

Cloud
DevOps

Engineer

Project Case Study

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Part 1 - Create Jenkins multi-server environment in Azure using Terraform

1. Use Azurerm resource provider

The screenshot shows a VS Code interface with the following details:

- File Explorer:** Shows two files: `vars.tf` and `main.tf`. `main.tf` contains the following code:

```
provider "azurerm" {  
  features {}  
}
```
- Terminal:** Displays the output of the `terraform init` command.

```
The default interactive shell is now zsh.  
To update your account to use zsh, please run `chsh -s /bin/zsh`.  
For more details, please visit https://support.apple.com/kb/HT208050.  
Srikanths-MacBook-Air:proj1-vm-tf skarra$ terraform init  
  
Initializing the backend...  
  
Initializing provider plugins...  
- Finding latest version of hashicorp/azurerm...  
- Installing hashicorp/azurerm v2.75.0...  
- Installed hashicorp/azurerm v2.75.0 (signed by HashiCorp)  
  
Terraform has created a lock file .terraform.lock.hcl to record the provider  
selections it made above. Include this file in your version control repository  
so that Terraform can guarantee to make the same selections by default when  
you run "terraform init" in the future.  
  
Terraform has been successfully initialized!  
  
You may now begin working with Terraform. Try running "terraform plan" to see  
any changes that are required for your infrastructure. All Terraform commands  
should now work.  
  
If you ever set or change modules or backend configuration for Terraform,  
rerun this command to reinitialize your working directory. If you forget, other  
commands will detect it and remind you to do so if necessary.  
Srikanths-MacBook-Air:proj1-vm-tf skarra$ terraform validate  
Success! The configuration is valid.  
  
Srikanths-MacBook-Air:proj1-vm-tf skarra$
```
- Status Bar:** Shows the current file (`main.tf`), line count (Ln 3, Col 2), spaces (Spaces: 4), encoding (UTF-8), line separator (LF), and the Terraform extension icon.

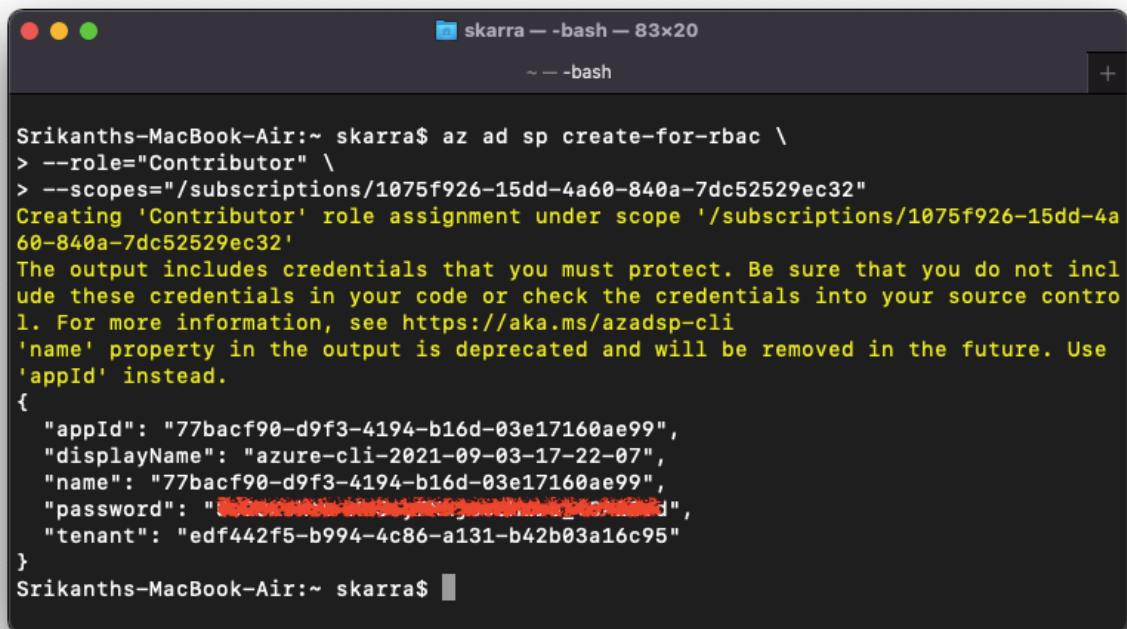
2. Generate Service Principal for Terraform in Azure

As I'm using TechM free trial, I won't be able to create App registration and service principal in Azure Portal. The option is to run AZ CLI command to generate service principal.

Code:

```
$ az ad sp create-for-rbac \
> --role="Contributor" \
> --scopes="/subscriptions/
```

Screenshot:



```
Srikanths-MacBook-Air:~ skarra$ az ad sp create-for-rbac \
> --role="Contributor" \
> --scopes="/subscriptions/1075f926-15dd-4a60-840a-7dc52529ec32"
Creating 'Contributor' role assignment under scope '/subscriptions/1075f926-15dd-4a60-840a-7dc52529ec32'
The output includes credentials that you must protect. Be sure that you do not include these credentials in your code or check the credentials into your source control. For more information, see https://aka.ms/azadsp-cli
'name' property in the output is deprecated and will be removed in the future. Use 'appId' instead.
{
  "appId": "77bacf90-d9f3-4194-b16d-03e17160ae99",
  "displayName": "azure-cli-2021-09-03-17-22-07",
  "name": "77bacf90-d9f3-4194-b16d-03e17160ae99",
  "password": "████████████████████████████████████████",
  "tenant": "edf442f5-b994-4c86-a131-b42b03a16c95"
}
Srikanths-MacBook-Air:~ skarra$
```

3. Create required Vars.tf to create two VMs in Azure

```
vars.tf -> variable "vm_size" -> default
  1 reference
  1  variable "rg" {
  2    type    = string
  3    default = "project1-rg"
  4  }
  5
  6  1 reference
  7  variable "location" {
  8    type    = string
  9    default = "westus3"
 10
 11  variable "vnet" {
 12    type = map(string)
 13    default = {
 14      "name"          = "project1-vnet"
 15      "address_space" = "10.0.0.0/16"
 16    }
 17  }
 18
 19  variable "subnet" {
 20    type = map(string)
 21    default = {
 22      "name"          = "subnet1"
 23      "address_range" = "10.0.0.0/24"
 24    }
 25  }
 26
 27  variable "vm_prefix" {
 28    type    = list(string)
 29    default = ["jenkins-master", "jenkins-slave"]
 30  }
```

vars.tf — proj1-vm-tf

vars.tf > variable "vm_size" > default

```
1 reference
32 variable "vm_size" {
33   type    = string
34   default = "Standard_DS11-1_v2"
35 }
36

1 reference
37 variable "os_disk_caching" {
38   type    = string
39   default = "ReadWrite"
40 }
41

1 reference
42 variable "os_disk_storage_account_type" {
43   type    = string
44   default = "StandardSSD_LRS"
45 }
46

47 variable "os_disk_size" {
48   default = 30
49 }
50

1 reference
51 variable "publisher" {
52   type    = string
53   default = "Canonical"
54 }
55

1 reference
56 variable "offer" {
57   type    = string
58   default = "UbuntuServer"
59 }
```

0 △ 0 ⚡ proj1-vm-tf Azure: SK55204@TechMahindra.com Spaces: 2 UTF-8 LF Terraform ⌂ ⌂

vars.tf — proj1-vm-tf

vars.tf main.tf

vars.tf > variable "vm_size" > default

```
55      1 reference
56  variable "offer" {
57    type    = string
58    default = "UbuntuServer"
59  }
60
61      1 reference
62  variable "sku" {
63    type    = string
64    default = "18.04-LTS"
65
66      4 references
67  variable "username" {
68    type    = string
69    default = "skarra"
```

Spaces: 2 UTF-8 LF Terraform ⚙️ 🔔

4. Create main.tf to create two Linux VMs

The screenshot shows a code editor window with a dark theme. The file being edited is `main.tf`, which contains Terraform configuration code. The code defines a provider block for `azurerm`, followed by resource blocks for a resource group, a virtual network, a subnet, and a network security group. The configuration uses variables from a `vars.tf` file. The right side of the editor shows a tree view of the project structure, and the bottom status bar indicates the file is part of `proj1-vm-tf` and is connected to Azure.

```
provider "azurerm" {
  features {}
}

resource "azurerm_resource_group" "rg" {
  name      = var.rg
  location  = var.location
}

resource "azurerm_virtual_network" "vnet" {
  name            = var.vnet["name"]
  address_space   = [var.vnet["address_space"]]
  resource_group_name = azurerm_resource_group.rg.name
  location        = azurerm_resource_group.rg.location
}

resource "azurerm_subnet" "subnet" {
  name          = var.subnet["name"]
  address_prefixes = [var.subnet["address_range"]]
  resource_group_name = azurerm_resource_group.rg.name
  virtual_network_name = azurerm_virtual_network.vnet.name
}

resource "azurerm_network_security_group" "nsg" {
  name          = "${var.subnet['name']}--nsg"
  location      = azurerm_resource_group.rg.location
  resource_group_name = azurerm_resource_group.rg.name
}

  security_rule {
    name          = "AllowSshInBound"
}
```

Ln 141, Col 90 Spaces: 2 UTF-8 LF Terraform

This screenshot shows a code editor with a dark theme, displaying a Terraform configuration file named `main.tf`. The file contains code for creating a Network Security Group (NSG) and associating it with a subnet. The configuration includes two security rules: one allowing SSH (port 22) and another allowing port 8080. It also creates a public IP resource and associates it with the NSG.

```
29 security_rule {
30   name          = "AllowSshInBound"
31   priority      = 100
32   direction     = "Inbound"
33   access        = "Allow"
34   protocol      = "Tcp"
35   source_port_range = "*"
36   destination_port_range = "22"
37   source_address_prefix = "*"
38   destination_address_prefix = "*"
39 }
40
41 security_rule {
42   name          = "Allow8080InBound"
43   priority      = 110
44   direction     = "Inbound"
45   access        = "Allow"
46   protocol      = "Tcp"
47   source_port_range = "*"
48   destination_port_range = "8080"
49   source_address_prefix = "*"
50   destination_address_prefix = "*"
51 }
52
53
54 resource "azurerm_subnet_network_security_group_association" "subnet-nsg" {
55   subnet_id      = azurerm_subnet.subnet.id
56   network_security_group_id = azurerm_network_security_group.nsg.id
57 }
58
59 resource "azurerm_public_ip" "pip" {
60   count          = length(var.vm_prefix)
61   name           = "${element(var.vm_prefix, count.index)}-pip"
62   resource_group_name = azurerm_resource_group.rg.name
}
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
```

Ln 141, Col 90 Spaces: 2 UTF-8 LF Terraform

This screenshot shows a code editor with a dark theme, displaying a Terraform configuration file named `main.tf`. The file creates a public IP resource, a network interface, and a Linux virtual machine. The VM is configured with two network interfaces, each having a dynamic private IP address and connected to a specific subnet. The configuration uses variables for the number of VMs and their names.

```
59 resource "azurerm_public_ip" "pip" {
60   count          = length(var.vm_prefix)
61   name           = "${element(var.vm_prefix, count.index)}-pip"
62   resource_group_name = azurerm_resource_group.rg.name
63   location       = azurerm_resource_group.rg.location
64   allocation_method = "Static"
65 }
66
67 resource "azurerm_network_interface" "nic" {
68   count          = length(var.vm_prefix)
69   name           = "${element(var.vm_prefix, count.index)}-nic"
70   location       = azurerm_resource_group.rg.location
71   resource_group_name = azurerm_resource_group.rg.name
72
73   ip_configuration {
74     name           = "ipconfig1"
75     subnet_id      = azurerm_subnet.subnet.id
76     private_ip_address_allocation = "Dynamic"
77     public_ip_address_id      = azurerm_public_ip.pip[count.index].id
78   }
79 }
80
81
82 resource "azurerm_linux_virtual_machine" "vm" {
83   count          = length(var.vm_prefix)
84   name           = "${element(var.vm_prefix, count.index)}-vm"
85   resource_group_name = azurerm_resource_group.rg.name
86   location       = azurerm_resource_group.rg.location
87   size           = var.vm_size
88   admin_username  = var.username
89   network_interface_ids = [
90     azurerm_network_interface.nic[count.index].id,
91   ]
}
92
93
94
95
96
97
98
99
```

Ln 66, Col 1 Spaces: 2 UTF-8 LF Terraform

```
main.tf - proj1-vm-tf
vars.tf    main.tf

79 }
80
81 resource "azurerm_linux_virtual_machine" "vm" {
82   count          = length(var.vm_prefix)
83   name           = "${element(var.vm_prefix, count.index)}-vm"
84   resource_group_name = azurerm_resource_group.rg.name
85   location        = azurerm_resource_group.rg.location
86   size            = var.vm_size
87   admin_username  = var.username
88   network_interface_ids = [
89     azurerm_network_interface.nic[count.index].id,
90   ]
91
92   admin_ssh_key {
93     username  = var.username
94     public_key = file("~/ssh/id_rsa.pub")
95   }
96
97   os_disk {
98     caching       = var.os_disk_caching
99     storage_account_type = var.os_disk_storage_account_type
100  }
101
102  source_image_reference {
103    publisher = var.publisher
104    offer     = var.offer
105    sku       = var.sku
106    version   = "latest"
107  }
108 }
109
110 resource "null_resource" "vm1-provisioner" {
111   provisioner "remote-exec" {
```

Ln 66, Col 1 Spaces: 2 UTF-8 LF Terraform

5. Use Terraform Provisioner to install JDK and Jenkins in VM1

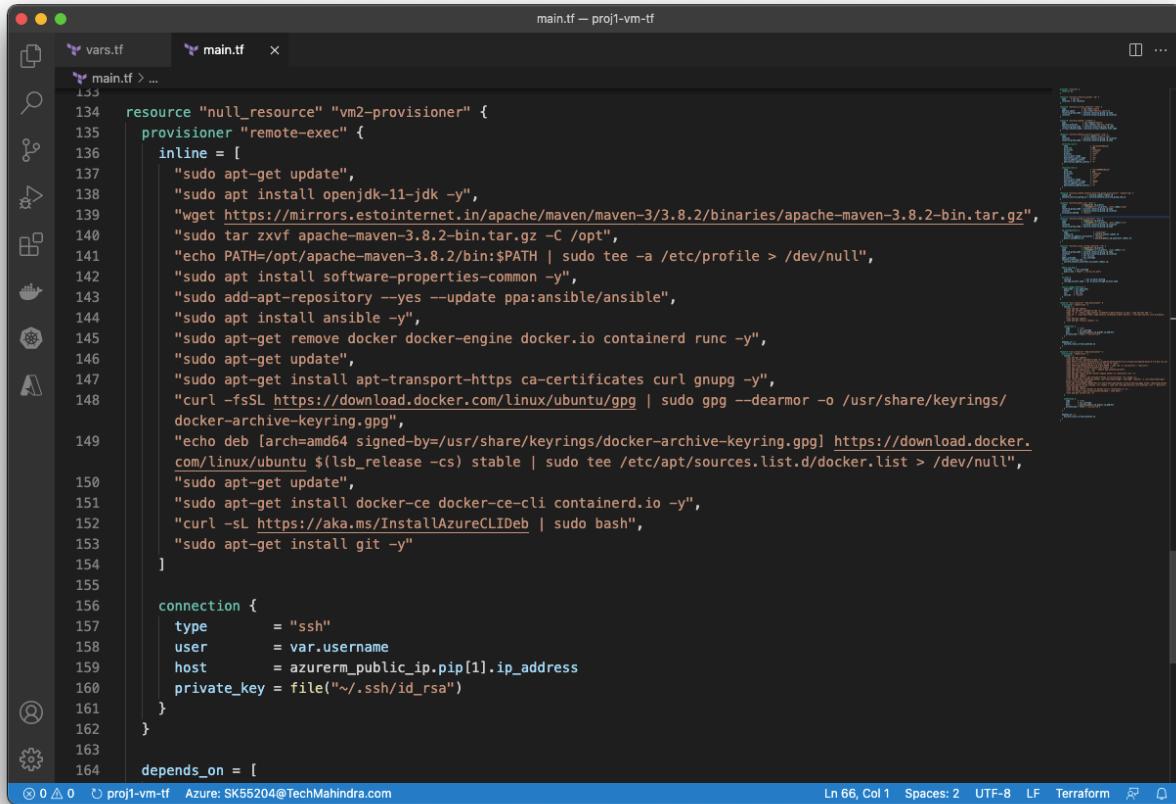
The screenshot shows a code editor window with two files: `vars.tf` and `main.tf`. The `main.tf` file contains Terraform code for provisioning Jenkins and Maven on Azure VMs.

```
resource "null_resource" "vm1-provisioner" {
  provisioner "remote-exec" {
    inline = [
      "sudo apt-get update",
      "sudo apt install openjdk-11-jdk -y",
      "wget -q -O - https://pkg.jenkins.io/debian-stable/jenkins.io.key | sudo apt-key add -",
      "sudo sh -c 'echo deb https://pkg.jenkins.io/debian-stable binary/ > /etc/apt/sources.list.d/jenkins.list'",
      "sudo apt-get update",
      "sudo apt-get install jenkins -y",
    ]
    connection {
      type     = "ssh"
      user     = var.username
      host     = azurerm_public_ip.pip[0].ip_address
      private_key = file("~/ssh/id_rsa")
    }
  }
  depends_on = [
    azurerm_linux_virtual_machine.vm
  ]
}

resource "null_resource" "vm2-provisioner" {
  provisioner "remote-exec" {
    inline = [
      "sudo apt-get update",
      "sudo apt install openjdk-11-jdk -y",
      "wget https://mirrors.estointernet.in/apache/maven/maven-3/3.8.2/binaries/apache-maven-3.8.2-bin.tar.gz",
      "sudo tar zxvf apache-maven-3.8.2-bin.tar.gz -C /opt",
      "echo PATH=/opt/apache-maven-3.8.2/bin:$PATH | sudo tee -a /etc/profile > /dev/null",
    ]
  }
}
```

The `vars.tf` file is partially visible on the left, showing variables like `username` and `azurerm_public_ip.pip`.

6. Use Terraform Provisioner to install JDK, Maven,Ansible,Docker,AzureCli and Git



```
main.tf – proj1-vm-tf
vars.tf
main.tf > ...
main.tf > ...
133
134 resource "null_resource" "vm2-provisioner" {
135   provisioner "remote-exec" {
136     inline = [
137       "sudo apt-get update",
138       "sudo apt install openjdk-11-jdk -y",
139       "wget https://mirrors.estointernet.in/apache/maven/maven-3/3.8.2/binaries/apache-maven-3.8.2-bin.tar.gz",
140       "sudo tar zxvf apache-maven-3.8.2-bin.tar.gz -C /opt",
141       "echo PATH=/opt/apache-maven-3.8.2/bin:$PATH | sudo tee -a /etc/profile > /dev/null",
142       "sudo apt install software-properties-common -y",
143       "sudo add-apt-repository --yes --update ppa:ansible/ansible",
144       "sudo apt install ansible -y",
145       "sudo apt-get remove docker docker-engine docker.io containerd runc -y",
146       "sudo apt-get update",
147       "sudo apt-get install apt-transport-https ca-certificates curl gnupg -y",
148       "curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o /usr/share/keyrings/
docker-archive-keyring.gpg",
149       "echo deb [arch=amd64 signed-by=/usr/share/keyrings/docker-archive-keyring.gpg] https://download.docker.
com/linux/ubuntu $lsb_release -cs) stable | sudo tee /etc/apt/sources.list.d/docker.list > /dev/null",
150       "sudo apt-get update",
151       "sudo apt-get install docker-ce docker-ce-cli containerd.io -y",
152       "curl -sL https://aka.ms/InstallAzureCLIDeb | sudo bash",
153       "sudo apt-get install git -y"
154     ]
155
156     connection {
157       type      = "ssh"
158       user      = var.username
159       host      = azurerm_public_ip.pip[1].ip_address
160       private_key = file("~/ssh/id_rsa")
161     }
162   }
163
164   depends_on = [
165 ]
```

⑧ 0 ▲ 0 ⚡ proj1-vm-tf Azure: SK55204@TechMahindra.com Ln 66, Col 1 Spaces: 2 UTF-8 LF Terraform

The screenshot shows a code editor interface with two tabs: `vars.tf` and `main.tf`. The `main.tf` tab is active, displaying the following Terraform code:

```
main.tf - proj1-vm-tf
main.tf > ...
vars.tf > ...

136     inline = [
137         "sudo apt-get update",
138         "sudo apt install openjdk-11-jdk -y",
139         "wget https://mirrors.estointernet.in/apache/maven/maven-3/3.8.2/binaries/apache-maven-3.8.2-bin.tar.gz",
140         "sudo tar zxvf apache-maven-3.8.2-bin.tar.gz -C /opt",
141         "echo PATH=/opt/apache-maven-3.8.2/bin:$PATH | sudo tee -a /etc/profile > /dev/null",
142         "sudo apt install software-properties-common -y",
143         "sudo add-apt-repository --yes --update ppa:ansible/ansible",
144         "sudo apt install ansible -y",
145         "sudo apt-get remove docker docker-engine docker.io containerd runc -y",
146         "sudo apt-get update",
147         "sudo apt-get install apt-transport-https ca-certificates curl gnupg -y",
148         "curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o /usr/share/keyrings/docker-archive-keyring.gpg",
149         "echo deb [arch=amd64 signed-by=/usr/share/keyrings/docker-archive-keyring.gpg] https://download.docker.com/linux/ubuntu $lsb_release -cs stable | sudo tee /etc/apt/sources.list.d/docker.list > /dev/null",
150         "sudo apt-get update",
151         "sudo apt-get install docker-ce docker-ce-cli containerd.io -y",
152         "curl -sL https://aka.ms/InstallAzureCLIDeb | sudo bash",
153         "sudo apt-get install git -y"
154     ]
155
156     connection {
157         type      = "ssh"
158         user      = var.username
159         host      = azurerm_public_ip.pip[1].ip_address
160         private_key = file("~/ssh/id_rsa")
161     }
162 }
163
164 depends_on = [
165     azurerm_linux_virtual_machine.vm
166 ]
167 }
```

The status bar at the bottom indicates the file is `Ln 66, Col 1`, has `Spaces: 2`, is in `UTF-8` encoding, and is a `LF` file type. It also shows the current user is `Azure: SK55204@TechMahindra.com`.

7. Init,Plan and Apply Terraform Script

Init

main.tf – proj1-vm-tf

```
vars.tf          main.tf > ...
135 provisioner "remote-exec" {
136   inline = [
137     "sudo apt-get update",
138     "sudo apt install openjdk-11-jdk -y",
139     "wget https://mirrors.estointernet.in/apache/maven/maven-3/3.8.2/binaries/apache-maven-3.8.2-bin.tar.gz",
140     "sudo tar zxvf apache-maven-3.8.2-bin.tar.gz -C /opt",
141     "echo PATH=/opt/apache-maven-3.8.2/bin:$PATH | sudo tee -a /etc/profile > /dev/null",
142     "sudo apt install software-properties-common -y"
143   ]
}
PROBLEMS      OUTPUT      DEBUG CONSOLE      TERMINAL
Srikanths-MacBook-Air:proj1-vm-tf skarra$ terraform init

Initializing the backend...

Initializing provider plugins...
- Finding latest version of hashicorp/azurerm...
- Finding latest version of hashicorp/null...
- Installing hashicorp/azurerm v2.75.0...
- Installed hashicorp/azurerm v2.75.0 (signed by HashiCorp)
- Installing hashicorp/null v3.1.0...
- Installed hashicorp/null v3.1.0 (signed by HashiCorp)

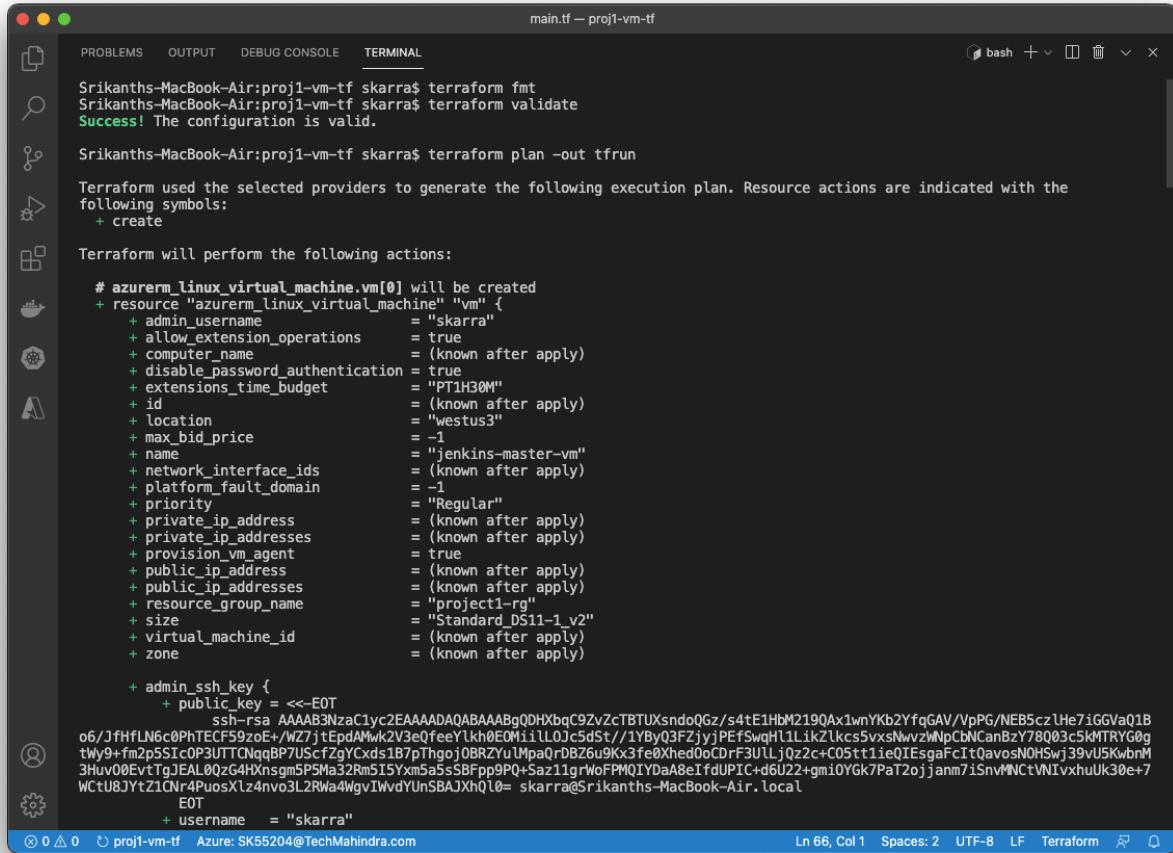
Terraform has created a lock file .terraform.lock.hcl to record the provider
selections it made above. Include this file in your version control repository
so that Terraform can guarantee to make the same selections by default when
you run "terraform init" in the future.

Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform plan" to see
any changes that are required for your infrastructure. All Terraform commands
should now work.

If you ever set or change modules or backend configuration for Terraform,
rerun this command to reinitialize your working directory. If you forget, other
commands will detect it and remind you to do so if necessary.
Srikanths-MacBook-Air:proj1-vm-tf skarra$
```

Fmt, validate and plan



Srikanths-MacBook-Air:proj1-vm-tf skarra\$ terraform fmt
Srikanths-MacBook-Air:proj1-vm-tf skarra\$ terraform validate
Success! The configuration is valid.

Srikanths-MacBook-Air:proj1-vm-tf skarra\$ terraform plan -out tfrun

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the following symbols:

- + create

Terraform will perform the following actions:

```
# azurerm_linux_virtual_machine.vm[0] will be created
+ resource "azurerm_linux_virtual_machine" "vm" {
    + admin_username          = "skarra"
    + allow_extension_operations = true
    + computer_name            = (known after apply)
    + disable_password_authentication = true
    + extensions_time_budget   = "PT1H30M"
    + id                      = (known after apply)
    + location                = "westus3"
    + max_bid_price           = -1
    + name                    = "jenkins-master-vm"
    + network_interface_ids   = (known after apply)
    + platform_fault_domain   = -1
    + priority                = "Regular"
    + private_ip_address       = (known after apply)
    + private_ip_addresses     = (known after apply)
    + provision_vm_agent      = true
    + public_ip_address        = (known after apply)
    + public_ip_addresses      = (known after apply)
    + resource_group_name      = "project1-rg"
    + size                    = "Standard_DS11-1_v2"
    + virtual_machine_id       = (known after apply)
    + zone                     = (known after apply)

    + admin_ssh_key {
        + public_key = <<-EOT
          ssh-rsa AAAAB3NzaC1yc2EAAAQABAAQgQDHXbqC92vZcTBUXsndoQGz/s4tE1HbM2190Ax1wnYKb2YfqGAV/VpPG/NEB5czLHe7iGGVaQ1B
          o6/JfHfLN6c0PhTECF59zoE+/WZ7jtEpdaMwk2V3e0feeYLkh0EOMiilL0Jc5dSt//1YByQ3FZjyjPEfSwqHl1LkZlkcs5vxsnwzMNpCbNCnCanBzY78Q03c5kMTRYG0g
          twly9+fm2p5S1cOP3UTCNqBP7UScfZgYcds187pThgojDBRZYUmpa0rDB26u9Kx3fe0XhedoCfF3UlljQz2c+C05ttie0IEsgaFcItQavosNHSwj39vU5KvbhM
          3Huvo0EvttgJEAL00zG4Hxnsqm5PSMa32Rm515Yxm5a5sSBFpp9PQ+Saz11grwofFMQIYDaA8eIfdUPIC+d6U22+gmi0YGk7pT2ojjanm7iSnMNctVNIvxhuUl30e+7
          WctUBJYtZ1QNra4puosXlZ4nv03L2Rwa4WgvIWvdYUnSBAXJxhQl0= skarra@Srikanths-MacBook-Air.local
        EOT
        + username   = "skarra"
    }
}
```

Ln 66, Col 1 Spaces: 2 UTF-8 LF Terraform

```
main.tf - proj1-vm-tf
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
bash + × ☰

+ username = "skarra"
}

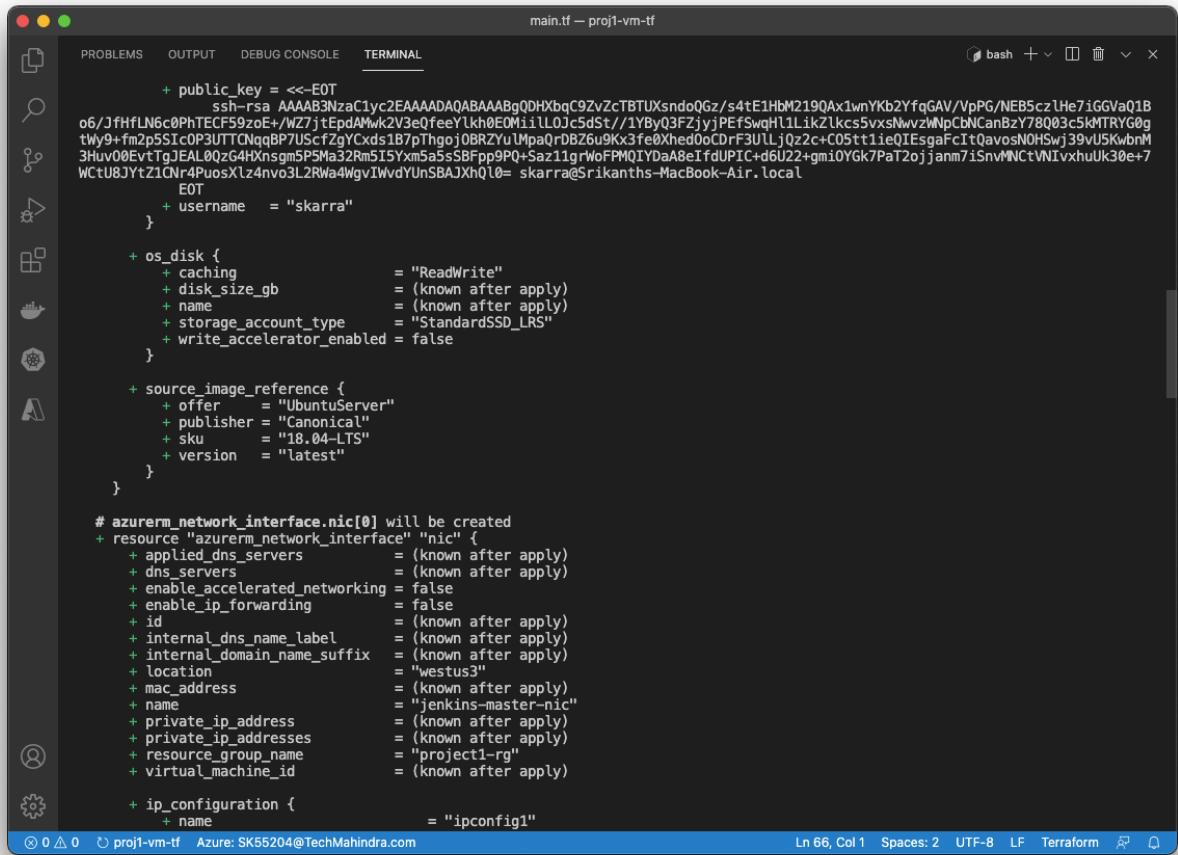
+ os_disk {
    + caching           = "ReadWrite"
    + disk_size_gb     = (known after apply)
    + name              = (known after apply)
    + storage_account_type = "StandardSSD_LRS"
    + write_accelerator_enabled = false
}

+ source_image_reference {
    + offer      = "UbuntuServer"
    + publisher  = "Canonical"
    + sku        = "18.04-LTS"
    + version    = "latest"
}
}

# azurerm_linux_virtual_machine.vm[1] will be created
+ resource "azurerm_linux_virtual_machine" "vm" {
    + admin_username          = "skarra"
    + allow_extension_operations = true
    + computer_name           = (known after apply)
    + disable_password_authentication = true
    + extensions_time_budget   = "PT1H30M"
    + id                      = (known after apply)
    + location                = "westus3"
    + max_bid_price            = -1
    + name                    = "jenkins-slave-vm"
    + network_interface_ids    = (known after apply)
    + platform_fault_domain    = -1
    + priority                 = "Regular"
    + private_ip_address       = (known after apply)
    + private_ip_addresses     = (known after apply)
    + provision_vm_agent       = true
    + public_ip_address        = (known after apply)
    + public_ip_addresses       = (known after apply)
    + resource_group_name      = "project1-rg"
    + size                     = "Standard_DS11-1_v2"
    + virtual_machine_id       = (known after apply)
    + zone                     = (known after apply)

    + admin_ssh_key {
        + public_key = <<-EOT

```



The screenshot shows a Mac OS X desktop environment with a terminal window open. The terminal window has a title bar "main.tf — proj1-vm-tf". The main area of the terminal displays a long command history, likely from a Bash shell, containing various system commands and file paths. The terminal window includes standard OS X interface elements like scroll bars and a status bar at the bottom.

```
main.tf — proj1-vm-tf
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
bash + × ⓘ ×

+ public_key = <<-EOT
    ssh-rsa AAAAB3NzaC1yc2EAAAQABAAQgQDHXbqC9ZvZcTBTUXsndoQGz/s4tE1HbM2190Ax1wnYKb2YfqGAV/VpPG/NEB5czlHe7iGGVaQ1B
o6/JfHfLN6c0PhTECF59zoE+/WZ7jtEpdaMwk2V3e0feeYLkh0EMiilL0Jc5dSt//1YBy03FZjyjPEfSwqh11LikZlkcs5vxshwz1MpCbNCnBzY7803c5kMTRYG0g
tWY9+fm2p5S1cOP3UTCNqq8P7UScfZgYcds187pThgojDBRZYU1MpaQrDBZ6u9Kx3fe0Xhed0oCdF3ULLj0z2c+C05tt1ie0IEsgaFc1tQavosNHSvi39vUSKvbhM
3HuV00EvT1gJEAL002g4Hxhsgm5PMa32Rm515Yxm5a5sSBFpp9PQ+Sa211grw0fPMQIYDaA8eIfdUPIC+d6U22+gm10YGk7PaT2bjanm7isnvMNctvNIVxhuUK30e+/W
Ctu8JYtZ1CNr4puosXLz4nvo3L2Rwa4WgvIWvdYUnSBAJXhQl0= skarra@Srikanths-MacBook-Air.local
    EOT
}
+ username  = "skarra"
}

+ os_disk {
+   caching          = "ReadWrite"
+   disk_size_gb    = (known after apply)
+   name             = (known after apply)
+   storage_account_type = "StandardSSD_LRS"
+   write_accelerator_enabled = false
}

+ source_image_reference {
+   offer            = "UbuntuServer"
+   publisher        = "Canonical"
+   sku              = "18.04-LTS"
+   version          = "latest"
}
}

# azurerm_network_interface.nic[0] will be created
+ resource "azurerm_network_interface" "nic" {
+   applied_dns_servers      = (known after apply)
+   dns_servers               = (known after apply)
+   enable_accelerated_networking = false
+   enable_ip_forwarding     = false
+   id                        = (known after apply)
+   internal_dns_name_label = (known after apply)
+   internal_domain_name_suffix = (known after apply)
+   location                  = "westus3"
+   mac_address                = (known after apply)
+   name                      = "jenkins-master-nic"
+   private_ip_address         = (known after apply)
+   private_ip_addresses       = (known after apply)
+   resource_group_name        = "projct1-rg"
+   virtual_machine_id         = (known after apply)

+   ip_configuration {
+     name           = "ipconfig1"
}

Ln 66, Col 1  Spaces: 2  UTF-8  LF  Terraform  ⌂  ⌂
```

The screenshot shows a dark-themed code editor window with a terminal tab open. The terminal tab displays the following Terraform configuration code:

```
main.tf — proj1-vm-tf
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
bash + v □ v ×

+ ip_configuration {
  + name          = "ipconfig1"
  + primary       = (known after apply)
  + private_ip_address = (known after apply)
  + private_ip_address_allocation = "dynamic"
  + private_ip_address_version   = "IPv4"
  + public_ip_address_id        = (known after apply)
  + subnet_id      = (known after apply)
}
}

# azurerm_network_interface.nic[1] will be created
+ resource "azurerm_network_interface" "nic" {
  + applied_dns_servers      = (known after apply)
  + dns_servers              = (known after apply)
  + enable_accelerated_networking = false
  + enable_ip_forwarding     = false
  + id                       = (known after apply)
  + internal_dns_name_label = (known after apply)
  + internal_domain_name_suffix = (known after apply)
  + location                 = "westus3"
  + mac_address               = (known after apply)
  + name                     = "jenkins-slave-nic"
  + private_ip_address        = (known after apply)
  + private_ip_addresses      = (known after apply)
  + resource_group_name       = "project1-rg"
  + virtual_machine_id        = (known after apply)

  + ip_configuration {
    + name          = "ipconfig1"
    + primary       = (known after apply)
    + private_ip_address = (known after apply)
    + private_ip_address_allocation = "dynamic"
    + private_ip_address_version   = "IPv4"
    + public_ip_address_id        = (known after apply)
    + subnet_id      = (known after apply)
  }
}

# azurerm_network_security_group.ngs will be created
+ resource "azurerm_network_security_group" "nsg" {
  + id           = (known after apply)
  + location     = "westus3"
  + name         = "subnet1-nsg"
```

The status bar at the bottom indicates the file is at Line 66, Column 1, with 2 spaces, using UTF-8 encoding, and is a Terraform file.

