# Ansible for Beginners

DI (FH) René Koch
Freelancer
The Checkmk Conference #10, 13.06.2024

# About me

- René Koch
- Self employeed consultant for:
  - Red Hat Ansible (Automation Platform)
  - Red Hat Enterprise Linux
  - Red Hat Satellite
  - Red Hat Identity Management (IPA)
  - (previously) Icinga 2

# About me

- René Koch
  - rkoch@rk-it.at
  - +43 660 / 464 0 464
  - https://at.linkedin.com/in/ren%C3%A9-koch-86516972

# Please introduce yourself

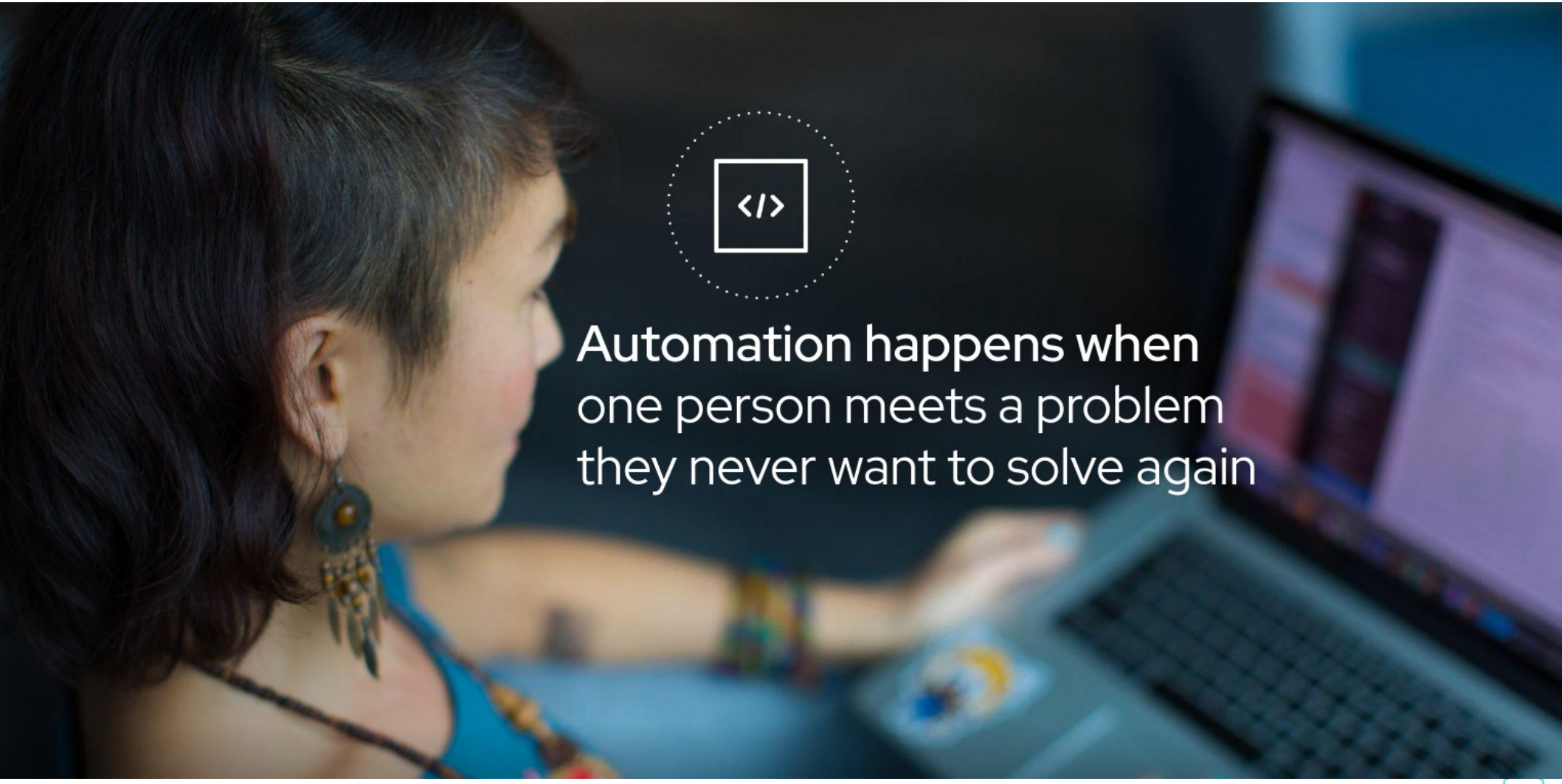
# Time table

- 08:30 – 10:00: Workshop
- 10:00 – 10:15: Break
- 10:15 – 12:00: Workshop
- 12:00 – 13:15: Lunch break
- 13:15 – 15:00: Workshop
- 15:00 – 15:15: Break
- 15:15 – 16:45: Workshop

# Table of content

# What is Ansible?

# What is Ansible?




Source: https://github.com/ansible/workshops/blob/devel/decks/ansible_rhel.pdf

# What is Ansible?

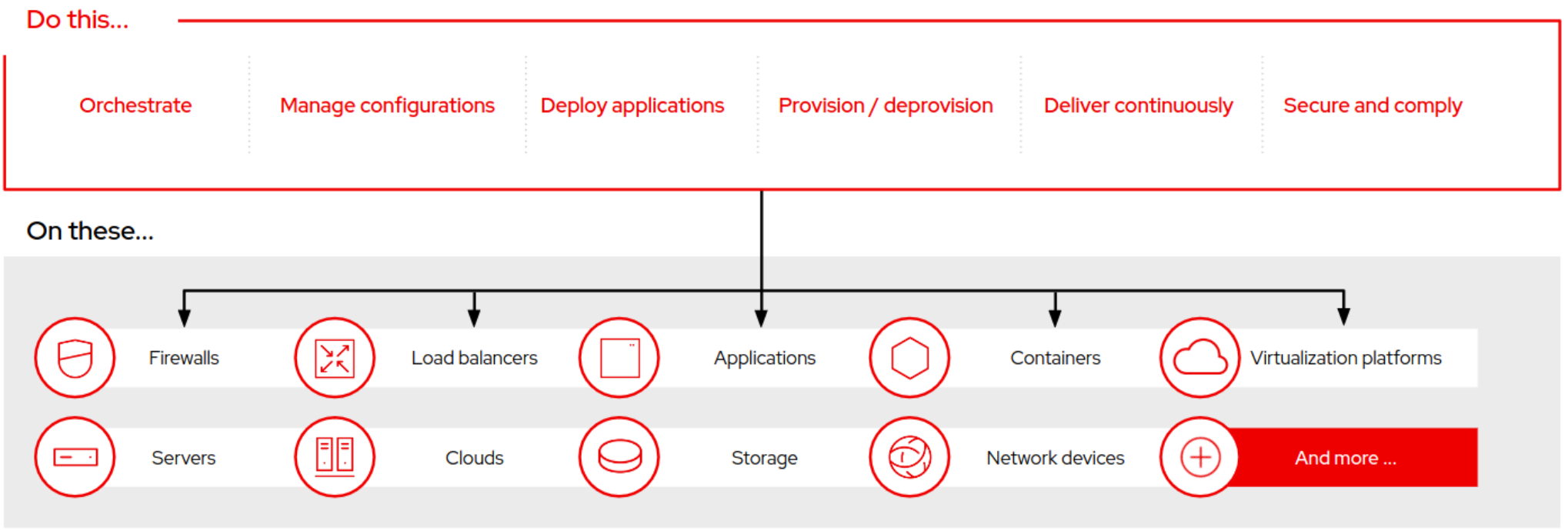
- Automation of provisioning, application deployment and Configuration management
- No agent is required on the target machine
- Use of SSH, WinRM and APIs
- Parallel execution of tasks on multiple machines
- Easy (to read) automation language (YAML)


Source: https://www.openssh.com/

# What is Ansible?

## Automate the deployment and management of automation

Your entire IT footprint




Source: https://github.com/ansible/workshops/blob/devel/decks/ansible_rhel.pdf

# What is Ansible?

- Competitors:





# What is Ansible?

## Defining community (or free) Ansible, AWX, and Red Hat Ansible Automation Platform

**Community Ansible**

Free, unsupported open source command line tool for automation.


**AWX**

Free, unsupported open source software. A GUI and API tool for wrapping around community Ansible.

