accentureoperations

PROVISIONING THE ORACLE DATABASE IN THE CLOUD

FRITS HOOGLAND

$(whoami)

Frits Hoogland

Working with Oracle products since 1996

Blog: http://fritshoogland.wordpress.com

Twitter: @fritshoogland

Email: frits.hoogland@accenture.com

Oracle ACE Director

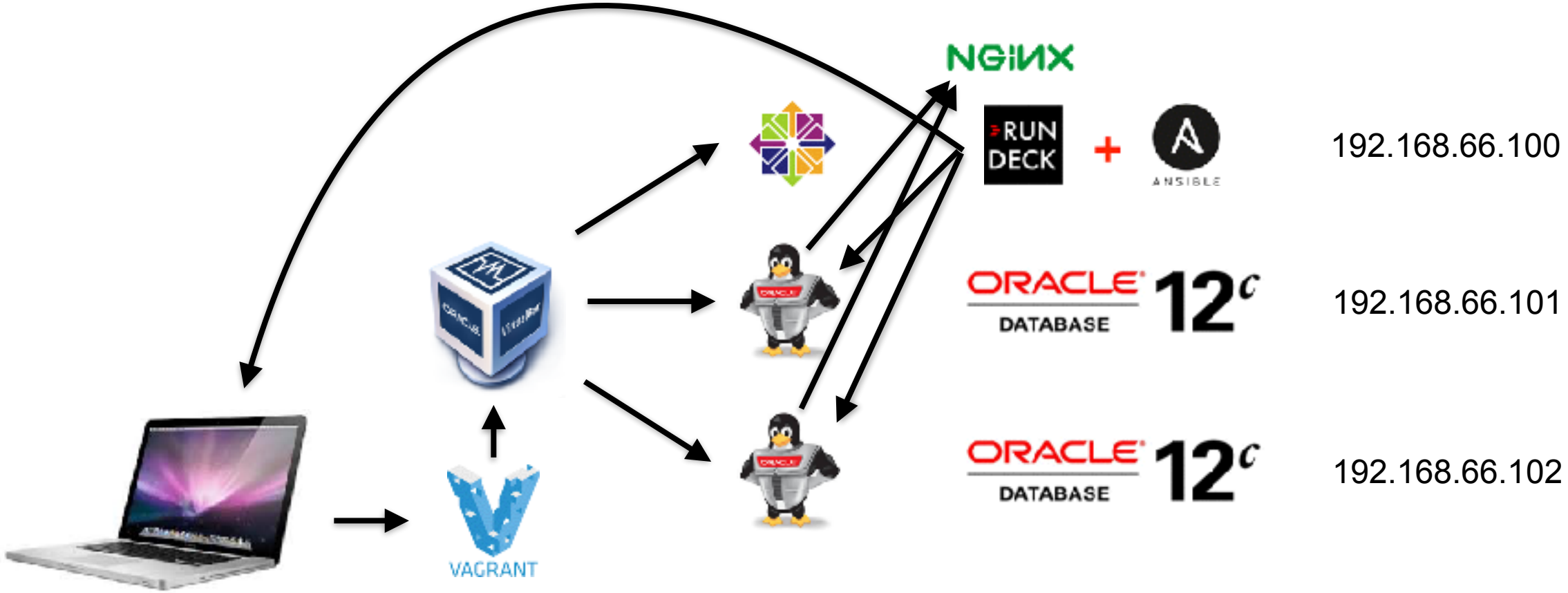
OakTable Member

ABOUT THIS PRESENTATION *

- Versions:
  - Database: Oracle version 12.1.0.2 + 170814 & 170718 patch
  - Operating system: Oracle Linux 7.3 (database + provisioning host)
  - Ansible 2.3.1.0
  - ~~Semaphore 2.3.0~~ Rundeck 2.9.2
  - (vagrant 1.9.7, virtual box 5.1.26)

- The intended audience for this talk is technical architects who want to implement orchestration (in the cloud).
- This is not an Ansible introduction.
- The purpose of this presentation is to show Ansible playbooks, display their readability, and give ideas about usage and usefulness.
- This presentation assumes you understand linux and Oracle administration.