The screenshot shows a code editor interface with a dark theme. The top bar includes tabs for PROBLEMS, OUTPUT, DEBUG CONSOLE, and TERMINAL. The TERMINAL tab is active, displaying a terminal window titled 'bash' with various icons. The main area contains a Terraform configuration file named 'main.tf'. The code defines an 'azurerm_network_security_group' resource named 'nsg' with two security rules. The first rule allows SSH traffic (port 22) from any source to the destination address prefix. The second rule allows port 8080 traffic (TCP, port 8080) from any source to the destination address prefix. The configuration uses Terraform's provider-specific syntax for Azure resources.

```
# azurerm_network_security_group.nsg will be created
resource "azurerm_network_security_group" "nsg" {
  + id          = (known after apply)
  + location    = "westus3"
  + name        = "subnet1-nsg"
  + resource_group_name = "project1-rg"
  + security_rule = [
    +
      + access           = "Allow"
      + description     = ""
      + destination_address_prefix = "*"
      + destination_address_prefixes = []
      + destination_application_security_group_ids = []
      + destination_port_range = "22"
      + destination_port_ranges = []
      + direction        = "Inbound"
      + name             = "AllowSshInBound"
      + priority         = 100
      + protocol         = "Tcp"
      + source_address_prefix = "*"
      + source_address_prefixes = []
      + source_application_security_group_ids = []
      + source_port_range = "*"
      + source_port_ranges = []
    },
    +
      + access           = "Allow"
      + description     = ""
      + destination_address_prefix = "*"
      + destination_address_prefixes = []
      + destination_application_security_group_ids = []
      + destination_port_range = "8080"
      + destination_port_ranges = []
      + direction        = "Inbound"
      + name             = "Allow8080InBound"
      + priority         = 110
      + protocol         = "Tcp"
      + source_address_prefix = "*"
      + source_address_prefixes = []
      + source_application_security_group_ids = []
      + source_port_range = "*"
      + source_port_ranges = []
    ],
  ]
}
```

Bottom status bar: ⚡ 0 ▲ 0 🌐 proj1-vm-tf Azure: SK55204@TechMahindra.com Ln 66, Col 1 Spaces: 2 UTF-8 LF Terraform

The screenshot shows a dark-themed code editor interface with a central code editor pane and various toolbars and status bars.

Code Editor Content:

```
# azurerm_public_ip.pip[0] will be created
+ resource "azurerm_public_ip" "pip" {
    + allocation_method      = "Static"
    + availability_zone     = (known after apply)
    + fqdn                  = (known after apply)
    + id                    = (known after apply)
    + idle_timeout_in_minutes = 4
    + ip_address            = (known after apply)
    + ip_version             = "IPv4"
    + location               = "westus3"
    + name                  = "jenkins-master-pip"
    + resource_group_name   = "project1-rg"
    + sku                   = "Basic"
    + sku_tier               = "Regional"
    + zones                 = (known after apply)
}

# azurerm_public_ip.pip[1] will be created
+ resource "azurerm_public_ip" "pip" {
    + allocation_method      = "Static"
    + availability_zone     = (known after apply)
    + fqdn                  = (known after apply)
    + id                    = (known after apply)
    + idle_timeout_in_minutes = 4
    + ip_address            = (known after apply)
    + ip_version             = "IPv4"
    + location               = "westus3"
    + name                  = "jenkins-slave-pip"
    + resource_group_name   = "project1-rg"
    + sku                   = "Basic"
    + sku_tier               = "Regional"
    + zones                 = (known after apply)
}

# azurerm_resource_group.rg will be created
+ resource "azurerm_resource_group" "rg" {
    + id                    = (known after apply)
    + location              = "westus3"
    + name                  = "project1-rg"
}

# azurerm_subnet.subnet will be created
+ resource "azurerm_subnet" "subnet" {
    + address_prefix          = (known after apply)
    + address_prefixes        = [

```

Toolbar Icons:

- File
- Search
- Find
- Replace
- Copy
- Paste
- Format
- Open
- Save
- Terminal

Status Bar:

main.tf — proj1-vm-tf

Ln 66, Col 1 Spaces: 2 UTF-8 LF Terraform

The screenshot shows a Microsoft Visual Studio Code interface with a terminal tab active. The terminal window displays Terraform configuration code for Azure resources, specifically a VNet, subnet, and security group association. The code includes resource declarations for azurerm_subnet, azurerm_subnet_network_security_group_association, and azurerm_virtual_network, along with their respective properties and values. The terminal status bar at the bottom indicates the file is 'main.tf' in the 'proj1-vm-tf' workspace, connected to 'Azure: SK55204@TechMahindra.com'.

```
# azurerm_subnet.subnet will be created
+ resource "azurerm_subnet" "subnet" {
    + address_prefixes          = ["10.0.0.0/24"]
    + enforce_private_link_endpoint_network_policies = false
    + enforce_private_link_service_network_policies = false
    + id                           = "subnet1"
    + name                         = "project1-rg"
    + resource_group_name          = "project1-vnet"
}

# azurerm_subnet_network_security_group_association.subnet-nsg will be created
+ resource "azurerm_subnet_network_security_group_association" "subnet-nsg" {
    + id                           = "subnet-nsg"
    + network_security_group_id   = "nsg1"
    + subnet_id                   = "subnet1"
}

# azurerm_virtual_network.vnet will be created
+ resource "azurerm_virtual_network" "vnet" {
    + address_space                = ["10.0.0.0/16"]
    + dns_servers                  = []
    + guid                         = "guid1"
    + id                           = "vnet1"
    + location                     = "westus3"
    + name                         = "project1-vnet"
    + resource_group_name          = "project1-rg"
    + subnet                       = "subnet1"
    + vm_protection_enabled       = false
}

# null_resource.vm1-provisioner will be created
+ resource "null_resource" "vm1-provisioner" {
    + id                           = "vm1-provisioner"
}

# null_resource.vm2-provisioner will be created
+ resource "null_resource" "vm2-provisioner" {
    + id                           = "vm2-provisioner"
}
```

The screenshot shows a Visual Studio Code interface with a dark theme. The main area displays a Terraform plan for a project named 'proj1-vm-tf'. The code editor shows the following Terraform plan:

```
main.tf — proj1-vm-tf
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
bash + v x
+ resource_group_name = "project1-rg"
+ virtual_network_name = "project1-vnet"
}
# azurerm_subnet_network_security_group_association.subnet-nsg will be created
+ resource "azurerm_subnet_network_security_group_association" "subnet-nsg" {
+ id = (known after apply)
+ network_security_group_id = (known after apply)
+ subnet_id = (known after apply)
}
# azurerm_virtual_network.vnet will be created
+ resource "azurerm_virtual_network" "vnet" {
+ address_space = [
+ "10.0.0.0/16",
]
+ dns_servers = (known after apply)
+ guid = (known after apply)
+ id = (known after apply)
+ location = "westus3"
+ name = "project1-vnet"
+ resource_group_name = "project1-rg"
+ subnet = (known after apply)
+ vm_protection_enabled = false
}
# null_resource.vm1-provisioner will be created
+ resource "null_resource" "vm1-provisioner" {
+ id = (known after apply)
}
# null_resource.vm2-provisioner will be created
+ resource "null_resource" "vm2-provisioner" {
+ id = (known after apply)
}
Plan: 13 to add, 0 to change, 0 to destroy.
```

Below the code editor, there are status icons for saved changes, file type, and user information. A terminal window is open at the bottom, showing the command: `terraform apply "tfrun"`. The terminal also shows the current user's name and session details. The status bar at the bottom right indicates the current line (Ln 66), column (Col 1), spaces (Spaces: 2), encoding (UTF-8), line feed (LF), and the Terraform extension icon.

Apply

The screenshot shows a terminal window titled "main.tf – proj1-vm-tf". The terminal is running a "bash" shell. The output of the "terraform apply -auto-approve" command is displayed, showing the creation of various Azure resources. The resources include an Azure Resource Group, Public IP addresses, Virtual Network, Network Security Groups, Subnets, Network Interfaces, and Linux Virtual Machines. The output includes status messages like "Creating...", "Creation complete after [time]", and "Still creating... [time elapsed]". The terminal interface includes a sidebar with icons for file operations, a search bar, and a bottom status bar with information like "Ln 66, Col 1" and "Spaces: 2".

```
Srikanths-MacBook-Air:proj1-vm-tf skarra$ terraform apply -auto-approve tfrun
azurerm_resource_group.rg: Creating...
azurerm_resource_group.rg: Creation complete after 5s [id=/subscriptions/1075f926-15dd-4a60-840a-7dc52529ec32/resourceGroups/project1-rg]
azurerm_public_ip.pip[0]: Creating...
azurerm_public_ip.pip[1]: Creating...
azurerm_virtual_network.vnet: Creating...
azurerm_network_security_group.nsg: Creating...
azurerm_public_ip.pip[1]: Still creating... [10s elapsed]
azurerm_public_ip.pip[0]: Still creating... [10s elapsed]
azurerm_virtual_network.vnet: Still creating... [10s elapsed]
azurerm_network_security_group.nsg: Still creating... [10s elapsed]
azurerm_public_ip.pip[1]: Creation complete after 10s [id=/subscriptions/1075f926-15dd-4a60-840a-7dc52529ec32/resourceGroups/project1-rg/providers/Microsoft.Network/publicIPAddresses/jenkins-slave-pip]
azurerm_public_ip.pip[0]: Creation complete after 13s [id=/subscriptions/1075f926-15dd-4a60-840a-7dc52529ec32/resourceGroups/project1-rg/providers/Microsoft.Network/publicIPAddresses/jenkins-master-pip]
azurerm_virtual_network.vnet: Creation complete after 14s [id=/subscriptions/1075f926-15dd-4a60-840a-7dc52529ec32/resourceGroups/project1-rg/providers/Microsoft.Network/virtualNetworks/project1-vnet]
azurerm_subnet.subnet: Creating...
azurerm_network_security_group.nsg: Creation complete after 16s [id=/subscriptions/1075f926-15dd-4a60-840a-7dc52529ec32/resourceGroups/project1-rg/providers/Microsoft.Network/networkSecurityGroups/subnet1-nsg]
azurerm_subnet.subnet: Creation complete after 9s [id=/subscriptions/1075f926-15dd-4a60-840a-7dc52529ec32/resourceGroups/project1-rg/providers/Microsoft.Network/virtualNetworks/project1-vnet/subnets/subnet1]
azurerm_subnet.network_security_group_association.subnet-nsg: Creating...
azurerm_network_interface.nic[1]: Creating...
azurerm_network_interface.nic[0]: Creating...
azurerm_subnet.network_security_group_association.subnet-nsg: Creation complete after 10s [id=/subscriptions/1075f926-15dd-4a60-840a-7dc52529ec32/resourceGroups/project1-rg/providers/Microsoft.Network/virtualNetworks/project1-vnet/subnets/subnet1]
azurerm_network_interface.nic[1]: Still creating... [10s elapsed]
azurerm_network_interface.nic[0]: Still creating... [10s elapsed]
azurerm_network_interface.nic[1]: Creation complete after 18s [id=/subscriptions/1075f926-15dd-4a60-840a-7dc52529ec32/resourceGroups/project1-rg/providers/Microsoft.Network/networkInterfaces/jenkins-slave-nic]
azurerm_network_interface.nic[0]: Still creating... [20s elapsed]
azurerm_network_interface.nic[0]: Creation complete after 23s [id=/subscriptions/1075f926-15dd-4a60-840a-7dc52529ec32/resourceGroups/project1-rg/providers/Microsoft.Network/networkInterfaces/jenkins-master-nic]
azurerm_linux_virtual_machine.vm[0]: Creating...
azurerm_linux_virtual_machine.vm[1]: Creating...
azurerm_linux_virtual_machine.vm[0]: Still creating... [10s elapsed]
azurerm_linux_virtual_machine.vm[1]: Still creating... [10s elapsed]
azurerm_linux_virtual_machine.vm[0]: Still creating... [20s elapsed]
azurerm_linux_virtual_machine.vm[1]: Still creating... [20s elapsed]
azurerm_linux_virtual_machine.vm[0]: Still creating... [30s elapsed]
azurerm_linux_virtual_machine.vm[1]: Still creating... [30s elapsed]
azurerm_linux_virtual_machine.vm[0]: Still creating... [40s elapsed]
azurerm_linux_virtual_machine.vm[1]: Still creating... [40s elapsed]
```

main.tf — proj1-vm-tf

TERMINAL

```
azurerm_linux_virtual_machine.vm[1]: Still creating... [40s elapsed]
azurerm_linux_virtual_machine.vm[1]: Still creating... [50s elapsed]
azurerm_linux_virtual_machine.vm[0]: Still creating... [50s elapsed]
azurerm_linux_virtual_machine.vm[1]: Creation complete after 1m0s [id=/subscriptions/1075f926-15dd-4a60-840a-7dc52529ec32/resourceGroups/project1-rg/providers/Microsoft.Compute/virtualMachines/jenkins-slave-vm]
azurerm_linux_virtual_machine.vm[0]: Still creating... [1m0s elapsed]
azurerm_linux_virtual_machine.vm[0]: Creation complete after 1m1s [id=/subscriptions/1075f926-15dd-4a60-840a-7dc52529ec32/resourceGroups/project1-rg/providers/Microsoft.Compute/virtualMachines/jenkins-master-vm]
null_resource.vm2-provisioner: Creating...
null_resource.vm1-provisioner: Creating...
null_resource.vm1-provisioner: Provisioning with 'remote-exec'...
null_resource.vm2-provisioner: Provisioning with 'remote-exec'...
null_resource.vm1-provisioner (remote-exec): Connecting to remote host via SSH...
null_resource.vm1-provisioner (remote-exec): Host: 20.106.90.38
null_resource.vm1-provisioner (remote-exec): User: skarra
null_resource.vm1-provisioner (remote-exec): Password: false
null_resource.vm1-provisioner (remote-exec): Private key: true
null_resource.vm1-provisioner (remote-exec): Certificate: false
null_resource.vm1-provisioner (remote-exec): SSH Agent: true
null_resource.vm1-provisioner (remote-exec): Checking Host Key: false
null_resource.vm1-provisioner (remote-exec): Target Platform: unix
null_resource.vm2-provisioner (remote-exec): Connecting to remote host via SSH...
null_resource.vm2-provisioner (remote-exec): Host: 20.106.89.231
null_resource.vm2-provisioner (remote-exec): User: skarra
null_resource.vm2-provisioner (remote-exec): Password: false
null_resource.vm2-provisioner (remote-exec): Private key: true
null_resource.vm2-provisioner (remote-exec): Certificate: false
null_resource.vm2-provisioner (remote-exec): SSH Agent: true
null_resource.vm2-provisioner (remote-exec): Checking Host Key: false
null_resource.vm2-provisioner (remote-exec): Target Platform: unix
null_resource.vm2-provisioner (remote-exec): Connected!
null_resource.vm1-provisioner (remote-exec): Connected!
null_resource.vm1-provisioner (remote-exec): % [Working]
null_resource.vm1-provisioner (remote-exec): Hit:1 http://azure.archive.ubuntu.com/ubuntu bionic InRelease
null_resource.vm2-provisioner (remote-exec): % [Connecting to security.ubuntu.com {
null_resource.vm2-provisioner (remote-exec): % [1 InRelease gpgv 242 kB] [Waiting f
null_resource.vm2-provisioner (remote-exec): Get:2 http://azure.archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 kB]
null_resource.vm2-provisioner (remote-exec): % [1 InRelease gpgv 242 kB] [2 InRelea
null_resource.vm2-provisioner (remote-exec): % [1 InRelease gpgv 242 kB] [Waiting f
null_resource.vm2-provisioner (remote-exec): Get:3 http://security.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
null_resource.vm2-provisioner (remote-exec): % [3 InRelease 88.2 kB/88.7 kB 99%]
```

Ln 66, Col 1 Spaces: 2 UTF-8 LF Terraform

```
main.tf -- proj1-vm-tf
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
bash + ⌂ ⌄ ⌁ ⌂ ×

null_resource.vm1-provisioner (remote-exec): Get:23 http://security.ubuntu.com/ubuntu bionic-security/restricted amd64 Packages [419 kB]
null_resource.vm1-provisioner (remote-exec): 88% [5 Packages store 0 B] [23 Packages]
null_resource.vm1-provisioner (remote-exec): Get:24 http://security.ubuntu.com/ubuntu bionic-security/restricted Translation-en [56.1 kB]
null_resource.vm1-provisioner (remote-exec): 89% [5 Packages store 0 B] [24 Translat
null_resource.vm1-provisioner (remote-exec): Get:25 http://security.ubuntu.com/ubuntu bionic-security/universe amd64 Packages [11
37 kB]
null_resource.vm1-provisioner (remote-exec): 89% [5 Packages store 0 B] [25 Packages]
null_resource.vm1-provisioner (remote-exec): Get:26 http://security.ubuntu.com/ubuntu bionic-security/universe Translation-en [25
9 kB]
null_resource.vm1-provisioner (remote-exec): 93% [5 Packages store 0 B] [26 Translat
null_resource.vm1-provisioner (remote-exec): Get:27 http://security.ubuntu.com/ubuntu bionic-security/multiverse amd64 Packages [
20.9 kB]
null_resource.vm1-provisioner (remote-exec): Get:28 http://security.ubuntu.com/ubuntu bionic-security/multiverse Translation-en [
4732 B]
null_resource.vm1-provisioner (remote-exec): 94% [5 Packages store 0 B]
null_resource.vm2-provisioner (remote-exec): 94% [5 Packages store 0 B]
null_resource.vm2-provisioner (remote-exec): 95% [Working]
null_resource.vm2-provisioner (remote-exec): 95% [6 Translation-en store 0 B]
null_resource.vm1-provisioner (remote-exec): 94% [5 Packages store 0 B]
null_resource.vm2-provisioner (remote-exec): 95% [6 Translation-en store 0 B]
null_resource.vm1-provisioner (remote-exec): 95% [Working]
null_resource.vm1-provisioner (remote-exec): 95% [6 Translation-en store 0 B]
null_resource.vm2-provisioner (remote-exec): 95% [Working]
null_resource.vm2-provisioner (remote-exec): 95% [8 Packages store 0 B]
null_resource.vm2-provisioner (remote-exec): 95% [Working]
null_resource.vm2-provisioner (remote-exec): 95% [9 Translation-en store 0 B]
null_resource.vm2-provisioner (remote-exec): 95% [Working]
null_resource.vm2-provisioner (remote-exec): 95% [10 Packages store 0 B]
null_resource.vm2-provisioner (remote-exec): 95% [Working]
null_resource.vm2-provisioner (remote-exec): 95% [11 Translation-en store 0 B]
null_resource.vm1-provisioner (remote-exec): 95% [6 Translation-en store 0 B]
null_resource.vm2-provisioner (remote-exec): 96% [Working]
null_resource.vm2-provisioner (remote-exec): 96% [12 Packages store 0 B]
null_resource.vm2-provisioner (remote-exec): 96% [Working]
null_resource.vm2-provisioner (remote-exec): 96% [13 Translation-en store 0 B]
null_resource.vm2-provisioner (remote-exec): 96% [Working]
null_resource.vm2-provisioner (remote-exec): 96% [14 Packages store 0 B]
null_resource.vm1-provisioner (remote-exec): 95% [Working]
null_resource.vm1-provisioner (remote-exec): 95% [8 Packages store 0 B]
null_resource.vm1-provisioner (remote-exec): 95% [Working]
null_resource.vm1-provisioner (remote-exec): 95% [9 Translation-en store 0 B]
null_resource.vm1-provisioner (remote-exec): 95% [Working]
null_resource.vm1-provisioner (remote-exec): 95% [10 Packages store 0 B]

Ln 66, Col 1  Spaces: 2  UTF-8  LF  Terraform  ⌂ ⌁ ⌂
```

The screenshot shows a terminal window with the following content:

```
main.tf -- proj1-vm-tf
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
bash + v □ v ×
null_resource.vm2-provisioner (remote-exec): linux-headers-4.15.0-151
null_resource.vm2-provisioner (remote-exec): Use 'sudo apt autoremove' to remove it.
null_resource.vm2-provisioner (remote-exec): The following additional packages will be installed:
null_resource.vm2-provisioner (remote-exec):   at-spi2-core ca-certificates-java
null_resource.vm2-provisioner (remote-exec):   fontconfig-config fonts-dejavu-core
null_resource.vm2-provisioner (remote-exec):   fonts-dejavu-extra java-common
null_resource.vm2-provisioner (remote-exec):   libasound2 libasound2-data
null_resource.vm2-provisioner (remote-exec):   libatk-bridge2.0-0
null_resource.vm2-provisioner (remote-exec):   libatk-wrapper-java
null_resource.vm2-provisioner (remote-exec):   libatk-wrapper-java-jni libatk1.0-0
null_resource.vm2-provisioner (remote-exec):   libatk1.0-data libatkspi2.0-0
null_resource.vm2-provisioner (remote-exec):   libdrm-amdgpu1 libdrm-intel1
null_resource.vm2-provisioner (remote-exec):   libdrm-nouveau2 libdrm-radeon1
null_resource.vm2-provisioner (remote-exec):   libfontconfig1 libfontenc1 libgif7
null_resource.vm2-provisioner (remote-exec):   libgl1 libgl1-mesa-dri libglapi-mesa
null_resource.vm2-provisioner (remote-exec):   libglvnd0 libglx-mesa0 libglx0
null_resource.vm2-provisioner (remote-exec):   libgraphite2-3 libharfbuzz0b
null_resource.vm2-provisioner (remote-exec):   libice-dev libice6 libjpeg-turbo8
null_resource.vm2-provisioner (remote-exec):   libjpeg8 liblcms2-2 liblvm10
null_resource.vm2-provisioner (remote-exec):   libnspr4 libnss3 libpciaccess0
null_resource.vm2-provisioner (remote-exec):   libpccsclite1 libpthread-stubs0-dev
null_resource.vm2-provisioner (remote-exec):   libsensors4 libsm-dev libsm6
null_resource.vm2-provisioner (remote-exec):   libx11-dev libx11-doc libx11-xcb1
null_resource.vm2-provisioner (remote-exec):   libxau-dev libxaw7 libxcb-dri2-0
null_resource.vm2-provisioner (remote-exec):   libxcb-dri3-0 libxcb-glx0
null_resource.vm2-provisioner (remote-exec):   libxcb-present0 libxcb-shape0
null_resource.vm2-provisioner (remote-exec):   libxcb-sync1 libxcb1-dev
null_resource.vm2-provisioner (remote-exec):   libcomposite1 libxdamage1
null_resource.vm2-provisioner (remote-exec):   libxdmcp-dev libxfixes3 libxf86
null_resource.vm2-provisioner (remote-exec):   libxi6 libxinerama1 libxmu6 libxpm4
null_resource.vm2-provisioner (remote-exec):   libxrandr2 libxrender1 libxshmfence1
null_resource.vm2-provisioner (remote-exec):   libxt-dev libxt6 libxtst6 libxv1
null_resource.vm2-provisioner (remote-exec):   libxxf86dg1 libxxf86vm1
null_resource.vm2-provisioner (remote-exec):   openjdk-11-jdk-headless
null_resource.vm2-provisioner (remote-exec):   openjdk-11-jre
null_resource.vm2-provisioner (remote-exec):   openjdk-11-jre-headless x11-common
null_resource.vm2-provisioner (remote-exec):   x11-utils x11proto-core-dev
null_resource.vm2-provisioner (remote-exec):   x11proto-dev xorg-sgml-doctools
null_resource.vm2-provisioner (remote-exec):   xtrans-dev
null_resource.vm2-provisioner (remote-exec): Suggested packages:
null_resource.vm2-provisioner (remote-exec):   default-jre libasound2-plugins
null_resource.vm2-provisioner (remote-exec):   alsamixer libice-doc liblcms2-utils
null_resource.vm2-provisioner (remote-exec):   pccscl lib-sensors libsm-doc
null_resource.vm2-provisioner (remote-exec):   libxcb-doc libxt-doc openjdk-11-demo
null_resource.vm2-provisioner (remote-exec):   openjdk-11-source visualvm
```

At the bottom of the terminal window, there is a status bar with the following information:

Ln 66, Col 1 Spaces: 2 UTF-8 LF Terraform

The screenshot shows a terminal window titled "main.tf — proj1-vm-tf". The window has tabs for PROBLEMS, OUTPUT, DEBUG CONSOLE, and TERMINAL, with TERMINAL selected. The terminal content displays the output of a Terraform plan command, showing the installation of various packages. The output includes:

```
null_resource.vm1-provisioner (remote-exec): Reading package lists... 99%
null_resource.vm1-provisioner (remote-exec): Reading package lists... Done
null_resource.vm2-provisioner (remote-exec): The following NEW packages will be installed:
null_resource.vm2-provisioner (remote-exec):   at-spi2-core ca-certificates-java
null_resource.vm2-provisioner (remote-exec):   fontconfig-config fonts-dejavu-core
null_resource.vm2-provisioner (remote-exec):   fonts-dejavu-extra java-common
null_resource.vm2-provisioner (remote-exec):   libasound2 libasound2-data
null_resource.vm2-provisioner (remote-exec):   libatk-bridge2.0-0
null_resource.vm2-provisioner (remote-exec):   libatk-wrapper-java
null_resource.vm2-provisioner (remote-exec):   libatk-wrapper-java-jni libatk1.0-0
null_resource.vm2-provisioner (remote-exec):   libatk1.0-data libatkspi2.0-0
null_resource.vm2-provisioner (remote-exec):   libdrm-amdgpu1 libdrm-intel1
null_resource.vm2-provisioner (remote-exec):   libdrm-nouveau2 libdrm-radeon1
null_resource.vm2-provisioner (remote-exec):   libfontconfig1 libfontenc1 libgif7
null_resource.vm2-provisioner (remote-exec):   libgl1 libgl1-mesa-dri libglapi-mesa
null_resource.vm2-provisioner (remote-exec):   libglvnd0 libglx-mesa0 libglx0
null_resource.vm2-provisioner (remote-exec):   libgraphite2-3 libharfbuzz0b
null_resource.vm2-provisioner (remote-exec):   libice-dev libice6 libjpeg-turbo8
null_resource.vm2-provisioner (remote-exec):   libjpeg8 liblcms2-2 liblvm10
null_resource.vm2-provisioner (remote-exec):   libnspr4 libnss3 libpciaccess0
null_resource.vm2-provisioner (remote-exec):   libpccsclite1 libpthread-stubs0-dev
null_resource.vm2-provisioner (remote-exec):   libsensors4 libsm-dev libsm6
null_resource.vm2-provisioner (remote-exec):   libx11-dev libx11-doc libx11-xcb1
null_resource.vm2-provisioner (remote-exec):   libxau-dev libxaw7 libxcb-dri2-0
null_resource.vm2-provisioner (remote-exec):   libxcb-dri3-0 libxcb-glx0
null_resource.vm2-provisioner (remote-exec):   libxcb-present0 libxcb-shape0
null_resource.vm2-provisioner (remote-exec):   libxcb-sync1 libxcb1-dev
null_resource.vm2-provisioner (remote-exec):   libxcompositel libxdamage1
null_resource.vm2-provisioner (remote-exec):   libxdmcp-dev libxfixes3 libxft2
null_resource.vm2-provisioner (remote-exec):   libxi6 libxinerama1 libxmu6 libxpm4
null_resource.vm2-provisioner (remote-exec):   libxrandr2 libxrender1 libxshmfence1
null_resource.vm2-provisioner (remote-exec):   libxt-dev libxt6 libxtst6 libxv1
null_resource.vm2-provisioner (remote-exec):   libxxf86dg1 libxxf86vm1
null_resource.vm2-provisioner (remote-exec):   openjdk-11-jdk
null_resource.vm2-provisioner (remote-exec):   openjdk-11-jdk-headless
null_resource.vm2-provisioner (remote-exec):   openjdk-11-jre
null_resource.vm2-provisioner (remote-exec):   openjdk-11-jre-headless x11-common
null_resource.vm2-provisioner (remote-exec):   x11-utils x11proto-core-dev
null_resource.vm2-provisioner (remote-exec):   x11proto-dev xorg-sgml-doctools
null_resource.vm2-provisioner (remote-exec):   xtrans-dev
null_resource.vm2-provisioner (remote-exec): 0 upgraded, 83 newly installed, 0 to remove and 30 not upgraded.
null_resource.vm2-provisioner (remote-exec): Need to get 295 MB of archives.
null_resource.vm2-provisioner (remote-exec): After this operation, 770 MB of additional disk space will be used.
null_resource.vm2-provisioner (remote-exec): 0% [Working]
```

The status bar at the bottom shows: Ln 66, Col 1 Spaces: 2 UTF-8 LF Terraform

The screenshot shows a terminal window with the following content:

```
main.tf -- proj1-vm-tf
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
bash + v □ ^ v x
null_resource.vm2-provisioner (remote-exec):
null_resource.vm2-provisioner (remote-exec): 7% [26 openjdk-11-jre-headless 0 B/37.2
null_resource.vm1-provisioner (remote-exec): The following package was automatically installed and is no longer required:
null_resource.vm1-provisioner (remote-exec):   linux-headers-4.15.0-151
null_resource.vm1-provisioner (remote-exec): Use 'sudo apt autoremove' to remove it.
null_resource.vm1-provisioner (remote-exec): The following additional packages will be installed:
null_resource.vm1-provisioner (remote-exec):   at-spi2-core ca-certificates-java
null_resource.vm1-provisioner (remote-exec):   fontconfig-config fonts-dejavu-core
null_resource.vm1-provisioner (remote-exec):   fonts-dejavu-extra java-common
null_resource.vm1-provisioner (remote-exec):   libasound2 libasound2-data
null_resource.vm1-provisioner (remote-exec):   libatk-bridge2.0-0
null_resource.vm1-provisioner (remote-exec):   libatk-wrapper-java
null_resource.vm1-provisioner (remote-exec):   libatk-wrapper-java-jni libatk1.0-0
null_resource.vm1-provisioner (remote-exec):   libatk1.0-data libatspi2.0-0
null_resource.vm1-provisioner (remote-exec):   libdrm-amdgpu1 libdrm-intel1
null_resource.vm1-provisioner (remote-exec):   libdrm-nouveau2 libdrm-radeon1
null_resource.vm1-provisioner (remote-exec):   libfontconfig1 libfontenc1 libgif7
null_resource.vm1-provisioner (remote-exec):   libgl1 libgl1-mesa-dri libglapi-mesa
null_resource.vm1-provisioner (remote-exec):   libglvnd0 libglx-mesa0 libglx0
null_resource.vm1-provisioner (remote-exec):   libgraphite2-3 libharfbuzz0b
null_resource.vm1-provisioner (remote-exec):   libice-dev libice6 libjpeg-turbo8
null_resource.vm1-provisioner (remote-exec):   libjpeg8 liblcms2-2 liblvm10
null_resource.vm1-provisioner (remote-exec):   libnspr4 libnss3 libpciaccess0
null_resource.vm1-provisioner (remote-exec):   libpcslite1 libpthread-stubs0-dev
null_resource.vm1-provisioner (remote-exec):   libsensors4 libsm-dev libsm6
null_resource.vm1-provisioner (remote-exec):   libxi1-dev libxi1-doc libxi1-xcb1
null_resource.vm1-provisioner (remote-exec):   libxau-dev libxaw7 libxcb-driz-0
null_resource.vm1-provisioner (remote-exec):   libxcb-dri3-0 libxcb-glx0
null_resource.vm1-provisioner (remote-exec):   libxcb-present0 libxcb-shape0
null_resource.vm1-provisioner (remote-exec):   libxcb-sync1 libxcb1-dev
null_resource.vm1-provisioner (remote-exec):   libcomposite1 libxdamage1
null_resource.vm1-provisioner (remote-exec):   libxdmcp-dev libxfices3 libxft2
null_resource.vm1-provisioner (remote-exec):   libxi6 libxinerama1 libxmu6 libxpm4
null_resource.vm1-provisioner (remote-exec):   libxrandr2 libxrender1 libxshmfence1
null_resource.vm1-provisioner (remote-exec):   libxt-dev libxt6 libxtst6 libxv1
null_resource.vm1-provisioner (remote-exec):   libxxf86dg1 libxxf86vm1
null_resource.vm1-provisioner (remote-exec):   openjdk-11-jdk-headless
null_resource.vm1-provisioner (remote-exec):   openjdk-11-jre
null_resource.vm1-provisioner (remote-exec):   openjdk-11-jre-headless x11-common
null_resource.vm1-provisioner (remote-exec):   x11-utils x11proto-core-dev
null_resource.vm1-provisioner (remote-exec):   x11proto-dev xorg-sgml-doctools
null_resource.vm1-provisioner (remote-exec):   xtrans-dev
null_resource.vm1-provisioner (remote-exec): Suggested packages:
null_resource.vm1-provisioner (remote-exec):   default-jre libasound2-plugins
null_resource.vm1-provisioner (remote-exec):   alsalibice-doc liblcms2-utils
```

