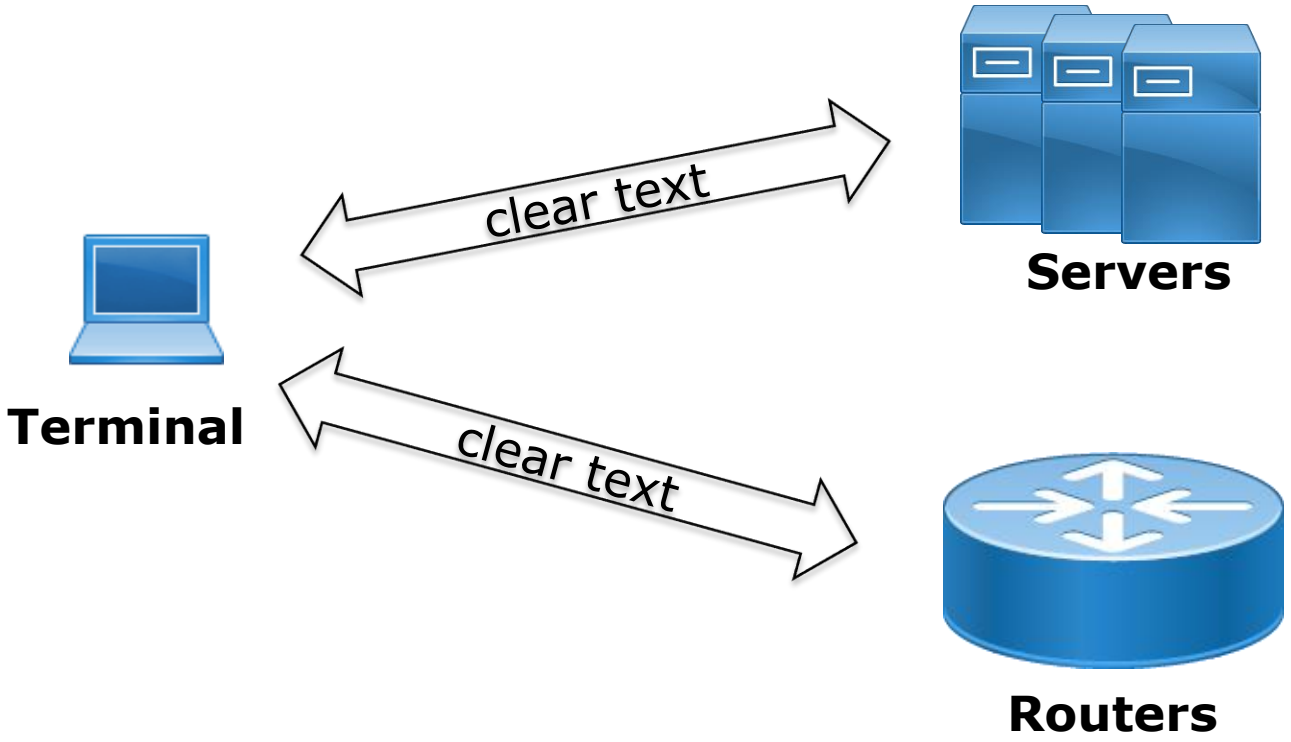
Revision:

APNIC

Secure?

