AUTOMATE THE EDGE

Using Ansible to Automate Edge Computing

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Edge is focused on where the workload is located

Pivot from network centric services to workload centric services
HOW EDGE COMPUTING WORKS

Edge computing allows data from internet of things devices to be **analyzed at the edge of the network** before being sent to a data center or cloud.
YOU ARE ON EDGE!
Reduce Latency
Place processing power closer to the data source

Save Bandwidth
Reduce the amount of traffic that needs to travel back to the data center core

Increased Resilience
Continuous business operations in the event of unexpected site blackout

Data Sovereignty
Meet standards and compliance requirements
EDGE IS **NOT** SPECIFIC TO ANY INDUSTRY

- Telecommunications
- Health–life science
- Manufacturing
- Transportation
- Retail
- Public sector
- Many others
USE CASES
NETWORK FUNCTION VIRTUALIZATION
Next Generation Mobile Networks

Responsible for:
- Global Infrastructure
- Mobile connectivity
- Addiction to Facebook

Limiting Factors:
- Bandwidth
- Rural locations
- VNF Vendors

Requirements:
- Increase to 1Gbps speeds
- Minimize truck roll
- Everything software defined
MILITARY OPERATIONS
Data Centers In Vehicles And Remote Stations

Responsible for:
- Human lives

Limiting Factors:
- Hostile environments
- Limited connectivity
- Small, harsh spaces - Sand

Requirements:
- Ruggedized infrastructure
- Application availability for logistics, comms, etc.
ON LOCATION TRAINING
Bring The Classroom Infrastructure On The Plane

Responsible for:
● Student experience
● Sufficient lab resources

Limiting Factors:
● Limited connectivity
● Availability of materials
● Instructor transport

Requirements:
● Low power
● Portable infrastructure
● Multi-tenancy
CYBER SECURITY

The Best Defense Is A Great Offense

Responsible for:
- Network integrity
- Detection and defense
- Data security

Limiting Factors:
- Compromised situation
- Unknown enemy
- External connectivity

Requirements:
- Portable infrastructure
- Run tested tools
DISASTER RESPONSE AND RECOVERY

We Think Of DR In The Data Center. Imagine Responding In Real Life

Responsible for:
- Response during
- Recovery after

Limiting Factors:
- Cell towers damaged
- Power out or unstable
- Multiple organizations

Requirements:
- Portable infrastructure
- Application availability for logistics, comms, etc.
AUTOMATION
CONSIDERATIONS
LOCAL OR CENTRALIZED ANALYTICS
Considerations For Edge Computing

Depends on Use Case and Workload

Local
● Source data is larger
● Decision localized
● Time to decision critical

Centralized
● Derived data is larger
● Aggregated decisions
DEVICE AND NETWORK SECURITY
Considerations For Edge Computing

Physical
- Immutable device provisioning
- TPM enabled
- Encrypt local storage

Logical
- Encrypt all network traffic
- Service account access only
- Automatic key rotation
EXAMPLE: CERTIFICATE CREATION AND VALIDATION

- name: Create a challenge for sample.com using a account key from a variable.
  acme_certificate:
    account_key_content: "{{ account_private_key }}"
    csr: /etc/pki/cert/csr/sample.com.csr
    dest: /etc/httpd/ssl/sample.com.crt
    register: sample_com_challenge

- copy:
  dest: /var/www/html/{{ sample_com_challenge['challenge_data']['sample.com']['http-01']['resource'] }}
  content: "{{ sample_com_challenge['challenge_data']['sample.com']['http-01']['resource_value'] }}"
  when: sample_com_challenge is changed

- name: Let the challenge be validated and retrieve the cert and intermediate certificate
  acme_certificate:
    account_key_src: /etc/pki/cert/private/account.key
    csr: /etc/pki/cert/csr/sample.com.csr
    dest: /etc/httpd/ssl/sample.com.crt
    fullchain_dest: /etc/httpd/ssl/sample.com-fullchain.crt
    chain_dest: /etc/httpd/ssl/sample.com-intermediate.crt
    data: "{{ sample_com_challenge }}"

Source: [https://docs.ansible.com/ansible/latest/modules/acme_certificate_module.html#acme-certificate-module](https://docs.ansible.com/ansible/latest/modules/acme_certificate_module.html#acme-certificate-module)
EXAMPLE: ENABLE TPM2 RESOURCE MANAGER