At the bottom of the terminal window, there is a status bar with the following information:

Ln 66, Col 1 Spaces: 2 UTF-8 LF Terraform

main.tf – proj1-vm-tf

```
null_resource.vml-provisioner (remote-exec): 0% [2 InRelease gpgv 88.7 kB]
null_resource.vml-provisioner (remote-exec): 0% [Working]
null_resource.vml-provisioner (remote-exec): 0% [3 InRelease gpgv 74.6 kB]
null_resource.vml-provisioner (remote-exec): 0% [Working]
null_resource.vml-provisioner (remote-exec): 0% [4 InRelease gpgv 88.7 kB]
null_resource.vml-provisioner (remote-exec): 0% [Working]
null_resource.vml-provisioner (remote-exec): 0% [7 Release.gpg gpgv 2044 B]
null_resource.vml-provisioner (remote-exec): 30% [Working]
null_resource.vml-provisioner (remote-exec): Get:8 https://pkg.jenkins.io/debian-stable binary/ Packages [20.6 kB]
null_resource.vml-provisioner (remote-exec): 44% [8 Packages 4113 B/20.6 kB 20%]
null_resource.vml-provisioner (remote-exec): 100% [Working]
null_resource.vml-provisioner (remote-exec): 100% [8 Packages store 0 B]
null_resource.vml-provisioner (remote-exec): 100% [Working]
null_resource.vml-provisioner (remote-exec): Fetched 23.4 kB in 1s (31.0 kB/s)
null_resource.vm2-provisioner (remote-exec): --2021-09-07 03:36:03-- https://mirrors.estointernet.in/apache/maven/maven-3/3.8.2/binaries/apache-maven-3.8.2-bin.tar.gz
null_resource.vm2-provisioner (remote-exec): Resolving mirrors.estointernet.in (mirrors.estointernet.in)... 43.255.166.254, 2403:8940:3::1:f
null_resource.vm2-provisioner (remote-exec): Connecting to mirrors.estointernet.in (mirrors.estointernet.in)|43.255.166.254|:443...
null_resource.vml-provisioner (remote-exec): Reading package lists... 0%
null_resource.vml-provisioner (remote-exec): Reading package lists... 0%
null_resource.vml-provisioner (remote-exec): Reading package lists... 0%
null_resource.vml-provisioner (remote-exec): Reading package lists... 3%
null_resource.vml-provisioner (remote-exec): Reading package lists... 3%
null_resource.vml-provisioner (remote-exec): Reading package lists... 5%
null_resource.vml-provisioner (remote-exec): connected.
null_resource.vm2-provisioner (remote-exec): HTTP request sent, awaiting response...
null_resource.vm2-provisioner (remote-exec): 200 OK
null_resource.vm2-provisioner (remote-exec): Length: 9338426 (8.9M) [application/octet-stream]
null_resource.vm2-provisioner (remote-exec): Saving to: 'apache-maven-3.8.2-bin.tar.gz'

null_resource.vml-provisioner (remote-exec): Reading package lists... 37%
null_resource.vml-provisioner (remote-exec): Reading package lists... 37%
null_resource.vml-provisioner (remote-exec): Reading package lists... 54%
null_resource.vml-provisioner (remote-exec): Reading package lists... 54%
null_resource.vml-provisioner (remote-exec): Reading package lists... 55%
```

```
main.tf -- proj1-vm-tf
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
bash + v ⌂ ⌄ ⌁ ⌂ ⌁ ×
null_resource.vm2-provisioner (remote-exec): ache-maven- 22% 2.01M 1.16MB/s
null_resource.vm2-provisioner (remote-exec): 10% [Connected to mirror.xmission.com (
null_resource.vm2-provisioner (remote-exec): che-maven-3 39% 3.55M 1.85MB/s
null_resource.vm2-provisioner (remote-exec): Get:2 https://pkg.jenkins.io/debian-stable binary/ jenkins 2.303.1 [69.7 MB]
null_resource.vm2-provisioner (remote-exec): 10% [2 jenkins 0 B/69.7 MB 0s]
null_resource.vm2-provisioner (remote-exec): he-maven-3. 64% 5.76M 2.68MB/s
null_resource.vm2-provisioner (remote-exec): e-maven-3.8 95% 8.51M 3.54MB/s
null_resource.vm2-provisioner (remote-exec): apache-mave 100% 8.91M 3.69MB/s in 2.4s
null_resource.vm2-provisioner (remote-exec): 2021-09-07 03:36:06 (3.69 MB/s) - 'apache-maven-3.8.2-bin.tar.gz' saved [9338426/9338426]

null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/README.txt
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/LICENSE
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/NOTICE
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/cdi-api.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/commons-cli.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/commons-io.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/commons-lang3.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/guava.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/guice.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/jansi.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/javax.inject.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/jcl-over-slf4j.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/jsoup.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/jsr250-api.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/org.eclipse.sisu.inject.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/org.eclipse.sisu.plexus.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/plexus-cipher.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/plexus-component-annotations.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/plexus-interpolation.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/plexus-sec-dispatcher.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/plexus-utils.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/lib/slf4j-api.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/boot/
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/boot/plexus-classworlds.license
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/bin/m2.conf
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/bin/mvn.cmd
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/bin/mvnDebug.cmd
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/bin/mvn
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/bin/mvnDebug
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/bin/mvnyjp
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/conf/
null_resource.vm2-provisioner (remote-exec): apache-maven-3.8.2/conf/logging/
Ln 66, Col 1  Spaces: 2  UTF-8  LF  Terraform  ⌂ ⌁
```

```
main.tf -- proj1-vm-tf
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
bash + v □ v ×

null_resource.vm2-provisioner (remote-exec): Reading package lists... 100%
null_resource.vm2-provisioner (remote-exec): Reading package lists... Done
null_resource.vm2-provisioner (remote-exec): 26% [2 jenkins 14.0 MB/69.7 MB 20%]
null_resource.vm2-provisioner (remote-exec): Building dependency tree... 0%
null_resource.vm2-provisioner (remote-exec): Building dependency tree... 0%
null_resource.vm2-provisioner (remote-exec): Building dependency tree... 50%
null_resource.vm2-provisioner (remote-exec): Building dependency tree... 50%
null_resource.vm2-provisioner (remote-exec): Building dependency tree
null_resource.vm2-provisioner (remote-exec): Reading state information... 0%
null_resource.vm2-provisioner (remote-exec): Reading state information... 0%
null_resource.vm2-provisioner (remote-exec): Reading state information... Done
null_resource.vm2-provisioner (remote-exec): The following package was automatically installed and is no longer required:
null_resource.vm2-provisioner (remote-exec):   linux-headers-4.15.0-151
null_resource.vm2-provisioner (remote-exec): Use 'apt autoremove' to remove it.
null_resource.vm2-provisioner (remote-exec): The following NEW packages will be installed:
null_resource.vm2-provisioner (remote-exec):   azure-cli
null_resource.vm2-provisioner (remote-exec): 0 upgraded, 1 newly installed, 0 to remove and 28 not upgraded.
null_resource.vm2-provisioner (remote-exec): Need to get 63.7 MB of archives.
null_resource.vm2-provisioner (remote-exec): After this operation, 964 MB of additional disk space will be used.
null_resource.vm2-provisioner (remote-exec): 0% [Working]
null_resource.vm2-provisioner (remote-exec): Get:1 https://packages.microsoft.com/repos/azure-cli bionic amd64 azure-cli all 2.28.0-1-bionic [63.7 MB]
null_resource.vm1-provisioner (remote-exec): 26% [2 jenkins 14.1 MB/69.7 MB 20%]
null_resource.vm2-provisioner (remote-exec): 0% [1 azure-cli 0 B/63.7 MB 0%]
null_resource.vm2-provisioner (remote-exec): 26% [2 jenkins 14.2 MB/69.7 MB 20%]
null_resource.vm2-provisioner (remote-exec): 19% [1 azure-cli 15.2 MB/63.7 MB 24%]
null_resource.vm2-provisioner (remote-exec): 26% [2 jenkins 14.2 MB/69.7 MB 20%]
null_resource.vm2-provisioner (remote-exec): 54% [1 azure-cli 43.3 MB/63.7 MB 68%]
null_resource.vm1-provisioner (remote-exec): 26% [2 jenkins 14.2 MB/69.7 MB 20%]
null_resource.vm2-provisioner (remote-exec): 88% [1 azure-cli 63.7 MB/63.7 MB 100%]
null_resource.vm2-provisioner (remote-exec): 100% [Working]
null_resource.vm2-provisioner (remote-exec): Fetched 63.7 MB in 2s (33.9 MB/s)
null_resource.vm1-provisioner (remote-exec): 26% [2 jenkins 14.3 MB/69.7 MB 21%]
null_resource.vm2-provisioner (remote-exec): 27% [2 jenkins 14.4 MB/69.7 MB 21%]
null_resource.vm2-provisioner (remote-exec): Selecting previously unselected package azure-cli.
null_resource.vm2-provisioner (remote-exec): (Reading database ...
null_resource.vm2-provisioner (remote-exec): (Reading database ... 5%
null_resource.vm2-provisioner (remote-exec): (Reading database ... 10%
null_resource.vm2-provisioner (remote-exec): (Reading database ... 15%
null_resource.vm2-provisioner (remote-exec): (Reading database ... 20%
null_resource.vm2-provisioner (remote-exec): (Reading database ... 25%
null_resource.vm2-provisioner (remote-exec): (Reading database ... 30%
null_resource.vm2-provisioner (remote-exec): (Reading database ... 35%
null_resource.vm2-provisioner (remote-exec): (Reading database ... 40%
null_resource.vm2-provisioner (remote-exec): (Reading database ... 45%
```

Ln 66, Col 1 Spaces: 2 UTF-8 LF Terraform

The screenshot shows a terminal window titled "main.tf — proj1-vm-tf". The terminal is running a bash shell. The output of the command is displayed, showing the progress of provisioning resources. The output includes messages from the "null_resource.vm1-provisioner (remote-exec)" block, such as file transfers and daemon setup. It also shows the final message "Apply complete! Resources: 13 added, 0 changed, 0 destroyed." and the creation of a specific resource with ID "id=1661050835520054934".

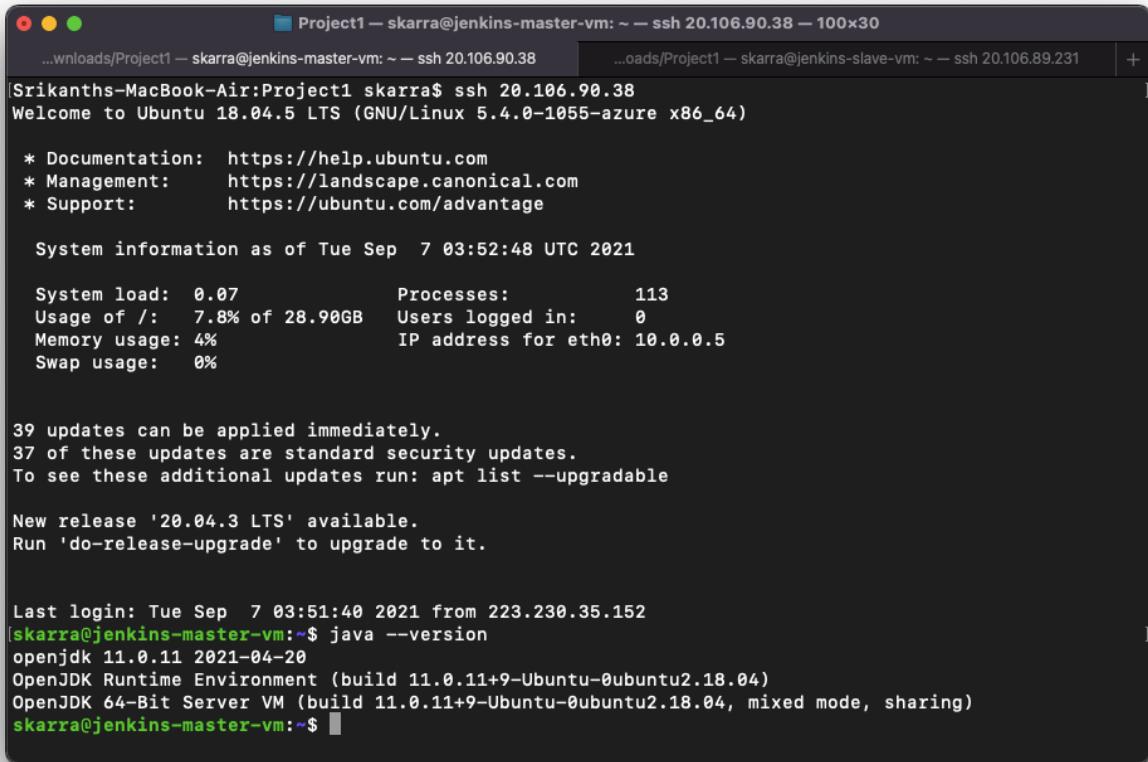
```
main.tf — proj1-vm-tf
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
bash + × ☰ ▾ ×

null_resource.vm1-provisioner (remote-exec): 89% [2 jenkins 68.5 MB/69.7 MB 98%]
null_resource.vm1-provisioner (remote-exec): 89% [2 jenkins 68.9 MB/69.7 MB 99%]
null_resource.vm1-provisioner (remote-exec): 90% [2 jenkins 69.3 MB/69.7 MB 99%]
null_resource.vm1-provisioner (remote-exec): 90% [2 jenkins 69.6 MB/69.7 MB 100%]
null_resource.vm1-provisioner (remote-exec): 100% [Working] 578 kB/s 0s
null_resource.vm1-provisioner (remote-exec): Fetched 69.8 MB in 6min 2s (193 kB/s)
null_resource.vm1-provisioner (remote-exec): Selecting previously unselected package daemon.
null_resource.vm1-provisioner (remote-exec): (Reading database ...
null_resource.vm1-provisioner (remote-exec): (Reading database ... 5%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 10%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 15%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 20%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 25%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 30%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 35%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 40%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 45%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 50%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 55%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 60%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 65%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 70%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 75%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 80%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 85%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 90%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 95%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 100%
null_resource.vm1-provisioner (remote-exec): (Reading database ... 79833 files and directories currently installed.)
null_resource.vm1-provisioner (remote-exec): Preparing to unpack .../daemon_0.6.4-1build1_amd64.deb ...
null_resource.vm1-provisioner (remote-exec): Unpacking daemon (0.6.4-1build1) ...
null_resource.vm1-provisioner (remote-exec): Selecting previously unselected package jenkins.
null_resource.vm1-provisioner (remote-exec): Preparing to unpack .../jenkins_2.303.1_all.deb ...
null_resource.vm1-provisioner (remote-exec): Unpacking jenkins (2.303.1) ...
null_resource.vm1-provisioner (remote-exec): Setting up daemon (0.6.4-1build1) ...
null_resource.vm1-provisioner (remote-exec): Setting up jenkins (2.303.1) ...
null_resource.vm1-provisioner: Still creating... [7m30s elapsed]
null_resource.vm1-provisioner (remote-exec): Processing triggers for systemd (237-3ubuntu10.49) ...
null_resource.vm1-provisioner (remote-exec): Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
null_resource.vm1-provisioner (remote-exec): Processing triggers for ureadahead (0.100.0-21) ...
null_resource.vm1-provisioner: Still creating... [7m40s elapsed]
null_resource.vm1-provisioner: Creation complete after 7m49s [id=1661050835520054934]

Apply complete! Resources: 13 added, 0 changed, 0 destroyed.
Srikanths-MacBook-Air:proj1-vm-tf skarra$
```

Ln 66, Col 1 Spaces: 2 UTF-8 LF Terraform

Validating master-vm



```
...wnloads/Project1 — skarra@jenkins-master-vm: ~ — ssh 20.106.90.38 — 100x30
...loads/Project1 — skarra@jenkins-slave-vm: ~ — ssh 20.106.89.231 — 100x30
[ Srikanths-MacBook-Air:Project1 skarra$ ssh 20.106.90.38
Welcome to Ubuntu 18.04.5 LTS (GNU/Linux 5.4.0-1055-azure x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

 System information as of Tue Sep  7 03:52:48 UTC 2021

 System load:  0.07      Processes:           113
 Usage of /:   7.8% of 28.90GB   Users logged in:    0
 Memory usage: 4%           IP address for eth0: 10.0.0.5
 Swap usage:   0%

39 updates can be applied immediately.
37 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

New release '20.04.3 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Last login: Tue Sep  7 03:51:40 2021 from 223.230.35.152
[skarra@jenkins-master-vm:~$ java --version
openjdk 11.0.11 2021-04-20
OpenJDK Runtime Environment (build 11.0.11+9-Ubuntu-0ubuntu2.18.04)
OpenJDK 64-Bit Server VM (build 11.0.11+9-Ubuntu-0ubuntu2.18.04, mixed mode, sharing)
skarra@jenkins-master-vm:~$ ]
```

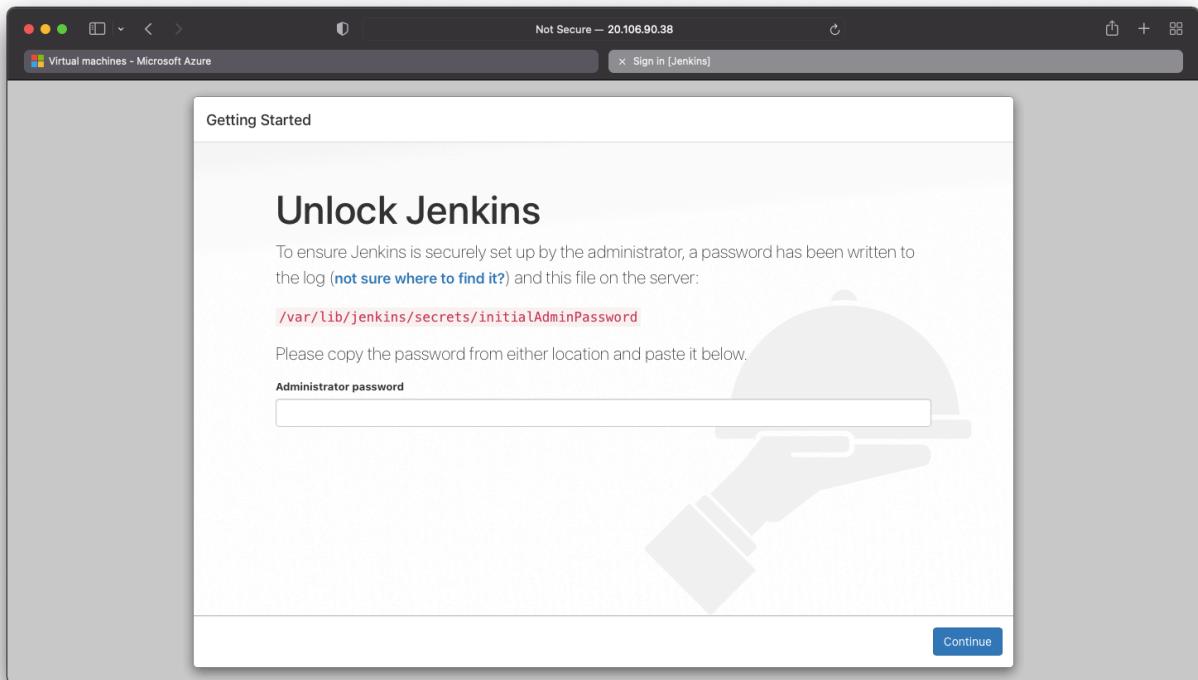
```

Project1 — skarra@jenkins-master-vm: ~ — ssh 20.106.90.38 — 100x30
...wnloads/Project1 — skarra@jenkins-master-vm: ~ — ssh 20.106.90.38           ...oads/Project1 — skarra@jenkins-slave-vm: ~ — ssh 20.106.89.231 | +]

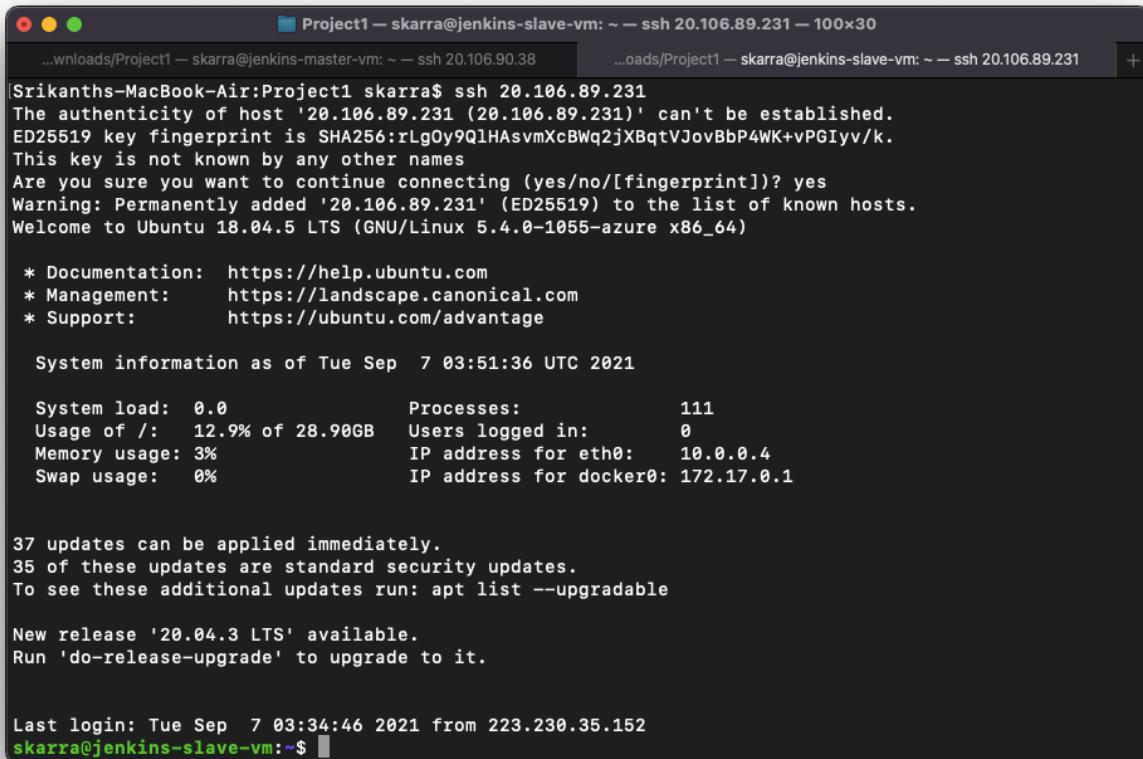
[skarra@jenkins-master-vm:~$ ps -ef | grep jenkins
jenkins  7447      1  0 03:42 ?        00:00:00 /lib/systemd/systemd --user
jenkins  7448  7447  0 03:42 ?        00:00:00 (sd-pam)
jenkins  7465      1  0 03:42 ?        00:00:00 /usr/bin/daemon --name=jenkins --inherit --env=JENKI
NS_HOME=/var/lib/jenkins --output=/var/log/jenkins/jenkins.log --pidfile=/var/run/jenkins/jenkins.pi
d -- /usr/bin/java -Djava.awt.headless=true -jar /usr/share/jenkins/jenkins.war --webroot=/var/cache
/jenkins/war --httpPort=8080
jenkins  7466  7465  4 03:42 ?        00:00:29 /usr/bin/java -Djava.awt.headless=true -jar /usr/sha
re/jenkins/jenkins.war --webroot=/var/cache/jenkins/war --httpPort=8080
skarra   7983  7956  0 03:53 pts/0    00:00:00 grep --color=auto jenkins
[skarra@jenkins-master-vm:~$]
[skarra@jenkins-master-vm:~$ sudo systemctl status jenkins
● jenkins.service - LSB: Start Jenkins at boot time
  Loaded: loaded (/etc/init.d/jenkins; generated)
  Active: active (exited) since Tue 2021-09-07 03:42:11 UTC; 11min ago
    Docs: man:systemd-sysv-generator(8)
   Tasks: 0 (limit: 4915)
  CGroup: /system.slice/jenkins.service

Sep 07 03:42:09 jenkins-master-vm systemd[1]: Starting LSB: Start Jenkins at boot time...
Sep 07 03:42:09 jenkins-master-vm jenkins[7395]: Correct java version found
Sep 07 03:42:09 jenkins-master-vm jenkins[7395]: * Starting Jenkins Automation Server jenkins
Sep 07 03:42:09 jenkins-master-vm su[7446]: Successful su for jenkins by root
Sep 07 03:42:09 jenkins-master-vm su[7446]: + ??? root:jenkins
Sep 07 03:42:09 jenkins-master-vm su[7446]: pam_unix(su:session): session opened for user jenkins by
Sep 07 03:42:10 jenkins-master-vm su[7446]: pam_unix(su:session): session closed for user jenkins
Sep 07 03:42:11 jenkins-master-vm jenkins[7395]: ...done.
Sep 07 03:42:11 jenkins-master-vm systemd[1]: Started LSB: Start Jenkins at boot time.
[skarra@jenkins-master-vm:~$]

```



Validating slave-vm



The screenshot shows a macOS terminal window with two tabs open. The left tab, titled 'Project1 — skarra@jenkins-slave-vm: ~ — ssh 20.106.89.231 — 100x30', displays the initial connection steps to a slave VM. It includes the host key fingerprint, a confirmation prompt for connecting, and the welcome message for Ubuntu 18.04.5 LTS. The right tab, titled '...wnloads/Project1 — skarra@jenkins-slave-vm: ~ — ssh 20.106.89.231', shows the system information command output. This output provides details about the system load (0.0), usage of the root partition (12.9% of 28.90GB), memory usage (3%), and swap usage (0%). It also indicates 37 updates available, 35 of which are security updates, and provides instructions for upgrading. The last line of the output shows the user's last login information.

```
Srikanths-MacBook-Air:Project1 skarra$ ssh 20.106.89.231
The authenticity of host '20.106.89.231 (20.106.89.231)' can't be established.
ED25519 key fingerprint is SHA256:rLgOy9QlHAsvmXcBWq2jXBqtVJovBbP4WK+vPGIyv/k.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '20.106.89.231' (ED25519) to the list of known hosts.

Welcome to Ubuntu 18.04.5 LTS (GNU/Linux 5.4.0-1055-azure x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

 System information as of Tue Sep  7 03:51:36 UTC 2021

 System load:  0.0          Processes:           111
 Usage of /:   12.9% of 28.90GB  Users logged in:    0
 Memory usage: 3%           IP address for eth0:  10.0.0.4
 Swap usage:   0%           IP address for docker0: 172.17.0.1

37 updates can be applied immediately.
35 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

New release '20.04.3 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Last login: Tue Sep  7 03:34:46 2021 from 223.230.35.152
skarra@jenkins-slave-vm:~$
```

```
Project1 — skarra@jenkins-slave-vm: ~ — ssh 20.106.89.231 — 100x32
...wnloads/Project1 — skarra@jenkins-master-vm: ~ — ssh 20.106.90.38      ...oads/Project1 — skarra@jenkins-slave-vm: ~ — ssh 20.106.89.231      +
[skarra@jenkins-slave-vm:~$ java --version
openjdk 11.0.11 2021-04-20
OpenJDK Runtime Environment (build 11.0.11+9-Ubuntu-0ubuntu2.18.04)
OpenJDK 64-Bit Server VM (build 11.0.11+9-Ubuntu-0ubuntu2.18.04, mixed mode, sharing)
[skarra@jenkins-slave-vm:~$ mvn --version
Apache Maven 3.8.2 (ea98e05a04480131370aa0c110b8c54cf726c06f)
Maven home: /opt/apache-maven-3.8.2
Java version: 11.0.11, vendor: Ubuntu, runtime: /usr/lib/jvm/java-11-openjdk-amd64
Default locale: en, platform encoding: UTF-8
OS name: "linux", version: "5.4.0-1055-azure", arch: "amd64", family: "unix"
[skarra@jenkins-slave-vm:~$ az --version
azure-cli          2.28.0
core                2.28.0
telemetry           1.0.6

Python location '/opt/az/bin/python3'
Extensions directory '/home/skarra/.azure/cliextensions'

Python (Linux) 3.6.10 (default, Sep  3 2021, 06:36:52)
[GCC 7.5.0]

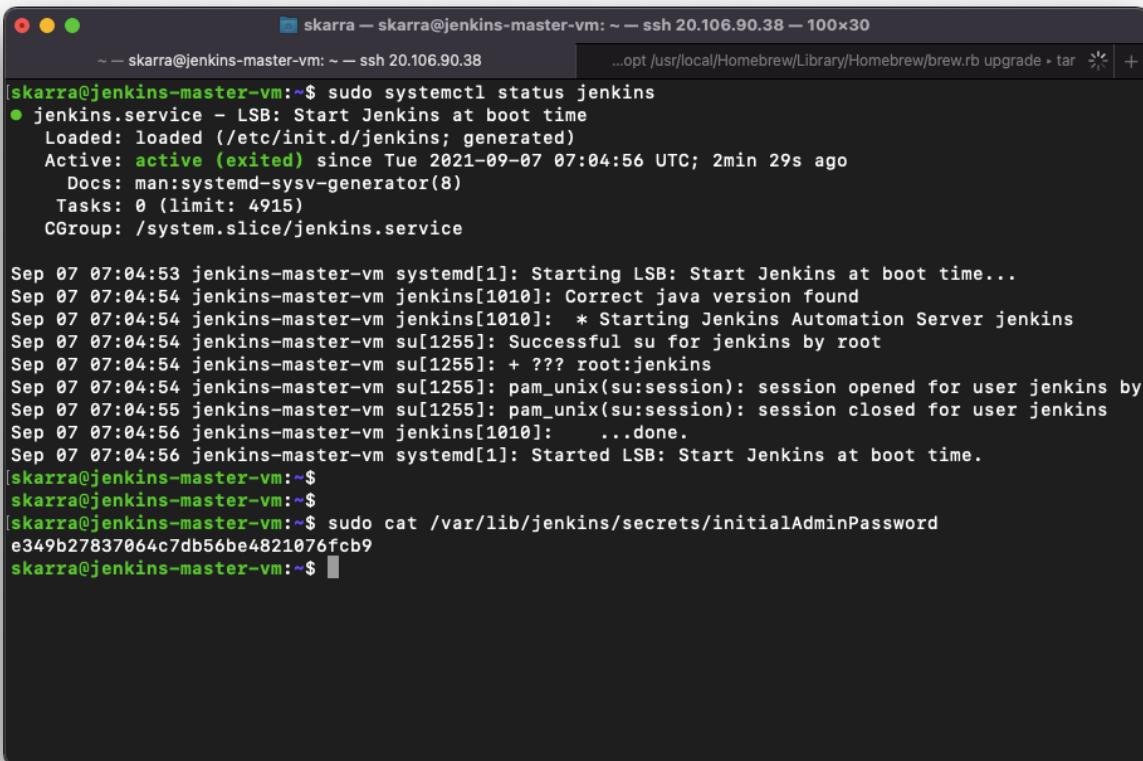
Legal docs and information: aka.ms/AzureCliLegal

Your CLI is up-to-date.

Please let us know how we are doing: https://aka.ms/azureclihats
and let us know if you're interested in trying out our newest features: https://aka.ms/CLIUstudy
skarra@jenkins-slave-vm:~$ ]
```

8. Manually Start Jenkins and configure required Plugins and Master Slave Configuration

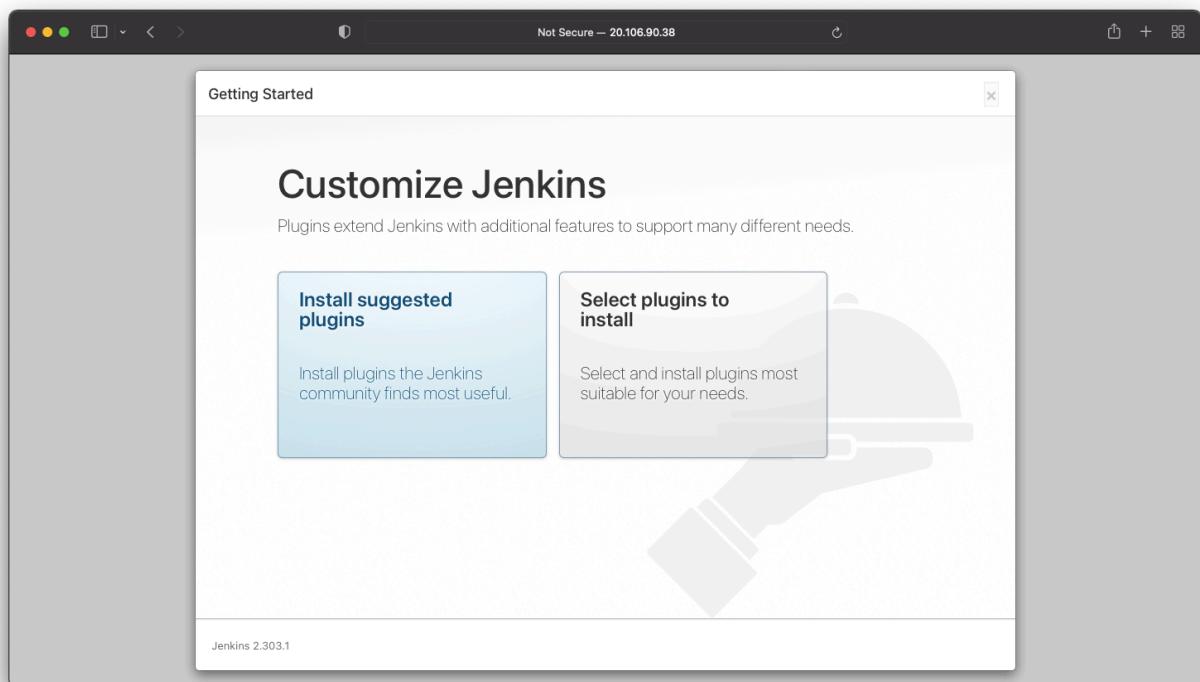
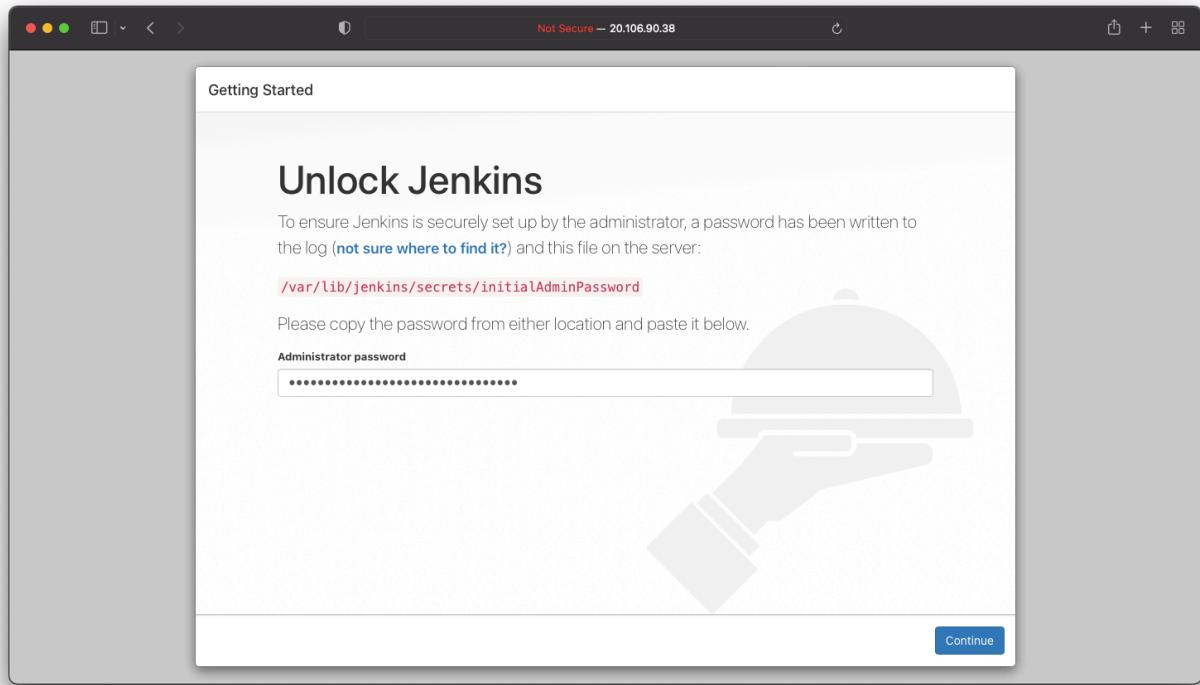
Jenkins service



```
skarra@jenkins-master-vm:~$ sudo systemctl status jenkins
● jenkins.service - LSB: Start Jenkins at boot time
  Loaded: loaded (/etc/init.d/jenkins; generated)
  Active: active (exited) since Tue 2021-09-07 07:04:56 UTC; 2min 29s ago
    Docs: man:systemd-sysv-generator(8)
    Tasks: 0 (limit: 4915)
   CGroup: /system.slice/jenkins.service

Sep 07 07:04:53 jenkins-master-vm systemd[1]: Starting LSB: Start Jenkins at boot time...
Sep 07 07:04:54 jenkins-master-vm jenkins[1010]: Correct java version found
Sep 07 07:04:54 jenkins-master-vm jenkins[1010]: * Starting Jenkins Automation Server jenkins
Sep 07 07:04:54 jenkins-master-vm su[1255]: Successful su for jenkins by root
Sep 07 07:04:54 jenkins-master-vm su[1255]: + ??? root:jenkins
Sep 07 07:04:54 jenkins-master-vm su[1255]: pam_unix(su:session): session opened for user jenkins by
Sep 07 07:04:55 jenkins-master-vm su[1255]: pam_unix(su:session): session closed for user jenkins
Sep 07 07:04:56 jenkins-master-vm jenkins[1010]:     ...done.
Sep 07 07:04:56 jenkins-master-vm systemd[1]: Started LSB: Start Jenkins at boot time.
[skarra@jenkins-master-vm:~$]
[skarra@jenkins-master-vm:~$]
[skarra@jenkins-master-vm:~$ sudo cat /var/lib/jenkins/secrets/initialAdminPassword
e349b27837064c7db56be4821076fcb9
skarra@jenkins-master-vm:~$]
```

Jenkins configuration



Not Secure — 20.106.90.38

Getting Started

Organization and Administration
Build Features
Build Tools
Build Analysis and Reporting
Pipelines and Continuous Delivery
Source Code Management
Distributed Builds
User Management and Security
Notifications and Publishing
Languages

All | None | Suggested Selected (20/57)

Note that the full list of plugins is not shown here. Additional plugins can be installed in the [Plugin Manager](#) once the initial setup is complete. See the [Wiki](#) for more information.

