Automation Demo

This is a small demo that will show the concepts of application automation

Objectives

- Discuss and explain issues of authentication and access with automation
- Understand secrets management and discuss potential software solutions
- Discuss and understand the creation and use of SSH/RSA keys in relation to private repositories
- Describe and Understand the functional domains of Packer and Vagrant
  - How to manage the creation of virtual machine images/artifacts with Packer
  - How to manage, create, and start those Virtual Machines in Vagrant
  - How to manage private networking in VirtualBox/Vagrant for application deployment
- Describe and understand the concept of provisioning and post-processing of virtual machine artifacts

Outcomes

At the end of this demonstration you will be able to deploy create two virtual machines, containing a sample NodeJS application and a sample relational database, via Packer and run/managed via Vagrant. You will have successfully deployed this application code from a private GitHub repo via SSH and securely used RSA keys and Linux ENV variables to do so.

Setup

For this demonstration, you need to have Packer, Vagrant, and VirtualBox installed. If you completed the Tooling Assignment then you will have the correct tools.

You can clone the sample code I will be using–issue the command:

```
git clone https://github.com/jhajek/packer-vagrant-build-scripts.git
```

```
bash # The sample application code is located in my public repo
jhajek # you can clone this and copy it to your own private
repo, located in the itmt-430 directory > sample code git clone
https://github/com/illinoistech-itm/jhajek.gitb
```

In this repo, under the folder named Packer > itmt430 you will find a detailed Readme.md. The content of that link will be reprinted here.

Initial Problem

How can you clone code from a private GitHub Repo? When you do so on the command line you are prompted for a password. This breaks automation. Git

and GitHub have a solution. You can add an RSA Public Key to GitHub (called a Deploy Key) and clone over SSH as opposed to https.

Pre-steps

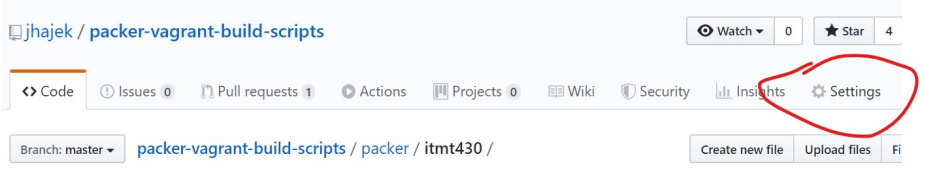
Secrets management (passwords, keys, key/value pairs) is the one of the main focuses of cyber-security as well as any application health. In building a application via automation tools, we have the concern of how we will place secrets into our new Operating System as well as how we will retrieve application code securely from a private GitHub repository.

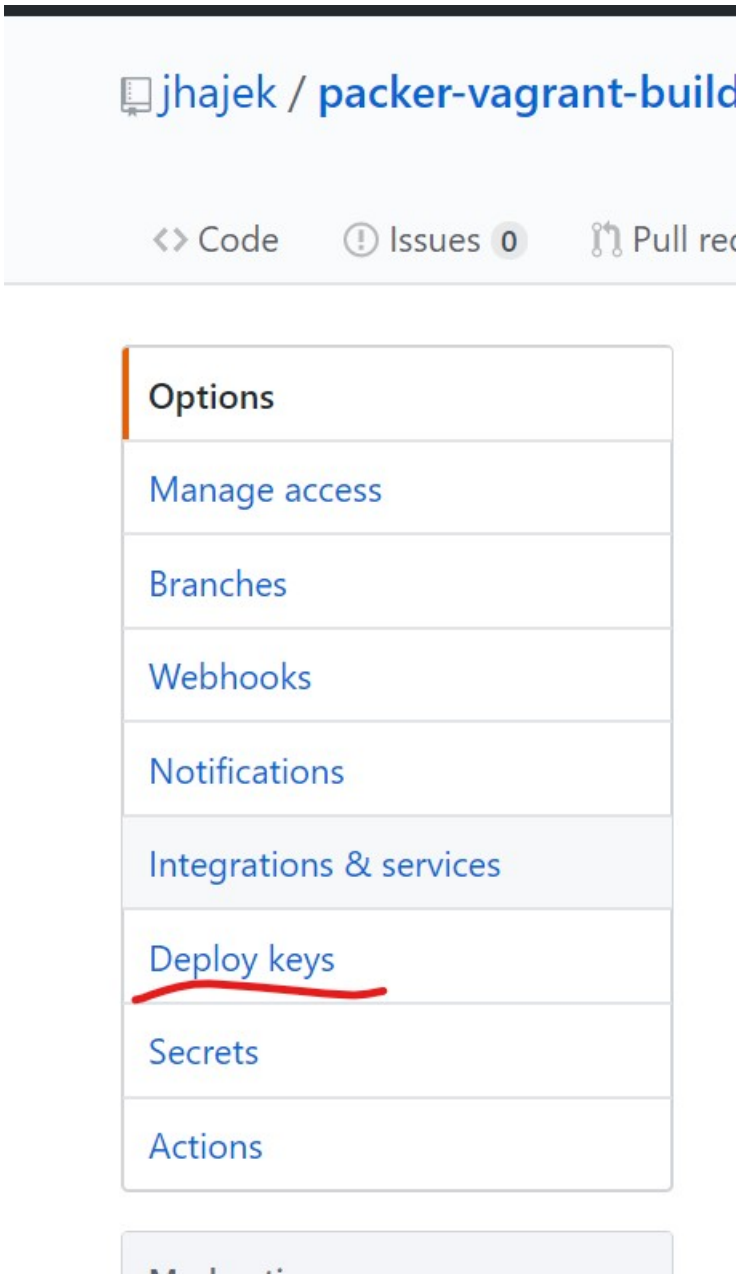
We will be using SSH/RSA keys to authenticate between your system and GitHub. You might have heard these referred to as public/private key authentication. You will need to generate a keypair. This can be done by issuing the following command from a shell on Mac, Linux, and PowerShell/Windows:

```
ssh-keygen
```

