



# A step closer to realizing the true vision of Storage Infrastructure as Code

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# What to expect

- 1) Brief Introduction to Infrastructure as Code
- 2) Enablers for Storage Infrastructure as Code
- 3) Infrastructure as Code in Action
- 4) Challenges and possible solutions for IAC





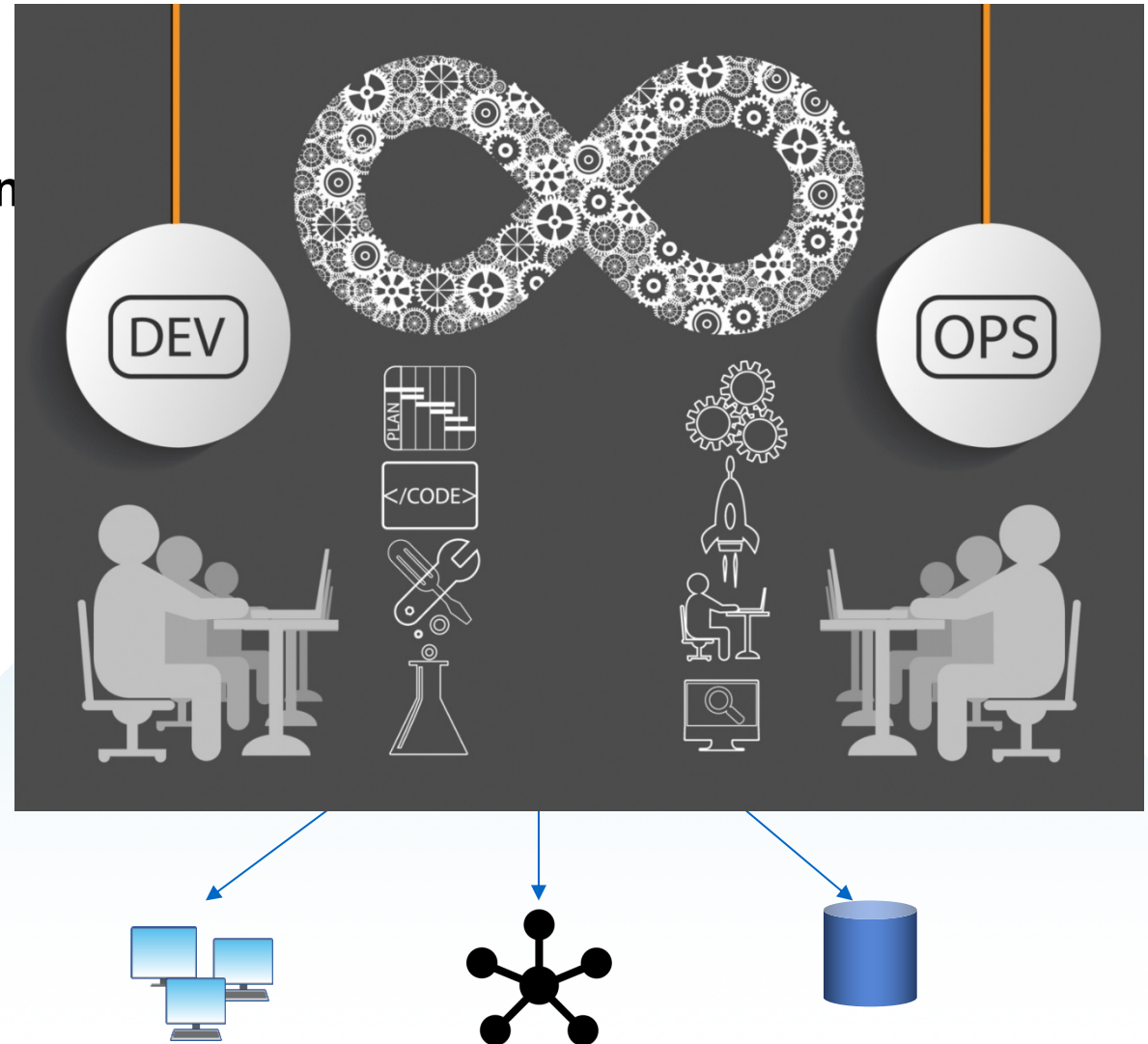
# Infrastructure as Code

What and why

# Infrastructure as Code (IaC)

## What, why?

- **Infrastructure management using code and software development techniques**
  - Manage infrastructure via source control
  - Apply testing to infrastructure
  - Avoid written documentation of infrastructure
  - Enable collaboration
- **Demand for dynamic infrastructure**
  - quickly build, update and destroy
- **Accelerate DevOps**
  - The new Buyer
  - App specific request