Build Features (5/10)

Config File Provider 11 ↗
Ability to provide configuration files (e.g. settings.xml for maven, XML, groovy, custom files,...) loaded through the UI which will be copied to the job workspace.

Jenkins 2.303.1 Back Install

This screenshot shows the Jenkins 'Getting Started' page. On the left is a sidebar with various categories like Organization and Administration, Build Features, and Source Code Management. The 'Build Features' section is expanded, showing a list of available plugins. One plugin, 'Config File Provider', is selected and highlighted in green. The status bar at the bottom indicates Jenkins 2.303.1.

Not Secure — 20.106.90.38

Getting Started

Organization and Administration
Build Features
Build Tools
Build Analysis and Reporting
Pipelines and Continuous Delivery
Source Code Management
Distributed Builds
User Management and Security
Notifications and Publishing
Languages

All | None | Suggested Selected (21/57)

Note that the full list of plugins is not shown here. Additional plugins can be installed in the [Plugin Manager](#) once the initial setup is complete. See the [Wiki](#) for more information.

Pipelines and Continuous Delivery (4/8)

GitHub Branch Source 30 ↗
Multibranch projects and organization folders from GitHub. Maintained by CloudBees, Inc.

Pipeline: GitHub Groovy Libraries 29 ↗
Allows Pipeline Groovy libraries to be loaded on the fly from GitHub.

Source Code Management (2/10)

GitHub 26 ↗
This plugin integrates GitHub to Jenkins.

Jenkins 2.303.1 Back Install

This screenshot shows the Jenkins 'Getting Started' page again, but this time the search bar is set to 'GitHub'. The 'Source Code Management' section is expanded, showing the 'GitHub' plugin selected and highlighted in green. The status bar at the bottom indicates Jenkins 2.303.1.

The screenshot shows the Jenkins 'Getting Started' page. At the top, it says 'Not Secure — 20.106.90.38'. The main heading is 'Getting Started'. Below the heading is a table of available Jenkins plugins:

Folders	OWASP Markup Formatter	Build Timeout	Credentials Binding
Timestamper	Workspace Cleanup	Ant	Gradle
Pipeline	Github Branch Source	Pipeline: GitHub Groovy Libraries	Pipeline: Stage View
Git	SSH Build Agents	Matrix Authorization Strategy	PAM Authentication
LDAP	Email Extension	Mailer	Config File Provider
GitHub			

To the right of the table, there is a vertical list of additional Jenkins components:

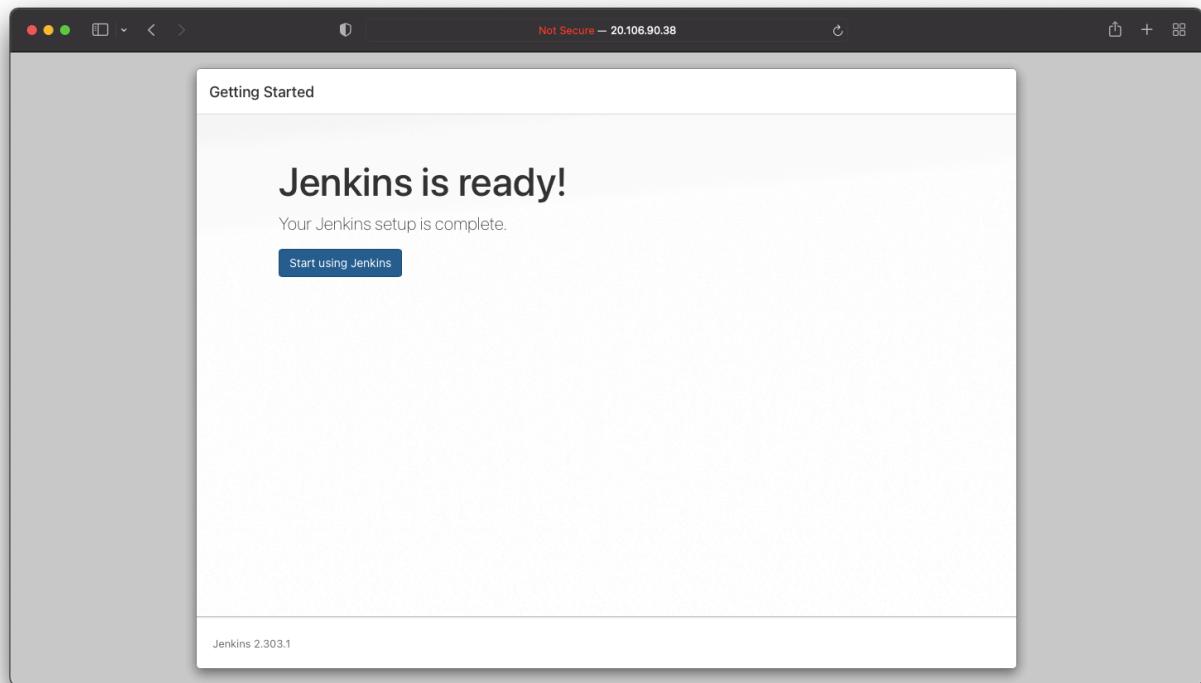
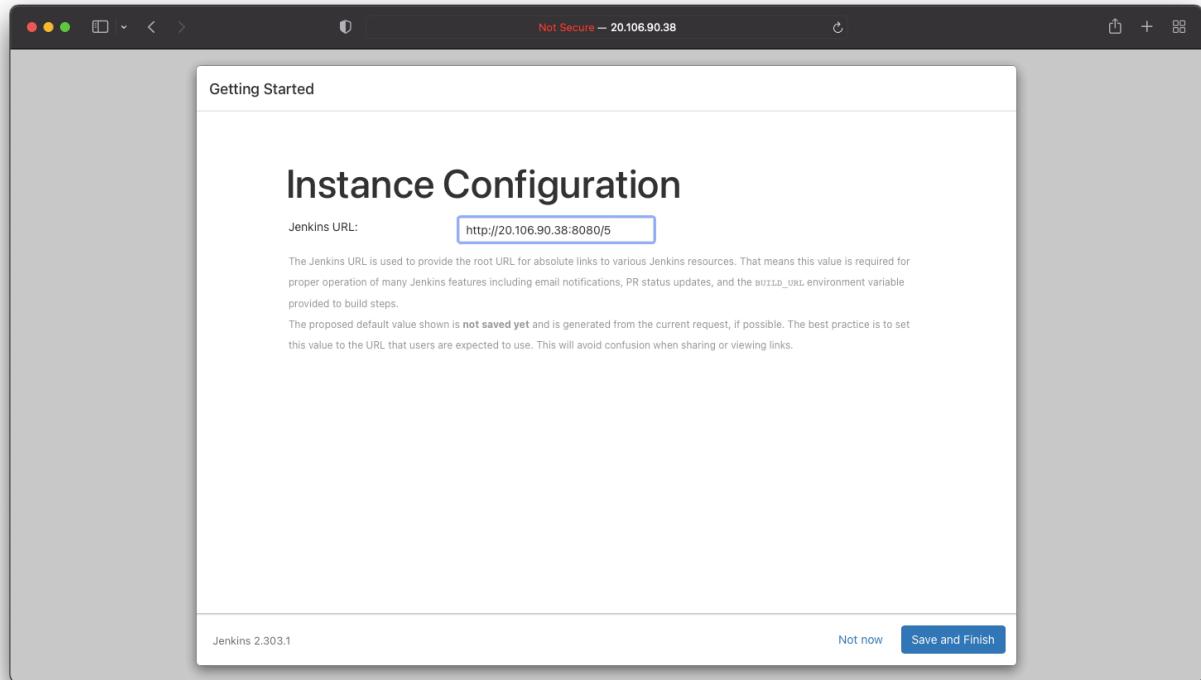
- ** SSH server
- Folders
- ** Trilead API
- OWASP Markup Formatter
- ** Structs
- ** Pipeline: Step API

At the bottom of the page, it says 'Jenkins 2.303.1'.

The screenshot shows the 'Create First Admin User' page. At the top, it says 'Not Secure — 20.106.90.38'. The main heading is 'Create First Admin User'. There are five input fields for user creation:

Username:	<input type="text" value="admin"/>
Password:	<input type="password" value="*****"/>
Confirm password:	<input type="password" value="*****"/>
Full name:	<input type="text" value="Srikanth"/>
E-mail address:	<input type="text" value="srikanth.karra@techmahinc"/>

At the bottom of the page, there are two buttons: 'Skip and continue as admin' and 'Save and Continue'.

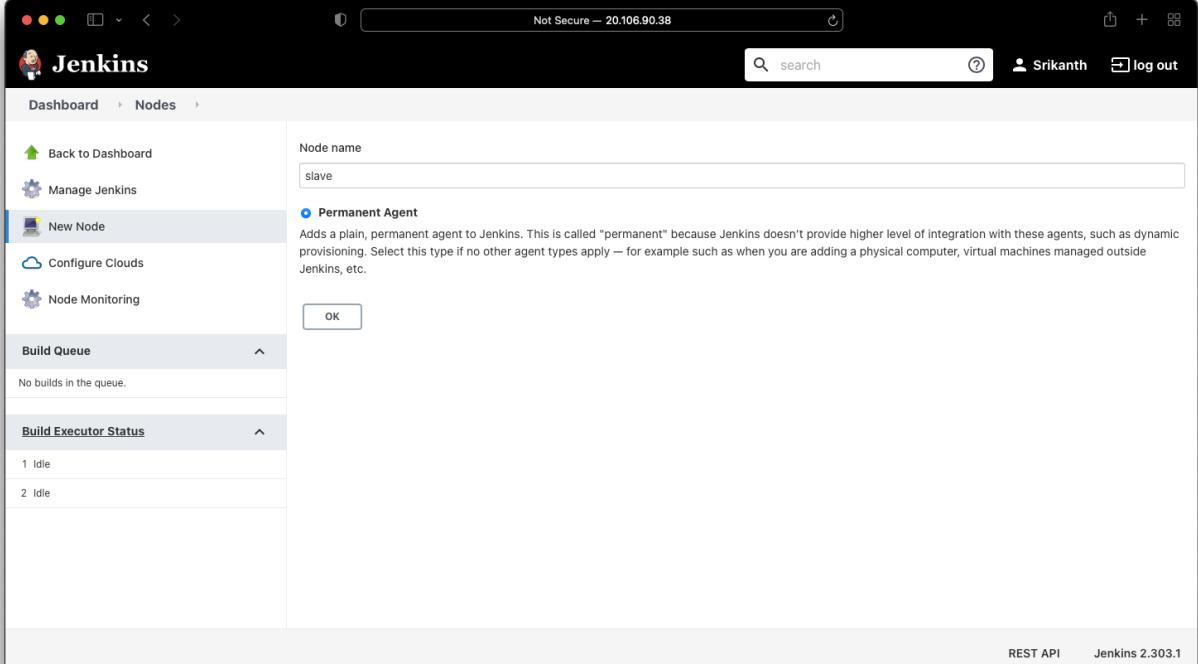


The screenshot shows the Jenkins dashboard at the URL `Not Secure — 20.106.90.38`. The top navigation bar includes a search bar, a user icon for Srikanth, and a log out link. On the left, a sidebar lists various Jenkins management options like 'New Item', 'Build History', and 'Manage Jenkins'. The main content area features a 'Welcome to Jenkins!' message with a brief introduction and links to 'Create a job', 'Set up a distributed build', and 'Learn more about distributed builds'. At the bottom right, there are links for 'REST API' and 'Jenkins 2.303.1'.

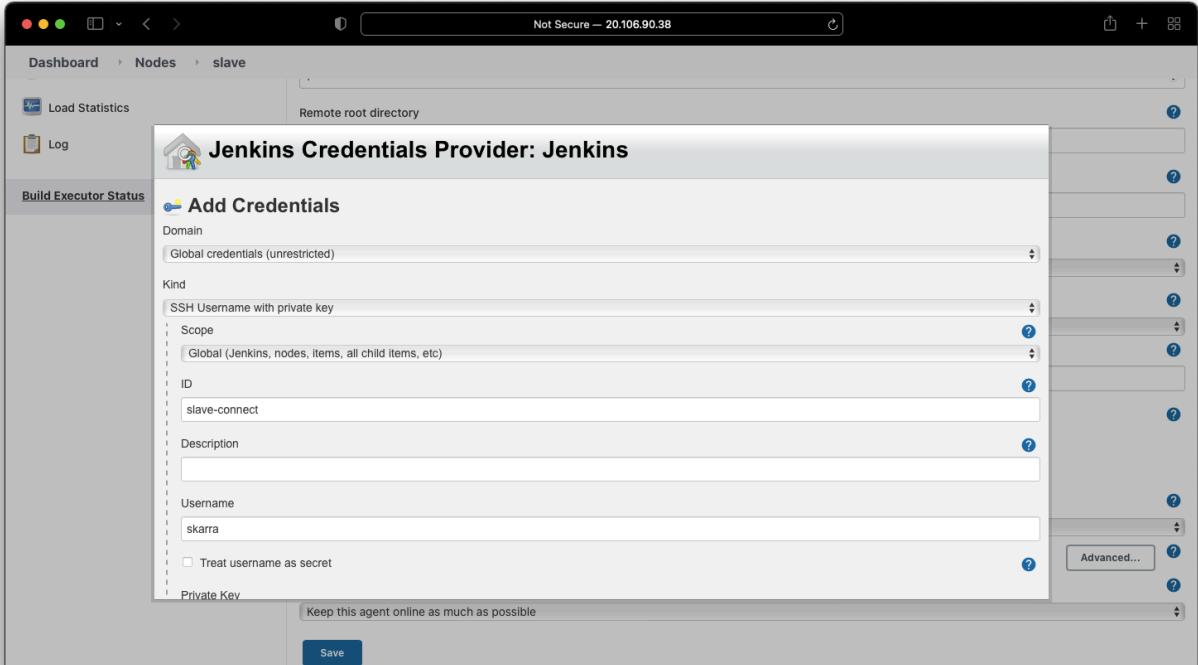
Configuring slave

The screenshot shows the Jenkins 'Nodes' page at the URL `Not Secure — 20.106.90.38`. The top navigation bar includes a search bar, a user icon for Srikanth, and a log out link. The sidebar on the left includes 'Back to Dashboard', 'Manage Jenkins', and 'Node Monitoring'. The main content area displays a table of nodes, with one row for the 'master' node. The table columns include Name, Architecture, Clock Difference, Free Disk Space, Free Swap Space, Free Temp Space, and Response Time. The 'master' node is listed with the following details: Name: master, Architecture: Linux (amd64), Clock Difference: In sync, Free Disk Space: 26.63 GB, Free Swap Space: 0 B, Free Temp Space: 26.63 GB, Response Time: 0ms. A blue button labeled 'Refresh status' is located at the bottom right of the table.

S	Name ↓	Architecture	Clock Difference	Free Disk Space	Free Swap Space	Free Temp Space	Response Time
	master	Linux (amd64)	In sync	26.63 GB	0 B	26.63 GB	0ms
		last checked	11 min	11 min	11 min	11 min	11 min



The screenshot shows the Jenkins web interface for managing nodes. The left sidebar has links for Back to Dashboard, Manage Jenkins, New Node (which is selected), Configure Clouds, and Node Monitoring. The main content area is titled "Nodes" and shows a "New Node" configuration dialog. The "Node name" field contains "slave". The "Permanent Agent" radio button is selected, with a tooltip explaining it adds a plain, permanent agent to Jenkins. Below the dialog are sections for "Build Queue" (empty) and "Build Executor Status" (1 Idle, 2 Idle). At the bottom right are links for REST API and Jenkins 2.303.1.



The screenshot shows the Jenkins Credentials Provider dialog for adding credentials. The title is "Jenkins Credentials Provider: Jenkins". The "Add Credentials" section is active, showing fields for "Domain" (Global credentials (unrestricted)), "Kind" (SSH Username with private key), "Scope" (Global (Jenkins, nodes, items, all child items, etc)), "ID" (slave-connect), "Description" (empty), "Username" (skarra), and "Private Key" (checkbox "Treat username as secret" is unchecked). A note at the bottom says "Keep this agent online as much as possible". A "Save" button is at the bottom right.

Not Secure — 20.106.90.38

Jenkins

Dashboard > Nodes > slave

[Back to List](#)

[Status](#)

[Delete Agent](#)

[Configure](#)

[Build History](#)

[Load Statistics](#)

[Log](#)

Build Executor Status

Name: slave

Description:

Number of executors: 1

Remote root directory: /opt/jenkins-root

Labels:

Usage: Use this node as much as possible

Launch method: Launch agents via SSH

Host: 10.0.0.4

Save

Not Secure — 20.106.90.38

Jenkins

Dashboard > Nodes > slave

Build Executor Status

1 Idle

Launch method: Launch agents via SSH

Host: 10.0.0.4

Credentials: skarra

Host Key Verification Strategy: Manually trusted key Verification Strategy

Require manual verification of initial connection:

Availability: Keep this agent online as much as possible

Node Properties

Disable deferred wipeout on this node

Environment variables

Tool Locations

Save

REST API Jenkins 2.303.1

Not Secure — 20.106.90.38

[JENKINS-42959] Failed known_hosts verification for SSH agent - Jenkins Jira

Dashboard > Nodes > slave

```

Checking Java version in the PATH
openjdk version "11.0.11" 2021-04-20
OpenJDK Runtime Environment (build 11.0.11+9-Ubuntu-0ubuntu2.18.04)
OpenJDK 64-Bit Server VM (build 11.0.11+9-Ubuntu-0ubuntu2.18.04, mixed mode, sharing)
[09/07/21 07:46:14] [SSH] Checking java version of /opt/jenkins-root/jdk/bin/java
Couldn't figure out the Java version of /opt/jenkins-root/jdk/bin/java
bash: /opt/jenkins-root/jdk/bin/java: No such file or directory

[09/07/21 07:46:14] [SSH] Checking java version of java
[09/07/21 07:46:14] [SSH] java -version returned 11.0.11.
[09/07/21 07:46:14] [SSH] Starting sftp client.
[09/07/21 07:46:14] [SSH] Copying latest remoting.jar...
Source agent hash is 48F75BD1D39836C61FF29F35F6E5FC60. Installed agent hash is 48F75BD1D39836C61FF29F35F6E5FC60
Verified agent jar. No update is necessary.
Expanded the channel window size to 4MB
[09/07/21 07:46:14] [SSH] Starting agent process: cd "/opt/jenkins-root" && java -jar remoting.jar -workDir /opt/jenkins-root -jar-cache /opt/jenkins-root/remoting/jarCache
Sep 07, 2021 7:46:14 AM org.jenkinsci.remoting.engine.WorkDirManager initializeWorkDir
INFO: Using /opt/jenkins-root/remoting as a remoting work directory
Sep 07, 2021 7:46:14 AM org.jenkinsci.remoting.engine.WorkDirManager setupLogging
INFO: Both error and output logs will be printed to /opt/jenkins-root/remoting
<===[JENKINS REMOTING CAPACITY]==>channel started
Remoting version: 4.10
This is a Unix agent
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by jenkins.slaves.StandardOutputSwapper$ChannelSwapper to constructor java.io.FileDescriptor(int)
WARNING: Please consider reporting this to the maintainers of jenkins.slaves.StandardOutputSwapper$ChannelSwapper
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
Evacuated stdout
Agent successfully connected and online

```

REST API Jenkins 2.303.1

Not Secure — 20.106.90.38

Srikanth log out

Dashboard > Nodes

[Back to Dashboard](#)

[Manage Jenkins](#)

[New Node](#)

[Configure Clouds](#)

[Node Monitoring](#)

Build Queue ▾
No builds in the queue.

Build Executor Status ▾

S	Name	Architecture	Clock Difference	Free Disk Space	Free Swap Space	Free Temp Space	Response Time
	master	Linux (amd64)	In sync	26.20 GB	0 B	26.20 GB	0ms
	slave	Linux (amd64)	In sync	24.95 GB	0 B	24.95 GB	35ms
	last checked	2 min 9 sec	2 min 9 sec	2 min 9 sec	2 min 9 sec	2 min 9 sec	2 min 9 sec

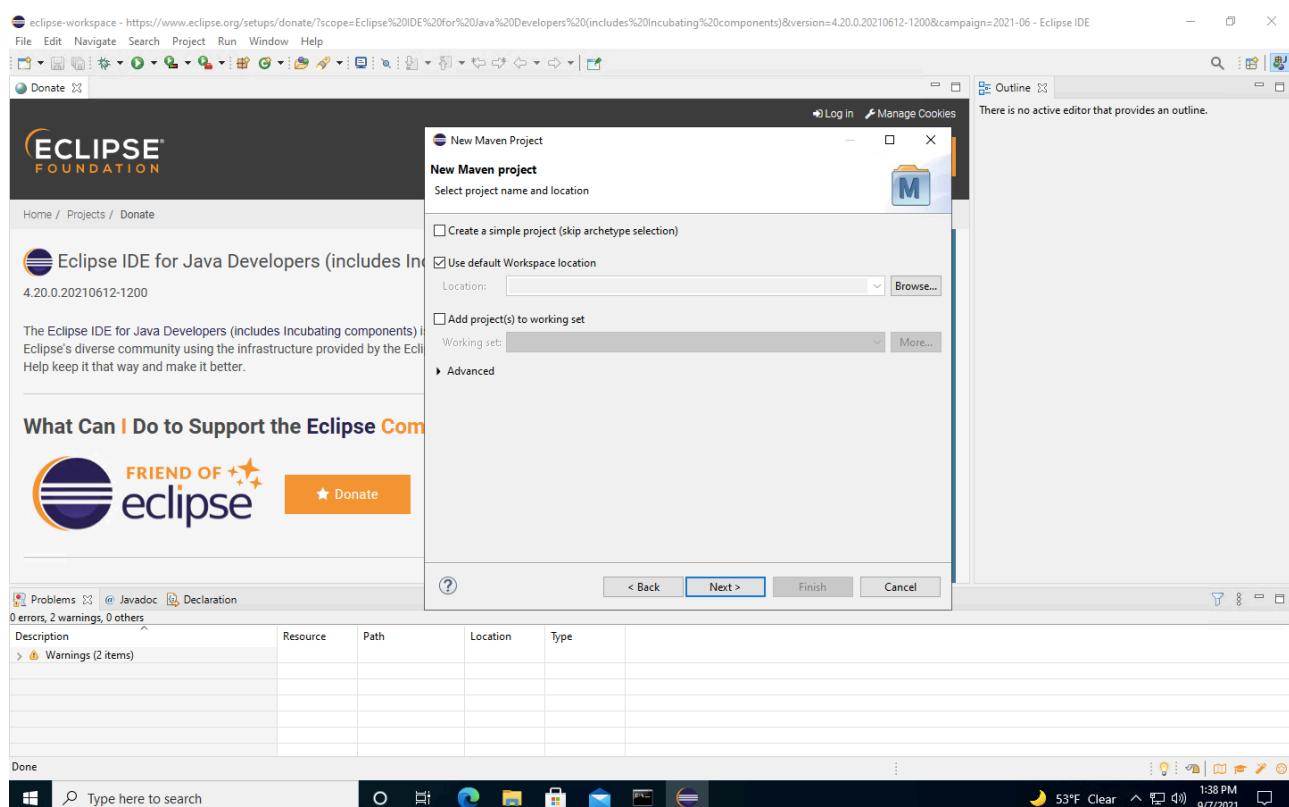
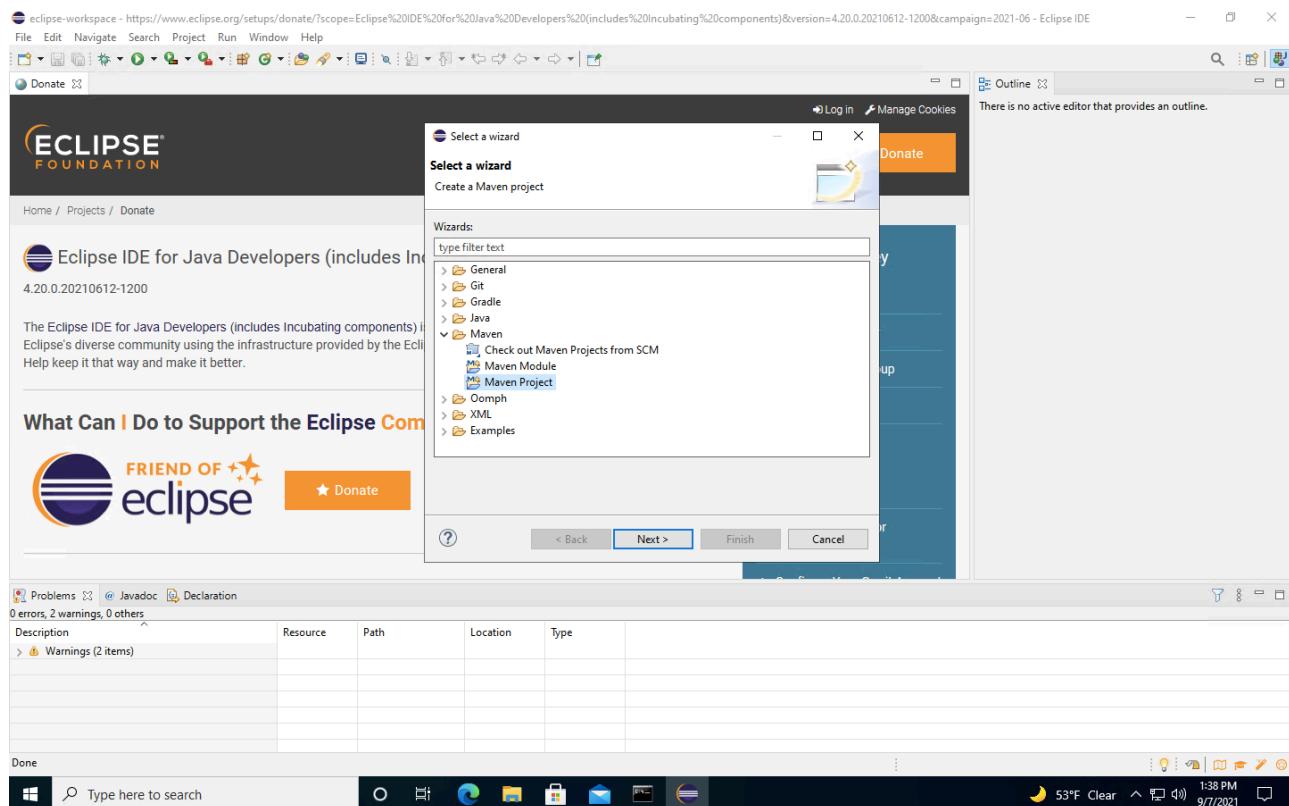
[Refresh status](#)

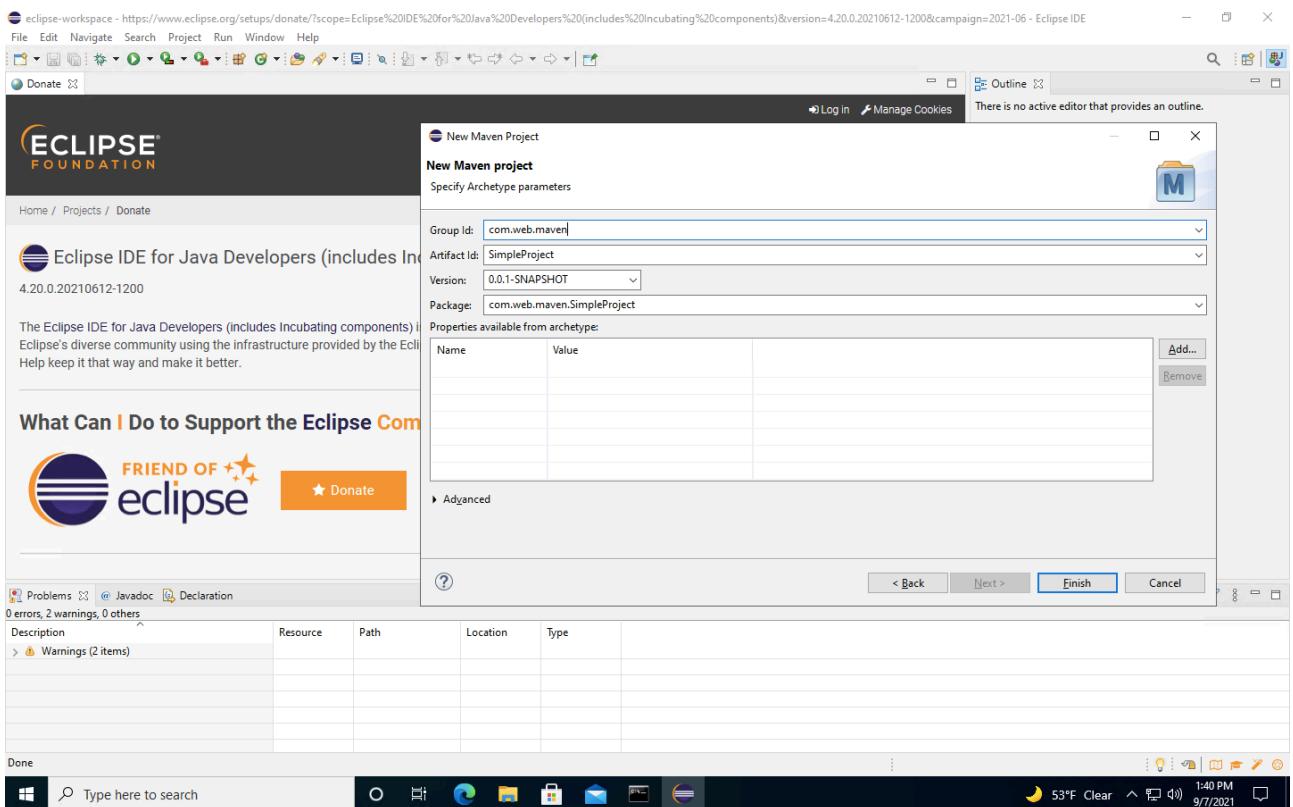
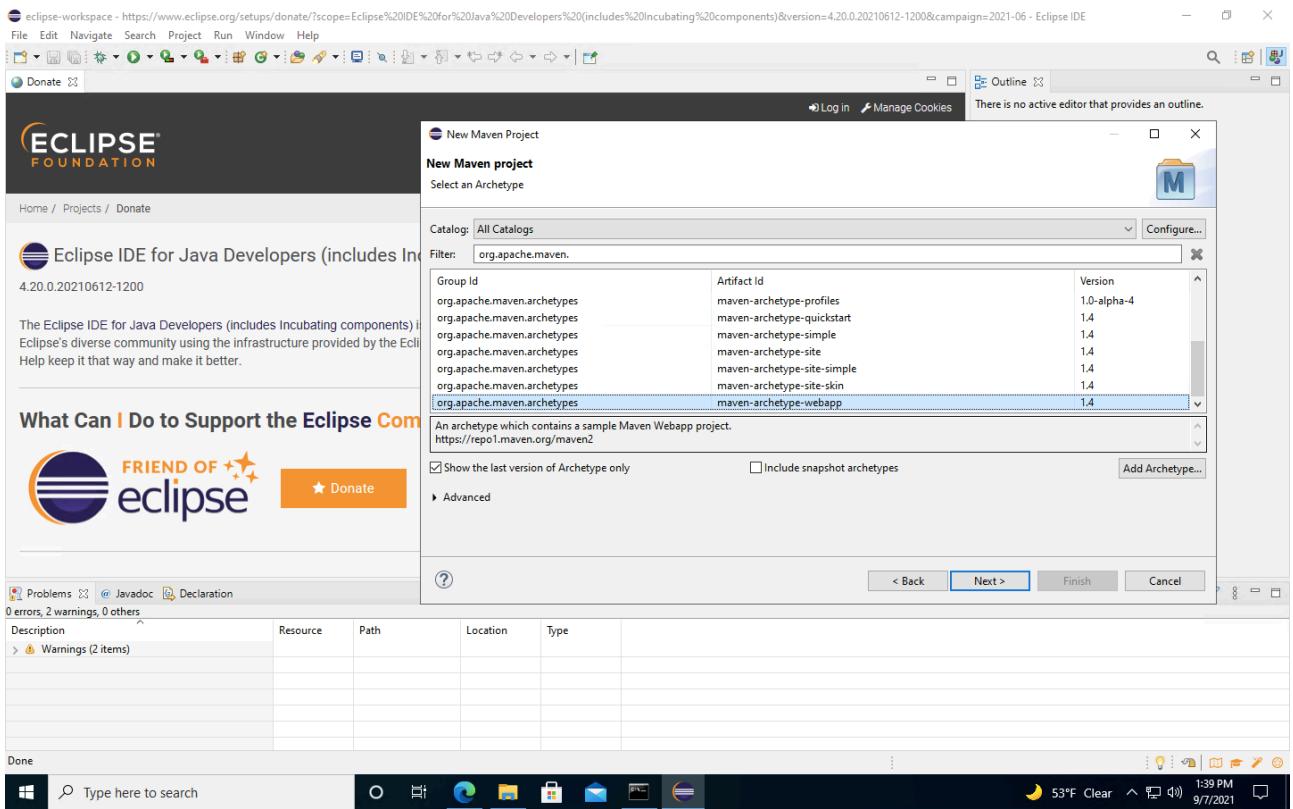
REST API Jenkins 2.303.1

