

StartupEngineeringAppliance.ova  
Oracle VirtualBox Appliance v0.0

“Startup Engineering”  
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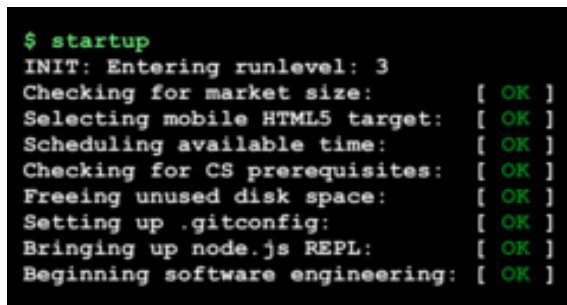
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# 1 Introduction

Throughout the first iteration of the course “Startup Engineering”, taught by Balaji S. Srinivasan and Vijay S. Pande (17 June 2013 - 25 August 2013), a conscientious effort to keep this document up-to-date will be a priority. Please report any errors, omissions, or questions through the classroom bulletin board in the thread “Startup Engineering Appliance v0.0”. This handbook shall be available in Portable Document Format (PDF) and L<sup>A</sup>T<sub>E</sub>X.

The development environment standardized upon by the “Startup Engineering” course instructors consists of Amazon Web Services Elastic Compute Cloud (AWS EC2) providing a platform for the software development tools, GitHub providing a source code repository, and Heroku providing simplified web application deployment services.

The StartupEngineeringAppliance has been created in response to the concerns, difficulties, and preferences expressed by a variety of course participants. This appliance can be run on course participant’s workstations while replicating the essential features of the virtualized workspace offered by AWS EC2. At this time, a version control system, git, is available but a web server is not included.

A terminal window with a black background and green text. The text shows the execution of the 'startup' command and a series of system checks, all of which are successful, indicated by '[ OK ]' at the end of each line.

```
$ startup
INIT: Entering runlevel: 3
Checking for market size:      [ OK ]
Selecting mobile HTML5 target: [ OK ]
Scheduling available time:    [ OK ]
Checking for CS prerequisites: [ OK ]
Freeing unused disk space:    [ OK ]
Setting up .gitconfig:        [ OK ]
Bringing up node.js REPL:     [ OK ]
Beginning software engineering: [ OK ]
```

Figure 1: Startup Engineering - Balaji S. Srinivasan, Vijay S. Pande

## 2 Oracle VirtualBox Appliance

The StartupEngineeringAppliance, Debian GNU/Linux 7 (32-bit iAPx86) configured as a 256MB RAM and 25GB HDD Oracle VirtualBox Appliance, is available for download from the URL contained within the README file

at `<https://github.com/horne1965/StartupEngineeringAppliance>`.

The appliance is provided as-is and the user assumes all risks and liabilities arising from use of this virtual machine.

This handbook uses a notational shorthand to indicate whether a command is to be executed on the user's workstation (ws) or the virtual machine (vm).

## **2.1 Installation of the Virtual Machine**

Oracle VirtualBox must be installed on the workstation before the StartupEngineeringAppliance can be activated and accessed. Oracle VirtualBox is available for download at `<https://www.virtualbox.org>`. Importing the virtual machine appliance takes approximately 2 minutes after which it is ready to use.

1. Select File from the application's main menu.
2. Click Import appliance...
3. Click Open
4. Navigate to the Oracle VirtualBox Archive (OVA) file  
StartupEngineeringAppliance.ova
5. Click Next
6. Click Import
7. Click Agree for the Software License Agreement

## **2.2 Management of the Virtual Machine**

Starting the StartupEngineeringAppliance virtual machine involves selecting the StartupEngineeringAppliance from within the Oracle VM VirtualBox Manager and clicking Start.

Shutting down the StartupEngineeringAppliance virtual machine should be performed within the appliance itself whenever possible. However, in some situations it might be necessary to forcefully shutdown the virtual machine

appliance via the Machine menu by selecting ACPI Shutdown. Closing the window in which the virtual machine is running is not recommended.

```
(vm) sudo shutdown -h now
```

Through the Oracle VM VirtualBox Manager various parameters affecting the configuration of the virtual machine are accessible when the virtual machine is in a stopped state.