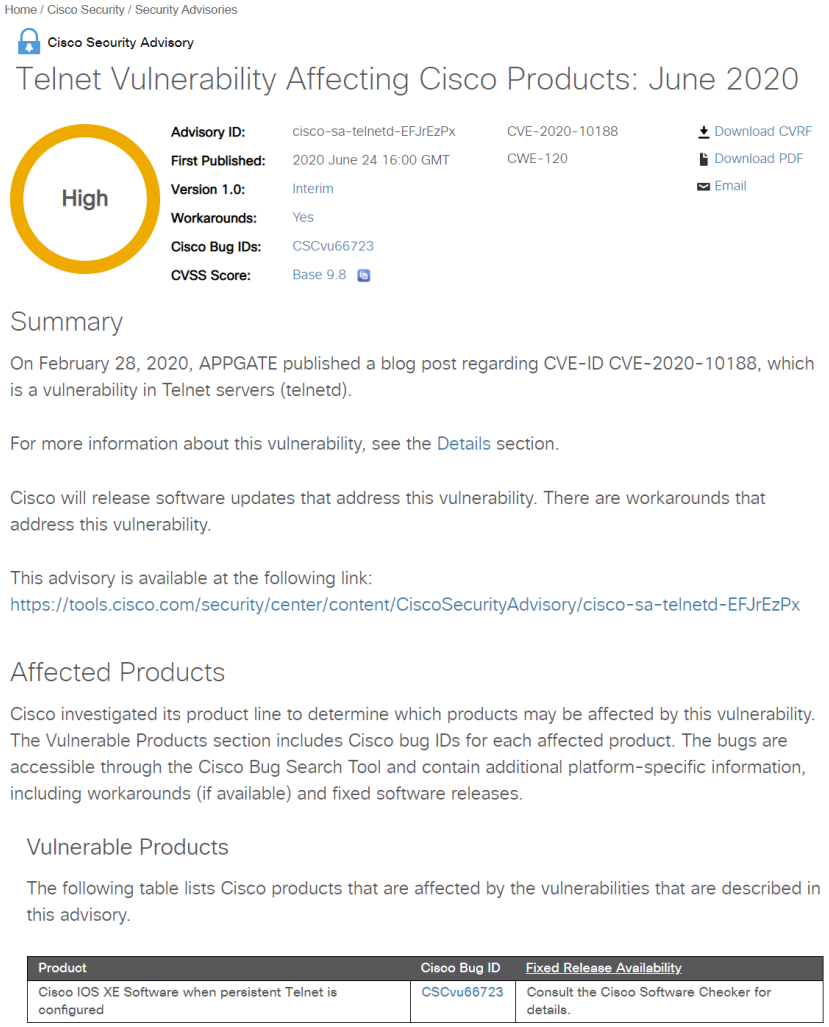
- **Authenticated** – I know who I am talking to
- Our communication is **Encrypted**

Telnet



https://packetlife.net/captures/protocol/telnet/

Telnet



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Cisco Security Advisory

Telnet Vulnerability Affecting Cisco Products: June 2020

High

Advisory ID:	cisco-sa-telnetd-EFJrEzPx	CVE-2020-10188	Download CVRF
First Published:	2020 June 24 16:00 GMT	CWE-120	Download PDF
Version 1.0:	Interim		Email
Workarounds:	Yes		
Cisco Bug IDs:	CSCvu66723		
CVSS Score:	Base 9.8		

Summary

On February 28, 2020, APPGATE published a blog post regarding CVE-ID CVE-2020-10188, which is a vulnerability in Telnet servers (telnetd).

For more information about this vulnerability, see the Details section.

Cisco will release software updates that address this vulnerability. There are workarounds that address this vulnerability.

This advisory is available at the following link:
https://tools.cisco.com/security/center/content/CiscoSecurityAdvisory/cisco-sa-telnetd-EFJrEzPx