You can accept the defaults by hitting enter. In this case we don't want a passcode for our key. If you have not generated a keypair before, two files `id_rsa` and `id_rsa.pub` will be generated in the `~/.ssh` directory. One is the private key, one is the public key.

Upon being made an admin of your team's GitHub repo, you will now have the ability to add public keys to your repo. GitHub refers to these as **Deploy Keys**.





Open your Public Key and paste the content into a new GitHub Deploy Key. Give the name a very descriptive key name so you can remember where the key is located. You don't want to be reusing keys or passing them around. You can generate and add as many keys as you want to.

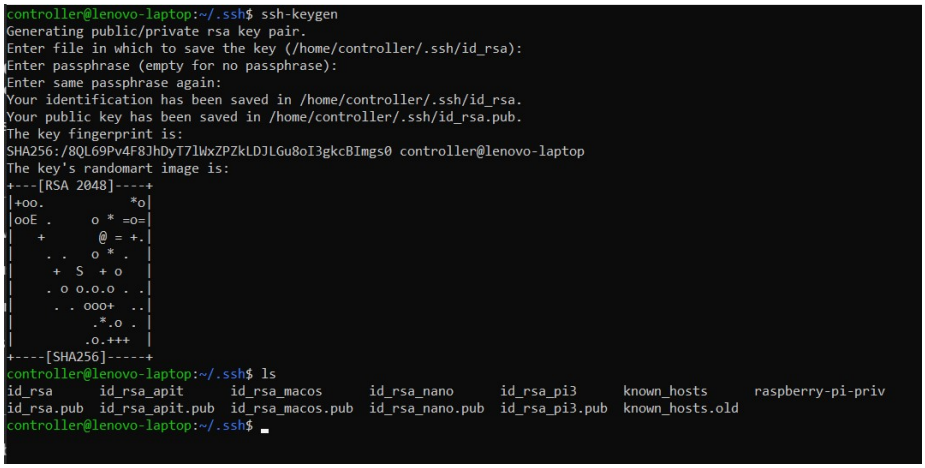


Figure 1: *ssh-keygen output*

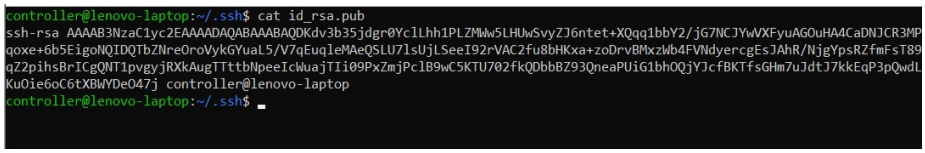


Figure 2: *id_rsa.pub*

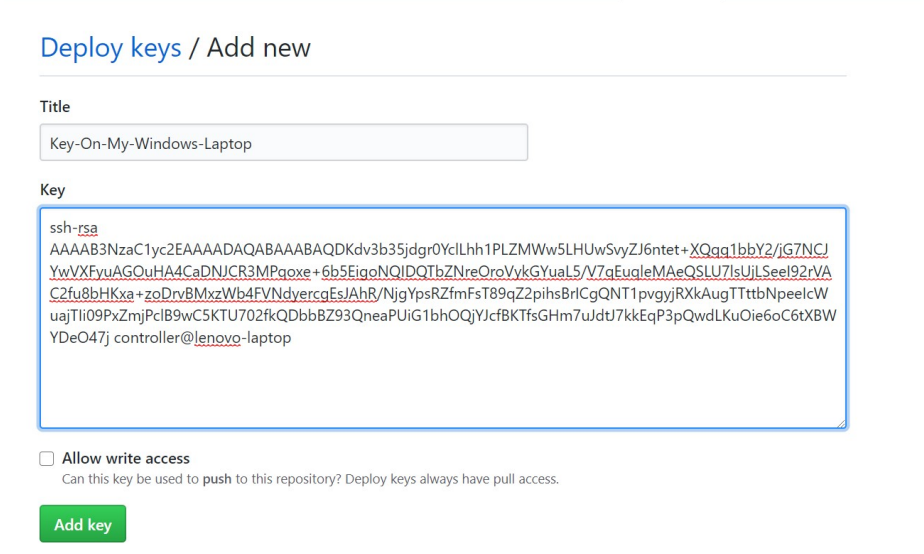


Figure 3: *How to add a new key*

SSH Config

What happens when we run this command?

```
# replace hajek.git with your teams or your own private repo name
git clone git@github.com:illinoistech-itm/hajek.git
```

You are prompted with a yes/no prompt, which will prevent an automated cloning.

There is a way to disable the fingerprinting. It involves creating a file called `config` and placing it in your `~/.ssh` directory. This `config` file is an SSH default file that any SSH connection will read automatically. This helps setup FQDNs or complicated file paths and saves you the time to type them. The file should contain this content at the least:

```
Host   github.com
Hostname github.com
IdentityFile  /home/vagrant/.ssh/id_rsa
StrictHostKeyChecking no
```

- The value `StrictHostKeyChecking` is what turns off the fingerprint checking.

- The `IdentityFile` value should point to your private key location (id_rsa)