Part 2

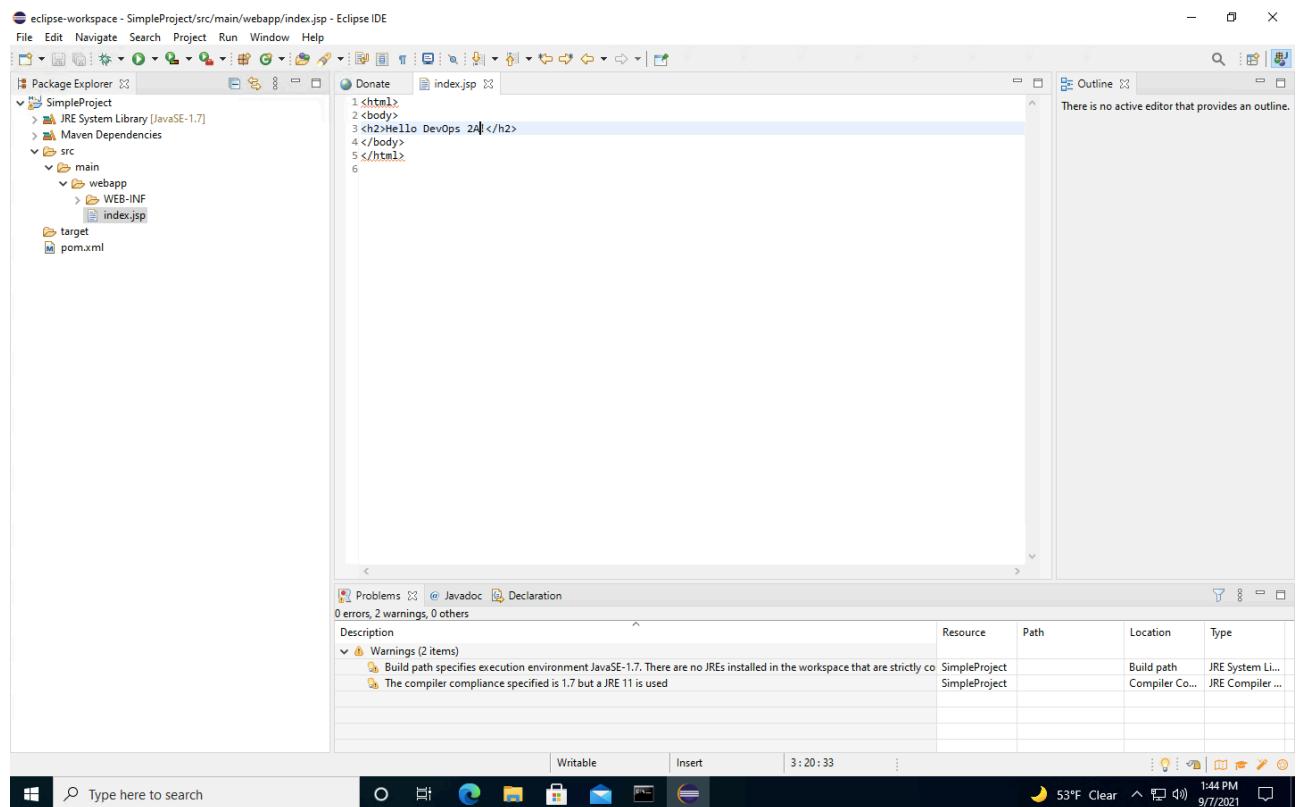
Phase 1: Simple Java WebApplication

Create Maven Project with Archetype as web application in eclipse

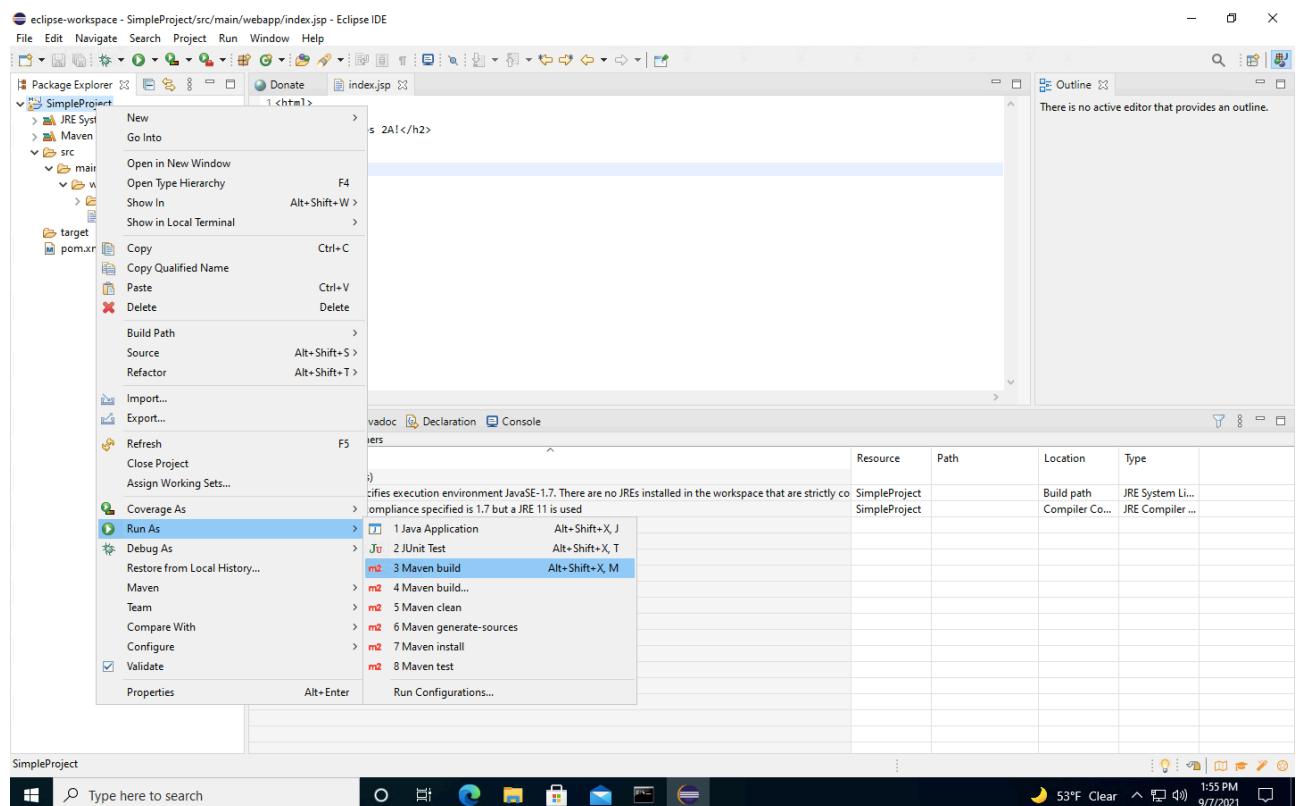


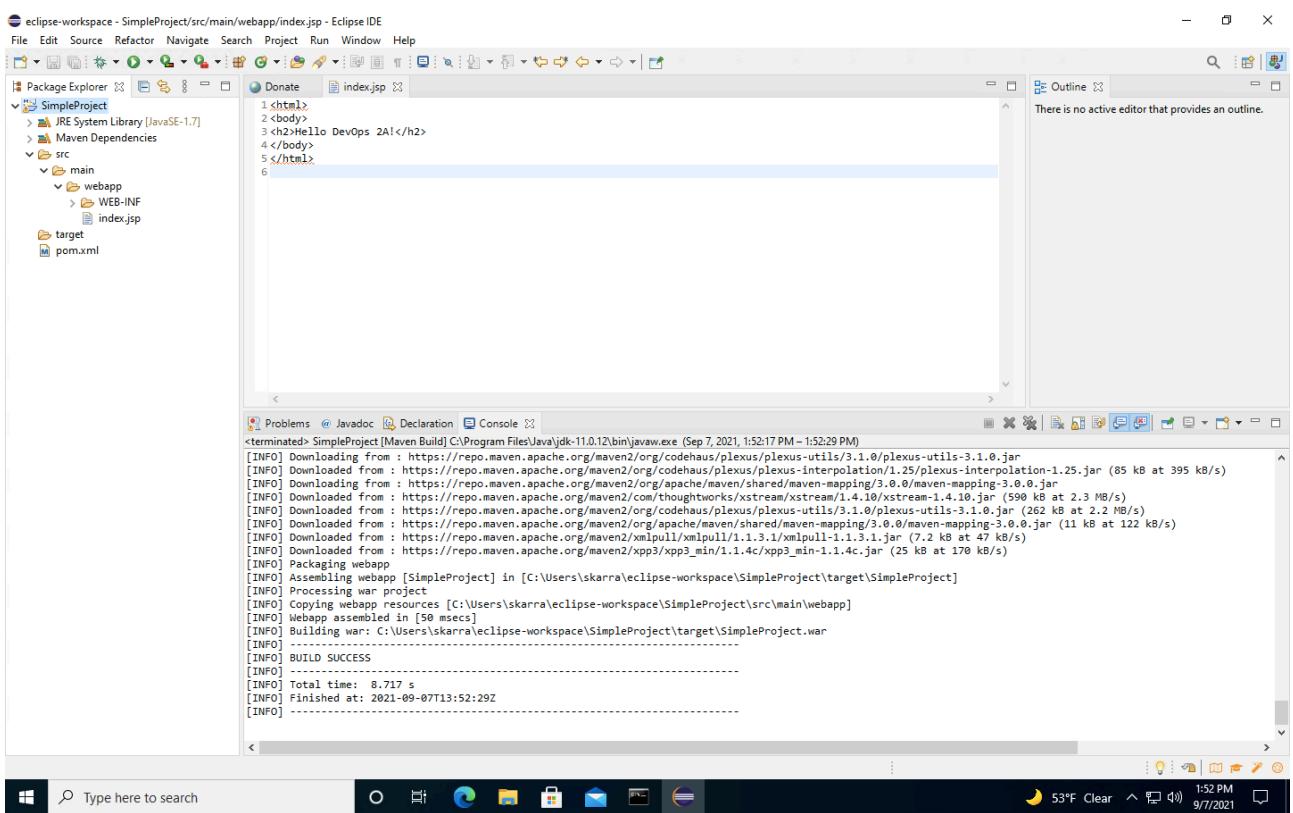
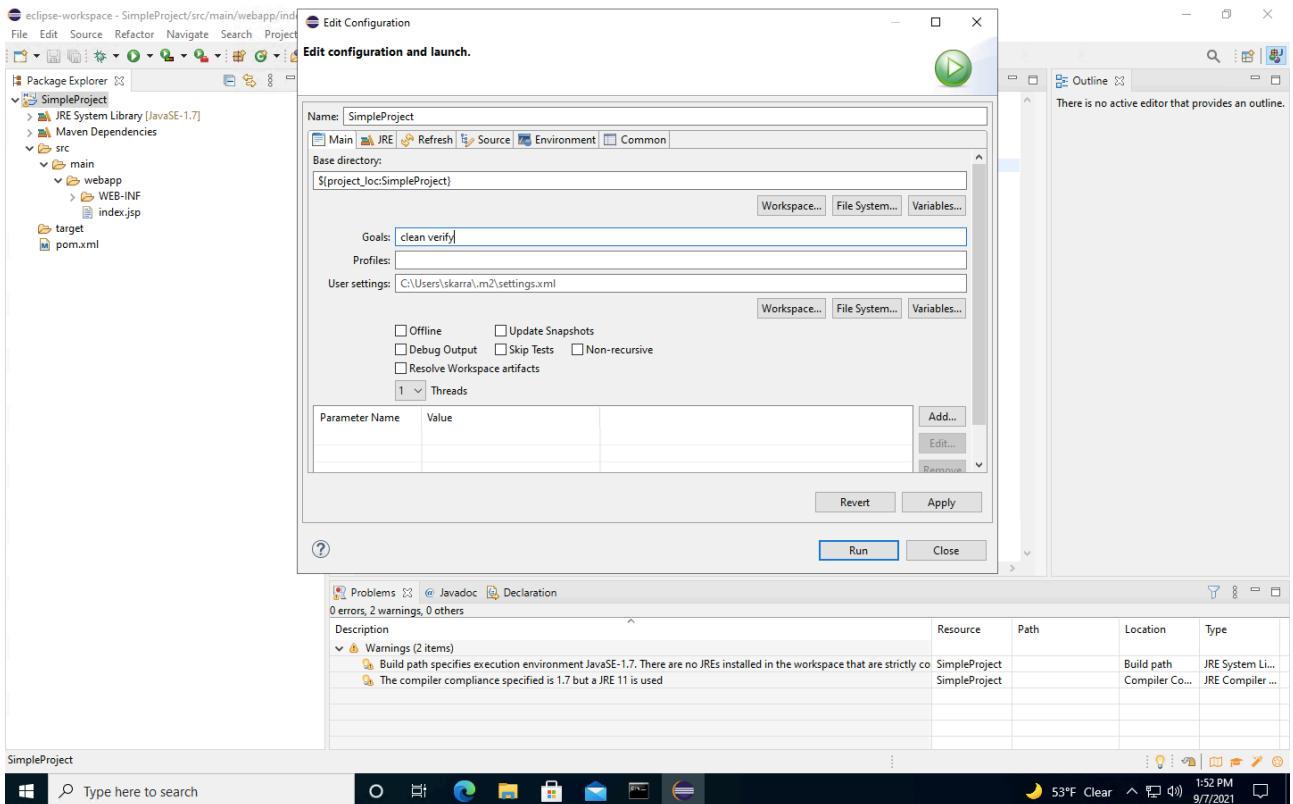


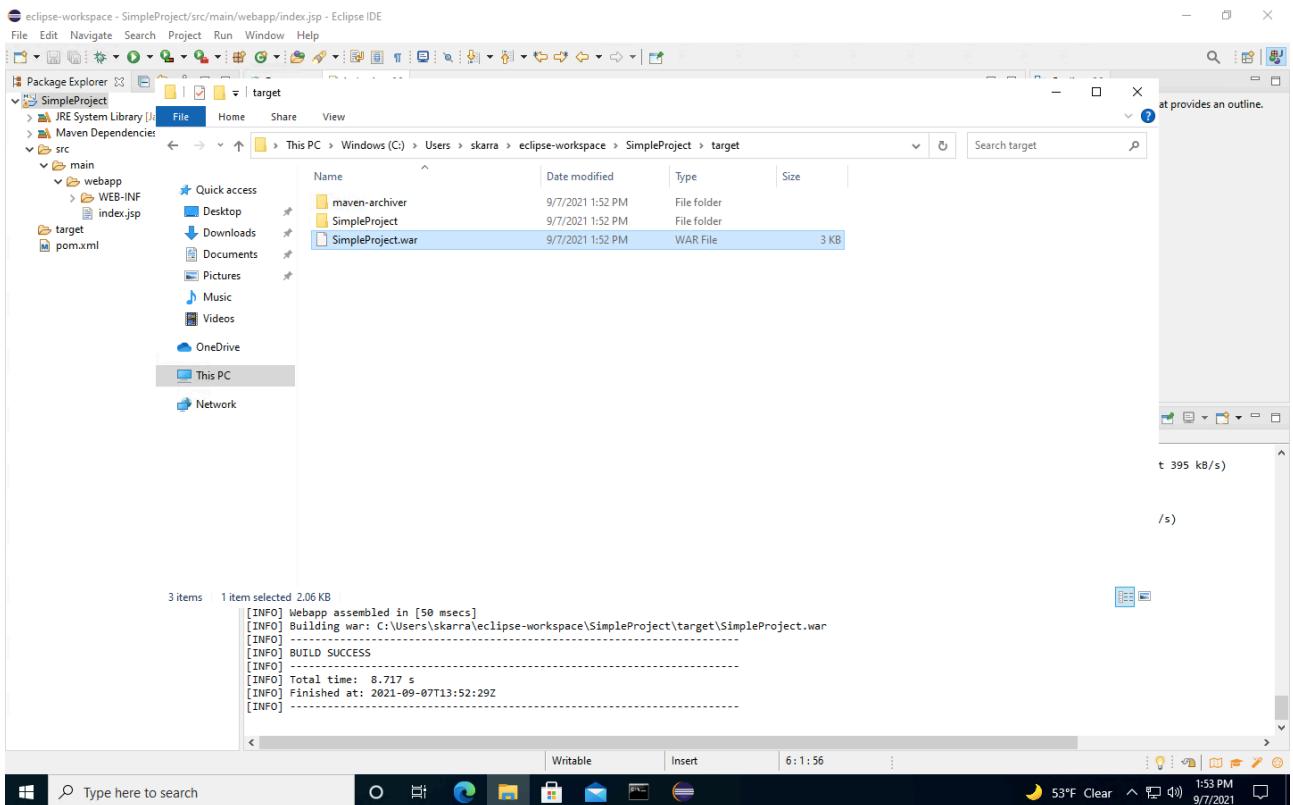
Modify Index.jsp under src/main/webcontent to display a custom message



Run Maven clean install in eclipse to check the build and check for .war file in target folder

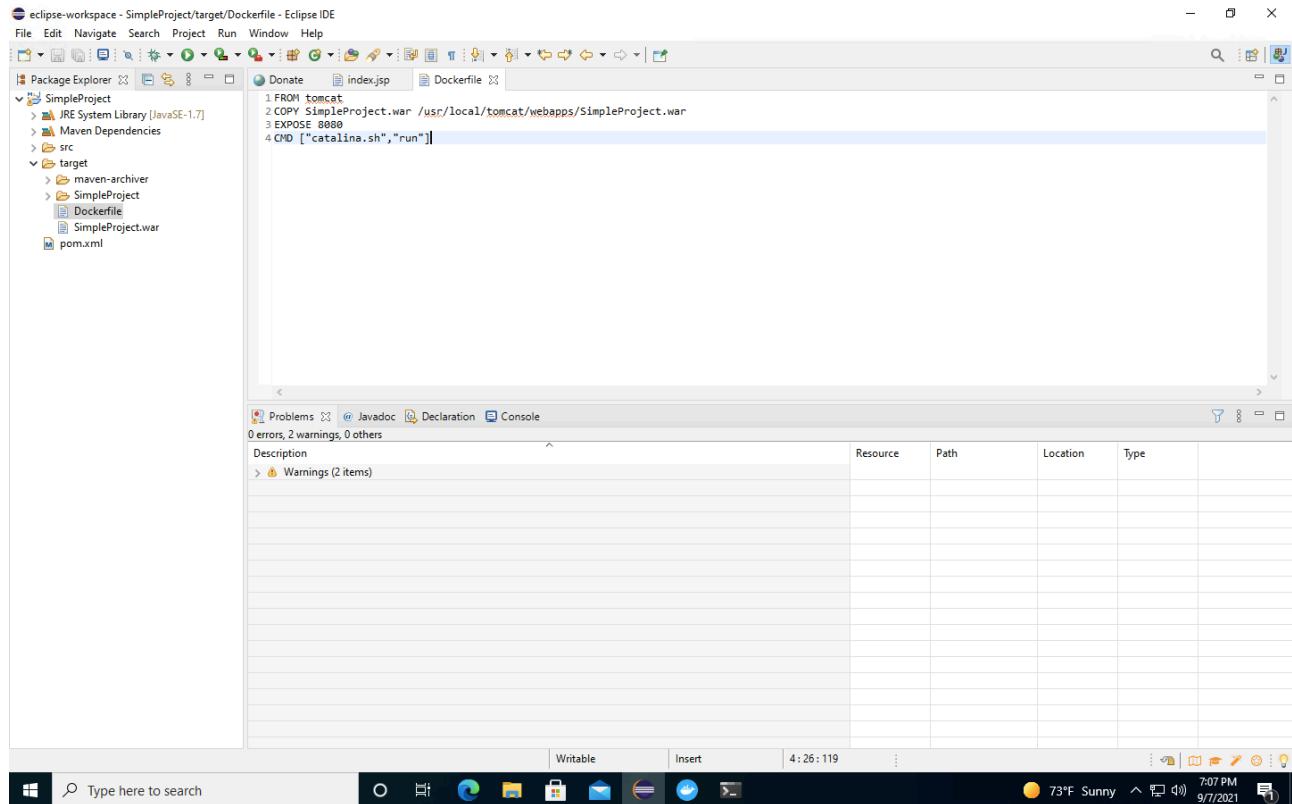






Phase 2: Containerize the webapplication using Dockerfile

Generate Dockerfile under project folder of your app
Modify FORM statement to use tomcat as base image



The screenshot shows the Eclipse IDE interface with the following details:

- File Menu:** File, Edit, Navigate, Search, Project, Run, Window, Help.
- Toolbar:** Standard Eclipse toolbar with icons for file operations, search, and help.
- Package Explorer:** Shows a Maven project structure:
 - SimpleProject
 - JRE System Library [JavaSE-1.7]
 - Maven Dependencies
 - src
 - target
 - maven-archiver
 - SimpleProject
 - Dockerfile
 - SimpleProject.war
 - pom.xml
- Dockerfile Editor:** A code editor window titled "Dockerfile" containing the following Dockerfile content:

```
1 FROM tomcat
2 COPY SimpleProject.war /usr/local/tomcat/webapps/SimpleProject.war
3 EXPOSE 8080
4 CMD ["catalina.sh","run"]
```
- Problems View:** Shows 0 errors, 2 warnings, 0 others. The warnings section lists "Warnings (2 items)".
- Console View:** Shows a blank console area.
- Bottom Bar:** Includes a search bar, pinned application icons (File Explorer, Task List, etc.), and system status indicators (Windows logo, 73°F Sunny, 7:07 PM, 9/7/2021).

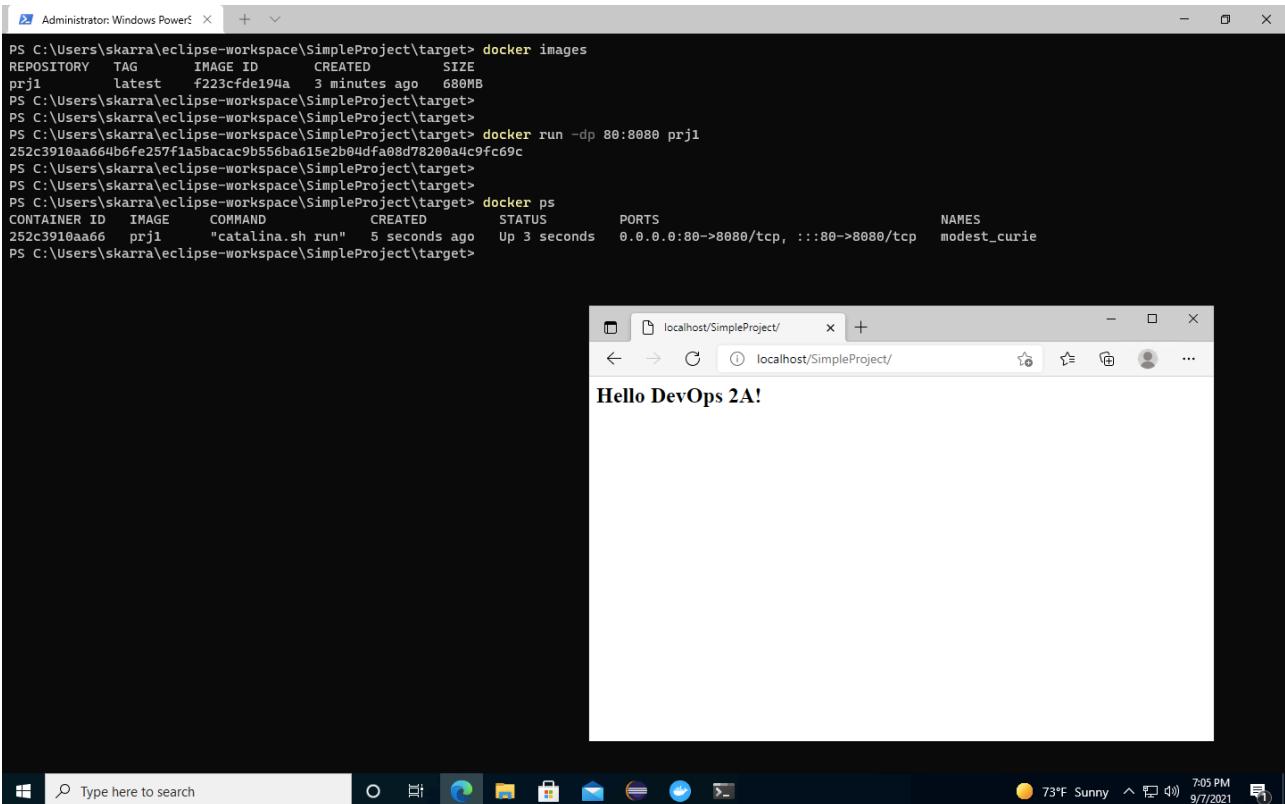
Test the Dockerfile by running Docker build and create a container

```
Administrator: Windows PowerShell - PS C:\Users\skarra\eclipse-workspace\SimpleProject\target> docker build -t prj1 .  
[+] Building 36.5s (4/6)  
=> [internal] load build definition from Dockerfile  
=> => transferring dockerfile: 156B  
=> [internal] load .dockerignore  
=> => transferring context: 2B  
=> [internal] load metadata for docker.io/library/tomcat:latest  
=> [1/2] FROM docker.io/library/tomcat@sha256:479374af92bb0f8492dd4bd4520b62f68227028215848c590bd86811b5abc808  
=> => resolve docker.io/library/tomcat@sha256:479374af92bb0f8492dd4bd4520b62f68227028215848c590bd86811b5abc808  
=> => sha256:479374af92bb0f8492dd4bd4520b62f68227028215848c590bd86811b5abc808 549B / 549B  
=> => sha256:9acb424c9df5f1383bf1f9df4e4430f049b7a40567d717a4bf88a62b196ff8bd 2.42kB / 2.42kB  
[+] Building 36.8s (4/6)  
  
=> [internal] load build definition from Dockerfile  
=> => transferring dockerfile: 156B  
=> [internal] load .dockerignore  
=> => transferring context: 2B  
=> [internal] load metadata for docker.io/library/tomcat:latest  
=> [1/2] FROM docker.io/library/tomcat@sha256:479374af92bb0f8492dd4bd4520b62f68227028215848c590bd86811b5abc808  
=> => resolve docker.io/library/tomcat@sha256:479374af92bb0f8492dd4bd4520b62f68227028215848c590bd86811b5abc808  
=> => sha256:479374af92bb0f8492dd4bd4520b62f68227028215848c590bd86811b5abc808 549B / 549B  
=> => sha256:9acb424c9df5f1383bf1f9df4e4430f049b7a40567d717a4bf88a62b196ff8bd 2.42kB / 2.42kB  
[+] Building 307.6s (7/7) FINISHED  
=> [internal] load build definition from Dockerfile  
=> => transferring dockerfile: 156B  
=> [internal] load .dockerignore  
=> => transferring context: 2B  
=> [internal] load metadata for docker.io/library/tomcat:latest  
=> [1/2] FROM docker.io/library/tomcat@sha256:479374af92bb0f8492dd4bd4520b62f68227028215848c590bd86811b5abc808  
=> => resolve docker.io/library/tomcat@sha256:479374af92bb0f8492dd4bd4520b62f68227028215848c590bd86811b5abc808  
=> => sha256:479374af92bb0f8492dd4bd4520b62f68227028215848c590bd86811b5abc808 549B / 549B  
=> => sha256:9acb424c9df5f1383bf1f9df4e4430f049b7a40567d717a4bf88a62b196ff8bd 2.42kB / 2.42kB  
=> => sha256:ab1f0eb1bb1a1ccf9f1599748lae4389253c0378fe1883b2d89d7849db18c7481 12.85kB / 12.85kB  
=> => sha256:911ea9f2bd153a53d5297e0631le18a72a86d7e2c8e1807176e08f991bde5d64 10.87MB / 10.87MB  
=> => sha256:955615a668ce16978a1u43fb6ee6215f43fe0ba0fd4790712a20317f73d3d366 54.93MB / 54.93MB  
=> => sha256:27ba02298672161ace69df17574fd7d3b59878eb957b6cc545c7ed7ac3e01587 54.57MB / 54.57MB  
=> => sha256:785dfbb36c0c7fbfd1c98d950a9b49054e84bcccd4b54ebfab50b0e93dbfeeffe 5.42MB / 5.42MB  
=> => sha256:5fccc14f3069954b636e499dcf931976a0e6ccaa4fc5336548a3d3f2e0e3e57e95d 208B / 208B  
=> => sha256:4a0c30feddc848311ffe0ca7cd5fe8ebbd514d76f31d709848fe4fd218ffb93c 203.12MB / 203.12MB  
=> => sha256:5fa2fe1e770832f8d3d926cd476bc1cb8944c77435957fc0c3cef02f588af3f 170B / 170B  
=> => sha256:6fa4e6871c2e84cd72948b84c8c4c3e0165faa515b70804433e905f34555096 12.81MB / 12.81MB
```

```
Administrator: Windows Powershell -> sha256:9acb424c9d5f1383b1f9fdf4e44330f049b7a40567d717a4bf88a62b196f8b0d 2.42kB / 2.42kB 0.0s
[+] Building 307.6s (7/7) FINISHED 0.1s
=> [internal] load build definition from Dockerfile 0.0s
=> ==> transferring dockerfile: 156B 0.0s
=> [internal] load .dockerignore 0.0s
=> ==> transferring context: 2B 0.0s
=> [internal] load metadata for docker.io/library/tomcat:latest 0.0s
=> [1/2] FROM docker.io/library/tomcat@sha256:47937da9f29b0ff8492dd4bd452b6f268227028215848c590bd86811b5abc808 304.4s
=> ==> resolve docker.io/library/tomcat@sha256:47937da9f29b0ff8492dd4bd452b6f268227028215848c590bd86811b5abc808 0.1s
=> ==> sha256:47937da9f29b0ff8492dd4bd452b6f268227028215848c590bd86811b5abc808 549B / 549B 0.0s
=> ==> sha256:9acb424c9d5f1383b1f9fdf4e44330f049b7a40567d717a4bf88a62b196f8b0d 2.42kB / 2.42kB 0.0s
=> ==> sha256:ab1f0eb11a1ccf9f1509748lae4389253c0378ef1883b28d9f7849db18c7481 12.85kB 0.0s
=> ==> sha256:911ea9f2bd51e5c034582970e0311e18a72a86d7e2c8e01776e80f991bded64 10.87MB / 10.87MB 3.5s
=> ==> sha256:95561a668ce16978a1d43cb0ee215f5d04e0fa0fd47987012a203171f73d436e 54.93MB / 54.93MB 40.6s
=> ==> sha256:2795f694190f4308619e046d95b5515eef98144d0bad0ceb6bbcb725a8 5.15MB / 5.15MB 2.0s
=> ==> sha256:27bba2ee996271a6ce9dd1754fdd7d3b59079e8b57bccc854c7edac301587 54.57MB / 54.57MB 48.5s
=> ==> sha256:785dfb36cc7fbfd1c98d950a9b49054e84bccccd4b54ebfab50be9e3dbfeeffe 5.42MB / 5.42MB 5.3s
=> ==> sha256:3fcbb1f0369549f9376a04ebcd9f31976a06ecca53368a3d32f4e03e57e95d 208B / 208B 5.7s
=> ==> sha256:4a0c30fed9dc84311ffe0ca7cd5f0e8bbd514d76f31d70b984f04fd2180ffb93c 203.12MB / 203.12MB 145.4s
=> ==> sha256:54za2f776832f8d926cd476bc1cb8944cf7345978e05cefb02f588af3f 170B / 170B 42.2s
=> ==> sha256:f6faue871c2e84cd872948b84c8c43e01657aa515b70880433e985f345555996 12.81MB / 12.81MB 54.4s
=> ==> extracting sha256:95561a668ce16978a1d43cb666215f43febabfb4798712a2d3171f73d4366 183.7s
=> ==> sha256:6d773893b1443f2612c20aeee86f4fa4052010a3ca9305961 130B / 130B 50.1s
=> ==> extracting sha256:2756ef5f69as198f4308619e0446d95f5515eef44814dbad0ceb6bbcb725a8 5.1s
=> ==> extracting sha256:911ea9f2bd51e5c03455297e06311e72a86d7e2c8e1807176e80f991bded64 6.3s
=> ==> extracting sha256:27bba2ee996271a6ce9dd1754fdd7d3b59079e8b57b6cc854c7edac301587 59.2s
=> ==> extracting sha256:785dfb36cc7fbfd1c98d950a9b49054e84bccccd4b54ebfab50be9e3dbfeeffe 4.9s
=> ==> extracting sha256:3fcbb1f0369549f9376a06ecca53368a3d32f4e03e57e95d 8.0s
=> ==> extracting sha256:4a8c30fed9dc84311ffe0ca7cd5f0e8bbd514d76f31d70b948f64fd2180ffb93c 68.0s
=> ==> extracting sha256:54za2f776832f8d3d926cd476bc1cb8944cf77345978e05cefb02f588af3f 8.0s
=> ==> extracting sha256:6fa4e6871c2e84cd872948b84c8c43e01657aa515b70880433e985f345555996 8.8s
=> ==> extracting sha256:6d773893b1443f2612c20aeee86f4fa4052010a33ca9305961 8.8s
[+] Building 2.16kB 0.0s
=> [2/2] COPY SimpleProject.war /usr/local/tomcat/webapps/SimpleProject.war 1.9s
=> exporting to image 0.3s
=> ==> exporting layers 0.1s
=> ==> writing image sha256:f223cfd1e194a0e757c2d30571a7bda227f612a675d1dd61e854070b1001d4b2eb 0.0s
=> ==> naming to docker.io/library/prj1 0.0s
```

```
Use 'docker scan' to run Snyk tests against images to find vulnerabilities and learn how to fix them  
PS C:\Users\skarra\eclipse-workspace\SimpleProject\target>
```