MY ENVIRONMENT



accentureoperations

ANSIBLE

- I am using Ansible version 2.3.1.0

- Ansible essentially describes the desired state.
  - Ansible is “not really” a programming language.
  - Ansible scripts should be re-runnable.
    - After a task has completed, the next run should result in ‘OK’.

SEMAPHORE

- Open source web based user interface for running Ansible.
  - Free, open source UI for running Ansible playbooks (not editing).
  - Similar product to Ansible Tower, which is a product that requires a license.
    - Tower provides more functionality.
  - “young” product, rough around the edges.

- General way semaphore works:
  - Create a git repository with the Ansible scripts in it.
  - Add a web based remote repository like Github or Gitlab to the local git repository.
  - Add the web based repository to a project in Semaphore.
  - Combine repository, inventory and ssh keys in a template in Semaphore.
  - Run the Ansible scripts using the template in Semaphore.

- https://fritshoogland.wordpress.com/2017/04/29/how-to-install-the-semaphore-ui-for-running-ansible/

RUNDECK

- Open source (+closed source) web based user interface for running tasks.
  - Plugin available for running Ansible.
  - Somewhat similar product to Ansible Tower, which is a product that requires a license.
  - Open source version feels like a “young” product, rough around the edges.

- General way rundeck works:
  - Create a project, in that project a job and associate it with one or a group of hosts.
  - Run a job once or multiple times, now or scheduled.

- https://fritshoogland.wordpress.com/2017/08/09/installation-of-rundeck-with-ansible-plugin-on-centos-7/

RUNDECK / SEMAPHORE / TOWER: WHY?

- Above mentioned UIs mean you can achieve:
  - Accountability.
  - Traceability.
  - Delegation of tasks.
  - Integrate with automation (REST).

- Surely you don't want your admins to perform standard tasks all on their own,
  - using a random version of corporate scripts,
  - or not using corporate scripts,
  - or using something somebody produced theirselves?
- If it is executed standards based and correctly:
  - then it's almost guaranteed not formally logged in any way?
  - You want standardisation and consistency, right?
  - Even if the task was executed perfectly, how could you know?

VAGRANT AND VIRTUALBOX

- The cloud provisioning examples are executed on virtual box VMs on my laptop.
  - Vagrant is a way to quickly create a VM *on your local laptop*.
  - Ideal for creating a test case or specific setup.

- To setup vagrant with virtualbox, all you need to do is install both free products.
  - You might want to modify the default VM location of virtualbox.

- If you want to (mass) provision cloud instances, have a look at terraform.
    - https://www.terraform.io
    - All popular cloud providers are supported.
    - Plugin for the Oracle cloud exists.

- Ansible can only work with a workaround on Windows as ‘Control Machine’.
  - Getting Ansible to work as provisioner for Vagrant has been cumbersome.

VAGRANT

- This is how my provisioning server (called ‘rundeck’) is created:

```
$ mkdir rundeck-v; cd $_
$ vi Vagrantfile
$ vagrant up
```

```
Vagrant.configure("2") do |config|
  config.vm.box = “centos/7"
  config.ssh.insert_key = false
  config.ssh.private_key_path = [ "~/.vagrant_ssh/id_dsa", "~/.vagrant.d/
insecure_private_key" ]
  config.vm.hostname = "rundeck.local"
  config.vm.network "private_network", ip: “192.168.66.100"
  config.vm.provider "virtualbox" do |vb|
   vb.name = “rundeck"
   vb.memory = "1024"
   vb.cpus = "1"
   # PERL L4 CACHE WORK AROUND
   if !File.exist?("u01_disk.vdi")
    vb.customize [ 'createhd', '--filename', "u01_disk.vdi", '--size', 40960 ]
   end
   vb.customize [ 'storageattach', :id, '--storagectl', 'SATA Controller', '--
port', 2, '--device', 0, '--type', 'hdd', '--medium', "u01_disk.vdi" ]
  end
end
```