Affected Products

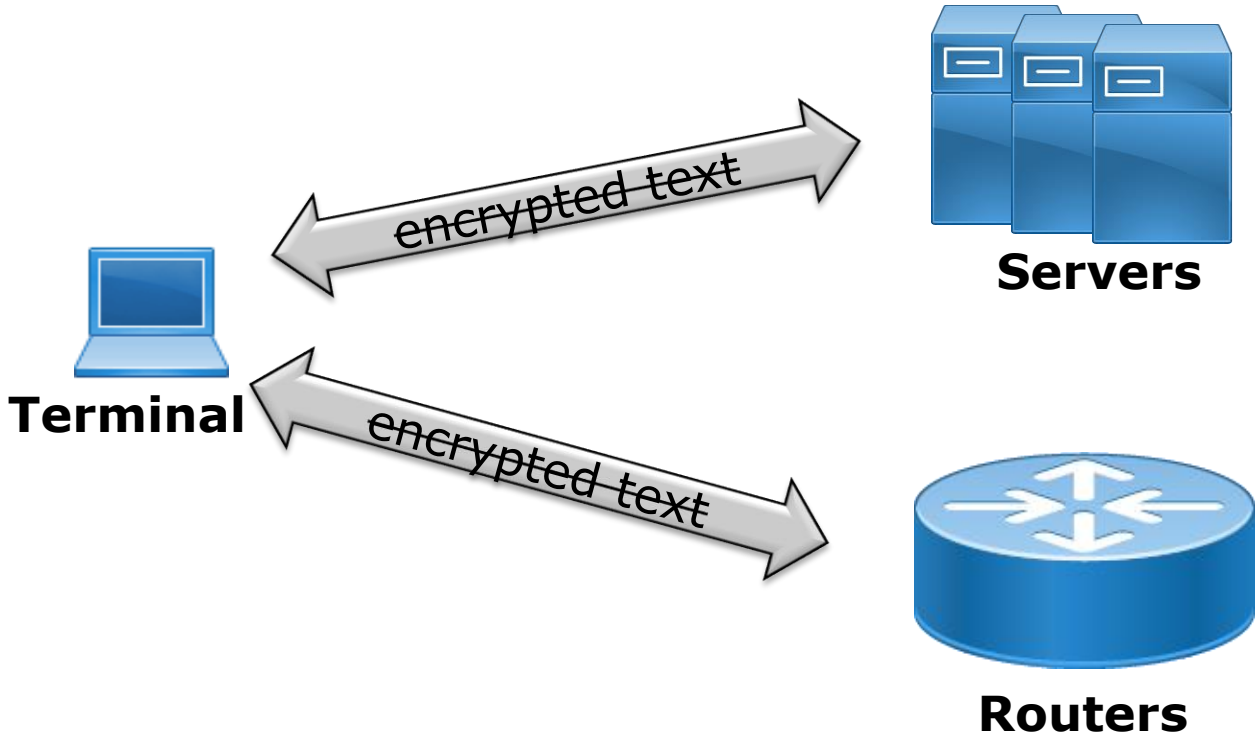
Cisco investigated its product line to determine which products may be affected by this vulnerability. The Vulnerable Products section includes Cisco bug IDs for each affected product. The bugs are accessible through the Cisco Bug Search Tool and contain additional platform-specific information, including workarounds (if available) and fixed software releases.

Vulnerable Products

The following table lists Cisco products that are affected by the vulnerabilities that are described in this advisory.

Product	Cisco Bug ID	Fixed Release Availability
Cisco IOS XE Software when persistent Telnet is configured	CSCvu66723	Consult the Cisco Software Checker for details.