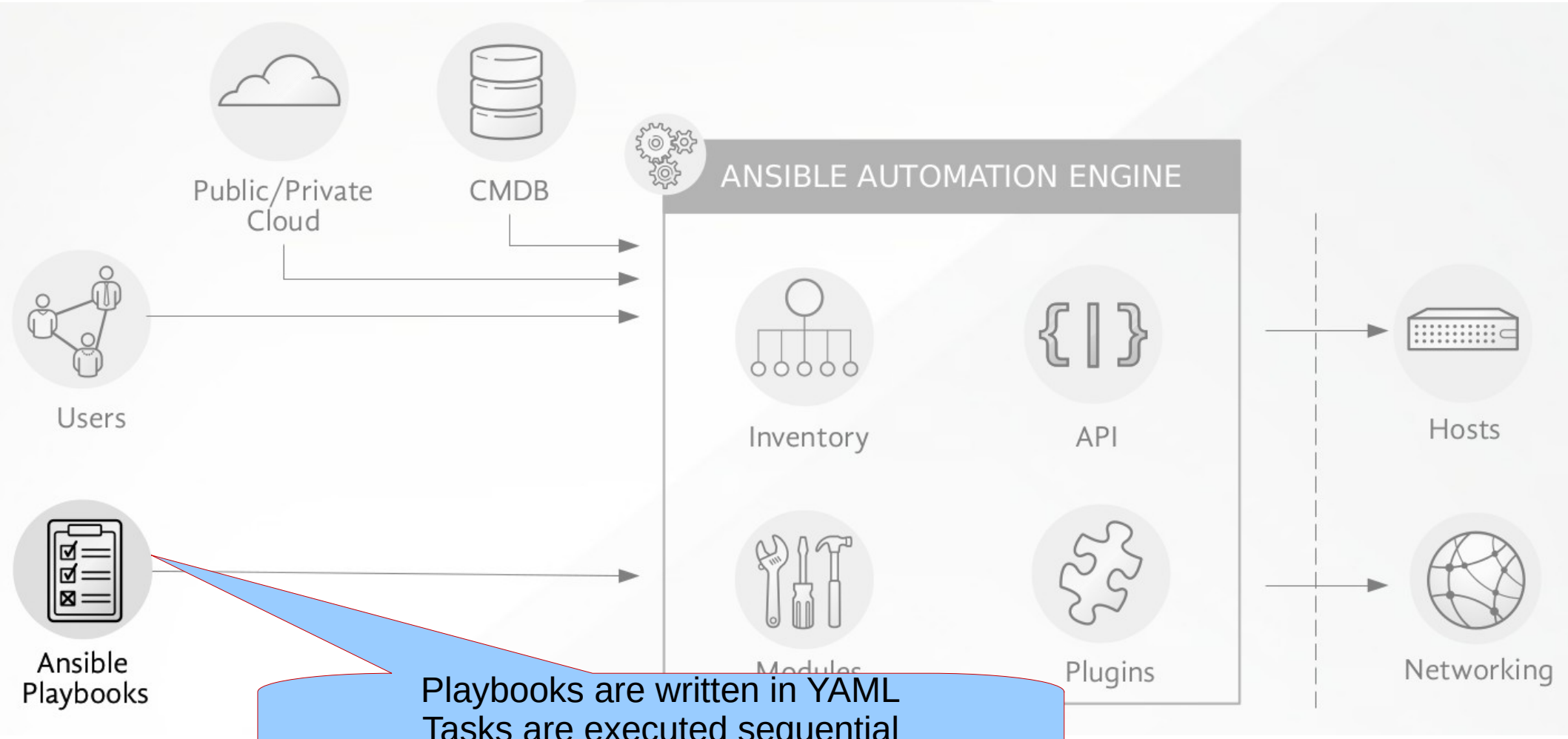
**Red Hat Ansible Automation Platform**

Subscription enterprise product. Combines 20+ community projects into a fully supported automation platform for your enterprise.

Source: https://www.redhat.com/en/technologies/management/ansible/compare-awx-vs-ansible-automation-platform?hsLang=en-us

# Ansible Core

# The Ansible basics




Playbooks are written in YAML
Tasks are executed sequential
Tasks execute Ansible modules

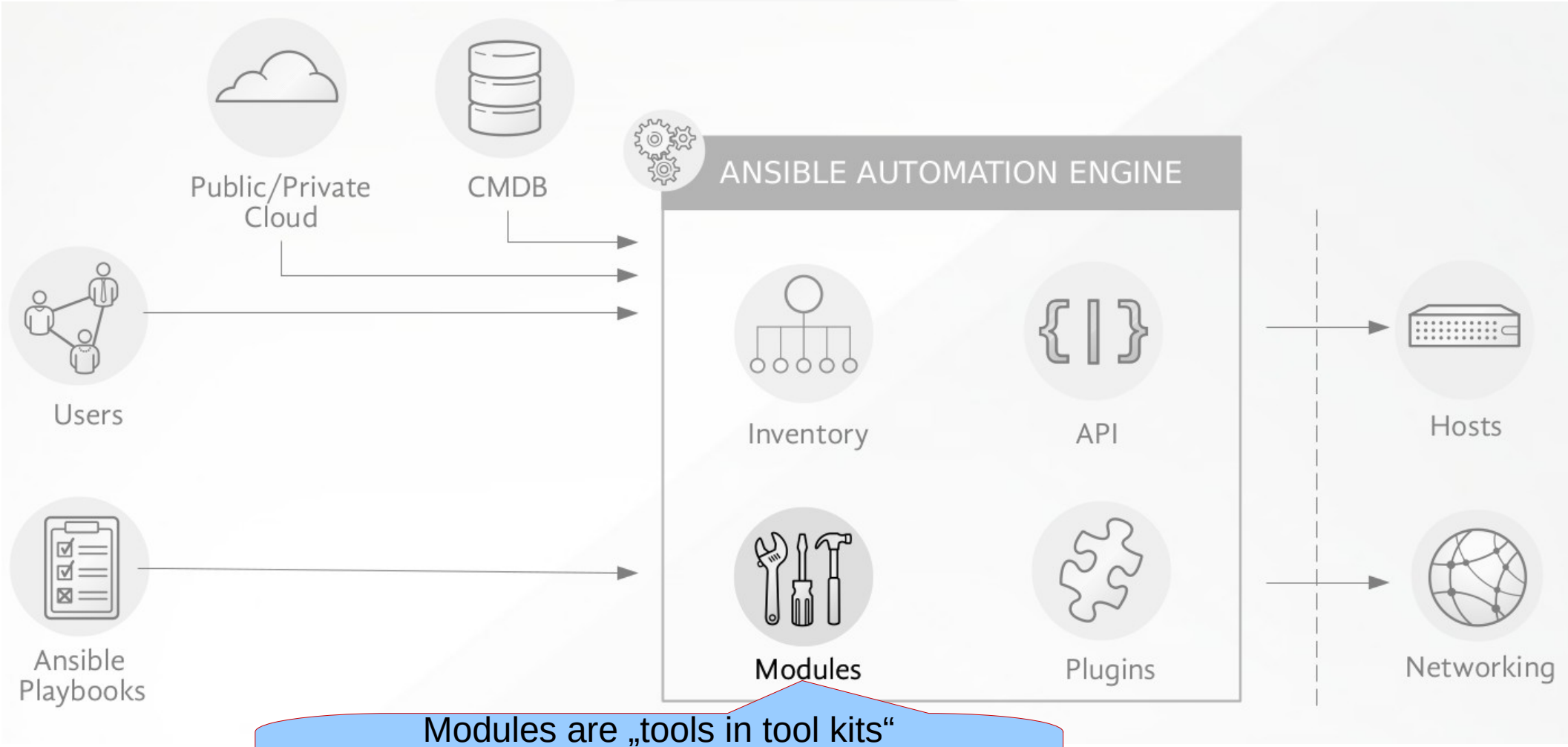
# Playbooks

```
---

- name: Configure nginx webserver
  hosts: webservers
  become: true
  tasks:
    - name: Enable epel repository
      ansible.builtin.yum:
        name: epel-release
        state: present

    - name: Install nginx
      ansible.builtin.yum:
        name: nginx
        state: present

    - name: Copy static.html
      ansible.builtin.copy:
        src: files/static.html
        dest: /usr/share/nginx/html/static.html
```

# Playbooks

```
$ ansible-playbook web-notls.yml

PLAY [Configure nginx webserver] ***********************************************

TASK [setup] *******************************************************************
ok: [instance-1]

TASK [Enable epel repository] **************************************************
ok: [instance-1]

TASK [Install nginx] ***********************************************************
changed: [instance-1]

TASK [Copy index.html] *********************************************************
changed: [instance-1]

TASK [Start and enable nginx] **************************************************
changed: [instance-1]


PLAY RECAP *********************************************************************
instance-1                 : ok=9    changed=5    unreachable=0    failed=0
```

# The Ansible basics

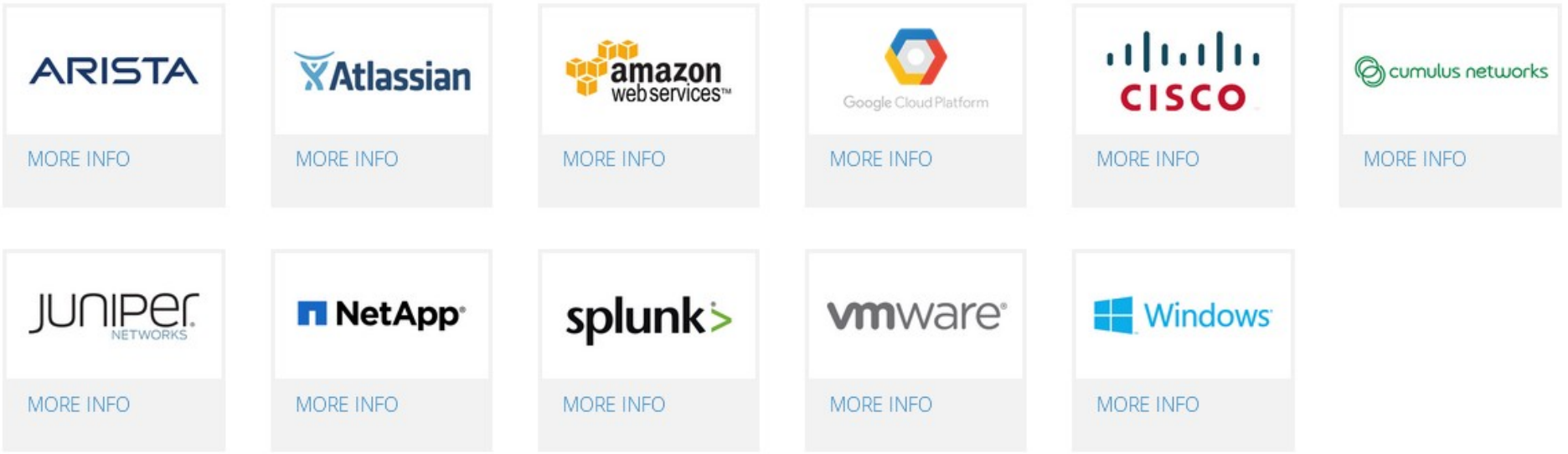



Modules are „tools in tool kits“
Python, Powershell or any other language
Increase easy deployment of Ansible code