accentureoperations

VAGRANT

```
$ mkdir rundeckmm-v; cd $_
$ vi Vagrantfile
$ vagrant up
```

```
servers=[{:hostname=>"rundeckmm1.local",:name=>"rundeckmm1",:ip => "192.168.66.101" },
         {:hostname=>"rundeckmm2.local",:name=>"rundeckmm2",:ip => "192.168.66.102" }]
Vagrant.configure("2") do |config|
  servers.each do |machine|
    config.vm.define machine[:hostname] do |node|
      node.vm.box = “box-cutter/ol73"
      node.vm.hostname = machine[:hostname]
      node.ssh.insert_key = false
      node.ssh.private_key_path = [ "~/.vagrant_ssh/id_dsa", "~/.vagrant.d/
insecure_private_key" ]
      node.vm.network "private_network", ip: machine[:ip]
      node.vm.provider "virtualbox" do |vb|
        vb.name = machine[:name]
        vb.memory = "1024"
        vb.cpus = "1"
        # PERL L4 CACHE WORK AROUND
        if !File.exist?("u01_disk-#{machine[:name]}.vdi")
vb.customize [ 'createhd','--filename',"u01_disk-#{machine[:name]}.vdi",'--size',
40960 ]
        end
vb.customize [ 'storageattach', :id, '--storagectl', 'SATA Controller', '--port', 2,
'--device', 0, '--type', 'hdd', '--medium', "u01_disk-#{machine[:name]}.vdi" ]
        end
      end
   end
end
```

accentureoperations

VAGRANT

- Vagrant uses a default username (‘vagrant’) for which a certificate is set for authentication.
  - This is the way cloud instances do provide access too.
  - Because vagrant is for local testing, the password of vagrant is made easy on purpose.

  - The default user (group actually) is provided all rights via sudo (/etc/sudoers.d/vagrant):

```
%vagrant ALL=(ALL) NOPASSWD: ALL
```

  - Oracle bare metal cloud (/etc/sudoers.d/90-cloud-init-users):

```
opc ALL=(ALL) NOPASSWD:ALL
```

CREATING AN IN-HOUSE RPM/YUM REPO

- nginx for serving the repository:
  - yum install nginx
  - /etc/nginx/nginx.conf:

```
server { listen *:80;
         root /repo;
         location / { autoindex on; }
       }
```

- create repository:
  - yum install createrepo yum-utils
  - cd /repo/your_repo_name
  - reposync -r *repository_definition_name* .
  - createrepo --update .
  - selinux: chcon -Rt httpd_sys_content_t /repo

- https://gitlab.com/FritsHoogland/setup_repo.git

HOW IT'S DONE: LINUX SETUP

Playbook: /var/rundeck/projects/Provisioning_oracle_presentation/git/provisioning-presentation/deploy.yml

Extra Ansible arguments: --tags=linux_setup

- Ansible playbook contains multiple 'plays'.
- 'Plays' are run by specifying their 'tag':

```
- name: setup linux
  hosts: all
  become: true
  vars:
    current_software_repo: ol7u3
    current_kernel_repo: ol7_uek4
    repo_host: 192.168.66.100
    kernel: kernel-uek-4.1.12-61.1.28.el7uek
  tags: linux_setup
  roles:
  - repository_handling
  - setup_kernel
  - setup_linux_for_oracle121
  - setup_u01
```


LINUX SETUP: REPOSITORY_HANDLING

```
---
- name: disable all yum repositories
  replace:
    dest: /etc/yum.repos.d/public-yum-ol7.repo
    regexp: '^enabled.*=.*1$'
    replace: 'enabled=0'

- name: set current software yum repositories
  yum_repository:
    name: '{{ item }}'
    description: '{{ item }}'
    baseurl: 'http://{{ repo_host }}/{{ item }}/'
    gpgkey: 'file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle'
  with_items:
    - '{{ current_software_repo }}'
    - '{{ current_kernel_repo }}'
```