### **3 StartupEngineeringAppliance: Access with a Password**

Initially, the StartupEngineeringAppliance virtual machine is accessible by means of simple authentication (userid and password). In the next section instructions on using certificate-based authentication will be provided so that all remote access must be through certificate-based authentication while local access continues to employ simple authentication. In this context remote access means using a terminal session running on the workstation hosting the virtual machine to connect with the virtual machine.

Note: The user account 'cloud' has superuser privileges by way of the 'sudo' command. The default superuser account (root) has been disabled for security. The default password may be changed after logging into the virtual machine.

```
(vm) passwd
```

#### **3.1 Local Access Verification: Simple Authentication**

After starting the StartupEngineeringAppliance virtual machine use the following credentials to login.

```
UserID: cloud
Password: engineering
```

Obtain the IP address of the virtual machine in preparation for remote access verification.

```
(vm) /sbin/ifconfig
```

If the presence of the hostname in the shell prompt is annoying, edit the BASH configuration file (`~/.bashrc`) removing references to the hostname (backslash-h) in all PS1 statements. The hostname remains unaffected but it will not be displayed as part of the shell prompt.

```
(vm) nano ~/.bashrc
```

Logout of the virtual machine. Login to the virtual machine. Display the hostname of the virtual machine.

```
(vm) hostname
```

## 3.2 Remote Access Verification: Simple Authentication

With the StartupEngineeringAppliance virtual machine running, launch a terminal session on the workstation and use the following credentials to login.

UserID: cloud

Password: engineering

```
(ws) ssh userid@vm_ip_address
```

# 4 StartupEngineeringAppliance: Remote Access without a Password

The StartupEngineeringAppliance virtual machine can be configured to require certificate-based authentication when remotely accessed. In this context remote access means using a terminal session running on the workstation hosting the virtual machine to connect with the virtual machine.

## 4.1 Self-Signed Certificates

Generating a self-signed certificate is as easy as executing the following command on the virtual machine.

```
(vm) ssh-keygen -t rsa -C "email_address"
```

Generating public/private rsa key pair.

Enter file in which to save the key (~/.ssh/id\_rsa): ~/.ssh/se.pem

With the exception of the preceding private key parameter all other certificate parameters should be left blank. In a workplace setting adding a passphrase to the private key is highly recommended; this is known as two-factor authentication.

Add the public key file to /home/cloud/.ssh/authorized\_keys.

```
(vm) cat ~/.ssh/se.pem.pub >> ~/.ssh/authorized_keys
```

```
(vm) sudo chmod 0600 ~/.ssh/*
```

Copy the private and public key-pair files to the workstation.

```
(ws) scp cloud@vm_ip_address:~/.ssh/se.pem ~/.ssh/se.pem
```

```
(ws) scp cloud@vm_ip_address:~/.ssh/se.pem.pub ~/.ssh/se.pem.pub
```

Delete the private key-pair file after copying the key-pair files (se.pem and se.pem.pub) to the workstation.

```
(vm) rm ~/.ssh/se.pem
```

## 4.2 Certificate-based Authentication

Edit the SSH server configuration file (/etc/ssh/sshd\_config) using either GNU nano or vi/vim.

```
(vm) sudo nano /etc/ssh/sshd_config
```

The SSH server configuration additions or changes are listed below.

```
PermitRootLogin no
```

```
PubKeyAuthentication yes
```

```
AuthorizedKeyFile %h/.ssh/authorized_keys
```

Restart the SSH server to activate the configuration changes.

```
(vm) sudo /etc/init.d/ssh restart
```

### 4.3 Remote Access Verification: Certificate-based Authentication

With the StartupEngineeringAppliance virtual machine running, launch a terminal session on the workstation and use the following credentials to login.

UserID: cloud

Certificate: se.pem (private key)

```
(ws) ssh -i ~/.ssh/certificate userid@vm_ip_address
```

## 5 Source Code Repository

To install the essential git software use the following command.

```
(vm) sudo apt-get install git-core
```

git is equally suited for local and remote source code repositories. In fact, version control systems (VCS) such as git can be used for source code and documentation projects.

Set the default name and email for git commits.

```
(vm) git config --global user.name "name"
```

```
(vm) git config --global user.email "email_address"
```

### Certificate-based Authentication

If you decide to use the same public key to access your GitHub repository, simply login to GitHub, click Account Settings, click SSH Keys, copy-and-paste the public key (se.pem.pub) into the textbox, and finally click Add key.