# Modules

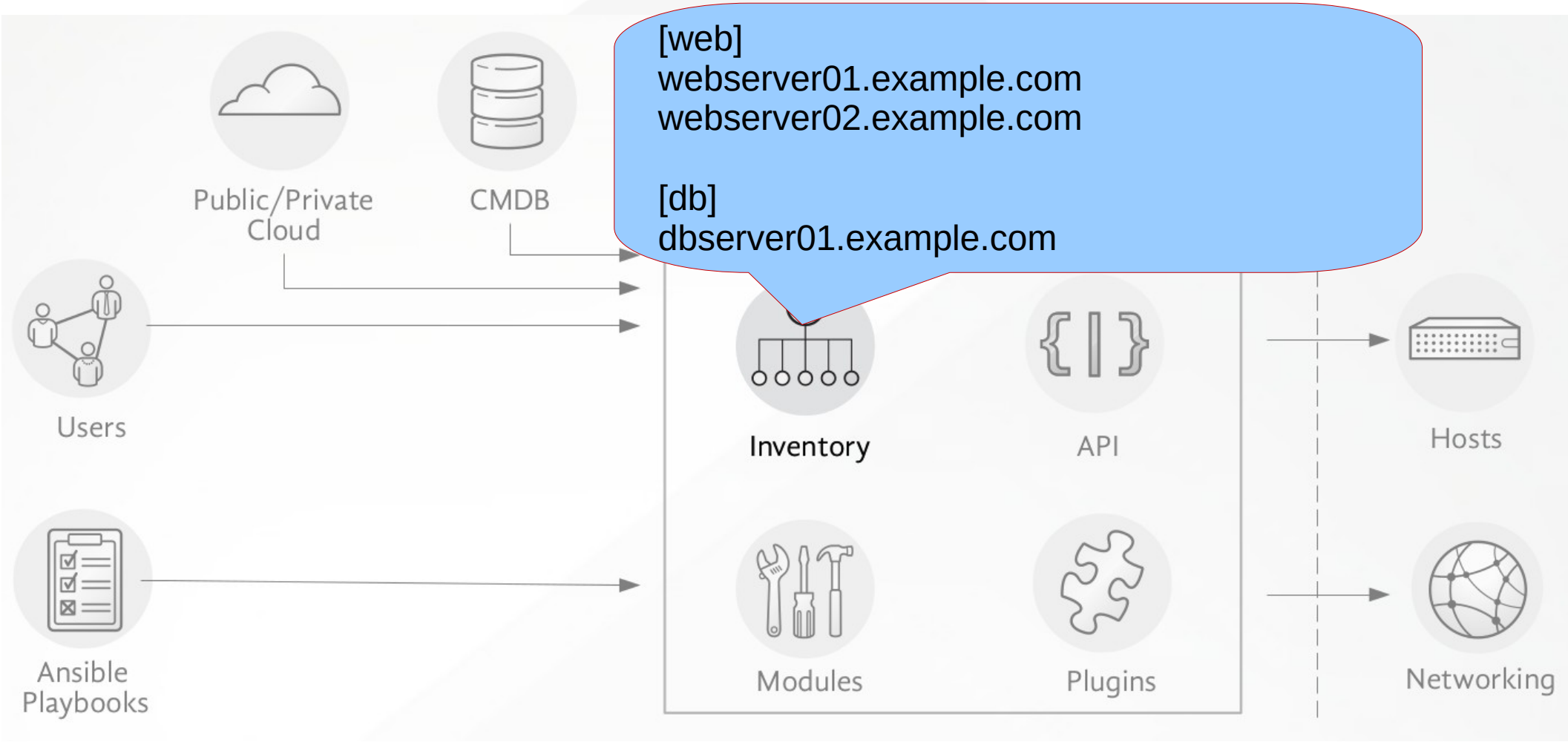
https://docs.ansible.com/ansible/latest/collections/index_module.html

- yum/apt/zypper/...
- service
- template
- user
- file
- copy

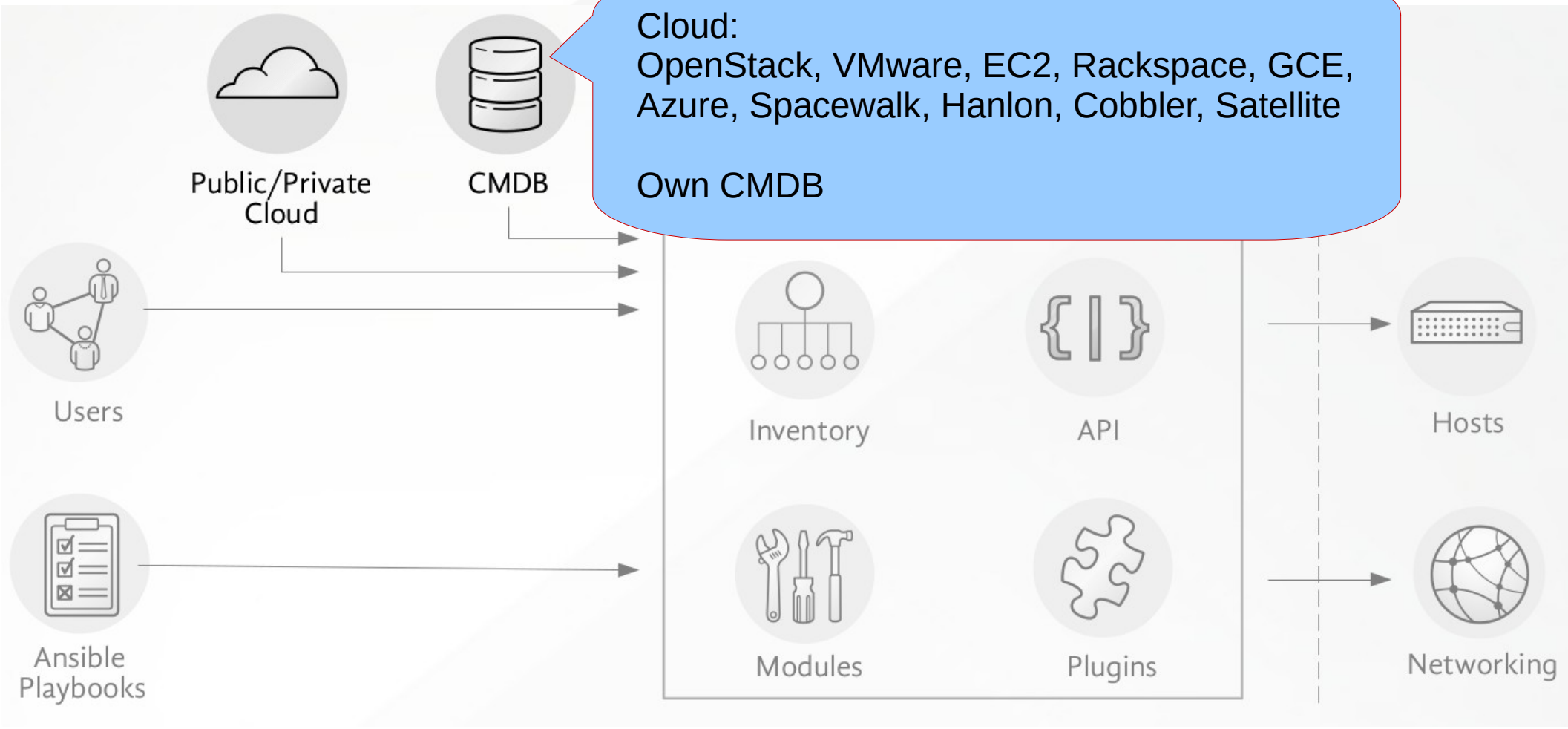



Quelle: https://www.ansible.com/how-ansible-works

# The Ansible basics

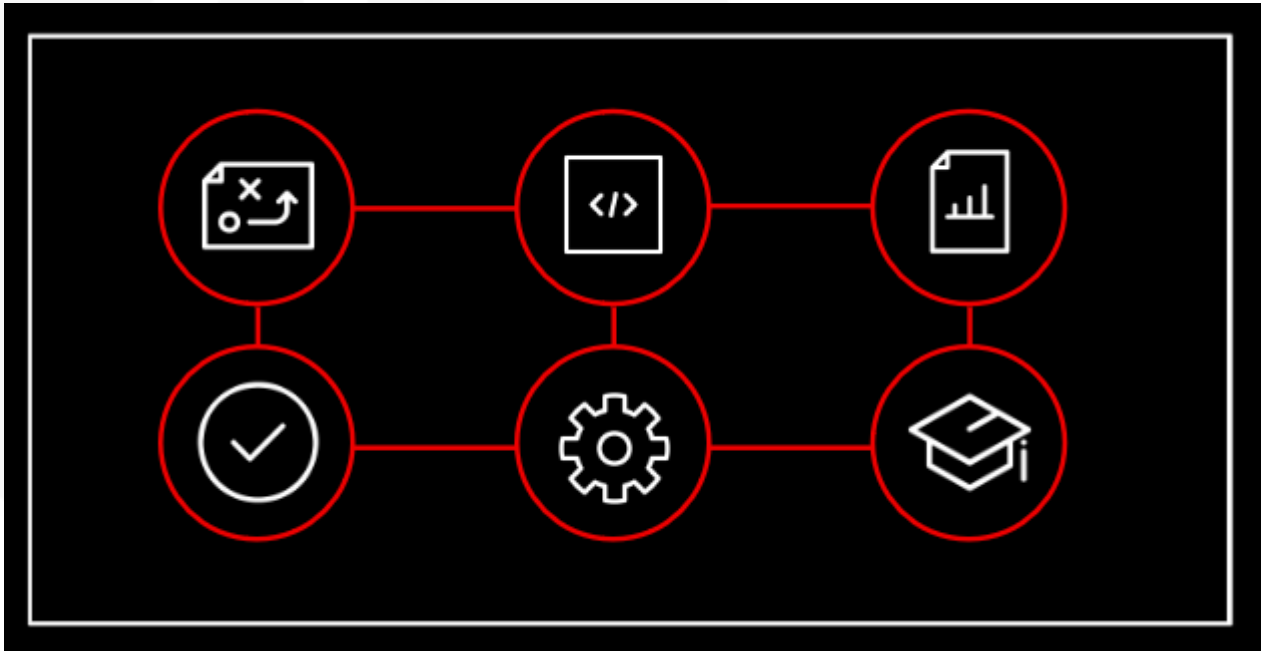


# The Ansible basics



# Collections

- Simplified and consistent content delivery
- Collections contains:
  - Modules
  - Playbooks
  - Roles
  - Plugins
  - Docs
  - Tests



Source: https://github.com/ansible/workshops/blob/devel/decks/ansible_rhel.pdf

# Collections

```
checkmk
└── general
    ├── ansible.cfg
    ├── CHANGELOG.rst
    ├── changelogs
...
    │   │   └── 4.3.1
    │   │       ├── fix_rule_conditions_missing.yml
    │   │       └── release_summary.yml
    ├── docs
    │   ├── activation_module.rst
...
    ├── meta
    │   └── runtime.yml
    ├── playbooks
    │   ├── demo
    │   │   ├── downtimes.yml
...
    ├── plugins
    │   ├── doc_fragments
    │   │   ├── common.py
...
```

# Collections

```
...
│   ├── lookup
│   │   └── bakery.py
...
│   ├── modules
│   │   └── activation.py
...
│   └── module_utils
│       └── api.py
...
├── README.md
└── roles
    ├── agent
    │   ├── defaults
    │   │   └── main.yml
    │   ├── handlers
    │   │   └── main.yml
    │   ├── meta
    │   │   └── main.yml
    │   ├── README.md
    │   ├── tasks
    │   │   └── Debian.yml
...
```