# Storage Infrastructure as Code

- Storage : D last piece in stack to be software defined
- Storage integration complex-Admin control
- Storage platforms sophisticated





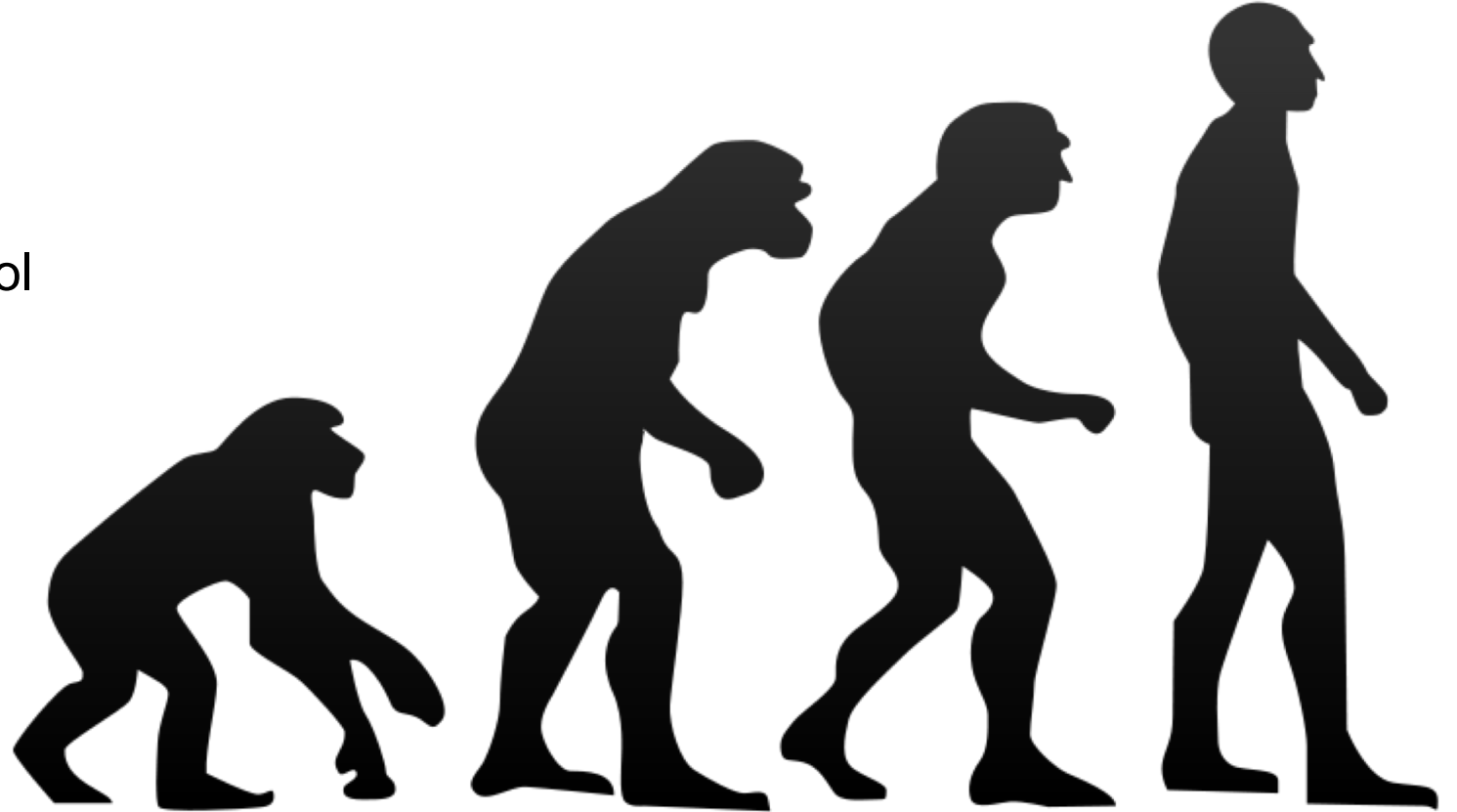
# Realize Storage Infrastructure With APIs

How and why

# Evolution

Automation has evolved from shell and bash scripts, to infrastructure definitions