Access the application from container and check it

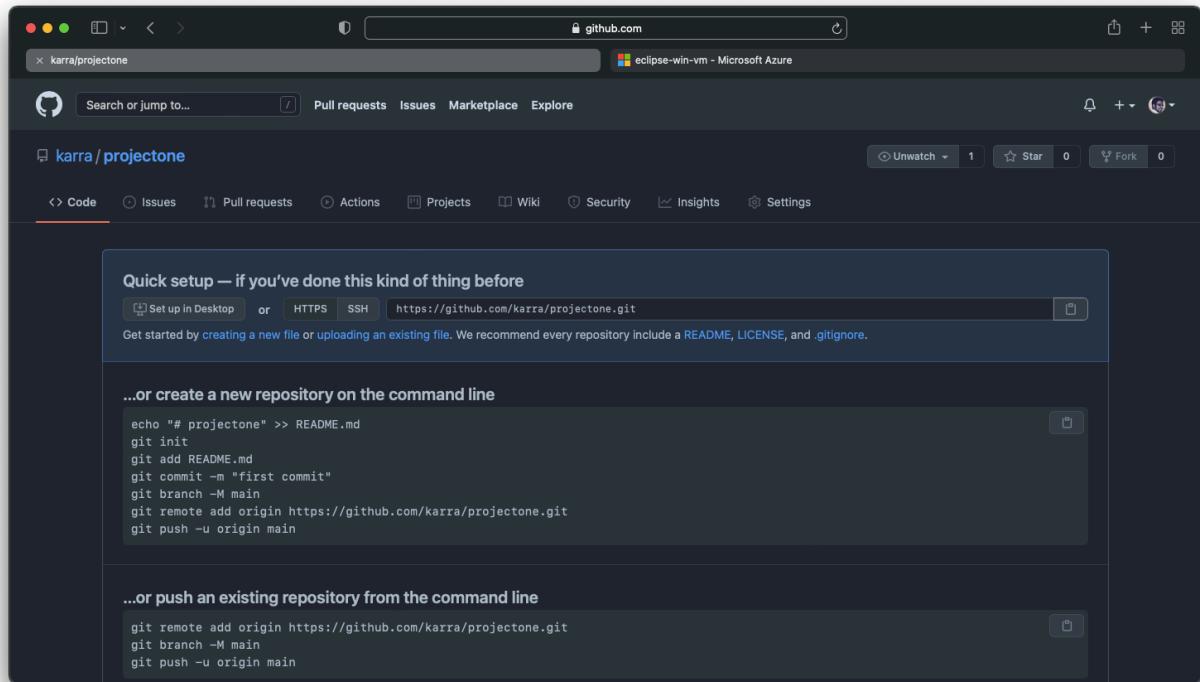


A screenshot of a Windows desktop environment. At the top is a taskbar with icons for File Explorer, Task View, Edge browser, File Explorer, Mail, File Explorer, and Task View again. The system tray shows the date as 9/7/2021, the time as 7:05 PM, and the weather as 73°F Sunny. In the center is a Windows PowerShell window titled "Administrator: Windows PowerShell". The command `docker images` was run, showing one image named "prj1" with a tag "latest". The command `docker run -dp 80:8080 prj1` was run, creating a container with ID "252c3910aa66". The command `docker ps` was run, showing the running container "prj1" with the name "modest_curie". Below the PowerShell window is a Microsoft Edge browser window with the URL "localhost/SimpleProject/". The page content is "Hello DevOps 2A!".

```
PS C:\Users\skarra\eclipse-workspace\SimpleProject\target> docker images
REPOSITORY TAG IMAGE ID CREATED SIZE
prj1 latest f223cfde194a 3 minutes ago 680MB
PS C:\Users\skarra\eclipse-workspace\SimpleProject\target>
PS C:\Users\skarra\eclipse-workspace\SimpleProject\target>
PS C:\Users\skarra\eclipse-workspace\SimpleProject\target> docker run -dp 80:8080 prj1
252c3910aa664b6fe257f1a5bacac9b556ba615e2b04dfa08d76200a4c9fc69c
PS C:\Users\skarra\eclipse-workspace\SimpleProject\target>
PS C:\Users\skarra\eclipse-workspace\SimpleProject\target>
PS C:\Users\skarra\eclipse-workspace\SimpleProject\target> docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
252c3910aa66 prj1 "catalina.sh run" 5 seconds ago Up 3 seconds 0.0.0.0:80->8080/tcp, :::80->8080/tcp modest_curie
PS C:\Users\skarra\eclipse-workspace\SimpleProject\target>
```

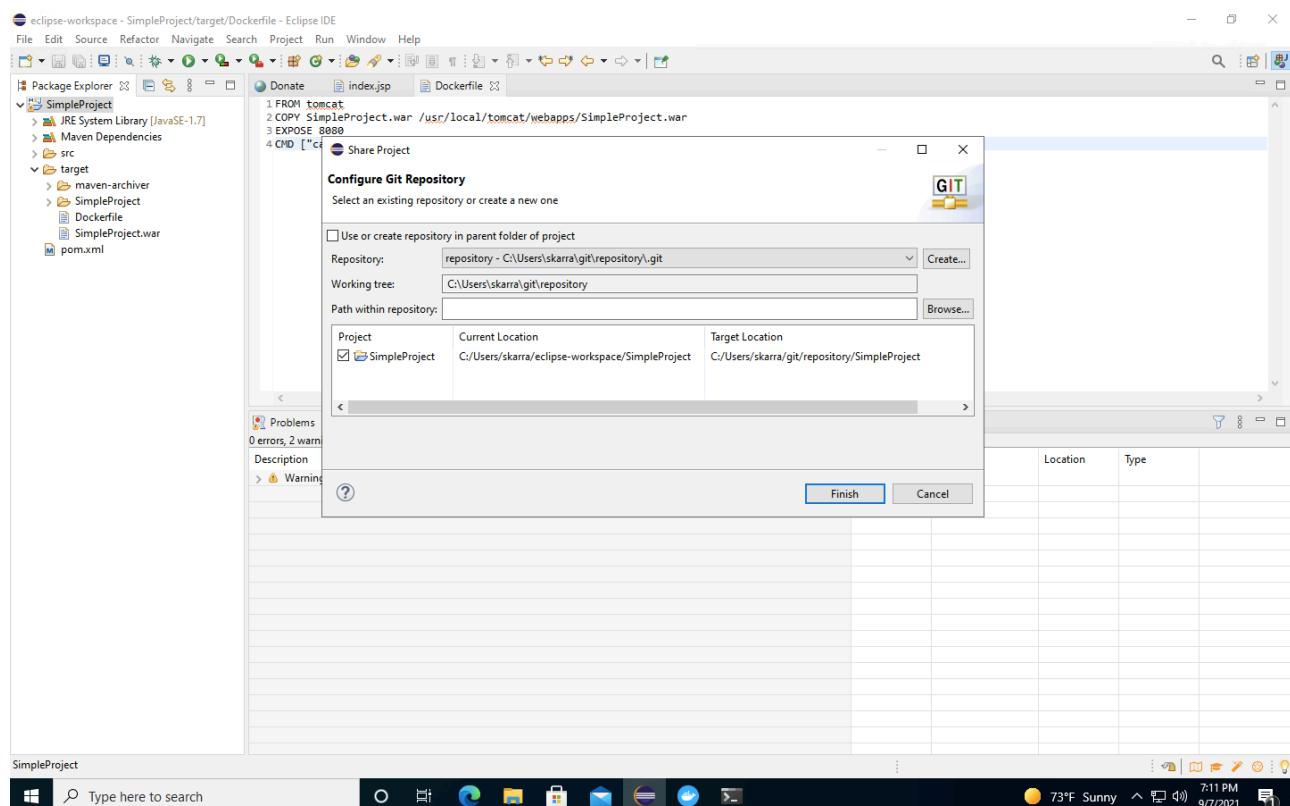
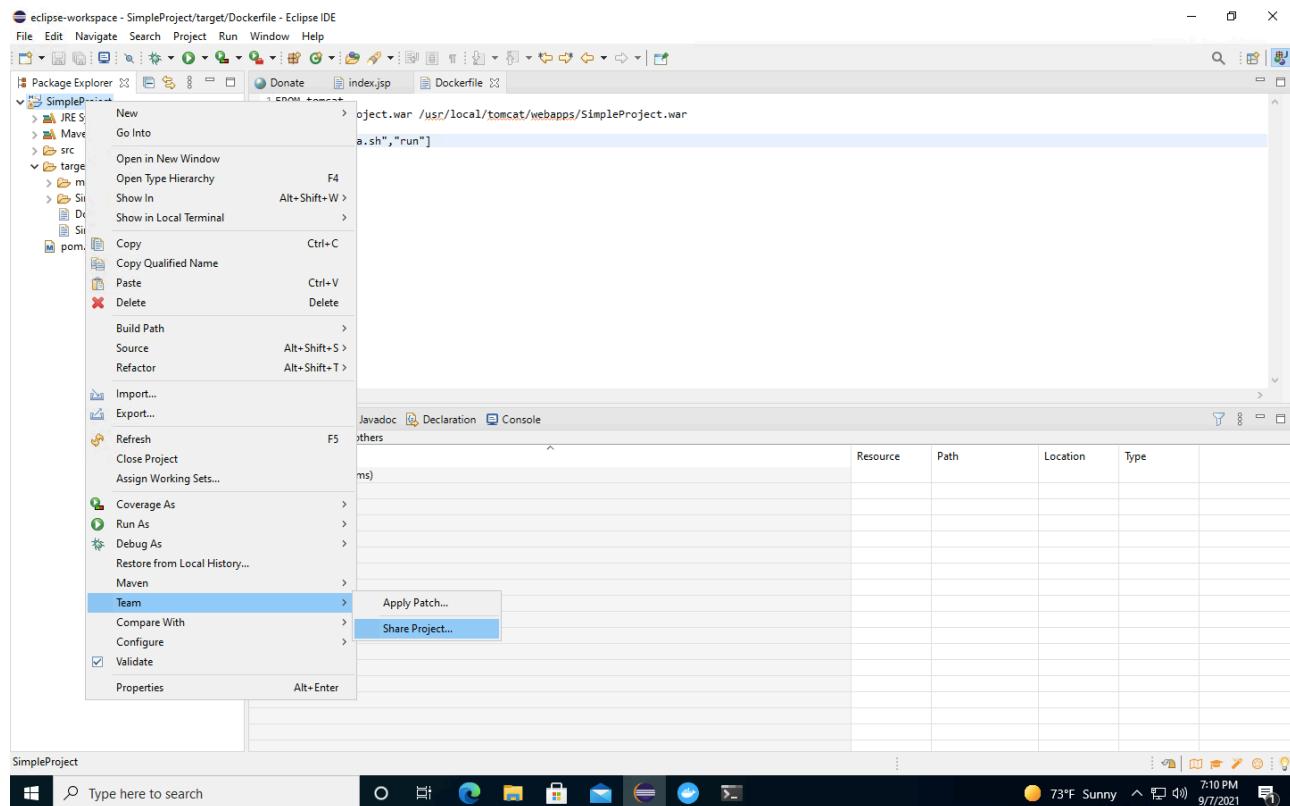
Phase 3: Pushing Code and Dockerfile to GIT

Create a *github* repository and copy repo URL



GitHub Link: <https://github.com/karra/projectone.git>

In Eclipse convert the app in to a local repo from Team meanu share Project Option



Commit and Push the code to remote repo

```
Administrator: Windows PowerShell + ▾
PS C:\Users\skarra\git\repository\SimpleProject> git config --global user.name "Srikanth Karra"
PS C:\Users\skarra\git\repository\SimpleProject> git config --global user.email "srikanth.karra@techmahindra.com"
PS C:\Users\skarra\git\repository\SimpleProject> ls

Directory: C:\Users\skarra\git\repository\SimpleProject

Mode                LastWriteTime       Length Name
----                ——————       ———— ——
d----
```

```
Administrator: Windows PowerShell + ▾
PS C:\Users\skarra\git\repository\SimpleProject> 2284 pom.xml

PS C:\Users\skarra\git\repository\SimpleProject> git add .
PS C:\Users\skarra\git\repository\SimpleProject> git remote add origin https://github.com/karra/projectone.git
PS C:\Users\skarra\git\repository\SimpleProject> git status
On branch master

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
    new file:  .classpath
    new file:  .gitignore
    new file:  .project
    new file:  .settings/org.eclipse.core.resourcesprefs
    new file:  .settings/org.eclipse.jdt.core.preferences
    new file:  .settings/org.eclipse.m2e.core.preferences
    new file:  pom.xml
    new file:  src/main/webapp/WEB-INF/web.xml
    new file:  src/main/webapp/index.jsp

PS C:\Users\skarra\git\repository\SimpleProject> git commit -m "first commit"
[master (root-commit) a504afe] first commit
 9 files changed, 144 insertions(+)
 create mode 100644 SimpleProject/.classpath
 create mode 100644 SimpleProject/.gitignore
 create mode 100644 SimpleProject/.project
 create mode 100644 SimpleProject/.settings/org.eclipse.core.resourcesprefs
 create mode 100644 SimpleProject/.settings/org.eclipse.jdt.core.preferences
 create mode 100644 SimpleProject/.settings/org.eclipse.m2e.core.preferences
 create mode 100644 SimpleProject/pom.xml
 create mode 100644 SimpleProject/src/main/webapp/WEB-INF/web.xml
 create mode 100644 SimpleProject/src/main/webapp/index.jsp
PS C:\Users\skarra\git\repository\SimpleProject>
PS C:\Users\skarra\git\repository\SimpleProject>
PS C:\Users\skarra\git\repository\SimpleProject> git push -u origin master

Windows PowerShell Type here to search 73°F Sunny 7:29 PM 9/7/2021
```

```
No commits yet

Changes to be committed:
(use "git rm --cached <file>..." to unstage)
 new file: .classpath
 new file: .gitignore
 new file: .project
 new file: .settings/org.eclipse.core.resourcesprefs
 new file: .settings/org.eclipse.jdt.core.prefs
 new file: .settings/org.eclipse.m2e.core.prefs
 new file: pom.xml
 new file: src/main/webapp/WEB-INF/web.xml
 new file: src/main/webapp/index.jsp

PS C:\Users\skarra\git\repository\SimpleProject>
PS C:\Users\skarra\git\repository\SimpleProject> git commit -m "first commit"
[master (root-commit) a504af0] first commit
 9 files changed, 144 insertions(+)
 create mode 100644 SimpleProject/.classpath
 create mode 100644 SimpleProject/.gitignore
 create mode 100644 SimpleProject/.project
 create mode 100644 SimpleProject/.settings/org.eclipse.core.resourcesprefs
 create mode 100644 SimpleProject/.settings/org.eclipse.jdt.core.prefs
 create mode 100644 SimpleProject/.settings/org.eclipse.m2e.core.prefs
 create mode 100644 SimpleProject/pom.xml
 create mode 100644 SimpleProject/src/main/webapp/WEB-INF/web.xml
 create mode 100644 SimpleProject/src/main/webapp/index.jsp
PS C:\Users\skarra\git\repository\SimpleProject>
PS C:\Users\skarra\git\repository\SimpleProject>
PS C:\Users\skarra\git\repository\SimpleProject> git push -u origin master
info: please complete authentication in your browser...
Enumerating objects: 17, done.
Counting objects: 100% (17/17), done.
Delta compression using up to 2 threads
Compressing objects: 100% (12/12), done.
Writing objects: 100% (17/17), 2.49 KiB | 851.00 KiB/s, done.
Total 17 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/karra/projectone.git
 * [new branch]      master -> master
Branch 'master' set up to track remote branch 'master' from 'origin'.
PS C:\Users\skarra\git\repository\SimpleProject>
```

Windows taskbar: Type here to search, Start button, File Explorer, Edge, File Manager, Mail, Task View, Taskbar icons, 73°F Sunny, 7:30 PM, 9/7/2021

The screenshot shows a GitHub repository page for 'karra/projectone'. The repository name is 'SimpleProject'. The commit history is displayed under the 'Code' tab, showing a single commit by 'Srikanth Karra' titled 'first commit' made 8 minutes ago. The commit message includes a link to the commit history. Below the commit list, there are links for 'Unwatch', 'Star', 'Fork', and other repository details. At the bottom of the page, there are links for GitHub's general terms and conditions.

Code

Srikanth Karra first commit

..

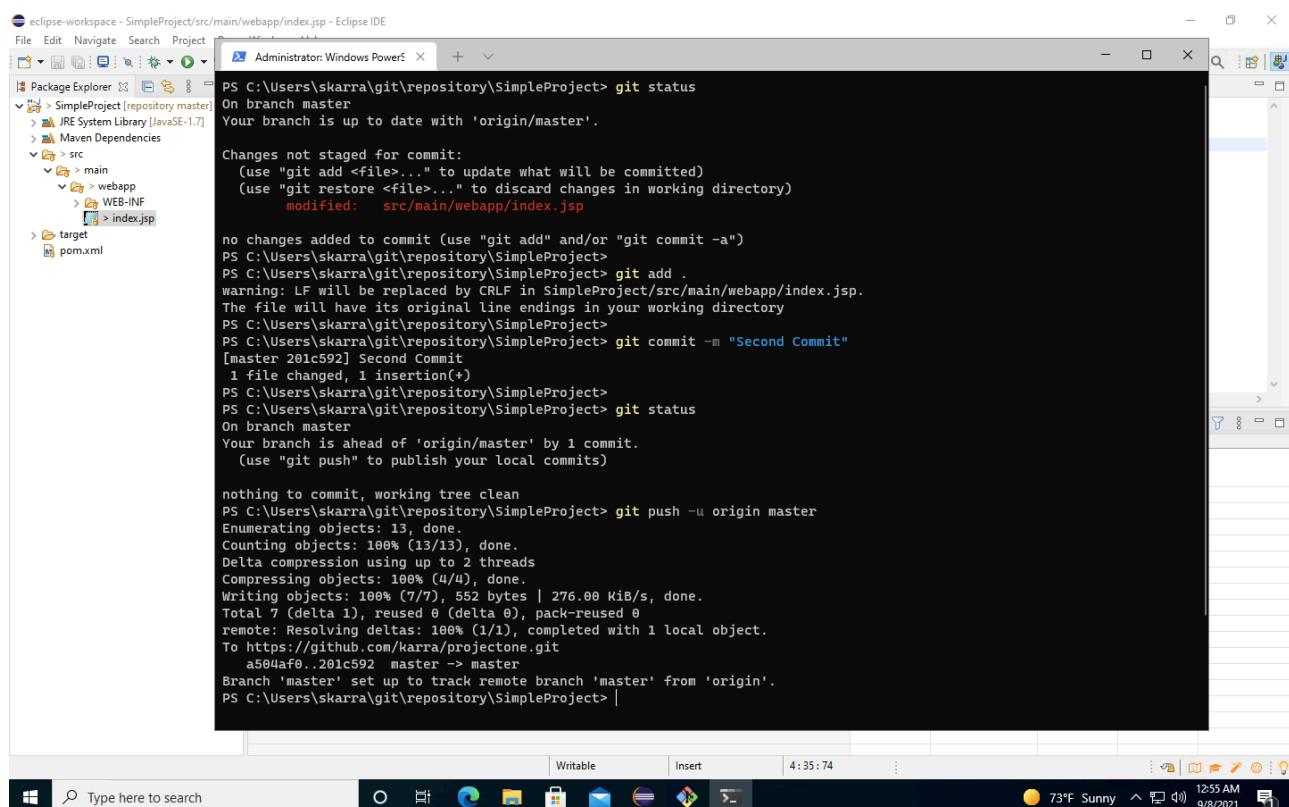
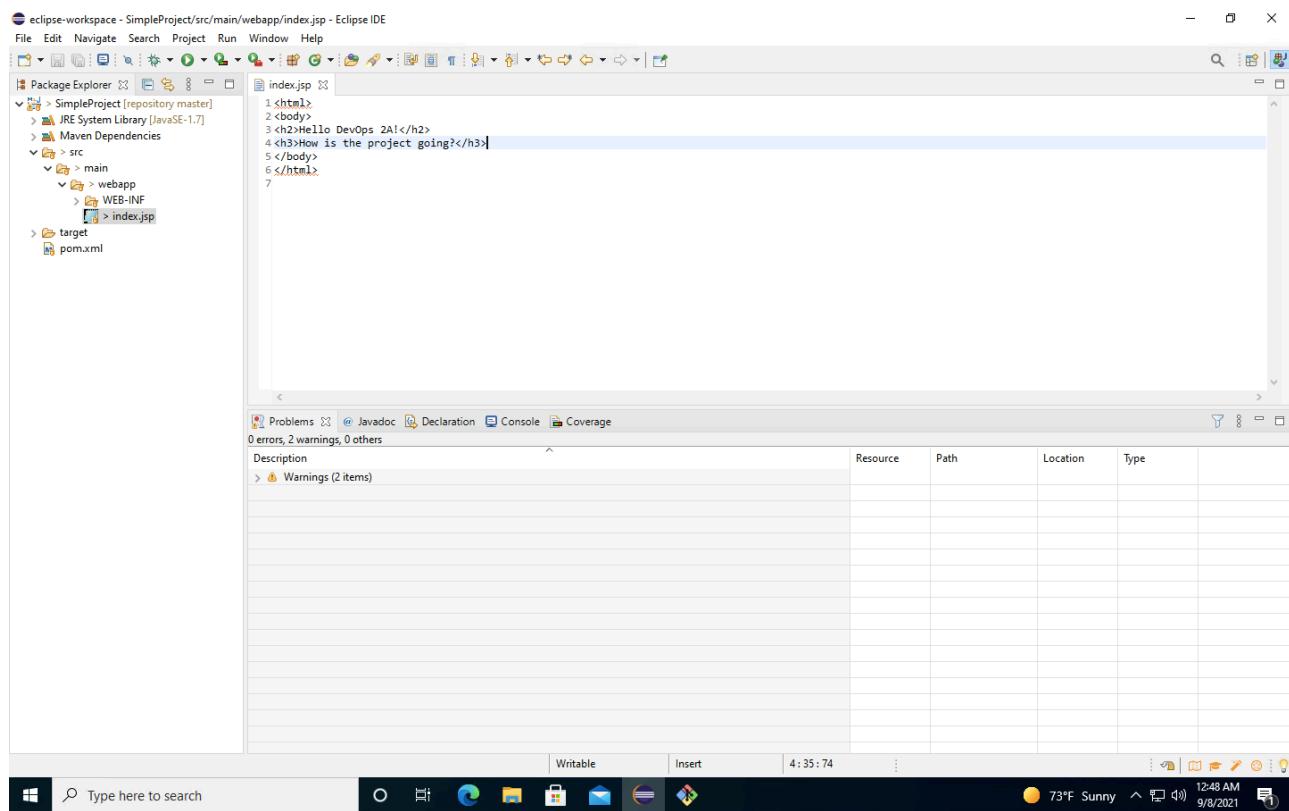
File	Commit	Time
.settings	first commit	8 minutes ago
src/main/webapp	first commit	8 minutes ago
.classpath	first commit	8 minutes ago
.gitignore	first commit	8 minutes ago
.project	first commit	8 minutes ago
pom.xml	first commit	8 minutes ago

Unwatch 1 Star 0 Fork 0

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Phase 4: Deploy a Change

Modify Project index.jsp, Commit and Push to remote repo



Check for the change in remote Repo

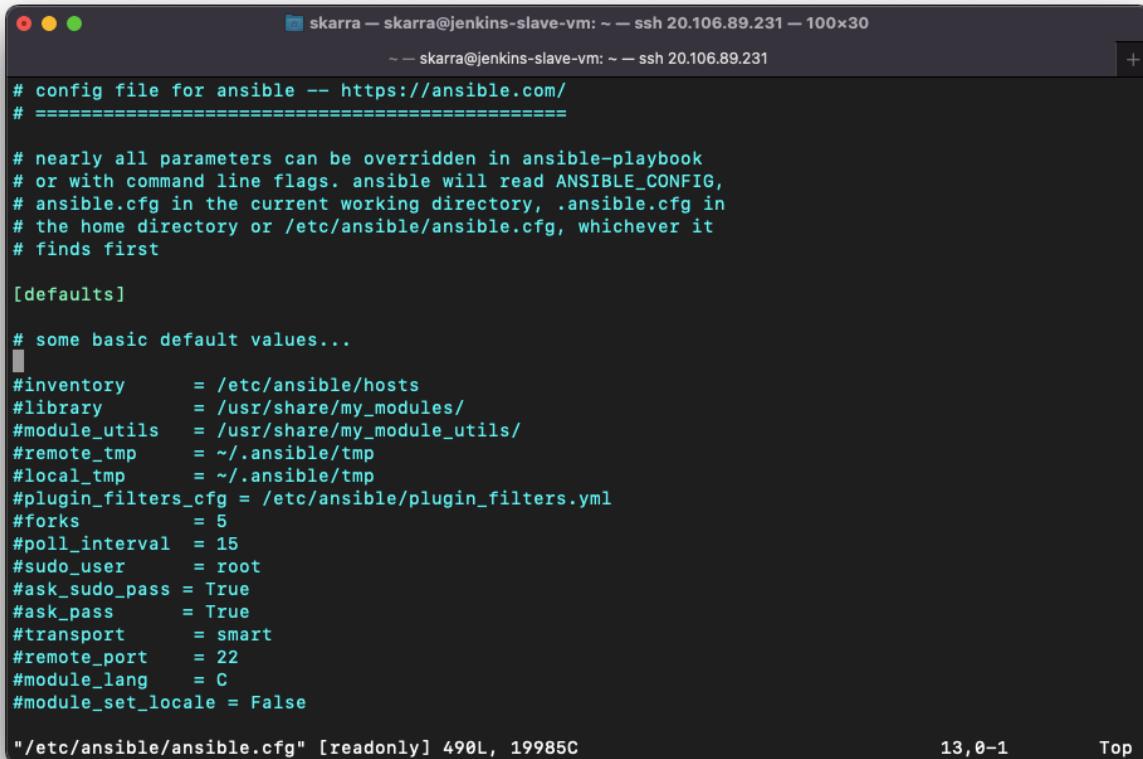
The screenshot shows a GitHub repository page for 'karra/projectone'. The repository has 1 star and 0 forks. A recent commit by 'Srikanth Karra' titled 'Second Commit' was made 3 minutes ago. The commit message is 'Hello DevOps 2A!'. The code diff shows the following changes:

```
diff --git a/src/main/webapp/index.jsp b/src/main/webapp/index.jsp
--- a/src/main/webapp/index.jsp
+++ b/src/main/webapp/index.jsp
@@ -1 +1 @@
<html>
<body>
<h2>Hello DevOps 2A!</h2>
<h3>How is the project going?</h3>
</body>
</html>
```

The page also includes standard GitHub navigation links like Code, Issues, Pull requests, Actions, Projects, Wiki, Security, Insights, and Settings.

Phase 5: Create a Ansible Playbook to Automate Machine Setup with Docker Engine

In build server configure Ansible manually



The screenshot shows a terminal window with the following content:

```
skarra — skarra@jenkins-slave-vm: ~ — ssh 20.106.89.231 — 100x30
~ — skarra@jenkins-slave-vm: ~ — ssh 20.106.89.231

# config file for ansible -- https://ansible.com/
# =====

# nearly all parameters can be overridden in ansible-playbook
# or with command line flags. ansible will read ANSIBLE_CONFIG,
# ansible.cfg in the current working directory, .ansible.cfg in
# the home directory or /etc/ansible/ansible.cfg, whichever it
# finds first

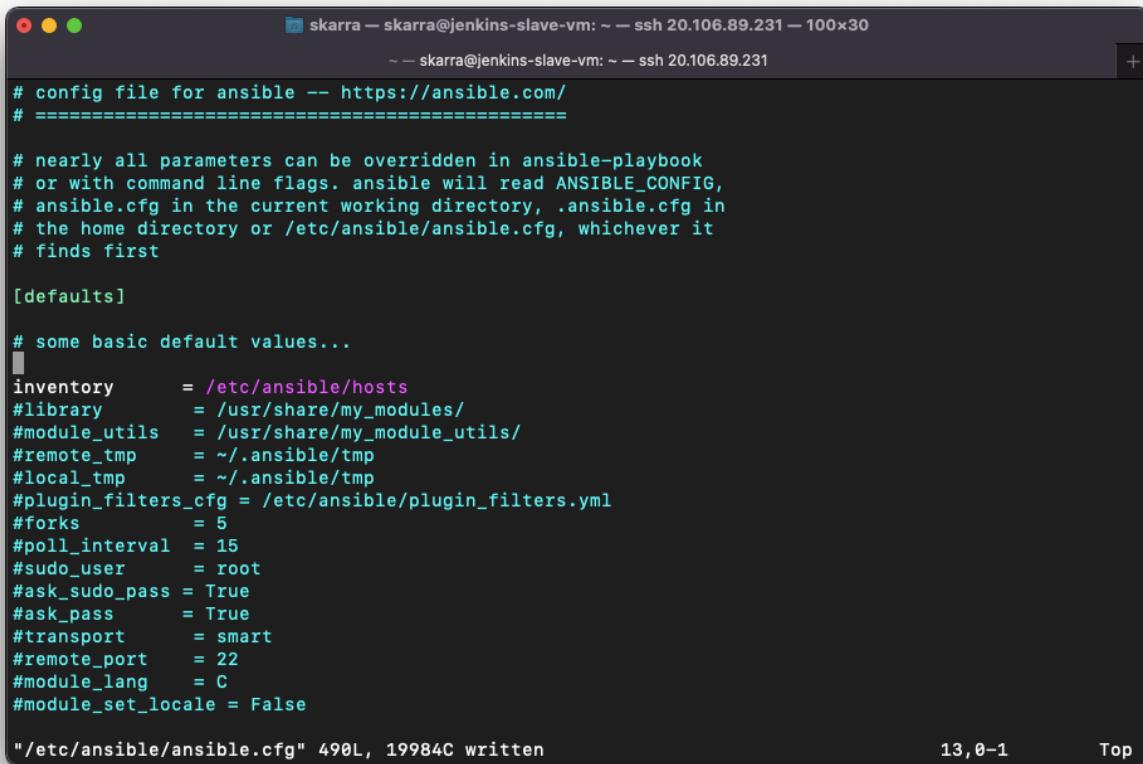
[defaults]

# some basic default values...
#inventory      = /etc/ansible/hosts
#library        = /usr/share/my_modules/
#module_utils   = /usr/share/my_module_utils/
#remote_tmp     = ~/.ansible/tmp
#local_tmp      = ~/.ansible/tmp
#plugin_filters_cfg = /etc/ansible/plugin_filters.yml
#forks          = 5
#poll_interval  = 15
#sudo_user      = root
#ask_sudo_pass  = True
#ask_pass        = True
#transport      = smart
#remote_port    = 22
#module_lang    = C
#module_set_locale = False

"/etc/ansible/ansible.cfg" [readonly] 490L, 19985C
```

At the bottom right of the terminal window, there are two small text elements: "13,0-1" and "Top".

