AST1501 - Introduction to Research

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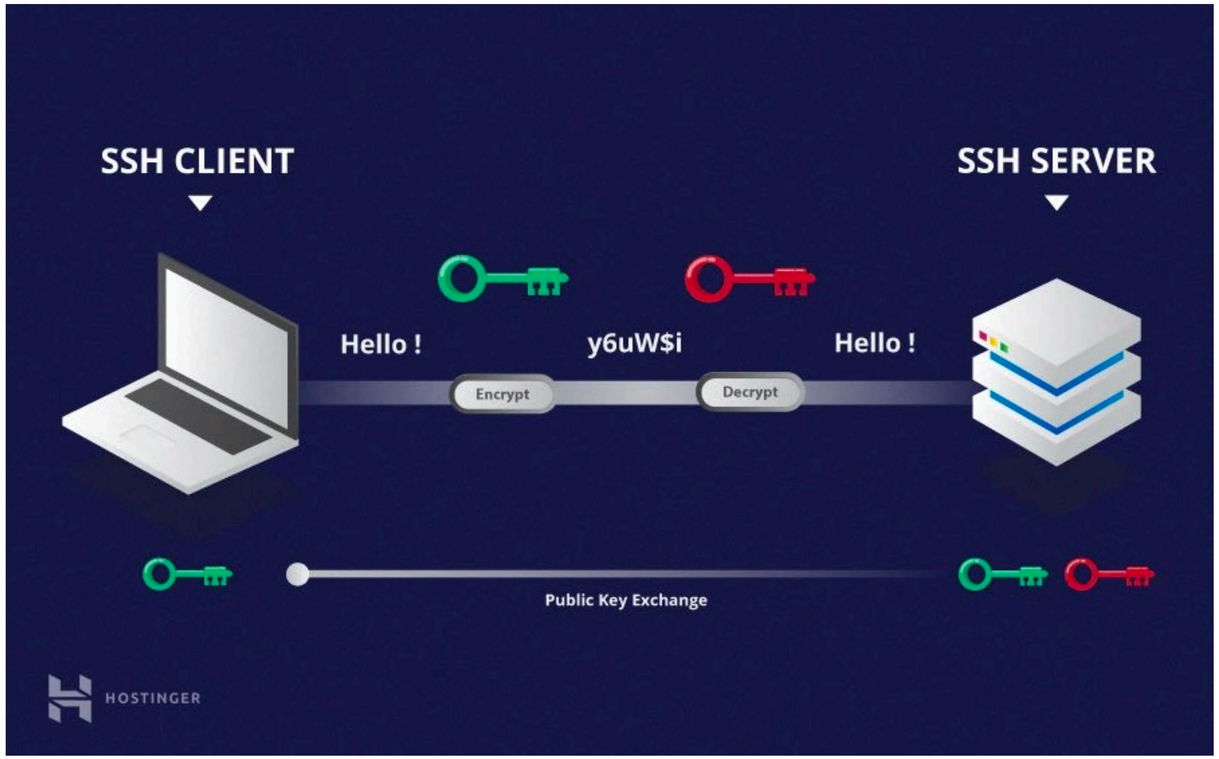
Intro to computing II

Overview

- git
- SSH


SSH CLIENT
SSH SERVER
Hello !
y6uW$i
Hello !
Encrypt
Decrypt
Public Key Exchange
HOSTINGER

SSH

SSH

Secure Shell

- Safely connecting to remote servers is done using SSH (Secure Shell), a networking protocol for computers
- Basic login

  `ssh bovy@lepus.astro.utoronto.ca`

  which will prompt you for your password
- Then get to a shell that is exactly like running a terminal on your own machine
- SSH also backs services like `rsync` to transfer files between computers

SSH

Keys

- Typing in your password all the time gets annoying, so better to use *SSH keys*
- SSH keys: private/public encryption key pair to authenticate as *you*
- Encryption keys work by placing your public key on, say, the server you want to log into and keeping the private key on your own machine
    - Public key can be easily matched to a private key, without allowing the private key to be determined from the public key
      (e.g., public key is large number that is the product of two large primes, private key is those two large primes)
    - **Never** share your private key; if it gets compromised, delete the pair and start over

SSH

Keys

- Create public/private pair using

```
ssh-keygen -t rsa
```

- Reports

```
Generating public/private rsa key pair.
Enter file in which to save the key (/Users/bovy/.ssh/id_rsa):
```

- Then asks

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

- Use a passphrase!
- Then get

```
Your identification has been saved in /Users/bovy/.ssh/KEYNAME
Your public key has been saved in /Users/bovy/.ssh/KEYNAME.pub
```

SSH

Keys

- If you need keys for multiple purposes, best to generate separate pairs in case they get compromised
- For example, I login automatically to the astro server from GitHub and I use a special SSH key for that
    - Note that for automated logins, you need to use a passphraseless key, another good reason to use separate keys!
- But when you move to a new computer, can copy private key to keep all logins working
- Passphrase will generally be remembered by your local password manager if you want

SSH

Configuration

- SSH configuration lives in the `.ssh` directory in your home directory
- Can contain a config file to configure logins, e.g.

```
Host NICKNAME
     Hostname SERVER.astro.utoronto.ca
     User USERNAME
     ForwardAgent yes
```

- Then you can simply login with

```
ssh NICKNAME
```

- Or `rsync`

```
rsync -azv NICKNAME:/some/directory .
```

SSH

Remote configuration

- To be able to login using SSH, you need to add your *public* key to the `authorized_keys` file in the `.ssh` directory on the remote machine
- For example

  ```
  cat ~/.ssh/id_rsa.pub | ssh -l USERNAME
  SERVER.astro.utoronto.ca 'sh -c "cat - >> ~/.ssh/
  authorized_keys"'
  ```

  Where `id_rsa.pub` is your public key

- Note that you can also use an extension in VS code to interact with remote code locally (e.g., locally edit Jupyter notebooks that are running remotely)