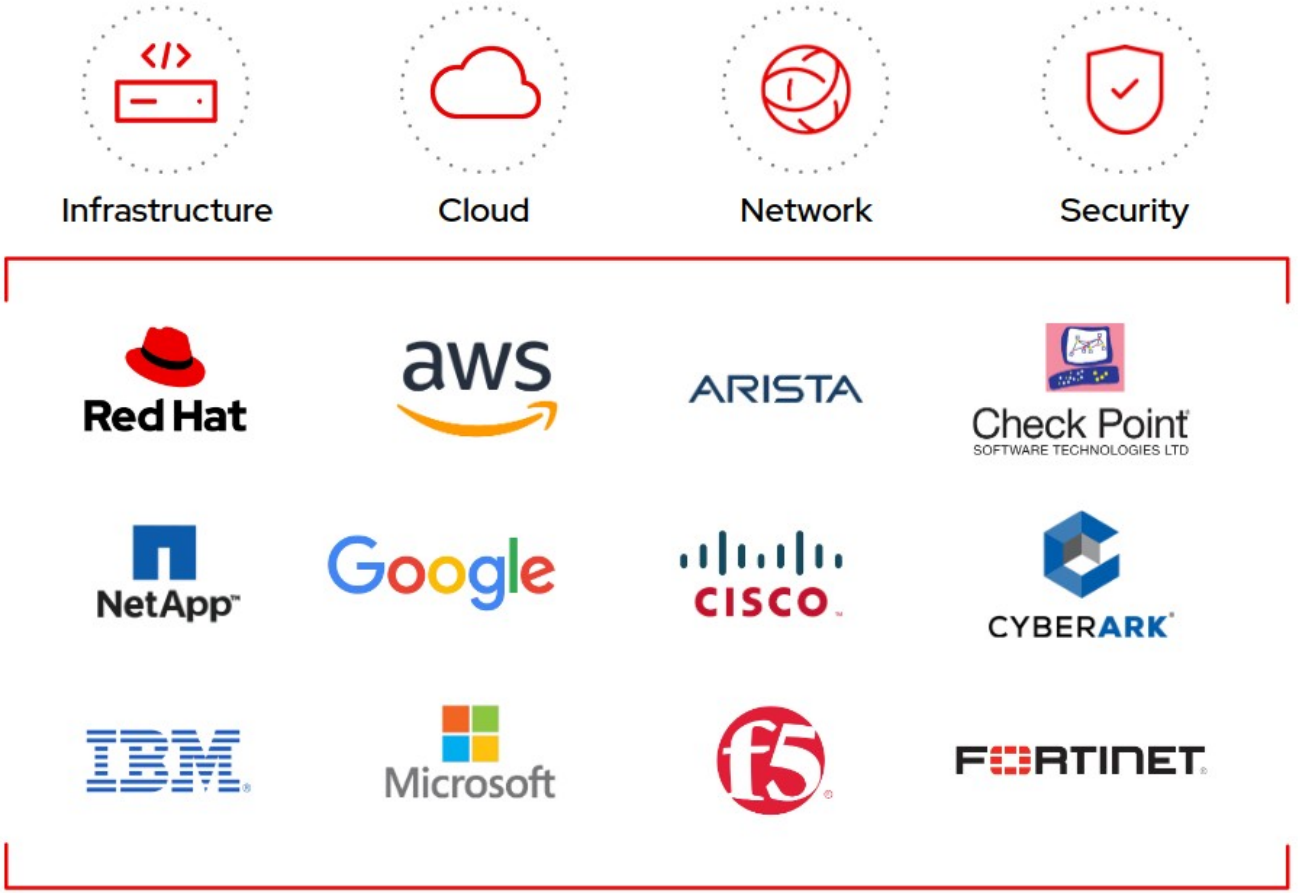
# Use Collections in Playbooks

```
---

- name: Configure nginx webserver
  hosts: webservers
  become: true
  tasks:
    - name: Enable epel repository
      ansible.builtin.yum:
        name: epel-release
        state: present

    - name: Install nginx
      ansible.builtin.yum:
        name: nginx
        state: present

    - name: Copy static.html
      ansible.builtin.copy:
        src: files/static.html
        dest: /usr/share/nginx/html/static.html
```

# Collections

90+

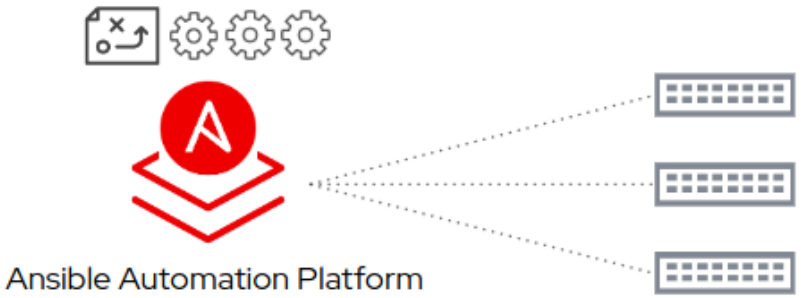
certified platforms




Source: https://github.com/ansible/workshops/blob/devel/decks/ansible_rhel.pdf

# How Ansible Works

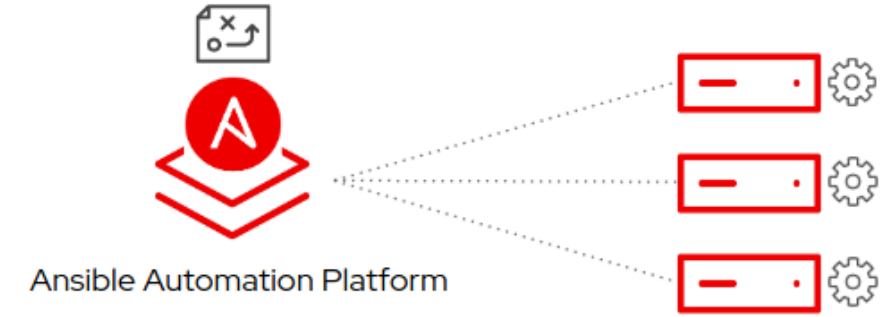
Module code is executed locally on the control node




Local Execution

Network Devices / API Endpoints

Module code is copied to the managed node, executed, then removed




Remote Execution

Linux / Windows Hosts

Source: https://github.com/ansible/workshops/blob/devel/decks/ansible_rhel.pdf

# Preparing the LAB environment

# Preparing the LAB environment

- Create LAB environment
  - Control node == target node
  - Use local connection
  - Configure sudo for privileged access

# Preparing the LAB environment

- Available VMs (if you don’t have your own)
- Pwds: **AnsibleW0rkshop2024!**

| Hostname | IP Address | Userrname | Participant |
|---|---|---|---|
| ansible-ws-1 | 116.203.227.120 | ansible | |
| ansible-ws-2 | 162.55.51.64 | ansible | |
| ansible-ws-3 | 188.245.36.142 | ansible | |
| ansible-ws-4 | 5.75.175.200 | ansible | |
| ansible-ws-5 | 94.130.57.183 | ansible | |
| ansible-ws-6 | 195.201.130.43 | ansible | |
| ansible-ws-7 | 116.203.17.200 | ansible | |
| ansible-ws-8 | 128.140.41.17 | ansible | |
| ansible-ws-9 | 159.69.216.194 | ansible | |
| ansible-ws-10 | 94.130.181.155 | ansible | |

# Preparing the LAB environment

- Configure sudo for privileged access

```
$ su -
# <EDITOR> /etc/sudoers.d/ansible
```

```
<USERNAME> ALL=(ALL) NOPASSWD: ALL
```

**Use user root to run this command!**

Replace <EDITOR> with vi, nano or your favorite editor

Replace <USERNAME> with your system user

# LAB 1: Configure sudo

# LAB 1: Configure sudo

- Configure sudo for privileged access

```
$ su -
# <EDITOR> /etc/sudoers.d/ansible
```

```
<USERNAME> ALL=(ALL) NOPASSWD: ALL
```

**Use user root to run this command!**

Replace <EDITOR> with vi, nano or your favorite editor

Replace <USERNAME> with your system user

# Install Ansible

# Install Ansible

- Most Linux distributions ship 2 versions:
  - **ansible-core**: Ansible binary + minimal set of collections
  - **ansible**: Ansible and selected collections

# Install Ansible - RHEL

- Install Ansible on RHEL 9

```
# subscription-manager repos --enable
codeready-builder-for-rhel-9-$(arch)-rpms
# dnf install
https://dl.fedoraproject.org/pub/epel/epel
-release-latest-9.noarch.rpm
# dnf install ansible
```

# Install Ansible – RHEL derivates

- Install Ansible on AlmaLinux, Rocky Linux 9

```
# dnf config-manager --set-enabled crb
# dnf install epel-release
# dnf install ansible
```

Source: https://commons.wikimedia.org/wiki/File:AlmaLinux_Icon_Logo.png

# Install Ansible – openSUSE

- Install Ansible on openSUSE 15.5

```
# zypper install ansible
```


Source: http://kuboosoft.blogspot.com/2012/12/opensuse-123-milestone-2-esta-aqui.html

# Install Ansible – Ubuntu

- Install Ansible on Ubuntu 24.04

```
# apt update
# apt install ansible
```


Source: https://windytheplaneh.deviantart.com/art/with-speedvideo-Ubuntu-logo-vector-1-599350984

# Install Ansible – pip

- Install Ansible with pip

```
$ pip install ansible
```


Source: https://sefiks.com/2020/03/21/publishing-python-packages-on-pip-and-pypi/

# LAB 2: Install Ansible

# LAB 2: Install Ansible

- Ensure Ansible is installed

```
$ ansible --version
ansible [core 2.14.14]
```

Depending on your operating system the Ansible version can be different

# Prepare Ansible inventory

# Prepare Ansible inventory

- Ansible needs to be aware of target machines
- As there is no agent, an inventory is used
- Inventory defines:
  - Available hosts
  - How to connect to these hosts
- More details about inventories will follow later in this workshop

# Prepare Ansible inventory

- Create folder for your Ansible code

```
$ mkdir playbooks
$ cd playbooks
$ <EDITOR> hosts

testserver ansible_connection=local
```

Replace <EDITOR> with vi, nano or your favorite editor

# Test connection to target server

- Make sure your target server is reachable

```
$ ansible testserver -i hosts -m ping
testserver | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3"
    },
    "changed": false,
    "ping": "pong"
}
```

Ansible does not send an ICMP ping to test the connection, it tries to log into the target machine.