LINUX SETUP: SETUP_KERNEL (1/2)

```
---
- name: install kernel
  yum:
    name: "{{ kernel }}"
    state: present

- name: set the desired kernel as default kernel
  shell: >
    /sbin/grubby --set-default=/boot/vmlinuz-{{ kernel | regex_replace('^kernel-(.*)$','\1') |
regex_replace('^uek-(.*)$','\1') }}.x86_64


- name: is the running kernel the desired kernel?
  shell: >
    if [ $(uname -r) = $( /sbin/grubby --default-kernel | sed "s/\/boot\/vmlinuz-//" ) ]; then echo
"yes"; else echo "no"; fi
  register: remain_running
```


LINUX SETUP: SETUP_KERNEL (2/2)

```
- block:
  - name: reboot to activate kernel
    shell: >
      sleep 2; /sbin/shutdown -r now "Ansible activate new kernel"
    async: 1
    poll: 0

  - name: wait for server to come down
    local_action: wait_for
    args:
      host: "{{ inventory_hostname }}"
      port: 22
      state: stopped
      timeout: 600
    become: false

  - name: wait for server to come back up
    local_action: wait_for
    args:
      host: "{{ inventory_hostname }}"
      port: 22
      state: started
      timeout: 600
    become: false
  when: "'no' in remain_running.stdout"
```

LINUX SETUP: SETUP_LINUX_FOR_ORACLE121 (1/2)

```
---
- name: upgrade all packages
  yum:
    name: "*"
    state: latest
    exclude: "kernel*"

- name: install acl, unzip, perl and unixODBC
  yum:
    name: "{{ item }}"
    state: installed
  with_items:
    - perl
    - unzip
    - unixODBC
    - acl

- name: disable selinux
  selinux:
    state: disabled
```

LINUX SETUP: SETUP_LINUX_FOR_ORACLE121 (2/2)

```
- name: install oracle preinstall package for database
  yum:
    name: oracle-rdbms-server-12cR1-preinstall.x86_64
    state: present

- name: copy public key to authorized_key file of oracle
  authorized_key:
    user: oracle
    key: "{{ lookup('file','~/.ssh/id_rsa.pub') }}"
```


LINUX SETUP: SETUP_U01 (1/2)

```
---
- name: create volume group vg_oracle using /dev/sdb
  lvg:
    vg: vg_oracle
    pvs: /dev/sdb

- name: create logical volume lv_oracle in vg_oracle
  lvol:
    vg: vg_oracle
    lv: lv_oracle
    size: 35g

- name: create filesystem in lv_oracle
  filesystem:
    fstype: xfs
    dev: /dev/vg_oracle/lv_oracle

- name: mount filesystem to /u01
  mount:
    name: /u01
    src: /dev/vg_oracle/lv_oracle
    state: mounted
    fstype: xfs
```


LINUX SETUP: SETUP_U01 (2/2)

```
- name: set ownership correct for /u01 directory
  file:
    dest: /u01
    state: directory
    owner: oracle
    group: oinstall
```


HOW IT'S DONE: ORACLE INSTALLATION AND PATCHING

- Play and tag:

```
- name: setup and patch oracle 12.1
  hosts: all
  become_user: oracle
  vars:
    database_inventory_name: Ansible_oh_12102
    stage_directory: /u01/stage
    oracle_home: /u01/app/oracle/product/12.1.0.2/dbhome_1
    oracle_base: /u01/app/oracle
    opatch_version: 12.2.0.1.8
    opatch_file: p6880880_121010_Linux-x86-64-{{ opatch_version }}.zip
  tags: oracle_121_install_patch
  roles:
  - install_oracle_12102
  - install_opatch
  - patch_oh_12102_to_psu_170814
  - patch_oh_12102_to_jvm_170718
```