SSH – encrypted channel



https://packetlife.net/captures/protocol/ssh/

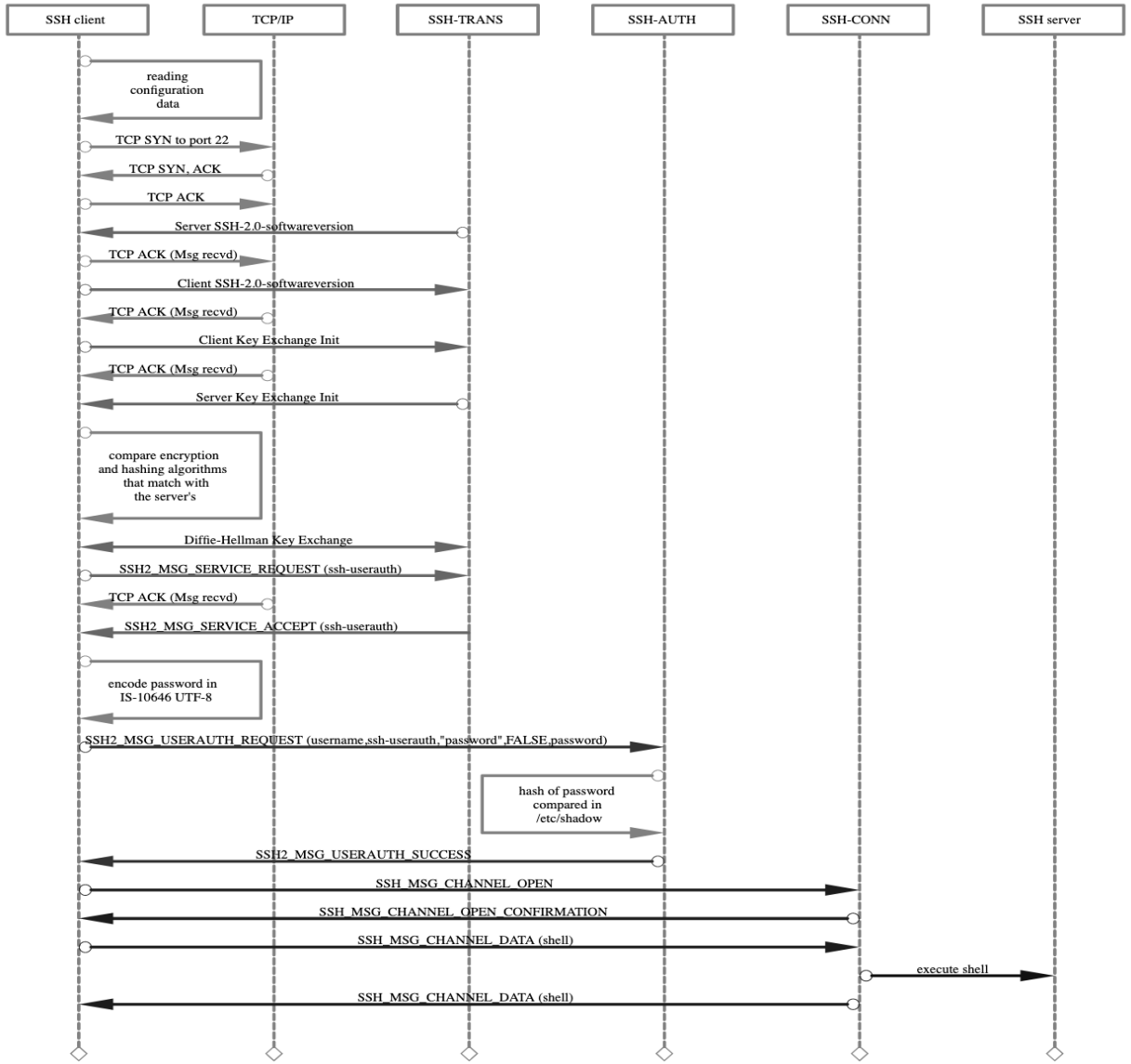
Secure Shell (SSH)

- Authenticated and encrypted shell access to a remote host
- Client-server model
- TCP 22
- It is much more than a secure shell
  - Transport protocol (eg. SCP, SFTP)
  - Connection forwarder
    - You can use it to build custom tunnels

SSH process

- Client-server crypto handshake
- Generate a *symmetric key* to secure the transport
- Client authenticates to server securely
- Secure communication can begin

Under the hood



SSH Authentication

- Client sends its username to server over the secure channel
  - Encrypted using the "**shared master key**"
- Server decrypts & checks username in the local database
  - If username not valid, tear down the SSH session!
  - If valid, the server sends back authentication method
    - Password based, or
    - Public-key based

SSH Auth – Password

- Client sends its password
  - encrypted using the shared master secret
- Server decrypts, and checks the password
  - If match found, access is granted (shell access)