# LAB 3: Add target to Ansible inventory

# LAB 3: Add target to Ansible inventory

- Make sure your target server is reachable

```
$ ansible testserver -i hosts -m ping
testserver | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3"
    },
    "changed": false,
    "ping": "pong"
}
```

# Ad-hoc Commands

# Ad-hoc Commands

- Easy way to execute ~~commands~~ modules on multiple machines
- Get list of available modules in latest Ansible package: https://docs.ansible.com/ansible/latest/collections/index_module.html

# Ad-hoc Commands

- Get uptime

```
$ ansible testserver -i hosts -m
ansible.builtin.command -a uptime
testserver | CHANGED | rc=0 >>
 14:42:44 up 39 min,  1 user,  load average: 0.00, 0.01, 0.01
```

- Show last 10 lines of messages

```
$ ansible testserver -i hosts -a "tail
/var/log/messages"
testserver | FAILED | rc=1 >>
tail: cannot open '/var/log/messages' for reading: Permission
denied
non-zero return code
```

# Ad-hoc Commands

- Show last 10 lines of messages with root permissions

```
$ ansible testserver -i hosts -a "tail /var/log/messages" -b
```

- Install Apache package

```
$ ansible testserver -i hosts -m ansible.builtin.yum -a "name=httpd state=installed" -b
```

# LAB 4: Create user

# LAB 4: Create user

- Create an user with the following settings:
  - Name: testuser
  - Gecos/Comment: Test User
  - Shell: /bin/bash
  - Ensure that the home directory /home/testuser will be created automatically

https://docs.ansible.com/ansible/latest/collections/index_module.html#ansible-builtin

# LAB 4: Create user

- Solution

```
$ ansible testserver -i hosts -m ansible.builtin.user -a
"name=testuser comment='Test User' shell=/bin/bash
state=present" -b
testserver  | CHANGED => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3"
    },
    "changed": true,
    "comment": "Test User",
    "create_home": true,
    "group": 1001,
    "home": "/home/testuser",
    "name": "testuser",
    "shell": "/bin/bash",
    "state": "present",
    "system": false,
    "uid": 1001
}
```

# Playbooks

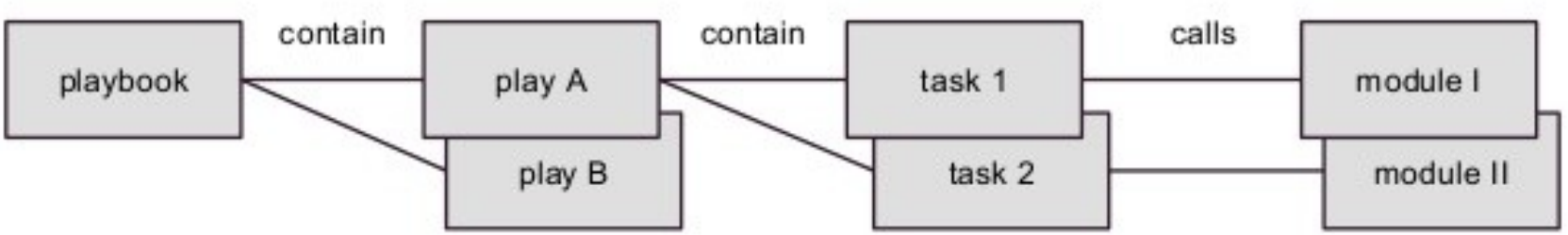
# Playbooks

- Recurring way of executing Ansible code
- Collection of Ansible tasks
- Dependencies between tasks

- In this workshop we are going to create a webserver (Apache) with a default web page.

# Playbooks

## Playbook




Source: *https://image.slidesharecdn.com/ansible-150925121447-lva1-app6891/95/ansible-101-16-638.jpg?cb=1443183393*

# Playbooks

- A playbooks consists of 1 or multiple **plays**

```
- name: Configure Apache webserver
```

- Each play consists of 1 or multiple **tasks**

```
- name: Enable epel repository
- name: Install Apache
```

# Playbooks

- Each tasks executes a **module**

```
- ansible.builtin.yum
- ansible.builtin.copy
- ansible.builtin.template
- ansible.builtin.service
```

# Simple Playbook

- Install Apache webserver with Ansible
- Use the correct sample code matching your operating system – either Red Hat based, Debian based or SUSE based

```
$ <EDITOR> web-notls.yml
```

**Ansible playbooks are written in YAML – make sure that the YAML-syntax is correct. Never use tab, always use spaces!**

# Simple Playbook – Red Hat

```
---
- name: Configure Apache webserver
  hosts: webservers
  become: true

  tasks:
    - name: Install Apache
      ansible.builtin.dnf:
        name: httpd
        state: present
```

# Simple Playbook – Debian

```
---
- name: Configure Apache webserver
  hosts: webservers
  become: true

  tasks:
    - name: Install Apache
      ansible.builtin.apt:
        name: apache2
        update_cache: true
        state: present
```

# Simple Playbook – SUSE

```
---
- name: Configure Apache webserver
  hosts: webservers
  become: true

  tasks:
    - name: Install Apache
      community.general.zypper:
        name: apache2
        state: present
```

# Simple Playbook

- It would be possible to use the generic **ansible.bultin.package** module, but imho it's easier to understand the code if the os specific package module is used

Note the different syntax between Ad-hoc command arguments (=) and a structured playbooks. In Playbooks, each argument is in a seperate line (:)

# Simple Playbook

- This playbooks should be executed only for group **webservers**. No ssh connection is required for the test host

```
$ <EDITOR> hosts
[webservers]
testserver ansible_connection=local
```

# Simple Playbook

- Playbooks are executed with command **ansible-playbook** instead of ansible

```
$ ansible-playbook -i hosts web-notls.yml

PLAY [Configure Apache webserver] ***********************************************

TASK [setup] ********************************************************************

ok: [testserver]

TASK [Install Apache] ***********************************************************

changed: [testserver]

PLAY RECAP **********************************************************************

testserver                 : ok=2    changed=1    unreachable=0    failed=0
```

# Simple Playbook

- Static files can be copied with **ansible.builtin.copy** module
- Ensure to deploy **static.html** page on your host

```
$ <EDITOR> web-notls.yml
```

Note: don’t add the placeholder „...“ to your playbook – it just tells you to append the new code before or after the existing one!

# Simple Playbook – Red Hat/Debian

```
...

    - name: Copy static.html
      ansible.builtin.copy:
        src: files/static.html
        dest: /var/www/html/static.html
```

# Simple Playbook – SUSE

```
...

    - name: Copy static.html
      ansible.builtin.copy:
        src: files/static.html
        dest: /srv/www/htdocs/static.html
```

# Simple Playbook

- Static files should be placed in folder **files**

```
$ mkdir files
$ <EDITOR> files/static.html

<html>
  <head>
    <title>Ansible workshop</title>
  </head>
  <body>
    <h1>Ansible workshop</h1>
    <p>This is our first web application, created in Ansible
workshop!</p>
  </body>
</html>
```

# Simple Playbook

- Deploy static webpage

```
$ ansible-playbook -i hosts web-notls.yml

PLAY [Configure Apache webserver]
*********************************************

TASK [setup]
*******************************************************************

ok: [testserver]

TASK [Install Apache]
***********************************************

ok: [testserver]

TASK [Copy static.html] ****************************************

changed: [testserver]

PLAY RECAP
*********************************************************************

testserver                 : ok=3    changed=1    unreachable=0    failed=0
```

# Simple Playbook

- Deploy static webpage

```
$ ansible-playbook -i hosts web-notls.yml

TASK [Install Apache]
**********************************************************

ok: [testserver]
```

If there are no changes to the system – e.g. Apache is already installed, Ansible marks this task with **ok** instead of **changed**.

# Simple Playbook

- Dynamic files can include e.g.:
  - variables
  - loop
  - conditions
- These files are copied with the **ansible.builtin.template** module
- Ensure to deploy **index.html** page on your host

```
$ <EDITOR> web-notls.yml
```

# Simple Playbook – Red Hat/Debian

```
...

    - name: Copy index.html
      ansible.builtin.template:
        src: templates/index.html.j2
        dest: /var/www/html/index.html
        mode: 0644
```

# Simple Playbook – SUSE

```
...

    - name: Copy index.html
      ansible.builtin.template:
        src: templates/index.html.j2
        dest: /srv/www/htdocs/index.html
        mode: 0644
```

# Simple Playbook

- Templates should be placed in folder **templates**

```
$ mkdir templates
$ <EDITOR> templates/index.html.j2

<html>
  <head>
    <title>Ansible workshop</title>
  </head>
  <body>
    <h1>Ansible workshop</h1>
    <p>This is our first web application, created in
Ansible workshop!</p>
    <p>{{ ansible_managed }}</p>
  </body>
</html>
```

# Simple Playbook

- Templates should be placed in folder **templates**
- File ending **.j2** is optional but strongly recommended
- More information about Jinja2 templating engine: https://jinja.palletsprojects.com/en/3.0.x/

It’s not required to study full Jinja documentation as only a couple of options are required.

# Simple Playbook

- Deploy dynamic webpage

```
$ ansible-playbook -i hosts web-notls.yml

...
TASK [Copy index.html]
**********************************************************

changed: [testserver]
...
```

# Simple Playbook

- Services are started with **ansible.builtin.service** module

```
$ <EDITOR> web-notls.yml
```

ansible.builtin.service is a proxy for specific service manager modules like ansible.builtin.systemd or ansible.builtin.sysvinit

# Simple Playbook – Red Hat

```
...

    - name: Start and enable Apache
      ansible.builtin.service:
        name: httpd
        state: started
        enabled: true
```

# Simple Playbook – Debian/SUSE

```
...

    - name: Start and enable Apache
      ansible.builtin.service:
        name: apache2
        state: started
        enabled: true
```

# LAB 5: Configure firewall

# LAB 5: Configure firewall

- Ensure to properly configure firewall by enabling the following ports:
  - 22
  - 80
- Alternativly configure the following services:
  - ssh
  - http

# LAB 5: Configure firewall – Red Hat / SUSE

- RHEL / CentOS / AlmaLinux / RockyLinux as well as SLES 15 / openSUSE uses firewalld per default
- Ensure that firewalld is installed
- Ensure that firewalld is running
- There’s a firewalld module available in collection ansible.posix – not in ansible.builtin!

# LAB 5: Configure firewall - Ubuntu

- Debian / Ubuntu uses ufw per default
- Ensure that ufw is installed
- Ensure that ufw is running
- There’s a ufw module available in collection community.general – not in ansible.builtin!