ORACLE_121_INSTALL_PATCH: INSTALL_ORACLE (1/3)

```
---
- name: check inventory if database version is already installed
  shell: >
    grep 'HOME NAME="{{ database_inventory_name }}"' /u01/app/oraInventory/ContentsXML/inventory.xml
    removes=/u01/app/oraInventory/ContentsXML/inventory.xml
  register: database_home_installed

- block:

  - name: create directory for installation files
    file:
      dest: "{{ stage_directory }}"
      state: directory
      owner: oracle
      group: oinstall
    become_user: root

  - name: transfer patch file for install
    synchronize:
      src: "files/{{ item }}"
      dest: "{{ stage_directory }}"
    with_items:
      - p21419221_121020_Linux-x86-64_1of10.zip
      - p21419221_121020_Linux-x86-64_2of10.zip
```


ORACLE_121_INSTALL_PATCH: INSTALL_ORACLE (2/3)

```
  - name: unzip installation media
    unarchive:
      copy: no
      src: "{{ stage_directory }}/{{ item }}"
      dest: "{{ stage_directory }}"
    with_items:
      - p21419221_121020_Linux-x86-64_1of10.zip
      - p21419221_121020_Linux-x86-64_2of10.zip

  - name: install oracle database software
    shell: >
      {{ stage_directory }}/database/runInstaller -silent -force -waitforcompletion -ignoresysprereqs -
ignorePrereq oracle.install.option=INSTALL_DB_SWONLY UNIX_GROUP_NAME=oinstall INVENTORY_LOCATION=/u01/
app/oraInventory ORACLE_HOME={{ oracle_home }} ORACLE_HOME_NAME="Ansible_oh_12102"
ORACLE_BASE={{ oracle_base }} oracle.install.db.InstallEdition=EE oracle.install.db.DBA_GROUP=dba
oracle.install.db.OPER_GROUP=dba oracle.install.db.BACKUPDBA_GROUP=dba oracle.install.db.DGDBA_GROUP=dba
oracle.install.db.KMDBA_GROUP=dba DECLINE_SECURITY_UPDATES=true
    register: database_install
    failed_when: "'The installation of Oracle Database 12c was successful.' not in
database_install.stdout"


  - name: run orainstRoot.sh
    shell: >
      /u01/app/oraInventory/orainstRoot.sh
    when: "'/u01/app/oraInventory/orainstRoot.sh' in database_install.stdout"
    become_user: root
```


ORACLE_121_INSTALL_PATCH: INSTALL_ORACLE (3/3)

```
- name: run root.sh
  shell: >
    {{ oracle_home }}/root.sh -silent
  become_user: root

- name: clean up install directory
  file:
    path: "{{ stage_directory }}"
    state: absent
  become_user: root

when: "database_home_installed.rc != 0 or 'skipped' in database_home_installed.stdout"
```


ORACLE_121_INSTALL_PATCH: INSTALL_OPATCH (1/2)

```
---
- name: create directory for installation files
  file:
    dest: "{{ stage_directory }}"
    state: directory
    owner: oracle
    group: oinstall
  become_user: root

- name: transfer patch file for install
  synchronize:
    src: "files/{{ opatch_file }}"
    dest: "{{ stage_directory }}"

- name: unzip opatch 12.1
  unarchive:
    copy: no
    src: "{{ stage_directory }}/p6880880_121010_Linux-x86-64-{{ opatch_version }}.zip"
    dest: "{{ stage_directory }}"

- name: gather 12.1.0 ORACLE_HOMEs from inventory
  shell: >
    grep 12\.1\.0\. /u01/app/oraInventory/ContentsXML/inventory.xml | sed -n "s/.*LOC=\"\(.*\)\"\ TYPE.*/
\1/p"
  register: all_12_1_homes
```


ORACLE_121_INSTALL_PATCH: INSTALL_OPATCH (2/2)

```
- name: install opatch if necessary
  shell: >
    if [ "$( {{ item }}/OPatch/opatch version | head -1 )" != "$( {{ stage_directory }}/OPatch/opatch
version | head -1 )" ]; then mv {{ item }}/OPatch {{ item }}/OPatch.$(date +%Y%m%d); unzip -oq
{{ stage_directory }}/p6880880_121010_Linux-x86-64-{{ opatch_version }}.zip -d {{ item }}; chown -R
oracle.oinstall {{ item }}/OPatch; fi
  ignore_errors: true
  with_items: "{{ all_12_1_homes.stdout_lines }}"

- name: clean up install directory
  file:
    path: "{{ stage_directory }}"
    state: absent
  become_user: root
```