Edit the SSH client configuration file (/etc/ssh/ssh\_config) using either GNU nano or vi/vim.

```
(vm) sudo nano /etc/ssh/ssh_config
```

The SSH client configuration additions or changes are listed below.

IdentityFile ~/.ssh/se.pem



## 5.1 Creation of a new Repository

### 5.1.1 Local Repository

A step-by-step example showing the creation of a local repository is presented to guide future use of git.

The subdirectory in which your git repositories are created is left to the reader. The README.md file is optional placeholder and its contents typically describe the project, provide documentation such as how to install or use the project, or even contact information.

```
(vm) mkdir ~/MyApp
(vm) cd ~/MyApp
(vm) git init
(vm) echo "MyApp" > README.md
(vm) git add README.md
(vm) git commit -m 'MyApp'
```

### 5.1.2 GitHub

A step-by-step example of pushing the local git repository to GitHub follows.

Create a repository named MyApp via the GitHub website. Ensure the local git repository exists or create the repository following the instructions in Section 5.1.1 Local Repository.

The local repository can be pushed to GitHub using either simple authentication or certificate-based authentication.

#### Simple Authentication

```
(vm) cd ~/MyApp
(vm) git remote add origin https://github.com/user_name/MyApp.git
(vm) git push origin master
```

#### Certificate-based Authentication

```
(vm) ssh -T git@github.com
(vm) cd ~/MyApp
```

```
(vm) git remote add origin git@github.com:user_name/MyApp.git  
(vm) git push origin master
```

## 5.2 Modification of an existing Repository

A step-by-step example showing the modification of an existing GitHub repository follows.

After confirming via the GitHub website that your MyApp repository exists, delete the local repository.

### 5.2.1 Local Repository

```
(vm) cd ~  
(vm) rm -Rf ~/MyApp
```

Fetch a copy of MyApp.git from GitHub in preparation for modifications to the repository.

```
git clone https://github.com/user_name/MyApp.git
```

Create a file named helloworld.js in the local repository using either GNU nano or vi/vim. Commit the changes to the local repository.

```
(vm) cd ~/MyApp  
(vm) nano helloworld.js  
(vm) git add helloworld.js  
(vm) git commit -m 'node.js example'
```

### 5.2.2 Github

The local repository can be pushed to GitHub using either simple authentication or certificate-based authentication.

#### Simple Authentication

```
(vm) cd ~/MyApp  
(vm) git push origin master
```

## Certificate-based Authentication

```
(vm) ssh -T git@github.com
(vm) cd ~/MyApp
(vm) git push origin master
```

Confirm via the GitHub website that your MyApp repository has been updated.

## 6 Application Deployment

### 6.1 Heroku

To install the Heroku client software,

```
(vm) wget -qO- https://toolbelt.heroku.com/install-ubuntu.sh | sh
```

If you decide to use the same public key to access your Heroku application hosting environment, use the heroku command-line utility to add it.

To add an existing public key,

```
(vm) heroku login
(vm) heroku keys:add
(vm) heroku logout
```

To create a new private/public key-pair,

```
(vm) heroku login
(vm) ssh-keygen -t rsa
(vm) heroku keys:add
(vm) heroku logout
```

### 6.2 GitHub and Heroku Integration Verification

```
(vm) git clone https://github.com/heroku/node-js-sample.git
(vm) cd node-js-sample
(vm) heroku login
(vm) heroku create
(vm) git push heroku master
(vm) heroku logout
```

Verify the generated URL for the web application displays the message "Hello world" in a web browser.

## 7 Debian GNU/Linux Repository

It is recommended the software repository mirror be updated to a repository as close as possible to your geographic location. Changing the repository is as simple as checking the master mirror listing (<http://www.debian.org/mirror/list>) for Debian GNU/Linux and then editing the software repository file (`/etc/apt/sources.list`) using either GNU nano or vi/vim.

```
(vm) sudo nano /etc/apt/sources.list
(vm) sudo apt-get update && apt-get upgrade
```

## 8 Additional Software

By default these software packages are not pre-installed on the StartupEngineeringAppliance virtual machine. As additional software is introduced throughout the course those packages will be included in this section.

### 8.1 node.js and npm

The Debian package for node.js has been specifically created using the source code available at `<http://nodejs.org/dist/node-latest.tar.gz>` for Debian GNU/Linux 7 "Wheezy".

```
(vm) sudo dpkg -i ~/node.js/node_0.10.12-1_i386.deb
```

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