# LAB 5: Configure firewall – Red Hat

Solution

```
...
    - name: Install firewalld
      ansible.builtin.dnf:
        name: firewalld
        state: present

    - name: Start and enable firewalld
      ansible.builtin.service:
        name: firewalld
        state: started
        enabled: true
```

# LAB 5: Configure firewall – Red Hat

- Solution

```
...
    - name: Open service ssh in firewalld
      ansible.posix.firewalld:
        service: ssh
        state: enabled
        permanent: true
        immediate: true

    - name: Open service http in firewalld
      ansible.posix.firewalld:
        service: http
        state: enabled
        permanent: true
        immediate: true
```

# LAB 5: Configure firewall – Ubuntu

Solution

```
...
    - name: Install ufw
      ansible.builtin.apt:
        name: ufw
        update_cache: true
        state: present

    - name: Start and enable ufw
      ansible.builtin.service:
        name: ufw
        state: started
        enabled: true
```

# LAB 5: Configure firewall – Ubuntu

- Solution

```
...
    - name: Enable service ssh in ufw
      community.general.ufw:
        port: ssh
        proto: tcp
        rule: allow

    - name: Enable service http in ufw
      community.general.ufw:
        port: http
        proto: tcp
        rule: allow

    - name: Enable ufw and reject everything
      community.general.ufw:
        state: enabled
        policy: reject
```

# LAB 5: Configure firewall – SUSE

Solution

```
...
    - name: Install firewalld
      community.general.zypper:
        name: firewalld
        state: present

    - name: Start and enable firewalld
      ansible.builtin.service:
        name: firewalld
        state: started
        enabled: true
```

# LAB 5: Configure firewall – SUSE

- Solution

```
...
    - name: Open service ssh in firewalld
      ansible.posix.firewalld:
        service: ssh
        state: enabled
        permanent: true
        immediate: true

    - name: Open service http in firewalld
      ansible.posix.firewalld:
        service: http
        state: enabled
        permanent: true
        immediate: true
```

# LAB 5: Configure firewall

## Solution

# Playbooks
# YAML Syntax

# YAML syntax

- YAML is a human-friendly data serialization language for all programming languages
- This chapter provides more information about YAML

# YAML syntax

- Playbook header
  - A YAML file should start with **---** as a header
  - Ansible doesn’t really care about this :)

```
---

- name: My first play
...
```

# YAML syntax

- Comments
  - Like many other languages, YAML uses the # sign for comments
  - Most of the time no comments are required, as all tasks should be named

```
# I am a comment :)
```

# YAML syntax

- Quoting / String
  - Ansible interprets nearly everything as a string, so no quoting is required except for special cases like variables (more later)

```
- name: "Install {{ package_name }}"
  ansible.builtin.dnf:
    name: "{{ package_name }}"
    state: present
```

# YAML syntax

- Booleans
  - Ansible accepts broad range for booleans, where matching strings are case insensitive

```
True | 'true' | 't' | 'yes' | 'y' | 'on'
| '1' | 1 | 1.0 => true

False | 'false' | 'f' | 'no' | 'n' |
'off' | '0' | 0 | 0.0 => false
```

# YAML syntax

- Booleans
  - Ansible accepts broad range for booleans, where matching strings are case insensitive

Tip: use only **true** and **false**, as these values are expected by yamllint for booleans.

# YAML syntax

- Lists
  - Lists start with a **-**
  - You’re already using lists of tasks and lists of plays
  - Install a list of packages (if the module supports it):

```
ansible.builtin.dnf:
  name:
    - httpd
    - mod_ssl
  state: present
```

# YAML syntax

- Lists
  - Consult module documentation if a list is supported

| | |
|---|---|
| **name**<br>aliases: pkg<br>list / elements=string | A package name or package specifier with version, like `name-1.0`. When using state=latest, this can be '*' which means run: dnf -y update. You can also pass a url or a local path to an rpm file. To operate on several packages this can accept a comma separated string of packages or a list of packages.<br>Comparison operators for package version are valid here `>`, `<`, `>=`, `<=`. Example - `name >= 1.0`. Spaces around the operator are required.<br>You can also pass an absolute path for a binary which is provided by the package to install. See examples for more information.<br>**Default:** `[]` |

# YAML syntax

- Lists
  - Lists are indexed by numbers

```
ansible.builtin.debug:
  var: my_list[0]
vars:
  my_list: ['foo', 'bar']

...
TASK [ansible.builtin.debug]
**************************************************

ok: [testserver] => {
    "my_list[0]": "foo"
}
```

# YAML syntax

- Dictionaries
  - Equivalent to hashes
  - Differ from a list as they are keyed using a string instead of a number

```
vars:
  package_name: httpd
```

# YAML syntax

- Dictionaries

```
ansible.builtin.debug:
  var: my_list.foo
vars:
  my_list:
    foo: bar


...
TASK [ansible.builtin.debug]
**********************************************************

ok: [testserver] => {

    "my_list.foo": "bar"
}
```

# YAML syntax

- Line breaks
  - Literal with **|**
  - Folded with **>**

# YAML syntax

- Line breaks - literal

```
ansible.builtin.debug:
  msg: |

    First line
    Second line
    Third line


...
TASK [ansible.builtin.debug]
*******************************************************
ok: [testserver] => {

    "msg": "First line\nSecond line\nThird line\n"

}
```

# YAML syntax

- Line breaks - folded

```
ansible.builtin.debug:
  msg: >

    One long
    line without
    line breaks


...
TASK [ansible.builtin.debug]
**********************************************************
ok: [testserver] => {

    "msg": "One long line without line breaks"

}
```

# Playbooks
# Loops and conditions

# Loops and conditions

- Often required to run tasks under certain conditions
- Repeat multiple actions – like configuring firewall ports
- Loops are realized with **loop** option
- https://docs.ansible.com/ansible/latest/playbook_guide/playbooks_loops.html

Earlier versions of Ansible used with_* instead of loop, but this is deprecated now.

# Loops and conditions

- Simplest way is a loop over lists
- Each element of the list is referenced by **item** keyword
- As item is a variable, it needs to be declared as a variable
- Install Apache and mod_ssl extension

# Loops and conditions – Red Hat

```
...

  tasks:
    - name: Install Apache and mod_ssl
      ansible.builtin.dnf:
        name: "{{ item }}"
        state: present
      loop:
        - httpd
        - mod_ssl
```

# Loops and conditions – Debian

```
...

  tasks:
    - name: Install Apache and mod_ssl
      ansible.builtin.apt:
        name: "{{ item }}"
        update_cache: true
        state: present
      loop:
        - apache2
        - libapache2-mod-ssl
```

# Loops and conditions – SUSE

```
...

  tasks:
    - name: Install Apache and mod_ssl
      community.general.zypper:
        name: "{{ item }}"
        state: present
      loop:
        - apache2
```

# Loops and conditions

- These examples are just to demonstrate loops – if a module supports lists natively, use it!
- Better code for installing packages:

```
- name: Install Apache and mod_ssl
  ansible.builtin.dnf:
    name:
      - httpd
      - mod_ssl
    state: present
```

# LAB 6: Improve firewall configuration

# LAB 6: Improve firewall configuration

- Ensure to properly configure firewall by enabling the following ports:
  - 22
  - 80
- Alternativly configure the following services:
  - ssh
  - http
- Use a list to avoid multiple tasks

# LAB 6: Improve firewall configuration – Red Hat / SUSE

- Solution

```
...
    - name: Open service ssh in firewalld
      ansible.posix.firewalld:
        service: "{{ item }}"
        state: enabled
        permanent: true
        immediate: true
      loop:
        - ssh
        - http
```

# LAB 6: Improve firewall configuration – Ubuntu

- Solution

```
...
    - name: Enable service ssh in ufw
      community.general.ufw:
        port: "{{ item }}"
        proto: tcp
        rule: allow
      loop:
        - ssh
        - http
```

# Loops and conditions

- Often required to loop over dictionaries, as simple lists aren’t sufficient
- Use loop with **dict2items** filter

# Loops and conditions

- Dictionary example

```
...
    - name: Dictionary example
      ansible.builtin.debug:
        msg: "{{ item.key }} - {{ item.value }}"
      loop: "{{ tag_data | dict2items }}"
      vars:
        tag_data:
          environment: dev
          application: web
```

# Loops and conditions

- Conditions are realized with **when** clause
- Possible to combine conditions with **and** keywork or creating a **list**
- Use **or** if conditions should not be combined
- When expects variables, so don’t declare them, but quote strings!

# Loops and conditions

- When example

```
...
    - name: Install VMware tools
      ansible.builtin.dnf:
        name: open-vm-tools
        state: present
      when: ansible_virtualization_type == "VMware"
```

More information about (special) variables can be found in the next chapter...

# Loops and conditions

- When **and** example

```
...
    - name: Install VMware tools
      ansible.builtin.dnf:
        name: open-vm-tools
        state: present
      when:
        - ansible_virtualization_type == "VMware"
        - ansible_os_family == "RedHat"
```

More information about (special) variables can be found in the next chapter...

# Loops and conditions

- When **or** example

```
...
    - name: Open service ssh in firewalld
      ansible.posix.firewalld:
        service: "{{ item }}"
        state: enabled
        permanent: true
        immediate: true
      loop:
        - ssh
        - http
      when: >
        ansible_os_family == "Suse" or
        ansible_os_family == "RedHat"
```

# Variables and facts

# Variables and facts

- Many possibilities to define custom variables
- Ansible has built-in variables
- Facts are specific variables for a host
- Always quote variables except in when clause
- https://docs.ansible.com/ansible/latest/playbook_guide/playbooks_variables.html

# Variables and facts

- Facts are gathered as first task of playbooks
- Disable facts gathering:

```
---
- name: Playbook without facts
  hosts: webservers
  become: true
  gather_facts: false
  tasks:
...
```

# Variables and facts

- If facts are enabled, a task is shown:

```
PLAY [Configure Apache webserver] **********************************************

TASK [setup] *******************************************************************

ok: [testserver]
```

# Variables and facts

- Gather facts with Ad-hoc command

```
$ ansible -i hosts -m setup testserver
```

```
testserver | SUCCESS => {
    "ansible_facts": {
        "ansible_all_ipv4_addresses": [
            "192.168.121.65"
        ],
        "ansible_all_ipv6_addresses": [
            "fe80::5054:ff:fede:7d69"
        ],
...
```

# LAB 7: Facts

# LAB 7: Facts

- Find out which facts are available for your test system

# LAB 7: Facts

- Solution

```
$ ansible -i hosts -m setup testserver
```

```
testserver | SUCCESS => {
    "ansible_facts": {
        "ansible_all_ipv4_addresses": [
            "192.168.121.65"
        ],
        "ansible_all_ipv6_addresses": [
            "fe80::5054:ff:fede:7d69"
        ],
...
```