Password Authentication

- Password Authentication is simple to set up
  - usually the default

- But allows brute-force guessing ☹

SSH Authentication - Public Key

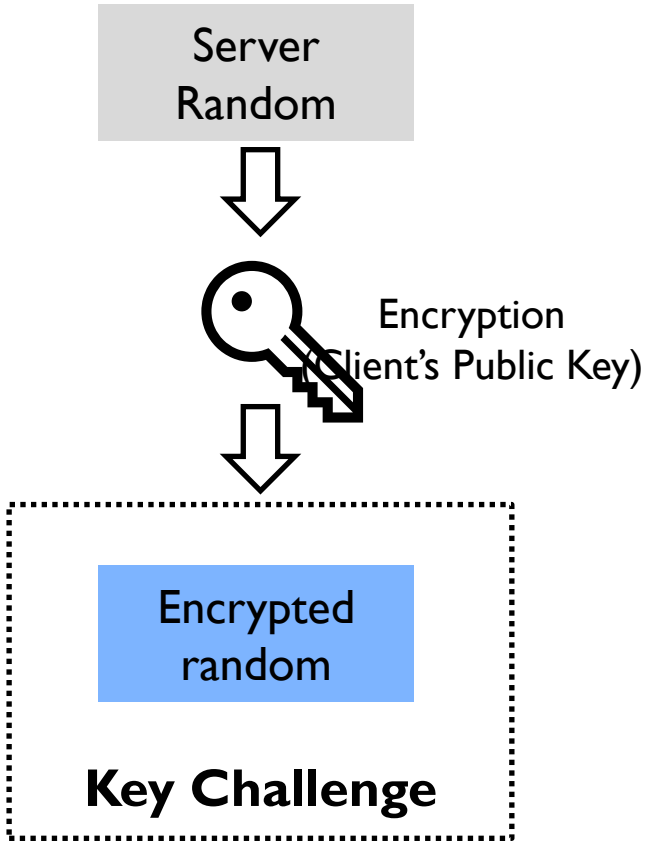
- User creates a key pair
  - public and private
    - **public key** - nonsensitive information
    - **private key** - is protected on the local machine by a strong passphrase

- Installs the public key in `$HOME/.ssh/authorized_keys` file on the target server
  - one time installation

How it works - Key Challenge

1. Client connects to server with a request to set up a key session
   - Sends KeyID for the key-pair it wants to use, and
   - Username/account-name

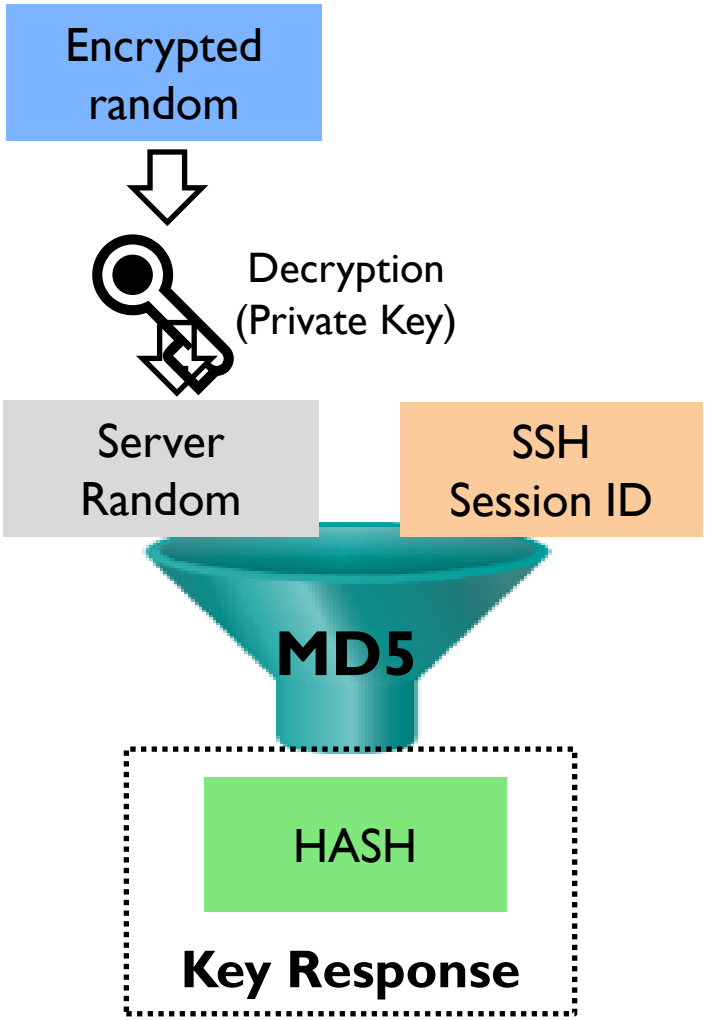
2. If there is a public key in the **authorized_keys**
   - server generates a random number
   - encrypts the random using client's public
   - sends the encrypted random as a key-challenge to client