ORACLE_121_INSTALL_PATCH: PATCH PSU (1/2)

```
---
- name: check patches in the oracle home
  shell: >
    {{ oracle_home }}/OPatch/opatch lspatches
  register: oracle_home_patches

- block:
  - name: create directory for installation files
    file:
      dest: "{{ stage_directory }}"
      state: directory
      owner: oracle
      group: oinstall
    become_user: root

  - name: transfer patch file for install
    synchronize:
      src: "files/{{ psu_patch_file }}"
      dest: "{{ stage_directory }}"

  - name: unzip patch
    unarchive:
      copy: no
      src: "{{ stage_directory }}/{{ psu_patch_file }}"
      dest: "{{ stage_directory }}"
      creates: "{{ stage_directory }}/{{ psu_patch_number }}"
```

```
vars/main.yml:
---
psu_patch_number: 26609783
psu_patch_file: p26609783_121020_Linux-x86-64.zip
psu_patch_success_line: "Composite patch 26609783
successfully applied."
```

accentureoperations

ORACLE_121_INSTALL_PATCH: PATCH PSU (2/2)

```
- name: apply patch to database home
  shell: >
    {{ oracle_home }}/OPatch/opatch apply -silent
    chdir={{ stage_directory }}/{{ psu_patch_number }}
  register: apply_oh_patch
  failed_when: "'{{ psu_patch_success_line }}' not in apply_oh_patch.stdout"

- name: clean up install directory
  file:
    path: "{{ stage_directory }}"
    state: absent
  become_user: root

when: "'{{ psu_patch_number }};' not in oracle_home_patches.stdout"
```


ORACLE_121_INSTALL_PATCH: PATCH JVM (1/2)

```
---
- name: check patches in the oracle home
  shell: >
    {{ oracle_home }}/OPatch/opatch lspatches
  register: oracle_home_patches

- block:
  - name: create directory for installation files
    file:
      dest: "{{ stage_directory }}"
      state: directory
      owner: oracle
      group: oinstall
    become_user: root

  - name: transfer patch file for install
    synchronize:
      src: "files/{{ jvm_patch_file }}"
      dest: "{{ stage_directory }}"

  - name: unzip patch
    unarchive:
      copy: no
      src: "{{ stage_directory }}/{{ jvm_patch_file }}"
      dest: "{{ stage_directory }}"
      creates: "{{ stage_directory }}/{{ jvm_patch_number }}"
```

vars/main.yml:

```
---
jvm_patch_number: 26027162
jvm_patch_file: p26027162_121020_Linux-x86-64.zip
jvm_patch_success_line: "Patch 26027162
successfully applied."
```


ORACLE_121_INSTALL_PATCH: PATCH JVM (2/2)

```
- name: apply patch to database home
  shell: >
    {{ oracle_home }}/OPatch/opatch apply -silent
    chdir={{ stage_directory }}/{{ jvm_patch_number }}
  register: apply_oh_patch
  failed_when: "'{{ jvm_patch_success_line }}' not in apply_oh_patch.stdout"

- name: clean up install directory
  file:
    path: "{{ stage_directory }}"
    state: absent
  become_user: root

when: "'{{ jvm_patch_number }};' not in oracle_home_patches.stdout"
```

CLONE AN ORACLE HOME

- Another way to create a new Oracle home is to clone it from an existing home.
  - Cloning means:
    - Creating an archive of an existing Oracle home.
    - Extracting the Oracle home from the archive.
    - Run clone.pl to:
      - Install the extracted Oracle home on the new machine.
      - Generate the inventory data.

CLONE AN ORACLE HOME

- The advantages of cloning an Oracle home are:
  - Additional patches installed are included automatically.
  - Shorter install time, less moving parts in the install procedure.