- name: Install necessary TPM packages
  become: yes
  yum:
    name: "tpm2-tools,tpm2-abrmd,tpm2-tss"
    state: present

- name: Enabled resource manager service and start now
  become: yes
  service:
    name: tpm2-abrmd
    state: started
    enabled: true

- name: Take ownership of the TPM
  become: yes
  shell: "tpm2_takeownership -o {{ tpm_owner_pwd }} -e {{ tpm_endorse_pwd }} -l {{ tpm_lockout_pwd }}"

#NOTE: Luke Hinds has an ansible role which creates a TPM2 simulator [https://github.com/lukehinds/ansible-tpm-simulator](https://github.com/lukehinds/ansible-tpm-simulator)

CONNECTIVITY
Considerations For Edge Computing
ANSIBLE RESOURCES FOR NETWORK AUTOMATION

Network Automation with Ansible
https://www.ansible.com/integrations/networks

Modules Maintained by the Ansible Network Team
https://docs.ansible.com/ansible/latest/modules/network_maintained.html
COMPONENTS AND SERVICES
Considerations For Edge Computing

Cloud Providers
- Ansible Cloud Modules
- Amazon Web Services
- Google Cloud Platform
- Microsoft Azure

Private Infrastructure
- Containerization
- OpenStack
- Traditional Virt
EXAMPLE: UTILIZING IAM IN AWS

tasks:
- name: Create a new IAM user with API keys
  iam:
    iam_type: user
    name: kevinjones
    state: present
    password: "{{ temp_pass }}"
    access_key_state: create

- name: Create IAM role with custom trust relationship
  iam:
    iam_type: role
    name: AAALambdaTestRole
    state: present
    trust_policy:
      Version: '2012-10-17'
      Statement:
      - Action: sts:AssumeRole
        Effect: Allow
        Principal:
          Service: lambda.amazonaws.com

Source: https://docs.ansible.com/ansible/latest/modules/iam_module.html
EXAMPLE: MANAGE USER ROLES IN OPENSTACK

# Grant an admin role on the user admin in the project project1
- os_user_role:
  cloud: hattrick
  user: kevinjones
  role: admin
  project: project1

# Revoke the admin role from the Chris Reynolds in the raleigh domain
- os_user_role:
  cloud: hattrick
  state: absent
  user: creynolds
  role: admin
  domain: raleigh

Source: https://docs.ansible.com/ansible/latest/modules/os_user_role_module.html#os-user-role-module
MINIMIZE MAINTENANCE
Considerations For Edge Computing

Operators
- People are expensive
- Not repeatable
- They also die

Hardware
- Compact spaces
- Rugged
- Reduce need to visit
EDGE AT RED HAT
MOBILE PORTFOLIO CENTER
A Truck That Brings Red Hat Summit To You

Red Hat’s edge weighs 85,000 pounds :)
MOBILE PORTFOLIO CENTER
A Truck That Brings Red Hat Summit To You
PROJECT HAT TRICK
Development Platform

ADMIN Node: 1
- RAM: 2 x 16GB
- M.2 SATA: Intel 540S 1TB
- 2.5" SSD 1: Intel S3520 960GB

COMPUTE Nodes: 4
- Motherboard / CPU: Xeon D1541 - (10GbE)
- RAM: 128GB (4x 32GB)
- M.2 NVMe SSD: Intel P600 480GB
- 4 x 2.5" SSD 1: Intel S3520 480GB
- TPM Module: Yes

NETWORK
- Netgear XS716T: 16 x 10GBaseT
DEMO: PIMP WORK.
RUN COMMAND.
BE A ROCKSTAR!
HAT TRICK DEPLOY PLAYBOOK

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- name: Configure KVM host
  import_playbook: kvm.yml

- name: Provision, install and configure IDM
  import_playbook: idm.yml

- name: Provision, install and configure Director
  import_playbook: director.yml

- name: Configure and deploy OpenStack overcloud
  import_playbook: overcloud.yml

- name: Provision, install and configure Tower
  import_playbook: tower.yml

- name: Provision, install and configure CloudForms
  import_playbook: cloudforms.yml

Source: https://github.com/RedHatGov/hattrick/blob/master/playbooks/hattrick/deploy-full.yml
RESOURCES

Roles - https://galaxy.ansible.com/RedHatGov

Repo - https://github.com/RedHatGov/hattrick

Other

https://www.redhat.com/en/blog/channel/vertical-industries-blog
https://www.openstack.org/edge-computing/
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