# Variables and facts

- Variables in Ansible tasks need to be quoted with **"{{ variable_name }}"** or **'{{ variable_name }}'**
- There are many possibilities for declaring variables (inventory, play, task,...)
- All variables are global
- Example: play variable

# Variables and facts

- Define variable for name of static.html file

```
---
- name: Configure Apache webserver
  hosts: webservers
  become: true

  vars:
    static_file: static.html

  tasks:
...
```

# Variables and facts – Red Hat / Debian

- Define variable for name of static.html file

```
...
    - name: Copy static.html
      ansible.builtin.copy:
        src: "files/{{ static_file }}"
        dest: "/var/www/html/{{ static_file }}"
...
```

# Variables and facts – SUSE

- Define variable for name of static.html file

```
...
    - name: Copy static.html
      ansible.builtin.copy:
        src: "files/{{ static_file }}"
        dest: "/srv/www/htdocs/{{ static_file }}"
...
```

# Variables and facts

- Possible to set variable during runtime with **ansible.builtin.set_fact** module

```
...
    tasks:
      - name: Define webroot for RHEL/Debian
        ansible.builtin.set_fact:
          web_root: /var/www/html
        when: >
          ansible_os_family == "Debian" or
          ansible_os_family == "RedHat"
...
```

# Variables and facts

- Possible to set variable during runtime with **ansible.builtin.set_fact** module

```
...
    - name: Define webroot for RHEL/Debian
      ansible.builtin.set_fact:
        web_root: /var/www/html
      when: >
        ansible_os_family == "Debian" or
        ansible_os_family == "RedHat"

    - name: Define webroot for SUSE
      ansible.builtin.set_fact:
        web_root: /srv/www/htdocs
      when: ansible_os_family == "Suse"
...
```

# Variables and facts

- Possible to set variable during runtime with **ansible.builtin.set_fact** module

```
...
    - name: Copy static.html
      ansible.builtin.copy:
        src: "{{ web_root }}/{{ static_file }}"
        dest: "{{ web_root }}/{{ static_file }}"
...
```

# Variables and facts

- Ansible has some built-in variables which can be very helpful
- See https://docs.ansible.com/ansible/latest/playbook_guide/playbooks_vars_facts.html#information-about-ansible-magic-variables

**If you try to override one of these variables, no error is displayed, but variable want be overridden!**

# Variables and facts

- Magic variables:
  - hostvars
  - groups
  - group_names
  - inventory_hostname
  - ansible_play_hosts
  - ansible_play_batch
  - ansible_playbook_python
  - inventory_dir
  - inventory_file
  - playbook_dir
  - role_path
  - ansible_check_mode
  - ansible_version

# Variables and facts

- Variables in Templates aren’t quoted, but double brackets **{{ variable_name }}** are still required!
- We already used special variable **ansible_managed** in index.html.j2

# LAB 8: Variables

# LAB 8: Variables

- Add inventory hostname to yout index.html template and make sure it’s displayed by your webserver.

```
$ <EDITOR> templates/index.html.j2
```

# LAB 8: Variables

- Add inventory hostname to index.html

```
$ <EDITOR> templates/index.html.j2

<html>
  <head>
    <title>Ansible workshop</title>
  </head>
  <body>
    <h1>Ansible workshop</h1>
    <p>This is our first web application, created in
Ansible workshop!</p>
    <p>{{ ansible_managed }}</p>
    <p>Hostname: {{ inventory_hostname }}</p>
  </body>
</html>
```

# Variables and facts

- Variables can be defined at 22 possible locations
- Don’t use all possibilities :)
- Preceedence can’t be changed
- See https://docs.ansible.com/ansible/latest/playbook_guide/playbooks_variables.html#variable-precedence-where-should-i-put-a-variable

# Variable preceedence

1) Command line (-u user)
2) Role defaults
3) Inventory file or script group vars
4) Inventory group_vars/all
5) Playbook group_vars/all
6) Inventory group_vars/*
7) Playbook group_vars/*
8) Inventory file or script host vars
9) Inventory host_vars/*
10) Playbook host_vars/*
11) Host facts / cached set_facts
12) Play vars
13) Play vars_prompt
14) Play vars_files
15) Role vars
16) Block vars
17) Task vars
18) include_vars
19) Set facts / registered vars
20) Role params
21) Include params
22) Extra vars (-e „user=user“)

# Inventories

# Inventories

- Ansible uses no agent, so an inventory is required to define possible targets
- 2 types of inventories:
  - Static inventories
  - Dynamic inventories
- Static inventories are most commonly in format:
  - INI
  - YAML

# Inventories

- Inventory is used for:
  - Defining hosts
  - Defining groups
  - Adding hosts to groups
  - Adding connection parameters for hosts

# Inventories

- Sample inventory in INI format

```
$ <EDITOR> hosts

[webservers]
testserver ansible_connection=local
```

# Inventories

- Sample inventory in YAML format

```
$ <EDITOR> hosts.yml


webservers:
  hosts:
    testserver:
      ansible_connection: local
```

# Inventories

- A host can be in mulitple groups
- Groups can be nested
- Special group **all** doesn’t need to be defined in inventory
- Use as many groups as you like!

# Inventories

- Adding development group

```
$ <EDITOR> hosts

[development:children]
webservers

[webservers]
testserver ansible_connection=local
```

# Inventories

- Adding development group

```
$ <EDITOR> hosts.yml
```

```
development:
  children:
    webservers
webservers:
  hosts:
    testserver:
      ansible_connection: local
```

# Inventories

- Possible to use wildcards for hostnames
- Imho no real practical use case...

```
[webservers]
testserver[01:09].example.com
```

```
webservers:
  hosts:
    testserver[01:09].example.com
```

# Inventories

- Aliases for human readable hostnames can be used
- Connection parameters can be overriden
- Per default Ansible uses Linux hostname resolution:
  - /etc/hosts
  - DNS
  - systemd-resolved
  - ssh_config
  - ...

# Inventories

- Aliases / Connection Parameters

```
[webservers]
testserver1 ansible_host=192.168.0.1
testserver2 ansible_host=192.168.0.2
testserver3
testserver4 ansible_user=root
testserver5 ansible_connection=local
testserver6 ansible_host= 192.168.0.6 ansible_user=root
```

# Inventories

- Host- and group vars can be defined in inventory
- Best practice is using host_vars and group_vars directory
- Example: define static_file variable in group_vars/webservers.yml file

# Inventories

- Example: define static_file variable in group_vars/webservers.yml file

```
$ mkdir group_vars
$ <EDITOR> group_vars/webservers.yml
```

```
---
static_file: static.html
```

# Inventories

- Example: define static_file variable in group_vars/webservers.yml file

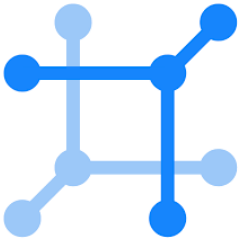
```
$ <EDITOR> web-notls.yml

---
- name: Configure Apache webserver
  hosts: webservers
  become: true

  vars:
    static_file: static.html

  tasks:
```

# Inventories

- Dynamic inventory for bigger setups
- Use inventory plugin to fetch information

```
$ ansible-doc -t inventory -l
```



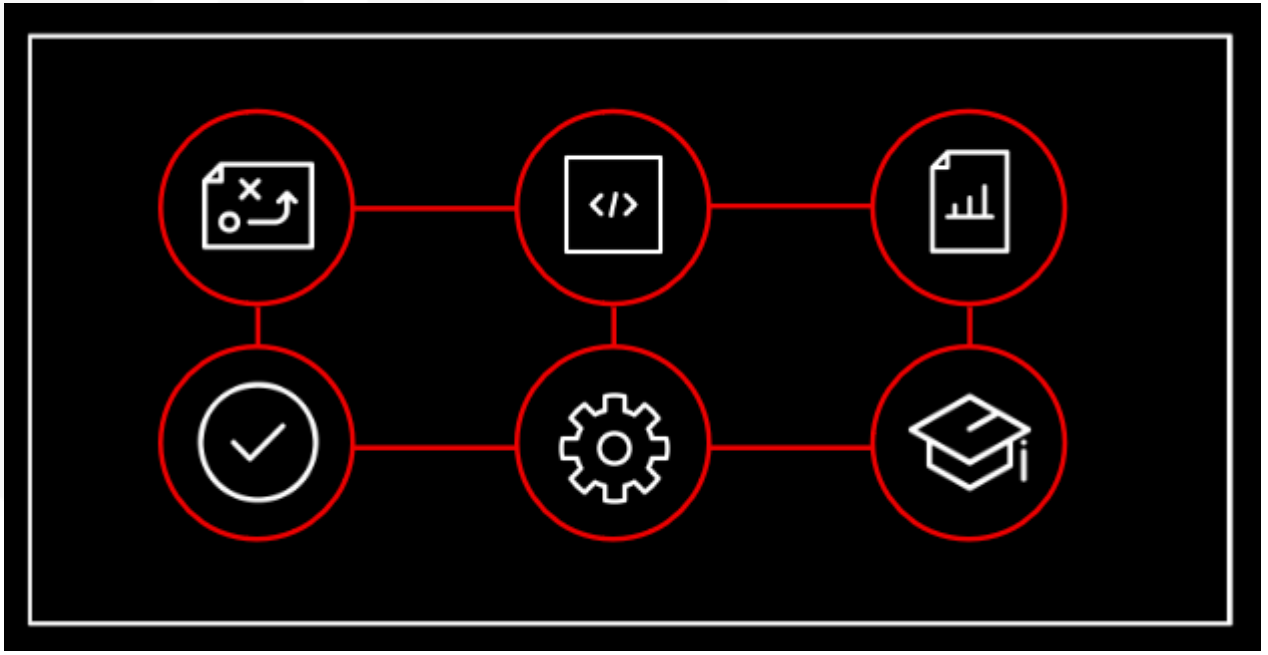


vmware by Broadcom

# Checkmk collection

# Collections

- Simplified and consistent content delivery
- Collections contains:
  - Modules
  - Playbooks
  - Roles
  - Plugins
  - Docs
  - Tests



Source: https://github.com/ansible/workshops/blob/devel/decks/ansible_rhel.pdf

# Checkmk Collection

- Developed by Checkmk team + community
- Documentation:
  https://galaxy.ansible.com/ui/repo/published/checkmk/general/
- Git Repository:
  https://github.com/Checkmk/ansible-collection-checkmk.general

# Checkmk Collection

- Install collection with ansible-galaxy

```
$ ansible-galaxy collection install checkmk.general
$ ansible-galaxy collection list | grep checkmk

checkmk.general          4.4.1
```

ansible-galaxy will download collection from galaxy.ansible.com if no private Automation hub is configured.