- Disadvantages of cloning an Oracle home:
  - Not flexible, you get it all.
  - You need to store the archive somewhere.
  - You need to update the installation in the archive with a new PSU.

HOW IT'S DONE: CREATE CLONE ARCHIVE

- Play and tag:

```
- name: clone oracle home
  hosts: all
  become: true
  become_user: oracle
  vars:
    clone_tarball_name: oh_clone_12102.tgz
    stage_directory: /u01/stage
    oracle_home: /u01/app/oracle/product/12.1.0.2/dbhome_1
  tags: clone_oracle_home
  roles:
  - clone_and_fetch_oh
```

CLONE ORACLE HOME: CLONE_AND_FETCH_OH

```
---
- name: create directory for clone tarballs
  file:
    dest: "{{ stage_directory }}"
    state: directory
    owner: oracle
    group: oinstall

- name: tarball the database home
  shell: >
    tar czpf {{ stage_directory}}/{{ clone_tarball_name }} {{ oracle_home }}
    creates={{ stage_directory }}/{{ clone_tarball_name }}
  args:
    warn: no

- name: transfer clone file for install
  synchronize:
    src: "{{ stage_directory }}/{{ clone_tarball_name }}"
    dest: files/
    mode: pull
  become: false

- name: remove directory for clone tarballs
  file:
    dest: "{{ stage_directory }}"
    state: absent
```

HOW IT'S DONE: ORACLE INSTALLATION VIA CLONE

- Play and tag:

```
- name: install oracle 12.1
  hosts: all
  become: true
  become_user: oracle
  vars:
    stage_directory: /u01/stage
    clone_tarball_name: oh_clone_12102.tgz
    database_inventory_name: Ansible_oh_12102
    oracle_home: /u01/app/oracle/product/12.1.0.2/dbhome_1
    oracle_base: /u01/app/oracle
  tags: oracle_121_install_clone
  roles:
  - install_oracle_12102_via_clone
```

CLONE ORACLE HOME: INSTALL_VIA_CLONE (1/2)

```
---
- name: check inventory if database version is already installed
  shell: >
    grep 'HOME NAME="{{ database_inventory_name }}"' /u01/app/oraInventory/ContentsXML/inventory.xml
    removes=/u01/app/oraInventory/ContentsXML/inventory.xml
  register: home_installed

- block:
  - name: create directory for installation files
    file:
      dest: "{{ stage_directory }}"
      state: directory
      owner: oracle
      group: oinstall
    become_user: root

  - name: transfer clone file for install
    synchronize:
      src: "files/{{ clone_tarball_name }}"
      dest: "{{ stage_directory }}"

  - name: untar clone tarball
    shell: >
      tar xzf {{ stage_directory }}/{{ clone_tarball_name }} --directory=/
            args:
              warn: no
```

CLONE ORACLE HOME: INSTALL_VIA_CLONE (2/2)

```
  - name: create database home from the clone tarball
    shell: >
      perl {{ oracle_home }}/clone/bin/clone.pl -silent -waitforcompletion -ignoresysprereqs
ORACLE_BASE={{ oracle_base }} ORACLE_HOME={{ oracle_home }}
ORACLE_HOME_NAME={{ database_inventory_name }} INVENTORY_LOCATION=/u01/app/oraInventory OSDBA_GROUP=dba
    register: run_clone_db
    failed_when: "'The cloning of {{ database_inventory_name }} was successful.' not in
run_clone_db.stdout"

  - name: run orainstRoot.sh
    shell: >
      /u01/app/oraInventory/orainstRoot.sh
    become_user: root
    when: "'/u01/app/oraInventory/orainstRoot.sh' in run_clone_db.stdout"

  - name: run root.sh
    shell: >
      {{ oracle_home }}/root.sh -silent
    become_user: root

  - name: clean up install directory
    file:
      path: "{{ stage_directory }}"
      state: absent
    become_user: root

  when: "home_installed.rc != 0 or 'skipped' in home_installed.stdout"
```