Modify ansible.cfg to use hosts file as inventory



```
# config file for ansible -- https://ansible.com/
# =====

# nearly all parameters can be overridden in ansible-playbook
# or with command line flags. ansible will read ANSIBLE_CONFIG,
# ansible.cfg in the current working directory, .ansible.cfg in
# the home directory or /etc/ansible/ansible.cfg, whichever it
# finds first

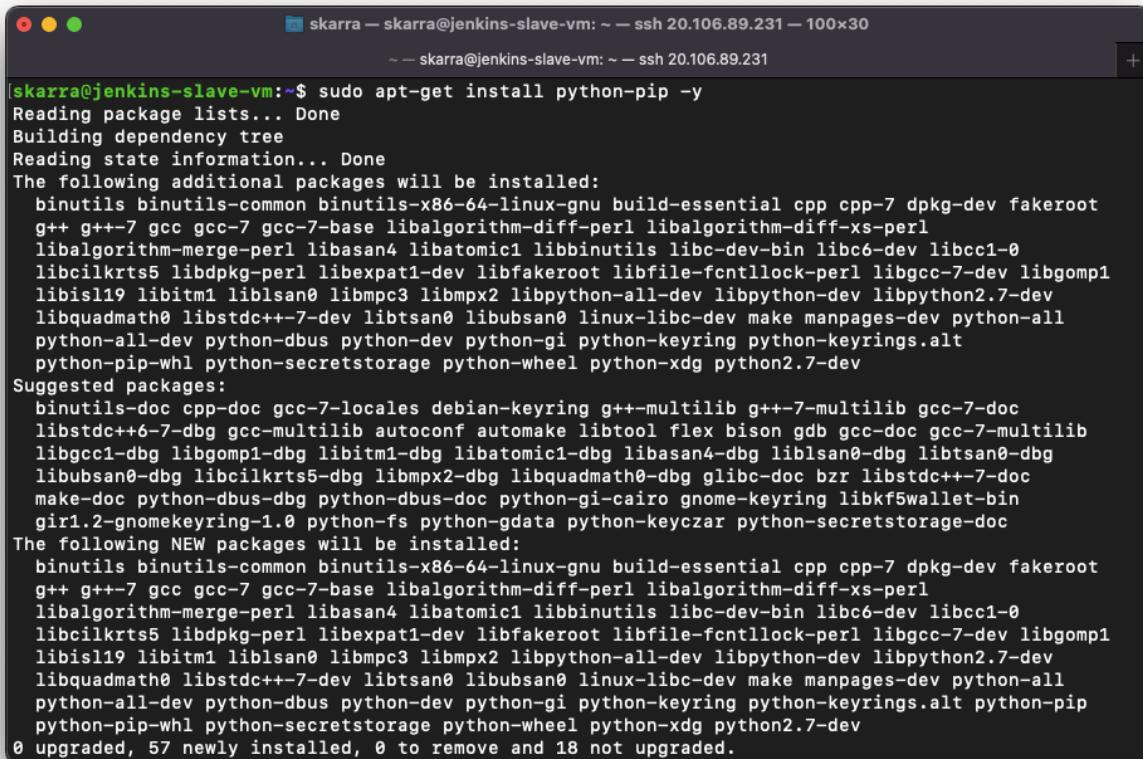
[defaults]

# some basic default values...

inventory      = /etc/ansible/hosts
#library        = /usr/share/my_modules/
#module_utils   = /usr/share/my_module_utils/
#remote_tmp     = ~/.ansible/tmp
#local_tmp      = ~/.ansible/tmp
#plugin_filters_cfg = /etc/ansible/plugin_filters.yml
#forks          = 5
#poll_interval  = 15
#sudo_user      = root
#ask_sudo_pass  = True
#ask_pass        = True
#transport       = smart
#remote_port    = 22
#module_lang    = C
#module_set_locale = False

"/etc/ansible/ansible.cfg" 490L, 19984C written
```

install python-pip in ansible server



```
[skarra@jenkins-slave-vm:~$ sudo apt-get install python-pip -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
binutils binutils-common binutils-x86_64-linux-gnu build-essential cpp cpp-7 dpkg-dev fakeroot
g++ g++-7 gcc gcc-7 gcc-7-base libalgorithm-diff-perl libalgorithm-diff-xs-perl
libalgorithm-merge-perl libasan4 libatomic1 libbinutils libc-dev-bin libc6-dev libcc1-0
libcilkrt5 libdpkg-perl libexpat1-dev libfakeroot libfile-fcntllock-perl libgcc-7-dev libgomp1
libis19 libitm1 liblsan0 libmpc3 libmpx2 libpython-all-dev libpython-dev libpython2.7-dev
libquadmath0 libstdc++-7-dev libtsan0 libubsan0 linux-libc-dev make manpages-dev python-all
python-all-dev python-dbus python-dev python-keyring python-keyrings.alt
python-pip-whl python-secretstorage python-wheel python-xdg python2.7-dev
Suggested packages:
binutils-doc cpp-doc gcc-7-locales debian-keyring g++-multilib g++-7-multilib gcc-7-doc
libstdc++-7-dbg gcc-multilib autoconf automake libtool flex bison gdb gcc-doc gcc-7-multilib
libgcc1-dbg libgomp1-dbg libitm1-dbg libatomic1-dbg libasan4-dbg liblsan0-dbg libtsan0-dbg
libubsan0-dbg libcilkrt5-dbg libmpx2-dbg libquadmath0-dbg glibc-doc bzip2 libstdc++-7-doc
make-doc python-dbus-doc python-gi-cairo gnome-keyring libkf5wallet-bin
gir1.2-gnomekeyring-1.0 python-fs python-gdata python-keyczar python-secretstorage-doc
The following NEW packages will be installed:
binutils binutils-common binutils-x86_64-linux-gnu build-essential cpp cpp-7 dpkg-dev fakeroot
g++ g++-7 gcc gcc-7 gcc-7-base libalgorithm-diff-perl libalgorithm-diff-xs-perl
libalgorithm-merge-perl libasan4 libatomic1 libbinutils libc-dev-bin libc6-dev libcc1-0
libcilkrt5 libdpkg-perl libexpat1-dev libfakeroot libfile-fcntllock-perl libgcc-7-dev libgomp1
libis19 libitm1 liblsan0 libmpc3 libmpx2 libpython-all-dev libpython-dev libpython2.7-dev
libquadmath0 libstdc++-7-dev libtsan0 libubsan0 linux-libc-dev make manpages-dev python-all
python-all-dev python-dbus python-dev python-keyring python-keyrings.alt python-pip
python-pip-whl python-secretstorage python-wheel python-xdg python2.7-dev
0 upgraded, 57 newly installed, 0 to remove and 18 not upgraded.
```

```
skarra — skarra@jenkins-slave-vm: ~ — ssh 20.106.89.231 — 100x30
~ — skarra@jenkins-slave-vm: ~ — ssh 20.106.89.231

Setting up libcilkkrts5:amd64 (7.5.0-3ubuntu1~18.04) ...
Setting up libubsan0:amd64 (7.5.0-3ubuntu1~18.04) ...
Setting up fakeroot (1.22-2ubuntu1) ...
update-alternatives: using /usr/bin/fakeroot-sysv to provide /usr/bin/fakeroot (fakeroot) in auto mode
Setting up libgcc-7-dev:amd64 (7.5.0-3ubuntu1~18.04) ...
Setting up cpp-7 (7.5.0-3ubuntu1~18.04) ...
Setting up libstdc++-7-dev:amd64 (7.5.0-3ubuntu1~18.04) ...
Setting up libalgorithm-merge-perl (0.08-3) ...
Setting up libalgorithm-diff-xs-perl (0.04-5) ...
Setting up libexpat1-dev:amd64 (2.2.5-3ubuntu0.2) ...
Setting up libpython2.7-dev:amd64 (2.7.17-1~18.04ubuntu1.6) ...
Setting up python2.7-dev (2.7.17-1~18.04ubuntu1.6) ...
Setting up binutils-x86-64-linux-gnu (2.30-21ubuntu1~18.04.5) ...
Setting up cpp (4:7.4.0-1ubuntu2.3) ...
Setting up libpython-dev:amd64 (2.7.15~rc1-1) ...
Setting up python-dev (2.7.15~rc1-1) ...
Setting up libpython-all-dev:amd64 (2.7.15~rc1-1) ...
Setting up python-all-dev (2.7.15~rc1-1) ...
Setting up binutils (2.30-21ubuntu1~18.04.5) ...
Setting up gcc-7 (7.5.0-3ubuntu1~18.04) ...
Setting up g++-7 (7.5.0-3ubuntu1~18.04) ...
Setting up gcc (4:7.4.0-1ubuntu2.3) ...
Setting up dpkg-dev (1.19.0.5ubuntu2.3) ...
Setting up g++ (4:7.4.0-1ubuntu2.3) ...
update-alternatives: using /usr/bin/g++ to provide /usr/bin/c++ (c++) in auto mode
Setting up build-essential (12.4ubuntu1) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for libc-bin (2.27-3ubuntu1.4) ...
skarra@jenkins-slave-vm:~$
```

Using PIP install azure modules in Ansible server

```
skarra — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231 — 103x41
~ -- skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231

[skarra@jenkins-slave-vm:~/vm$ sudo pip install ansible[azure]
The directory '/home/skarra/.cache/pip/http' or its parent directory is not owned by the current user a
nd the cache has been disabled. Please check the permissions and owner of that directory. If executing
pip with sudo, you may want sudo's -H flag.
The directory '/home/skarra/.cache/pip' or its parent directory is not owned by the current user and ca
ching wheels has been disabled. check the permissions and owner of that directory. If executing pip wit
h sudo, you may want sudo's -H flag.
Requirement already satisfied: ansible[azure] in /usr/lib/python2.7/dist-packages
Collecting azure-cli-core==2.0.35 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/ee/81/561473d6614d15f450eba6b7c8e0e1fbba34bf117f
e77c1188010870e24/azure_cli_core-2.0.35-py2.py3-none-any.whl (90kB)
    100% |██████████| 92kB 5.1MB/s
Collecting azure-cli-nspkg==3.0.2 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/7c/94/cf884b92a870422f02c3f1f86573d04d5cc1abdc2ac
51b8419c7ee2e2a00/azure_cli_nspkg-3.0.2-py2.py3-none-any.whl
Collecting azure-common==1.1.11 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/97/3b/2c7cda25382c3bb566008c5c8f8aa28663fd15a80a6
204c76ae0035de107/azure_common-1.1.11-py2.py3-none-any.whl
Collecting azure-graphrbac==0.40.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/89/0a/29f7e2914033e2536026b8f0d7f8deb1edda68c9a93
ce4757b2b1e39568b/azure_graphrbac-0.40.0-py2.py3-none-any.whl (63kB)
    100% |██████████| 71kB 12.5MB/s
Collecting azure-keyvault==1.0.0a1 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/03/f3/fe18493d4ce781368f23d05701a8203344fdc15dbf9
cfee4450652776d1a/azure_keyvault-1.0.0a1-py2.py3-none-any.whl (109kB)
    100% |██████████| 112kB 9.3MB/s
Collecting azure-mgmt-authorization==0.51.1 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/a1/71/9a20913e92771b3c23564f1bea54d376d09fb30a755
85087c70b769d75c8/azure_mgmt_authorization-0.51.1-py2.py3-none-any.whl (111kB)
    100% |██████████| 112kB 10.5MB/s
Collecting azure-mgmt-automation==0.1.1 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/b0/a5/e3e1dd8b1cad0e97df3a274360fddc2e036a9eeb776
53aff4ab8a09ad28d/azure_mgmt_automation-0.1.1-py2.py3-none-any.whl (380kB)
    100% |██████████| 389kB 3.3MB/s
Collecting azure-mgmt-batch==5.0.1 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/97/81/a9eb3fd2ab070159105b4cf9640c24410ac8195286
729d62bffd871de94/azure_mgmt_batch-5.0.1-py2.py3-none-any.whl (87kB)
    100% |██████████| 92kB 12.4MB/s
Collecting azure-mgmt-cdn==3.0.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/ab/17/1684f274bd57ff81b0ac9000030d5796bf88c9735a0
93ba8b693c39ca6fd/azure_mgmt_cdn-3.0.0-py2.py3-none-any.whl (108kB)
```

```
skarra — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231 — 103x41
~ — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231

729d62bfdf871de94/azure_mgmt_batch==5.0.1-py2.py3-none-any.whl (87kB)
  100% |████████████████████████████████| 92kB 12.4MB/s
Collecting azure-mgmt-cdn==3.0.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/ab/17/1684f274bd57ff81b0ac9000030d5796bf88c9735a0
93ba8b693c39ca6fd/azure_mgmt_cdn-3.0.0-py2.py3-none-any.whl (108kB)
  100% |████████████████████████████████| 112kB 11.0MB/s
Collecting azure-mgmt-compute==4.4.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/b7/c4/2ba0af13ecfc8a3dc2a43cb7306d8b1fe6881b9302
8afb3820458a1a3e2/azure_mgmt_compute-4.4.0-py2.py3-none-any.whl (2.5MB)
  100% |████████████████████████████████| 2.5MB 540kB/s
Collecting azure-mgmt-containerinstance==1.4.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/77/50/f7f419e0ac788d41d080d5f25daf988b993063aab3b
fd90def54e93e72d7/azure_mgmt_containerinstance-1.4.0-py2.py3-none-any.whl (87kB)
  100% |████████████████████████████████| 92kB 10.9MB/s
Collecting azure-mgmt-containerregistry==2.0.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/c5/b6/926aba2129e87976a00c4742aa1dba4fea09708c087
1ab48ec7937f9ac99/azure_mgmt_containerregistry-2.0.0-py2.py3-none-any.whl (274kB)
  100% |████████████████████████████████| 276kB 5.2MB/s
Collecting azure-mgmt-containerservice==4.4.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/5b/2f/0eba2bdb5d3f66c076a66b0020ccfe9c7e78534ac13
2faaa104c138680c1/azure_mgmt_containerservice-4.4.0-py2.py3-none-any.whl (206kB)
  100% |████████████████████████████████| 215kB 6.8MB/s
Collecting azure-mgmt-cosmosdb==0.5.2 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/71/69/b21344bd4cebec03118db5582418a290468113c6cd0
5a0a76a6617510e2/azure_mgmt_cosmosdb-0.5.2-py2.py3-none-any.whl (101kB)
  100% |████████████████████████████████| 102kB 12.1MB/s
Collecting azure-mgmt-devtestlabs==3.0.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/9b/e0/583e30ffbfc26d0f950b3d364195ca31beb7806b26f
c4cbc940f7fad61b0/azure_mgmt_devtestlabs-3.0.0-py2.py3-none-any.whl (381kB)
  100% |████████████████████████████████| 389kB 3.6MB/s
Collecting azure-mgmt-dns==2.1.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/c7/d7/0f986a64b06db93cf29b76f9a188f5778eb959624a0
0ed6aedc335ee58d2/azure_mgmt_dns-2.1.0-py2.py3-none-any.whl (134kB)
  100% |████████████████████████████████| 143kB 9.8MB/s
Collecting azure-mgmt-hdinsight==0.1.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/14/8c/394f790d71193b3252b7fc13c9931df737436fc3495
072455680d5a617a9/azure_mgmt_hdinsight-0.1.0-py2.py3-none-any.whl (117kB)
  100% |████████████████████████████████| 122kB 11.1MB/s
Collecting azure-mgmt-iothub==0.7.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/9c/c8/333e4f03eef95832f90534c2aea3b6809c2b5d50ca0
87b7ce4e125527ea9/azure_mgmt_iothub-0.7.0-py2.py3-none-any.whl (131kB)
```

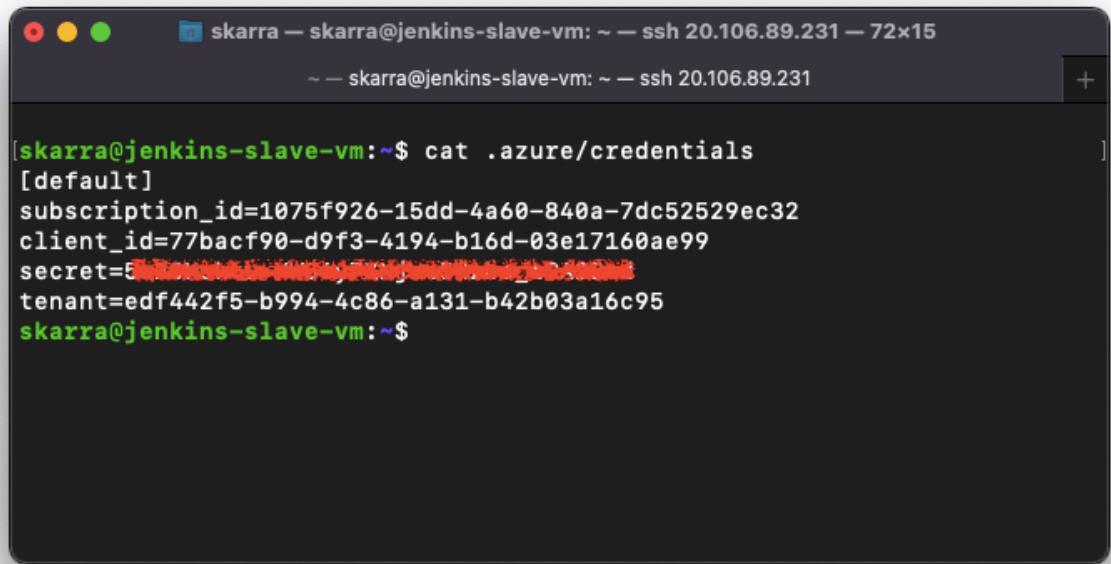
```
skarra — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231 — 103x41
~ — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231

  Downloading https://files.pythonhosted.org/packages/9c/c8/333e4f03eef95832f90534c2aea3b6809c2b5d50ca0
87b7ce4e125527ea9/azure_mgmt_iothub-0.7.0-py2.py3-none-any.whl (131kB)
    100% |████████████████████████████████| 133kB 8.7MB/s
Collecting azure-mgmt-keyvault==1.1.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/49/de/0d69aedae7c5f6428314640b65947203ab80409c12b
5d4e66fb5b7a4182e/azure_mgmt_keyvault-1.1.0-py2.py3-none-any.whl (111kB)
    100% |████████████████████████████████| 112kB 11.3MB/s
Collecting azure-mgmt-loganalytics==0.2.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/70/40/c9b77bf82916e963a701fb396673f7ddc4cdab9552
4b6d2edf927b05630/azure_mgmt_loganalytics-0.2.0-py2.py3-none-any.whl (89kB)
    100% |████████████████████████████████| 92kB 12.4MB/s
Collecting azure-mgmt-marketplaceordering==0.1.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/a8/cb/13502fdbaf520d08fb280eb31ecfe5d926b9cf92259
c22280bbde96b307d/azure_mgmt_marketplaceordering-0.1.0-py2.py3-none-any.whl
Collecting azure-mgmt-monitor==0.5.2 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/6a/3b/a8b95ee25f1c209ad82ad06de39f4efbf9dc8a8dc5
da5a7a48d7897bf3e/azure_mgmt_monitor-0.5.2-py2.py3-none-any.whl (247kB)
    100% |████████████████████████████████| 256kB 5.5MB/s
Collecting azure-mgmt-network==2.3.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/59/36/611dca31be00288f13fb632b4a3397791cf4cdd2c21
f331829ec3e086c52/azure_mgmt_network-2.3.0-py2.py3-none-any.whl (7.8MB)
    100% |████████████████████████████████| 7.8MB 177kB/s
Collecting azure-mgmt-nspkg==2.0.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/c9/e3/48b98f929290b0cd0aaa4707ecabb8aaeb267e8ef62
8af907fid1c506ec7/azure_mgmt_nspkg-2.0.0-py2.py3-none-any.whl
Collecting azure-mgmt-rdbms==1.4.1 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/2a/6c/9b8446c20bc2deff03f148e757d4d397abd67e1d4fd
aca45e1a8ada9e7e2/azure_mgmt_rdbms-1.4.1-py2.py3-none-any.whl (243kB)
    100% |████████████████████████████████| 245kB 5.7MB/s
Collecting azure-mgmt-redis==5.0.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/90/a7/42342a984b2916972c5c5e24df94e3cd5e4377a8dc4
65a83415706d9be6f/azure_mgmt_redis-5.0.0-py2.py3-none-any.whl (43kB)
    100% |████████████████████████████████| 51kB 12.3MB/s
Collecting azure-mgmt-resource==2.1.0 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/2b/2e/e79a278bedfc21308ab0c632759cfda5d7ff02d6226
0bcc4632449937dcf/azure_mgmt_resource-2.1.0-py2.py3-none-any.whl (757kB)
    100% |████████████████████████████████| 757kB 1.8MB/s
Collecting azure-mgmt-servicebus==0.5.3 (from ansible[azure])
  Downloading https://files.pythonhosted.org/packages/28/ad/9e90f8bab40a9682410e57ed08a799be113c5e470be
c247b099038c6389e/azure_mgmt_servicebus-0.5.3-py2.py3-none-any.whl (112kB)
    100% |████████████████████████████████| 112kB 11.2MB/s
```

```
skarra — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231 — 103x41
~ — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231

(from requests[security]->ansible[azure])
Requirement already satisfied: chardet<5,>=3.0.2; python_version < "3" in /home/skarra/.local/lib/python2.7/site-packages (from requests[security]->ansible[azure])
Requirement already satisfied: monotonic; python_version == "2.7" in /usr/local/lib/python2.7/dist-packages (from humanfriendly>=4.7->azure-cli-core==2.0.35->ansible[azure])
Requirement already satisfied: importlib-metadata<5,>=0.23; python_version == "2.7" in /usr/local/lib/python2.7/dist-packages (from argcomplete>=1.8.0->azure-cli-core==2.0.35->ansible[azure])
Requirement already satisfied: oauthlib>=3.0.0 in /home/skarra/.local/lib/python2.7/site-packages (from requests-oauthlib>=0.5.0->msrest==0.6.1->ansible[azure])
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python2.7/dist-packages (from importlib-metadata<5,>=0.23; python_version == "2.7"->argcomplete>=1.8.0->azure-cli-core==2.0.35->ansible[azure])
Requirement already satisfied: configparser>=3.5; python_version < "3" in /usr/local/lib/python2.7/dist-packages (from importlib-metadata<5,>=0.23; python_version == "2.7"->argcomplete>=1.8.0->azure-cli-core==2.0.35->ansible[azure])
Requirement already satisfied: contextlib2; python_version < "3" in /usr/local/lib/python2.7/dist-packages (from importlib-metadata<5,>=0.23; python_version == "2.7"->argcomplete>=1.8.0->azure-cli-core==2.0.35->ansible[azure])
Requirement already satisfied: pathlib2; python_version < "3" in /usr/local/lib/python2.7/dist-packages (from importlib-metadata<5,>=0.23; python_version == "2.7"->argcomplete>=1.8.0->azure-cli-core==2.0.35->ansible[azure])
Requirement already satisfied: scandir; python_version < "3.5" in /usr/local/lib/python2.7/dist-packages (from pathlib2; python_version < "3"->importlib-metadata<5,>=0.23; python_version == "2.7"->argcomplete>=1.8.0->azure-cli-core==2.0.35->ansible[azure])
Installing collected packages: azure-nspkg, azure-cli-nspkg, azure-cli-core, azure-common, azure-graphrbac, azure-keyvault, azure-mgmt-nspkg, azure-mgmt-authorization, azure-mgmt-automation, azure-mgmt-batch, azure-mgmt-cdn, azure-mgmt-compute, azure-mgmt-containerinstance, azure-mgmt-containerregistry, azure-mgmt-containerservice, azure-mgmt-cosmosdb, azure-mgmt-devtestlabs, azure-mgmt-dns, azure-mgmt-hdinsight, azure-mgmt-iothub, azure-mgmt-keyvault, azure-mgmt-loganalytics, azure-mgmt-marketplaceordering, azure-mgmt-monitor, azure-mgmt-network, azure-mgmt-rdbms, azure-mgmt-redis, azure-mgmt-resource, azure-mgmt-servicebus, azure-mgmt-sql, azure-mgmt-storage, azure-mgmt-trafficmanager, azure-mgmt-web, azure-storage
Successfully installed azure-cli-core-2.0.35 azure-cli-nspkg-3.0.2 azure-common-1.1.11 azure-graphrbac-0.40.0 azure-keyvault-1.0.0a1 azure-mgmt-authorization-0.51.1 azure-mgmt-automation-0.1.1 azure-mgmt-batch-5.0.1 azure-mgmt-cdn-3.0.0 azure-mgmt-compute-4.4.0 azure-mgmt-containerinstance-1.4.0 azure-mgmt-containerregistry-2.0.0 azure-mgmt-containerservice-4.4.0 azure-mgmt-cosmosdb-0.5.2 azure-mgmt-devtestlabs-3.0.0 azure-mgmt-dns-2.1.0 azure-mgmt-hdinsight-0.1.0 azure-mgmt-iothub-0.7.0 azure-mgmt-keyvault-1.1.0 azure-mgmt-loganalytics-0.2.0 azure-mgmt-marketplaceordering-0.1.0 azure-mgmt-monitor-0.5.2 azure-mgmt-network-2.3.0 azure-mgmt-nspkg-2.0.0 azure-mgmt-rdbms-1.4.1 azure-mgmt-redis-5.0.0 azure-mgmt-resource-2.1.0 azure-mgmt-servicebus-0.5.3 azure-mgmt-sql-0.10.0 azure-mgmt-storage-3.1.0 azure-mgmt-trafficmanager-0.50.0 azure-mgmt-web-0.41.0 azure-nspkg-2.0.0 azure-storage-0.35.1
skarra@jenkins-slave-vm:~/vm$
```

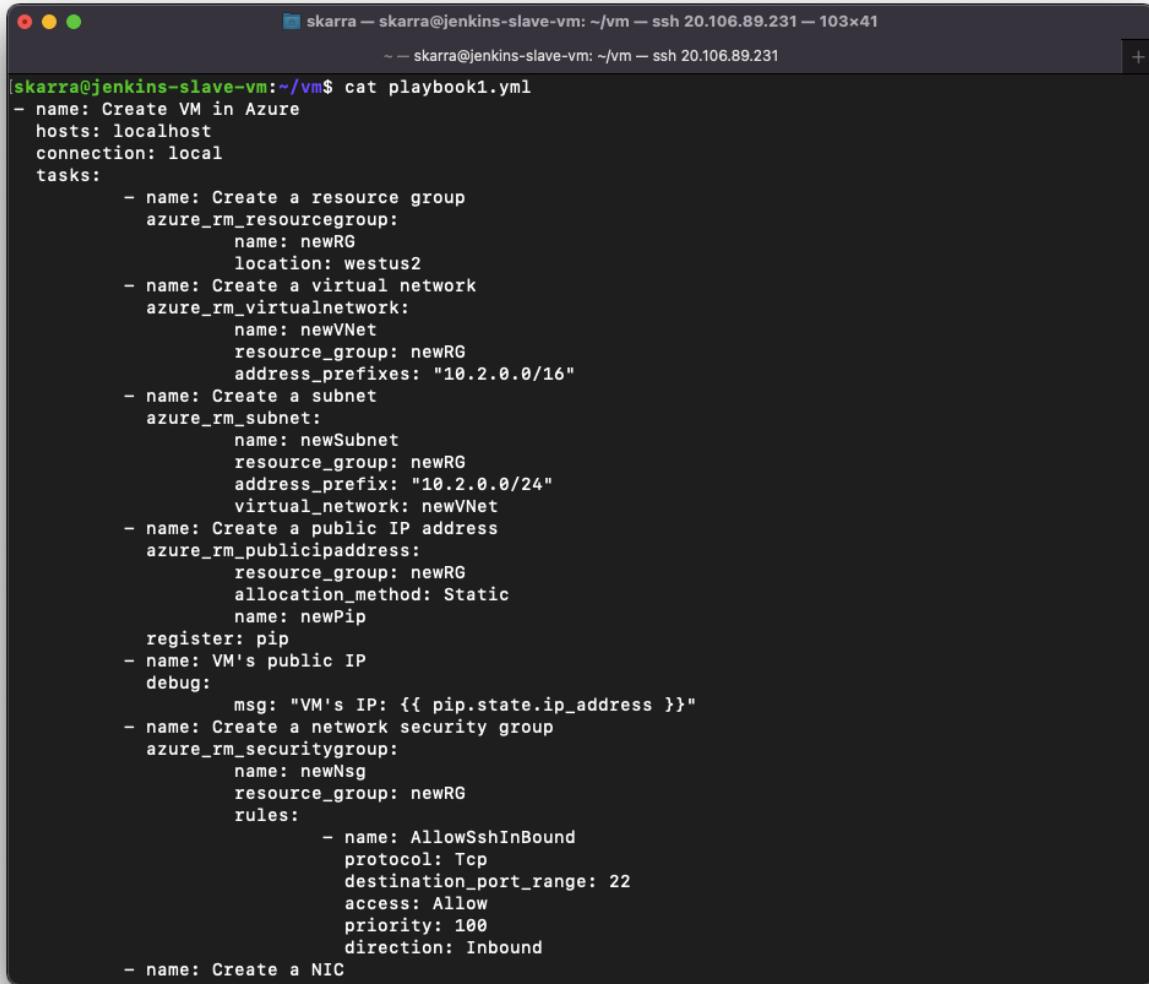
Use the same service Principle created for terraform for ansible to get authenticated to Azure



A terminal window titled "skarra — skarra@jenkins-slave-vm: ~ — ssh 20.106.89.231 — 72x15". The command "cat .azure/credentials" is run, displaying the following content:

```
[skarra@jenkins-slave-vm:~$ cat .azure/credentials
[default]
subscription_id=1075f926-15dd-4a60-840a-7dc52529ec32
client_id=77bacf90-d9f3-4194-b16d-03e17160ae99
secret=REDACTED
tenant=edf442f5-b994-4c86-a131-b42b03a16c95
skarra@jenkins-slave-vm:~$
```

Create a playbook1 to create a vm in azure



A terminal window titled "skarra — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231 — 103x41". The command "cat playbook1.yml" is run, displaying the following Ansible YAML code:

```
[skarra@jenkins-slave-vm:~/vm$ cat playbook1.yml
- name: Create VM in Azure
  hosts: localhost
  connection: local
  tasks:
    - name: Create a resource group
      azure_rm_resourcegroup:
        name: newRG
        location: westus2
    - name: Create a virtual network
      azure_rm_virtualnetwork:
        name: newVNet
        resource_group: newRG
        address_prefixes: "10.2.0.0/16"
    - name: Create a subnet
      azure_rm_subnet:
        name: newSubnet
        resource_group: newRG
        address_prefix: "10.2.0.0/24"
        virtual_network: newVNet
    - name: Create a public IP address
      azure_rm_publicipaddress:
        resource_group: newRG
        allocation_method: Static
        name: newPip
      register: pip
    - name: VM's public IP
      debug:
        msg: "VM's IP: {{ pip.state.ip_address }}"
    - name: Create a network security group
      azure_rm_securitygroup:
        name: newNsg
        resource_group: newRG
        rules:
          - name: AllowSshInBound
            protocol: Tcp
            destination_port_range: 22
            access: Allow
            priority: 100
            direction: Inbound
    - name: Create a NIC
```

```
skarra — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231 — 103x41
~ — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231

msg: "VM's IP: {{ pip.state.ip_address }}"
- name: Create a network security group
  azure_rm_securitygroup:
    name: newNsg
    resource_group: newRG
    rules:
      - name: AllowSshInBound
        protocol: Tcp
        destination_port_range: 22
        access: Allow
        priority: 100
        direction: Inbound
- name: Create a NIC
  azure_rm_networkinterface:
    name: newNic
    resource_group: newRG
    virtual_network: newVNet
    subnet: newSubnet
    public_ip_name: newPip
    security_group: newNsg
- name: Create a VM
  azure_rm_virtualmachine:
    name: newVM
    resource_group: newRG
    vm_size: Standard_D2s_v3
    admin_username: skarra
    ssh_password_enabled: false
    ssh_public_keys:
      - path: /home/skarra/.ssh/authorized_keys
        key_data: "ssh-rsa AAAAB3NzaC1yc2EAAAQABAAQCuOo9WpiJPZhYBti2dGZu3l0EW4F8LWsCyVbRNM9h7phZDcKm+bs19LjD/bZbxhyxRUUBmLjVjDiH9arpyu0gP4WuPuiYONCQSSb8uYLh3fdGoJY1LREPEyDcxZXZdKFmkgtRqu7S/NqQlqj4ox+zY0R4zKo3+QUNDuiBG8LUEl0jt4K8COKdq/v3Rsq4RUGI9291YOUykww9zmDRY1cjt3jhT0OtFfo/Xc8+HevwqjN49/HzXvWD4rTaori3SdC3Ju9GvmsM/Ycg8B+l46vcjaMLFmKgG/JBhbC/a0hY8EEMpk7TV4gsSQ/GqjKedALUeNTDwq3Lc36ZpxIM8v9
skarra@jenkins-slave-vm:~/vm$
```

Update the playbook2 to install Docker engine on the VM

```
skarra — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231 — 100x41
~ — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231

[skarra@jenkins-slave-vm:~/vm$ cat playbook2.yml
- name: Install Docker in Azure VM
  hosts: azurevm
  become: true
  vars:
    PREREQ_PACKAGES:
      - apt-transport-https
      - ca-certificates
      - curl
      - gnupg
      - lsb-release
    DOCKER_PACKAGES:
      - docker-ce
      - docker-ce-cli
      - containerd.io
  tasks:
    - name: install prerequisite packages
      apt:
        name: "{{ PREREQ_PACKAGES }}"
        state: present
        force_apt_get: "yes"
        update_cache: "yes"

    - name: add Docker's official GPG key
      apt_key:
        url: https://download.docker.com/linux/ubuntu/gpg
        state: present

    - name: Add Docker Repository
      apt_repository:
        repo: deb https://download.docker.com/linux/ubuntu bionic stable
        state: present

    - name: install docker packages
      apt:
        name: "{{ DOCKER_PACKAGES }}"
        state: present
        force_apt_get: "yes"
        update_cache: "yes"
skarra@jenkins-slave-vm:~/vm$ ]
```

create a shell script to get VM ip and updating it in Inventory File

```
skarra — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231 — 135x10
~ — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231

[skarra@jenkins-slave-vm:~/vm$ cat getIP.sh
#!/bin/bash
sudo sed -i '/azurevm/d' /etc/ansible/hosts
az login --service-principal --username $ARM_CLIENT_ID --password $ARM_CLIENT_SECRET --tenant $ARM_TENANT_ID > /dev/null
ip= `az vm list-ip-addresses -n newVM -g newRG --query [].virtualMachine.network.publicIpAddresses[0]. ipAddress -o tsv` 
echo -e "azurevm ansible_host=$ip ansible_ssh_extra_args=' -o StrictHostKeyChecking=no'" | sudo tee -a /etc/ansible/hosts > /dev/null
skarra@jenkins-slave-vm:~/vm$ ]
```

Phase 6: Push Ansible code to the same Git

Push playbook1,playbook2 and shell script to Remote Git repo created in Phase3

```
skarra@jenkins-slave-vm:~$ git --version
git version 2.17.1
[skarra@jenkins-slave-vm:~$ git config --global user.name "Srikanth Karra"
[skarra@jenkins-slave-vm:~$ git config --global user.email "srikanth.karra@techmahindra.com"
[skarra@jenkins-slave-vm:~$
```

```
skarra@jenkins-slave-vm:~/vm$ ll
total 20
drwxrwxr-x  2 skarra skarra 4096 Sep 13 08:59 .
drwxr-xr-x 17 skarra skarra 4096 Sep 13 08:58 ..
-rw-rw-r--  1 skarra skarra  429 Sep 12 05:29 getIP.sh
-rw-rw-r--  1 skarra skarra 3186 Sep 12 05:57 playbook1.yml
-rw-rw-r--  1 skarra skarra 1216 Sep 12 05:03 playbook2.yml
[skarra@jenkins-slave-vm:~/vm$]
[skarra@jenkins-slave-vm:~/vm$ git init
Initialized empty Git repository in /home/skarra/vm/.git/
[skarra@jenkins-slave-vm:~/vm$]
[skarra@jenkins-slave-vm:~/vm$ ll
total 24
drwxrwxr-x  3 skarra skarra 4096 Sep 13 09:00 .
drwxr-xr-x 17 skarra skarra 4096 Sep 13 08:58 ..
drwxrwxr-x  7 skarra skarra 4096 Sep 13 09:00 .git/
-rw-rw-r--  1 skarra skarra  429 Sep 12 05:29 getIP.sh
-rw-rw-r--  1 skarra skarra 3186 Sep 12 05:57 playbook1.yml
-rw-rw-r--  1 skarra skarra 1216 Sep 12 05:03 playbook2.yml
[skarra@jenkins-slave-vm:~/vm$]
[skarra@jenkins-slave-vm:~/vm$]
[skarra@jenkins-slave-vm:~/vm$ git status
On branch master

No commits yet

Untracked files:
  (use "git add <file>..." to include in what will be committed)

    getIP.sh
    playbook1.yml
    playbook2.yml

nothing added to commit but untracked files present (use "git add" to track)
skarra@jenkins-slave-vm:~/vm$
```

```
skarra — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231 — 104x36
~ — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231

[skarra@jenkins-slave-vm:~/vm$ git remote add origin https://github.com/karra/projectone.git
[skarra@jenkins-slave-vm:~/vm$ git checkout -b pipeline2
Switched to a new branch 'pipeline2'
[skarra@jenkins-slave-vm:~/vm$ git add .
[skarra@jenkins-slave-vm:~/vm$ git status
On branch pipeline2

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)

    new file:   getIP.sh
    new file:   playbook1.yml
    new file:   playbook2.yml

[skarra@jenkins-slave-vm:~/vm$ git commit -m "first commit of ansible stuff"
[origin/pipeline2 (root-commit) 6e2a576] first commit of ansible stuff
  3 files changed, 112 insertions(+)
  create mode 100644 getIP.sh
  create mode 100644 playbook1.yml
  create mode 100644 playbook2.yml
[skarra@jenkins-slave-vm:~/vm$ git status
On branch pipeline2
nothing to commit, working tree clean
[skarra@jenkins-slave-vm:~/vm$ skarra@jenkins-slave-vm:~/vm$ ]
```

```
skarra — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231 — 104x23
~ — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231

[skarra@jenkins-slave-vm:~/vm$ git push -u origin pipeline2
Username for 'https://github.com': skarra
Password for 'https://skarra@github.com':
Counting objects: 5, done.
Compressing objects: 100% (5/5), done.
Writing objects: 100% (5/5), 1.94 KiB | 1.94 MiB/s, done.
Total 5 (delta 0), reused 0 (delta 0)
remote:
remote: Create a pull request for 'pipeline2' on GitHub by visiting:
remote:     https://github.com/karra/projectone/pull/new/pipeline2
remote:
To https://github.com/karra/projectone.git
 * [new branch]      pipeline2 -> pipeline2
Branch 'pipeline2' set up to track remote branch 'pipeline2' from 'origin'.
[skarra@jenkins-slave-vm:~/vm$ skarra@jenkins-slave-vm:~/vm$ ]
```

Check for the change in remote Repo

The screenshot shows a GitHub repository page for 'karra/projectone'. At the top, there's a banner indicating 'pipeline2 had recent pushes less than a minute ago' with a 'Compare & pull request' button. Below the banner, it shows '2 branches' and '0 tags'. A message states 'This branch is 1 commit ahead, 15 commits behind master.' On the left, a list of files shows three commits from 'Srikanth Karra': 'first commit of ansible stuff' (6e2a576, 1 minute ago), 'getIP.sh' (1 minute ago), 'playbook1.yml' (1 minute ago), and 'playbook2.yml' (1 minute ago). A call-to-action at the bottom encourages adding a README with a 'Add a README' button.

pipeline2 had recent pushes less than a minute ago

Compare & pull request

2 branches 0 tags

This branch is 1 commit ahead, 15 commits behind master.