# Checkmk Collection

- Sample playbooks are located in playbooks/demo folder

```
├── downtimes.yml
├── full.yml
├── groups.yml
├── hosts-and-folders.yml
├── lookup.yml
├── README.md
├── rules.yml
└── users-and-contacts.yml
```

Playbooks in collections are not intended pro production use!

# Checkmk Collection

- Using the collection

```
---
- hosts: all
  tasks:
    - name: Activate changes
      checkmk.general.activation:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        sites: "my_site"
```

# Checkmk Collection

- Roles for installing and configuring agents and servers:
  - agent
  - server

You will most likely use this code only as a reference.

```
---
- hosts: all
  roles:
     - checkmk.general.server
```

checkmk



# Checkmk collection Modules

# Checkmk Collection

- Module: activation

```
---
- hosts: all
  tasks:
    - name: Activate changes
      checkmk.general.activation:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        force_foreign_changes: true
        sites: "my_site"
      run_once: true
```

# Checkmk Collection

- Module: bakery

```
---
- hosts: all
  tasks:
    - name: Bake and sign all agents
      checkmk.general.bakery:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        signature_key_id: 1
        signature_key_passphrase: "my_key"
        state: baked_signed
```

# Checkmk Collection

- Module: contact_group

```
---
- hosts: all
  tasks:
    - name: Create a single contact group
      checkmk.general.contact_group:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        name: "my_contact_group"
        title: "My Contact Group"
        customer: "provider"
        state: present
```

# Checkmk Collection

- Module: discovery

```
---
- hosts: all
  tasks:
    - name: Add newly discovered services on host
      checkmk.general.discovery:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        host_name: "my_host"
        name: "my_contact_group"
        state: new
```

# Checkmk Collection

- Module: downtime

```
---
- hosts: all
  tasks:
    - name: Schedule host downtime
      checkmk.general.downtime:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        host_name: "my_host"
        name: "my_contact_group"
        start_after:
          minutes: 5
        end_after:
          days: 7
          hours: 5
```

# Checkmk Collection

- Module: folder

```
---
- hosts: all
  tasks:
    - name: Create a single folder
      checkmk.general.folder:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        path: "/my_folder"
        name: "My Folder"
        state: present
```

# Checkmk Collection

- Module: host

```
---
- hosts: all
  tasks:
    - name: Create a host
      checkmk.general.host:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        name: "my_host"
        folder: "/"
        state: present
```

# Checkmk Collection

- Module: host_group

```
---
- hosts: all
  tasks:
    - name: Create a single host group
      checkmk.general.host_group:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        name: "my_host_group"
        title: "My Host Group"
        customer: "provider"
        state: present
```

# Checkmk Collection

- Module: password

```
---
- hosts: all
  tasks:
    - name: Delete a password
      checkmk.general.password:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        name: "my_password"
        state: absent
```

# Checkmk Collection

- Module: rule

```
---
- hosts: all
  tasks:
    - name: Delete the first rule
      checkmk.general.rule:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        ruleset: "checkgroup_parameters:memory_percentage_used"
        rule:
          rule_id: "{{ response.content.id }}"
        state: absent
```

# Checkmk Collection

- Module: service_group

```
---
- hosts: all
  tasks:
    - name: Create a single service group
      checkmk.general.service_group:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        name: "my_service_group"
        title: "My Service Group"
        customer: "provider"
        state: present
```

# Checkmk Collection

- Module: tag_group

```
---
- hosts: all
  tasks:
    - name: Create a tag group
      checkmk.general.tag_group:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        name: "datacenter"
        title: "Dataccenter"
        topic: "Tags"
        tags:
          - id: datacenter_1
            title: "Datacenter 1"
        state: present
```

# Checkmk Collection

- Module: timeperiod

```
---
- hosts: all
  tasks:
    - name: Delete a timeperiod
      checkmk.general.timeperiod:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        name: "worktime"
        state: absent
```

# Checkmk Collection

- Module: user

```
---
- hosts: all
  tasks:
    - name: Delete a user
      checkmk.general.user:
        server_url: "https://my_server"
        site: "my_site"
        automation_user: "my_user"
        automation_secret: "my_secret"
        name: "my_user"
        state: absent
```

# Checkmk collection Plugins

# Checkmk Collection

- Lookup plugins: bakery

```
---
- hosts: all
  tasks:
    - name: Show bakery status
      ansible.builtin.debug:
        msg: "Bakery status is {{ bakery }}"
      vars:
        bakery: "{{ lookup('checkmk.general.bakery',
                           server_url=https://my_server,
                           site=my_site,
                           automation_user=my_user,
                           automation_secret=my_secret
                         ) }}"
```

# Checkmk Collection

- Lookup plugins: folder

```
---
- hosts: all
  tasks:
    - name: Get attributes of folder
      ansible.builtin.debug:
        msg: "Attributes of folder: {{ attributes }}"
      vars:
        attributes: "{{ lookup('checkmk.general.folder',
                        'my_folder',
                        server_url=https://my_server,
                        site=my_site,
                        automation_user=my_user,
                        automation_secret=my_secret
                      ) }}"
```

# Checkmk Collection

- Lookup plugins: folders

```
---
- hosts: all
  tasks:
    - name: Get all subfolders of the main folder
      ansible.builtin.debug:
        msg: "Folder tree: {{ item.id }}"
      loop: "{{ lookup('checkmk.general.folders',
                       '~',
                       show_hosts=false,
                       recursive=true,
                       server_url=https://my_server,
                       site=my_site,
                       automation_user=my_user,
                       automation_secret=my_secret
                      ) }}"
```

# Checkmk Collection

- Lookup plugins: host

```
---
- hosts: all
  tasks:
    - name: Get attributes of host
      ansible.builtin.debug:
        msg: "Attributes of host: {{ attributes }}"
      vars:
        attributes: "{{ lookup('checkmk.general.host',
                        'my_host',
                        effective_attributes=true,
                        server_url=https://my_server,
                        site=my_site,
                        automation_user=my_user,
                        automation_secret=my_secret
                      ) }}"
```

# Checkmk Collection

- Lookup plugins: hosts

```
---
- hosts: all
  tasks:
    - name: Get all hosts
      ansible.builtin.debug:
        msg: "Host: {{ item.id }}, IP:
{{ item.extensions.effective_attributes.ipaddress }}"
      loop: "{{ lookup('checkmk.general.hosts',
                       effective_attributes=true,
                       server_url=https://my_server,
                       site=my_site,
                       automation_user=my_user,
                       automation_secret=my_secret
                    ) }}"
```

# Checkmk Collection

- Lookup plugins: rule

```
---
- hosts: all
  tasks:
    - name: Get a rule with a particular rule id
      ansible.builtin.debug:
        msg: "Rule: {{ attributes }}"
      vars:
        attributes: "{{ lookup('checkmk.general.rule',
                        rule_id='a9285bc1-dcaf-45e0-a3ba-
ad398ef06a49',
                        server_url=https://my_server,
                        site=my_site,
                        automation_user=my_user,
                        automation_secret=my_secret
                      ) }}"
```

# Checkmk Collection

- Lookup plugins: rules

```
---
- hosts: all
  tasks:
    - name: Get a list of rules of ruleset host_groups
      ansible.builtin.debug:
        msg: "Rule: {{ item.extensions }}"
      loop: "{{ lookup('checkmk.general.rules',
                       ruleset='host_groups',
                       server_url=https://my_server,
                       site=my_site,
                       automation_user=my_user,
                       automation_secret=my_secret
                     ) }}"
```

# Checkmk Collection

- Lookup plugins: ruleset

```
---
- hosts: all
  tasks:
    - name: Get details about a particular ruleset
      ansible.builtin.debug:
        msg: "Ruleset: {{ item.extensions }}"
      loop: "{{ lookup('checkmk.general.ruleset',
                       ruleset='host_groups',
                       server_url=https://my_server,
                       site=my_site,
                       automation_user=my_user,
                       automation_secret=my_secret
                     ) }}"
```

# Checkmk Collection

- Lookup plugins: rulesets

```
---
- hosts: all
  tasks:
    - name: Get all used rulesets
      ansible.builtin.debug:
        msg: "Ruleset: {{ item.extensions.name }} has
{{ item.extensions.number_of_rules }} rules"
      loop: "{{ lookup('checkmk.general.rulesets',
                       regex='',
                       rulesets_used=true,
                       server_url=https://my_server,
                       site=my_site,
                       automation_user=my_user,
                       automation_secret=my_secret
                      ) }}"
```

# Checkmk Collection

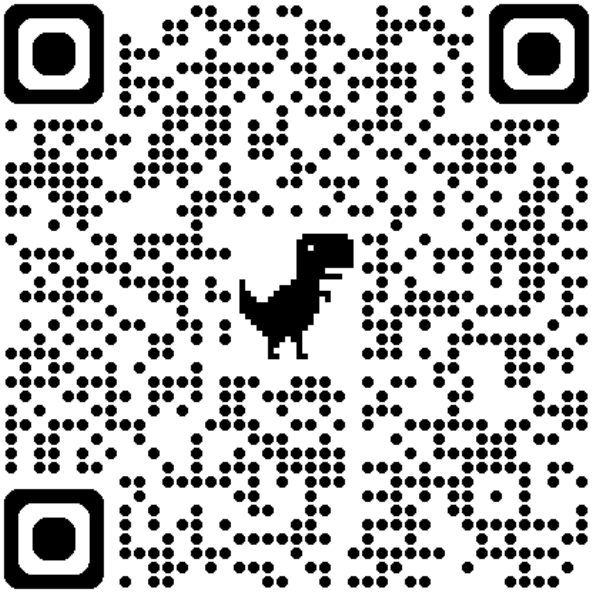
- Lookup plugins: version

```
---
- hosts: all
  tasks:
    - name: Show Checkmk version
      ansible.builtin.debug:
        msg: "Server version is {{ version }}"
      vars:
        version: "{{ lookup('checkmk.general.version',
                            server_url=https://my_server,
                            site=my_site,
                            automation_user=my_user,
                            automation_secret=my_secret
                           ) }}"
```

# Feedback

# Feedback

- https://forms.gle/r9CmPfSx46GKZmNZ7



# Thanks a lot for your participation

DI (FH) René Koch
Freelancer
The Checkmk Conference #10, 13.06.2024