After adding the `config` file, we now encounter a file permission error. You will see the issue here is that GitHub requires the file to be permission 600 if you are on Linux or Mac, but not Windows.

One aspect of cloning via SSH is we now introduce the concept of fingerprinting, or anti-man-in-the-middle.

Packer User-Variables

In this example we will be using Packer and Vagrant. Packer will be used to construct and automate the build of our application. Packer makes use of `scp` commands during its post-provisioner phase in order to allow files and other secrets to be transferred.

https://www.packer.io/docs/templates/user-variables.html

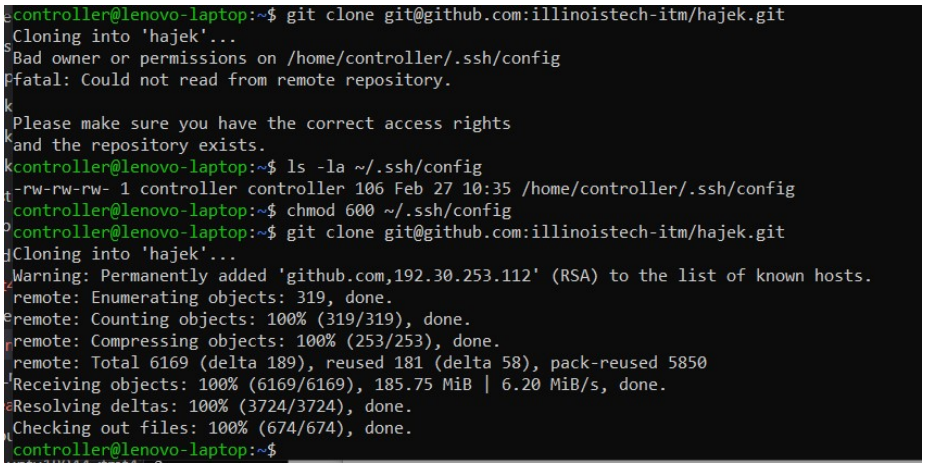


Figure 4: *bad-permission*

What we need to set username and passwords securely in Packer

1) Issue the command inside of the folder, `cp variables-sample.json variables.json`
    1) The `variables.json` file contains key value pairs of variables and passwords to be passed into the provisioner shell script.
    2) This renames the file `variables-sample.json` to `variables.json` (There is an entry in the `.gitignore` so you cannot accidentally `git push` your passwords).
2) Edit the `variables.json` file replacing default values with your own
3) Issue the command `packer build --var-file=./variables.json ubuntu18044-itmt430-database.json` and `packer build --var-file=./variables.json ubuntu18044-itmt430-webserver.json` to begin the install with password, usernames, and RSA private key properly seeded
4) This way we can securely build the system, deploy it and when building it pass in passwords via environment variables

Webserver contents

1) This application has an Nginx webserver running on port 80.

2) It has a Nodejs Hello World application running on port 3000.
3) It has an Nginx route to the Nodejs app located at `/app`

Database contents

1) System will create a `.my.cnf` file which allows for password-less authentication
2) System will pre-seed MariaDB or MySql root password