Srikanth Karra first commit of ansible stuff 6e2a576 1 minute ago 1 commit

getIP.sh first commit of ansible stuff 1 minute ago

playbook1.yml first commit of ansible stuff 1 minute ago

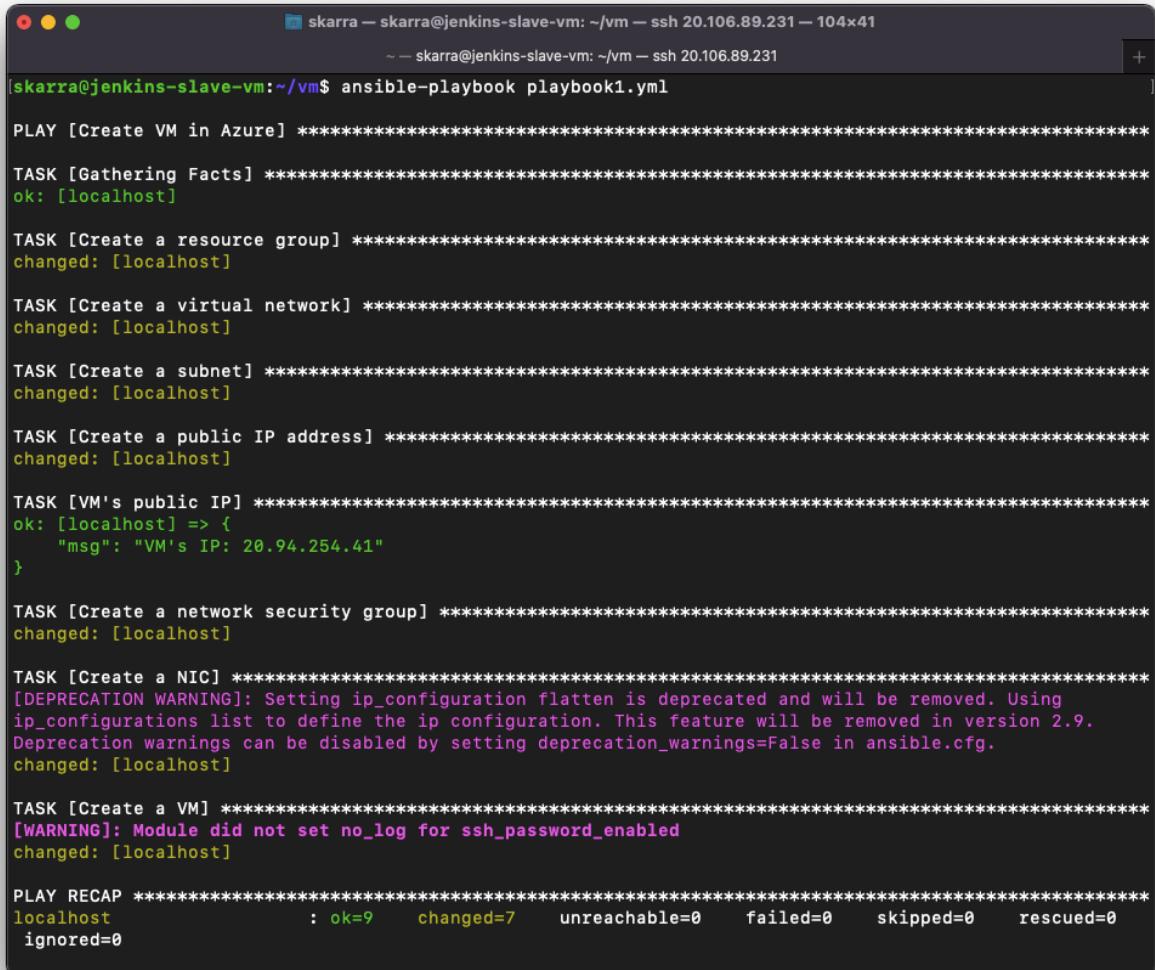
playbook2.yml first commit of ansible stuff 1 minute ago

Add a README

Phase 7: Deploy Your Ansible Playbook to Azure and Test it

From Build server run the playbook1,playbook2 and shell script to test for the required result

ansible-playbook playbook1.yml



The screenshot shows a terminal window titled "skarra" running on a Jenkins slave VM. The command "ansible-playbook playbook1.yml" is being executed. The output shows the playbook running through various tasks to create a VM in Azure, including gathering facts, creating a resource group, a virtual network, a subnet, a public IP address, a network security group, and a NIC. It also creates the VM itself. A warning about the deprecation of ip_configuration flatten is displayed. The final PLAY RECAP summary shows 9 tasks successful, 7 changed, 0 unreachable, 0 failed, 0 skipped, 0 rescued, and 0 ignored.

```
skarra@jenkins-slave-vm:~/vm$ ansible-playbook playbook1.yml

PLAY [Create VM in Azure] ****
TASK [Gathering Facts] ****
ok: [localhost]

TASK [Create a resource group] ****
changed: [localhost]

TASK [Create a virtual network] ****
changed: [localhost]

TASK [Create a subnet] ****
changed: [localhost]

TASK [Create a public IP address] ****
changed: [localhost]

TASK [VM's public IP] ****
ok: [localhost] => {
    "msg": "VM's IP: 20.94.254.41"
}

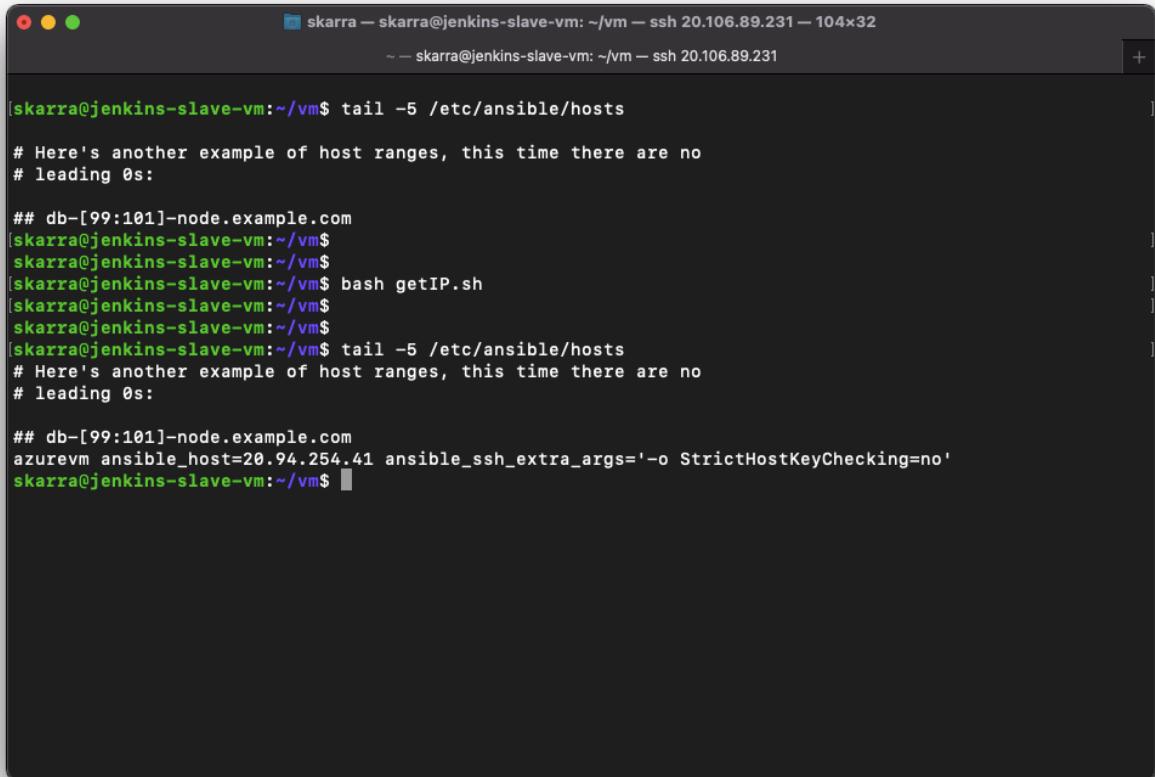
TASK [Create a network security group] ****
changed: [localhost]

TASK [Create a NIC] ****
[DEPRECATION WARNING]: Setting ip_configuration flatten is deprecated and will be removed. Using ip_configurations list to define the ip configuration. This feature will be removed in version 2.9.
Deprecation warnings can be disabled by setting deprecation_warnings=False in ansible.cfg.
changed: [localhost]

TASK [Create a VM] ****
[WARNING]: Module did not set no_log for ssh_password_enabled
changed: [localhost]

PLAY RECAP ****
localhost                  : ok=9      changed=7      unreachable=0      failed=0      skipped=0      rescued=0      ignored=0
```

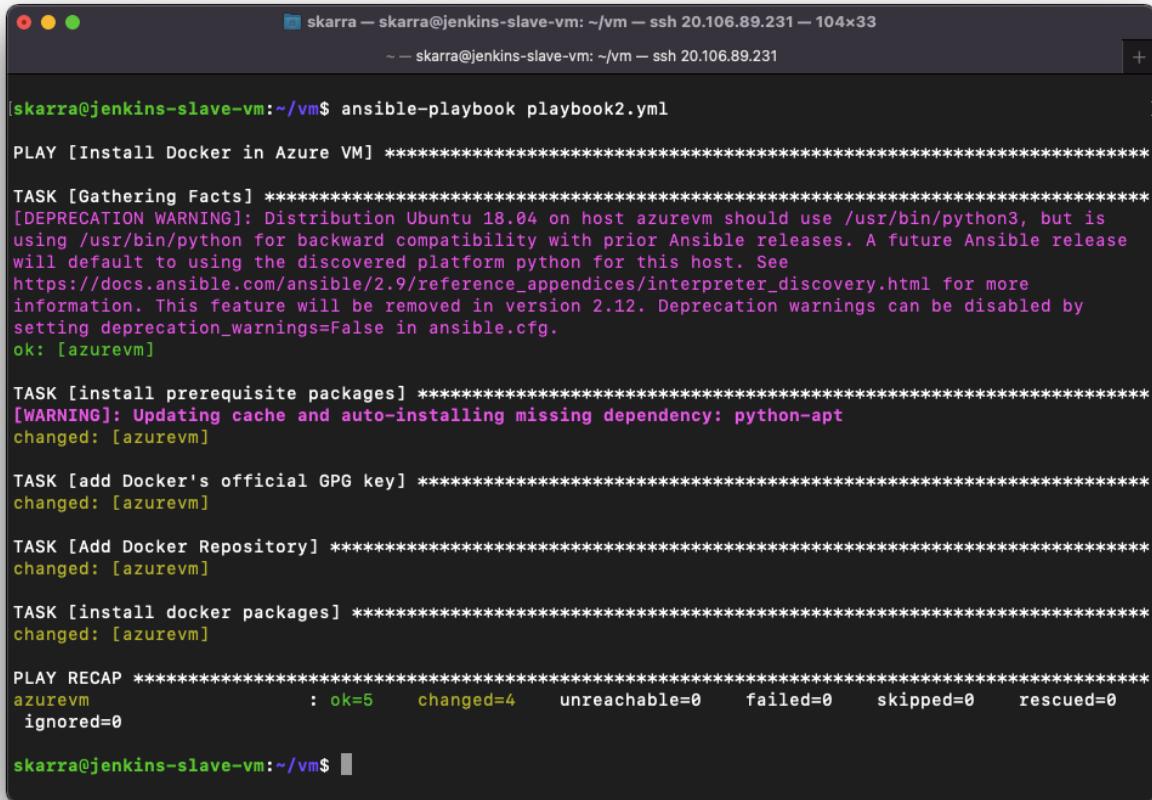
bash getIP.sh



The screenshot shows a macOS terminal window with two tabs open. The active tab, titled 'skarra — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231 — 104x32', displays the command 'tail -5 /etc/ansible/hosts' and its output. The output shows host definitions for 'db-[99:101]-node.example.com' and 'azurevm'. The second tab, titled '~ — skarra@jenkins-slave-vm: ~/vm — ssh 20.106.89.231', is visible in the background.

```
[skarra@jenkins-slave-vm:~/vm$ tail -5 /etc/ansible/hosts
# Here's another example of host ranges, this time there are no
# leading 0s:
## db-[99:101]-node.example.com
[skarra@jenkins-slave-vm:~/vm$ skarra@jenkins-slave-vm:~/vm$ [skarra@jenkins-slave-vm:~/vm$ bash getIP.sh
[skarra@jenkins-slave-vm:~/vm$ skarra@jenkins-slave-vm:~/vm$ [skarra@jenkins-slave-vm:~/vm$ [skarra@jenkins-slave-vm:~/vm$ tail -5 /etc/ansible/hosts
# Here's another example of host ranges, this time there are no
# leading 0s:
## db-[99:101]-node.example.com
azurevm ansible_host=20.94.254.41 ansible_ssh_extra_args='--StrictHostKeyChecking=no'
skarra@jenkins-slave-vm:~/vm$ ]]
```

```
ansible-playbook playbook2.yml
```



The screenshot shows a terminal window with a dark background and light-colored text. At the top, it displays the command: `skarra@jenkins-slave-vm:~/vm$ ansible-playbook playbook2.yml`. The terminal then outputs the results of the Ansible playbook execution:

```
PLAY [Install Docker in Azure VM] *****
TASK [Gathering Facts] *****
[DEPRECATION WARNING]: Distribution Ubuntu 18.04 on host azurevm should use /usr/bin/python3, but is
using /usr/bin/python for backward compatibility with prior Ansible releases. A future Ansible release
will default to using the discovered platform python for this host. See
https://docs.ansible.com/ansible/2.9/reference_appendices/interpreter_discovery.html for more
information. This feature will be removed in version 2.12. Deprecation warnings can be disabled by
setting deprecation_warnings=False in ansible.cfg.
ok: [azurevm]

TASK [install prerequisite packages] *****
[WARNING]: Updating cache and auto-installing missing dependency: python-apt
changed: [azurevm]

TASK [add Docker's official GPG key] *****
changed: [azurevm]

TASK [Add Docker Repository] *****
changed: [azurevm]

TASK [install docker packages] *****
changed: [azurevm]

PLAY RECAP *****
azurevm : ok=5    changed=4    unreachable=0    failed=0    skipped=0    rescued=0
ignored=0
```

At the bottom of the terminal window, the prompt `skarra@jenkins-slave-vm:~/vm$` is visible.

Phase 8: Workflow Automation with Jenkins

Create Repo in hub.docker.com

The screenshot shows a Docker Hub repository page for the user 'srikanthkarra' with the repository name 'projectone'. The page includes a search bar, navigation links for Explore, Repositories, Organizations, Help, and an Upgrade button. The repository details show it has 1 private repository. It features sections for Docker commands (with a 'docker push' command example), Tags and Scans (empty), and Automated Builds (disabled). A note about Advanced Image Management is present.

Configure Global tool configurations in Jenkins to use JDK, Maven and Git

The screenshot shows the Jenkins Global Tool Configuration page. It allows users to manage Maven and JDK configurations. Under Maven Configuration, 'Use default maven settings' is selected for both Default settings provider and Default global settings provider. Under JDK, a new JDK named 'java' is being added, with its JAVA_HOME path set to '/usr/lib/jvm/java-11-openjdk-amd64'. The 'Install automatically' checkbox is unchecked. Buttons for Save, Apply, and Delete JDK are at the bottom.

The screenshot shows the Jenkins Global Tool Configuration page for the 'Git' tool. The page has a header with tabs for 'Virtual machines - Microsoft Azure' and 'Global Tool Configuration [Jenkins]'. The main content area is titled 'Dashboard > Global Tool Configuration'. It contains three sections: 'Git', 'Gradle', and 'Ant'. The 'Git' section includes fields for 'Name' (set to 'Default'), 'Path to Git executable' (set to 'git'), and an 'Install automatically' checkbox. A red 'Delete Git' button is located in the top right of this section. Below the 'Git' section is a 'Save' and 'Apply' button.

The screenshot shows the Jenkins Global Tool Configuration page for the 'Maven' tool. The layout is identical to the Git configuration page. The 'Maven' section includes fields for 'Name' (set to 'maven') and 'MAVEN_HOME' (set to '/opt/apache-maven-3.8.2'). A yellow warning message states: '⚠ /opt/apache-maven-3.8.2 is not a directory on the Jenkins master (but perhaps it exists on some agents)'. An 'Install automatically' checkbox is present. A red 'Delete Maven' button is located in the top right of this section. Below the 'Maven' section is a 'Save' and 'Apply' button.

The screenshot shows the Jenkins Global Tool Configuration interface for Docker. At the top, there's a header bar with tabs for 'Virtual machines - Microsoft Azure' and 'Global Tool Configuration [Jenkins]'. Below the header, the main content area has a title 'Dashboard > Global Tool Configuration'. A sub-header 'List of Maven installations on this system' is followed by a section titled 'Docker' with a sub-header 'Docker installations'. Inside this section, there's a button 'Add Docker'. Below it, a form for adding a new Docker installation is shown, with fields for 'Name' (set to 'docker') and 'Installation root'. There's also a checkbox 'Install automatically' and a red 'Delete Docker' button. Another 'Add Docker' button is located below the first one. At the bottom of this section, there's a note 'List of Docker installations on this system' and two buttons: 'Save' and 'Apply'. In the bottom right corner of the main content area, the text 'Jenkins 2.303.1' is visible.

Configure Git credentials in Jenkins Vault

The screenshot shows the Jenkins Global credentials (unrestricted) page. The top navigation bar includes 'System > Global credentials (unrestricted) [Jenkins]' and a user profile for 'Srikanth'. The main content area features a title 'Global credentials (unrestricted)' with a castle icon. Below the title, a note says 'Credentials that should be available irrespective of domain specification to requirements matching.' A table lists a single credential entry:

ID	Name	Kind	Description
slave-connect	skarra	SSH Username with private key	

Below the table, it says 'Icon: S M L'. At the bottom right of the page, the text 'REST API' and 'Jenkins 2.303.1' are present.

New Credentials [Jenkins]

Jenkins

Dashboard > Credentials > System > Global credentials (unrestricted)

Kind: Username with password

Scope: Global (Jenkins, nodes, items, all child items, etc)

Username: karra

Treat username as secret:

Password: (*****)

ID:

Description: GitHub credentials

OK

REST API Jenkins 2.303.1

System > Global credentials (unrestricted) [Jenkins]

Jenkins

Dashboard > Credentials > System > Global credentials (unrestricted)

Global credentials (unrestricted)

Credentials that should be available irrespective of domain specification to requirements matching.

ID	Name	Kind	Description	Actions
slave-connect	skarra	SSH Username with private key		 
7595e614-dc64-483e-a8fb-faab0c5ffe66	karra/***** (GitHub credentials)	Username with password	GitHub credentials	 

Icon: [S](#) [M](#) [L](#)

REST API Jenkins 2.303.1

Create Pipeline1 using Freestyle project in Jenkins

The screenshot shows the Jenkins 'New Item' creation interface. The title bar says 'Not Secure — 20.106.90.38' and 'karra/projectone'. The user 'Srikanth' is logged in. The main area has a heading 'Enter an item name' with a text input field containing 'project1' and a note '» Required field'. Below this is a list of project types:

- Freestyle project**: Described as the central feature of Jenkins, combining any SCM with any build system.
- Pipeline**: Described as orchestrating long-running activities across multiple build agents.
- Multi-configuration project**: Suitable for projects with many configurations, like testing on multiple environments.
- Folder**: Creates a container for grouping items together.
- Organization**: Scans a GitHub organization or user account for repositories.

At the bottom are 'OK' and 'Cancel' buttons.

The screenshot shows the Jenkins 'pipeline1' configuration page under the 'General' tab. The title bar says 'Not Secure — 20.106.90.38' and 'Virtual machines - Microsoft Azure' and 'pipeline1 Config [Jenkins]'. The 'General' tab is selected. The configuration section is titled 'Project One' and contains a list of build steps:

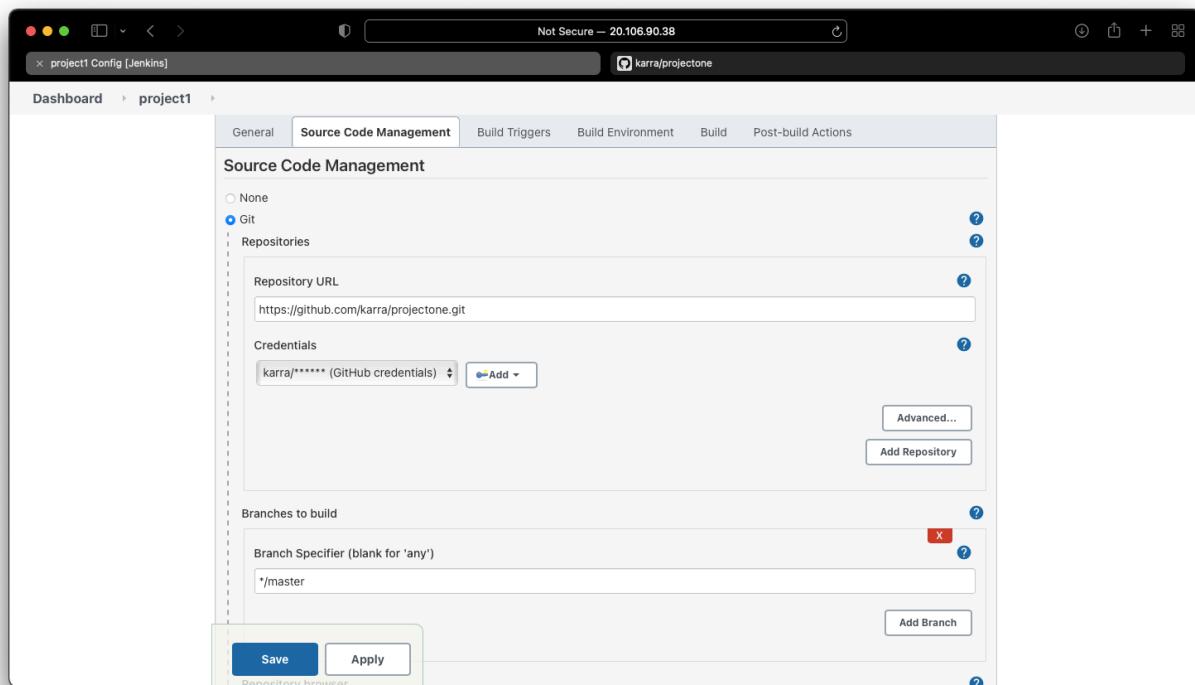
- Fetch Application Code and Ansible Playbook to workspace
- Build Application Code
- Build the Docker Image
- Push the Docker image to hub.docker.com/Azure Container registry
- Store artifacts and Ansible playbook in workspace
- Run Ansible playbook to deploy Infra to Azure
- Deploy Docker container to Docker host VM

Below the build steps is a 'Plain text' preview button. A list of configuration options follows:

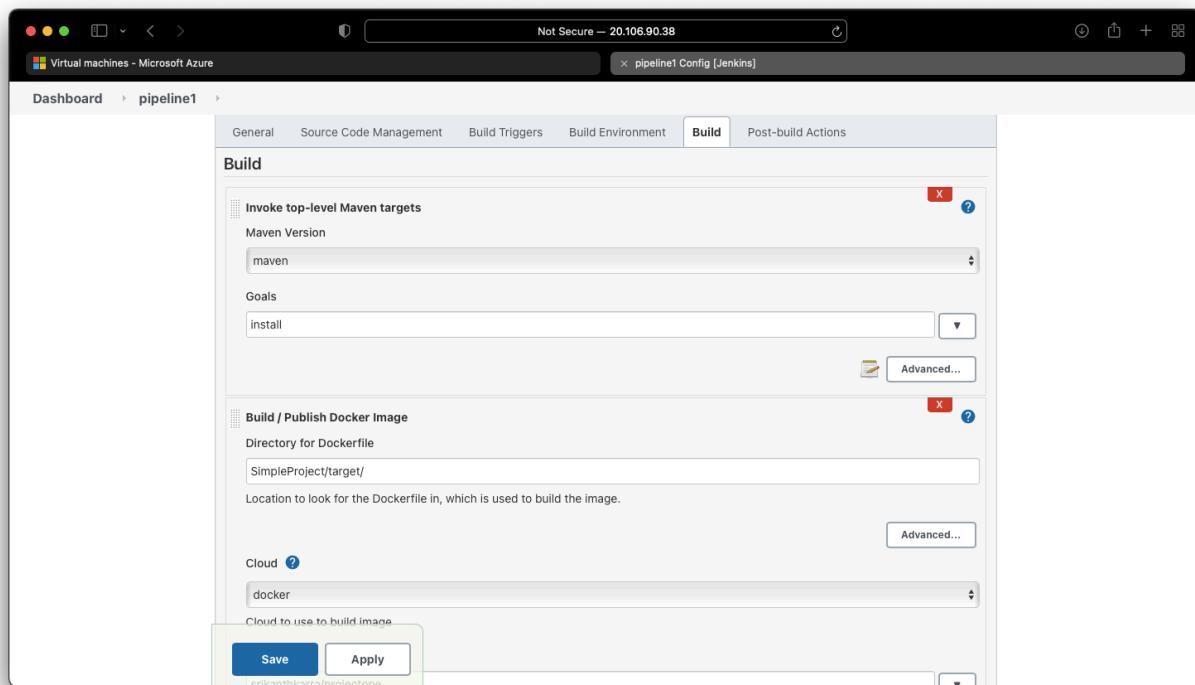
- Commit agent's Docker container
- Define a Docker template
- Discard old builds
- GitHub project
- This build requires lockable resources
- This project is parameterised
- Throttle builds
- Disable this project
- Execute concurrent builds if necessary
- Restrict where this project can be run

Below these is a 'Label Expression' field containing 'slave1'. A note states 'Label slave1 matches 1 node. Permissions or other restrictions provided by plugins may further reduce that list.' At the bottom are 'Save' and 'Apply' buttons, and an 'Advanced...' link.

In SCM stage Pull code form Remote Repo



In Build Stage, Step1 : use maven top level target to build



In Build Stage Step 2: User Docker build and Push to create image whih contains your app and push to Docker Hub

The screenshot shows the Jenkins Pipeline configuration for a project named 'pipeline1'. The 'Build' tab is selected. Under the 'Build / Publish Docker Image' section, the 'Directory for Dockerfile' is set to 'SimpleProject/target/'. The 'Cloud' dropdown is set to 'docker'. The 'Image' dropdown is set to 'srikanthkarra/projectone'. The 'Push image' checkbox is checked. Under 'Registry Credentials', there is a dropdown set to 'srikanthkarra/******** (Docker Hub)'. There are also two unchecked checkboxes for 'Clean local images' and 'Attempt to remove images when jenkins deletes the run'. At the bottom, there are 'Save' and 'Apply' buttons.

Create Pipeline2 using Freestyle project in Jenkins

The screenshot shows the Jenkins dashboard with a search bar and user 'Srikanth' logged in. A new project is being created, with the name 'pipeline2' entered into the 'Enter an item name' field. Below the input field, there are several project types listed: 'Freestyle project' (selected), 'Pipeline', 'Multi-configuration project', 'Folder', and 'GitHub Organization'. Each item has a brief description and a small icon. At the bottom of the list, there is an 'OK' button and a 'Multibranch Pipeline' link.

The screenshot shows the Jenkins Pipeline configuration for 'pipeline2'. The 'General' tab is selected. The 'Project One - Pipeline 2' section contains a list of steps:

- Fetch Application Code and Ansible Playbook to workspace
- Build Application Code
- Build the Docker Image
- Push the Docker image to hub.docker.com/Azure Container registry
- Store artifacts and Ansible playbook in workspace
- Run Ansible playbook to deploy infra to Azure
- Deploy Docker container to Docker host VM

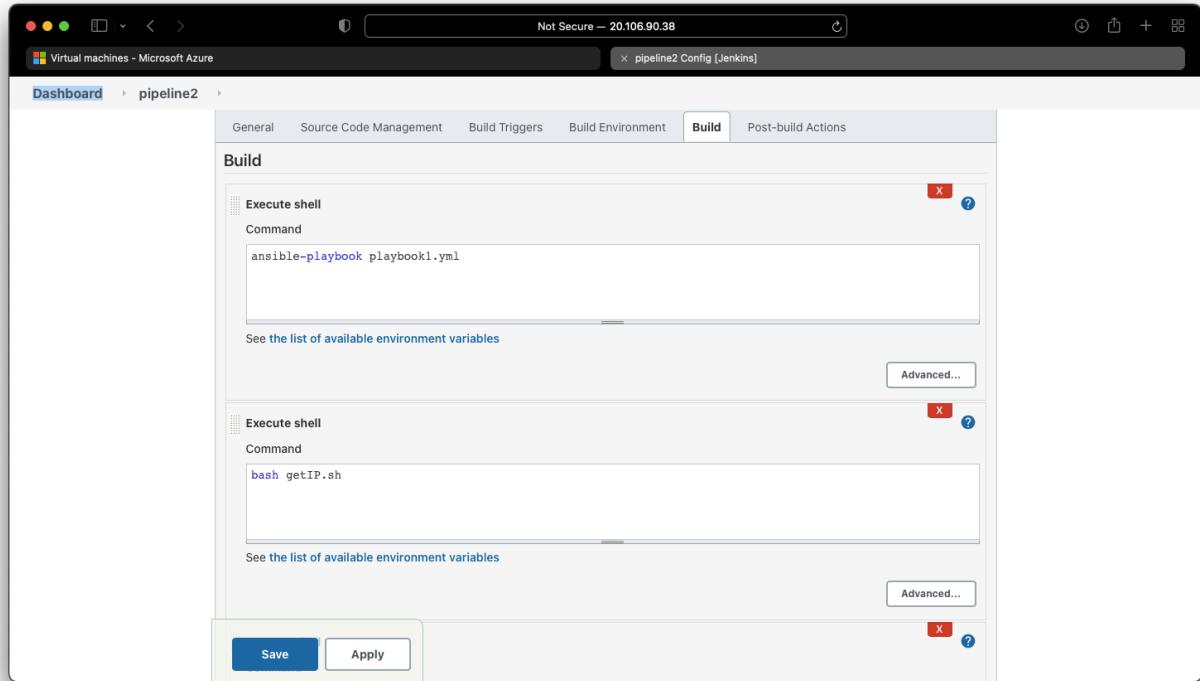
Below this, there is a 'Label Expression' field containing 'slave1'. A note states: 'Label slave1 matches 1 node. Permissions or other restrictions provided by plugins may further reduce that list.' At the bottom are 'Save' and 'Apply' buttons.

In SCM stage pull code from Remote Repo (separate branch for pipeline2)

The screenshot shows the Jenkins Pipeline configuration for 'pipeline2'. The 'Source Code Management' tab is selected. Under 'Source Code Management', 'Git' is selected. In the 'Repositories' section, a single repository is configured with the URL 'https://github.com/karra/projectone.git' and credentials 'karra/***** (GitHub credentials)'. The 'Branches to build' section has a 'Branch Specifier (blank for 'any')' set to '*pipeline2'. At the bottom are 'Save' and 'Apply' buttons.

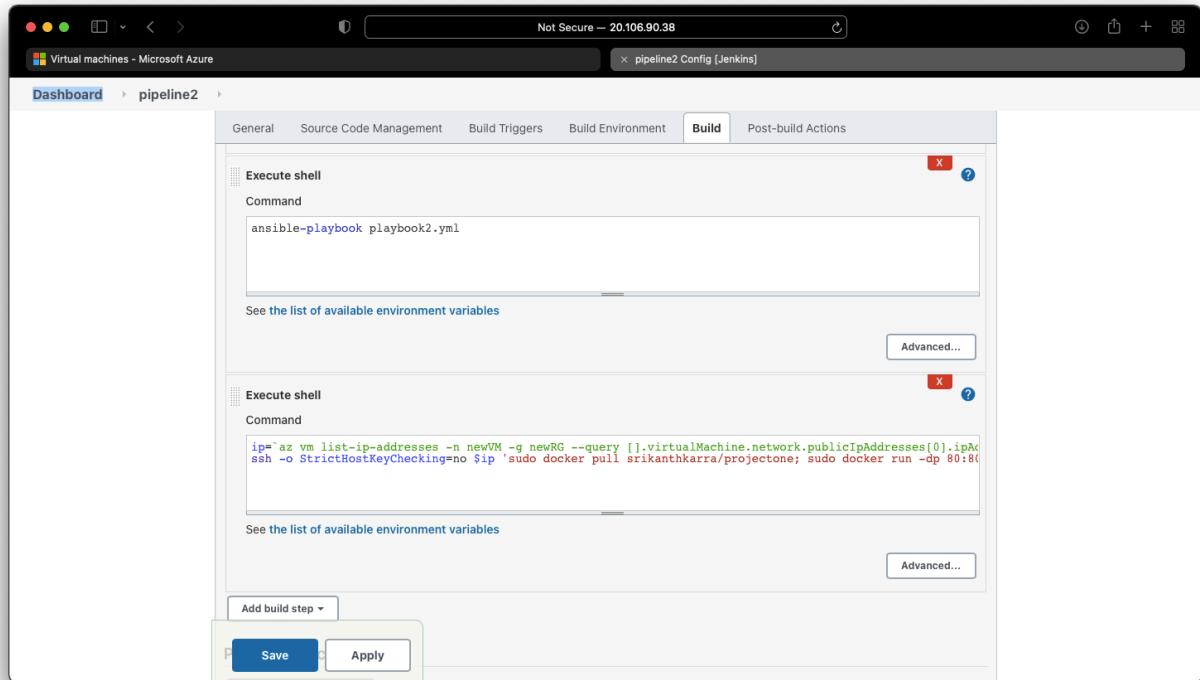
In Build Stage Step 1: Run ansible Playbook1

In Build Stage Step 2: Call Shell Script



In Build Stage Step 3: Run Ansible Playbook3

In Post Build Stage: Deploy Docker Container on Docker VM using image created in Docker HUB



In Github repo configure webhook for Jenkins

The screenshot shows the GitHub repository settings page for 'karra/projectone'. The 'Webhooks' tab is selected in the sidebar. The main area displays a 'Webhooks / Manage webhook' form. The 'Payload URL' field contains 'http://20.106.90.38:8080/github-webhook/'. The 'Content type' dropdown is set to 'application/x-www-form-urlencoded'. The 'Secret' field is empty. Under 'Which events would you like to trigger this webhook?', the 'Just the push event.' option is selected. The right side of the screen shows recent deliveries.

The screenshot shows the GitHub repository settings page for 'karra/projectone'. The 'Webhooks' tab is selected in the sidebar. The main area displays a 'Webhooks' list. A single webhook entry is shown: 'http://20.106.90.38:8080/github... (push)'. There are 'Edit' and 'Delete' buttons next to the entry. The right side of the screen shows recent deliveries.

For both the Pipelines configure Build trigger to use Github webhook for continuous integration

The screenshot shows the Jenkins configuration interface for pipeline1. The top navigation bar includes 'Virtual machines - Microsoft Azure' and the current tab 'pipeline1 Config [Jenkins]'. The main content area has tabs for General, Source Code Management, Build Triggers (selected), Build Environment, Build, and Post-build Actions. The 'Build Triggers' section contains several options: 'Trigger builds remotely (e.g., from scripts)', 'Build after other projects are built', 'Build periodically', 'GitHub hook trigger for GITScm polling' (which is checked), and 'Poll SCM'. Below this is the 'Build Environment' section with various checkboxes like 'Delete workspace before build starts' and 'Use secret text(s) or file(s)'. At the bottom are 'Save' and 'Apply' buttons.

The screenshot shows the Jenkins configuration interface for pipeline2. The top navigation bar includes 'Virtual machines - Microsoft Azure' and the current tab 'pipeline2 Config [Jenkins]'. The main content area has tabs for General, Source Code Management, Build Triggers (selected), Build Environment, Build, and Post-build Actions. The 'Build Triggers' section contains several options: 'Trigger builds remotely (e.g., from scripts)', 'Build after other projects are built' (which is checked), 'Projects to watch' (with 'pipeline1,' listed), 'Trigger only if build is stable' (which is selected), and 'Build periodically'. Below this is the 'Build Environment' section with various checkboxes like 'Delete workspace before build starts' and 'Use secret text(s) or file(s)'. At the bottom are 'Save' and 'Apply' buttons.