How it works - Key Response

3. Client decrypts the random number with its private key

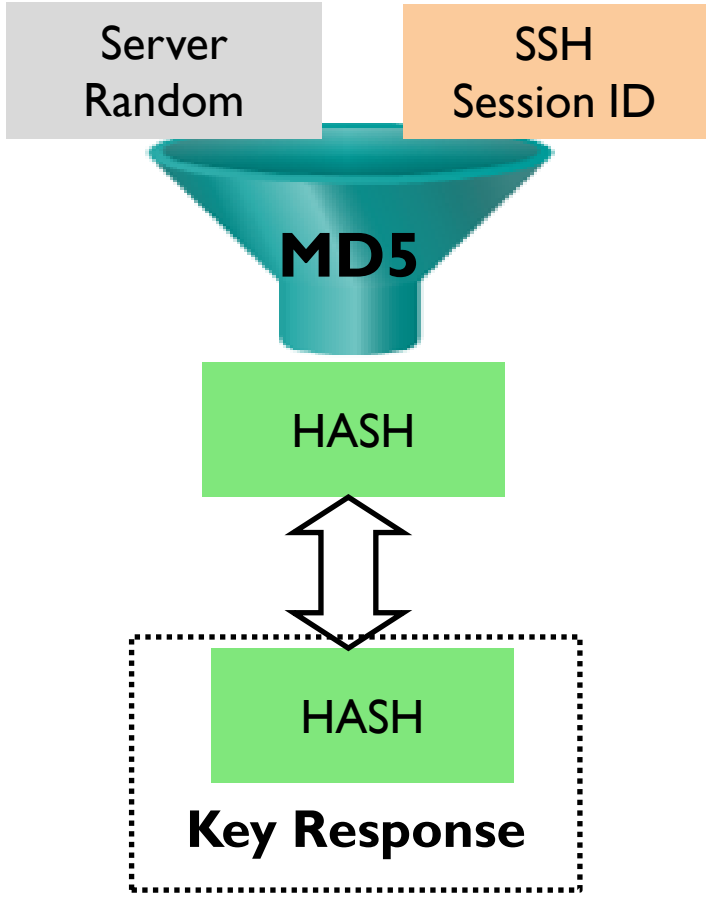
4. Creates an MD5 hash of the random and the session ID
   - sends back to the server as the key response
     - encrypted with shared Master key



How it works - Access

5. The server computes its own MD5 hash and compares it with the received hash
   - random + session ID

6. If the hashes match, the user must be in possession of the private key
   - **access is granted!**



Public Key Authentication

- Cannot derive private key from public key!
  - Cannot brute force either
- Requires one-time setup of public key on target system
- Requires unlocking private key with secret passphrase upon each connection
  - If you have setup one

Using SSH

- SSH is built-in
  - UNIX
  - Linux
  - MacOS X
  - Windows 10

Generate SSH key-pair

```
$/usr/home/foo> ssh-keygen -t rsa -b 4096 -C your_email@example.com
Generating public/private rsa key pair.
Enter file in which to save the key (/usr/home/foo/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /usr/home/foo/.ssh/id_rsa.
Your public key has been saved in /usr/home/foo/.ssh/id_rsa.pub.
The key fingerprint is:
27:99:35:e4:ab:9b:d8:50:6a:8b:27:08:2f:44:d4:20 your_email@example.com
```

SSH Keys

- Look inside the **`.ssh`** directory

`~/.ssh/id_rsa` is the private key

DO NOT SHARE THIS FILE!

`~/.ssh/id_rsa.pub` is the associated public key.

  – This can be shared freely without consequence.

Saving Key on the Target Host

- You can copy the *public key* into the server's **`authorized_keys`** file with the **`ssh-copy-id`** command

```
ssh-copy-id <user@server-ip>
```

- Alternatively, you can paste in the keys using SSH:

```
cat ~/.ssh/id_rsa.pub | ssh user@serverip "mkdir -p
~/.ssh && cat >> ~/.ssh/authorized_keys"
```

- That's it ☺

Key generation - “Older Windows OS”

- Download the following tools for the lab:
  - PuTTY (the Telnet and SSH client itself)
  - PuTTYgen (an RSA and DSA key generation utility)

  - https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html

Lab Exercise

1. Generate your ssh key-pair
2. Upload your SSH public key to the server
3. Login using your SSH public key


Questions