- Need for modern interface to  
Integrate with any:
  - Orchestration tool
  - Configuration management tool
  - North bound tool
- Need for interface:
  - Easy to integrate
  - Standardization



# RESTful APIs

## why

- Open API specification: Industry standard rest APIs
- Aligns well with modern Devops practices : security, dev, minimal learning curve.
- Benefits:
  - Formal definition of data models and consumption of storage objects remains standard across platforms
  - Consumption simplicity



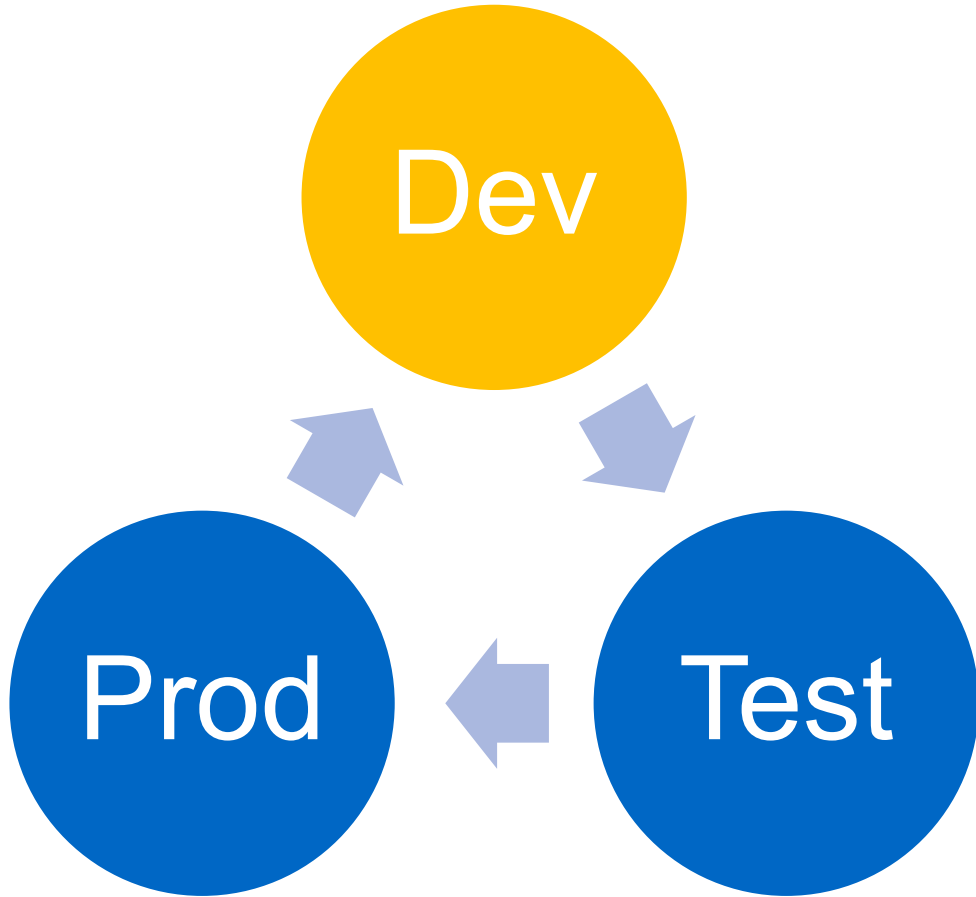
# Infrastructure as code in action

How



# LAMP stack

Spin up Compute, Network and Storage



- Development use case: Setup LAMP stack for web development

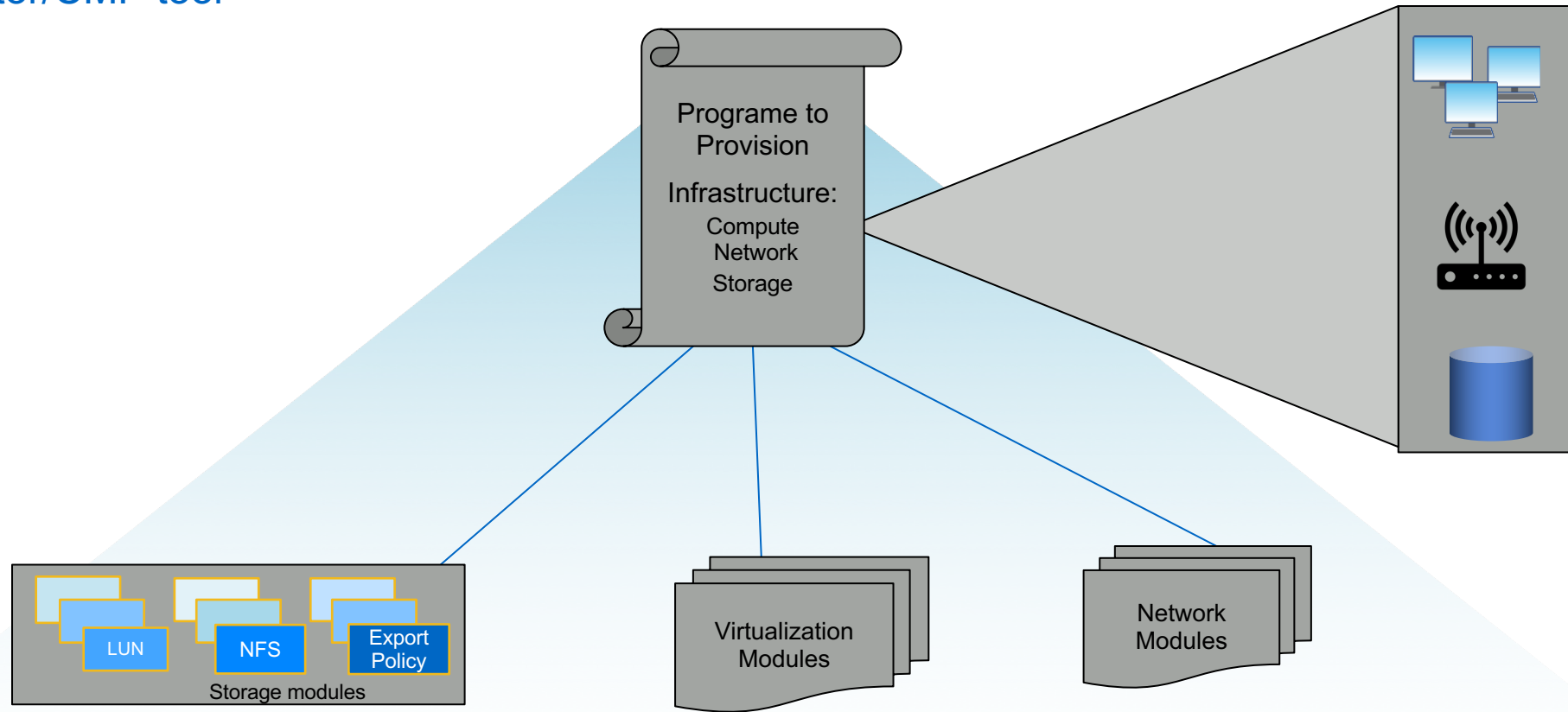
- Linux
- Apache
- MySQL
- Python/Perl





# Provision Infrastructure as Code

Ex Orchestrator/CMP tool



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# Playbook

## Playbook: Provision LAMP Stack

- 1.Task : Create Vm -> Virtulation Module
- 2. Task : Up Network -> Netwrok module
- 3. Task : Provision Storage -> Storage module
  - 4. Bring up applications

# Playbook to Provision NFS Share

Provision  
File share

Export Policy  
detail

NFS  
Share

Mount  
&Start NFS

```
1 - name: Provision File Share
  FileShareModule:
    host=10.195.50.132
    port=8443
    user=admin
    password=Netapp1!
    action=post
    name=ansibleFileShare4
    size=204803008
    storage_vm_key="{{ jsonResultforSV
    storage_service_level_key="{{ json
  register : jsonResult

- name: print the job key
  debug : msg="{{ jsonResult.meta.result.records[0].key}}"
```

```
2 - name: Find Provisioned File Share Key
  FileShareModule:
    host=10.195.50.132
    port=8443
    user=admin
    password=Netapp1!
    action=get
    name=ansibleFileShare
  register : jsonResultforFileShare

- name: print the file share key
  debug: msg="{{ jsonResultforFileShare.meta.result.records[0].key}}"
```

```
3 - name: Provision NFS Share
  NFSShareModule:
    host=10.195.50.132
    port=8443
    user=admin
    password=Netapp1!
    action=post
    export_policy_key="{{ jsonResultforExportPolicy.meta.result.records[0].key }}"
    file_share_key="{{ jsonResultforFileShare.meta.result.records[0].key }}"
  register : jsonResult

- name: print the job key
  debug : msg="{{ jsonResult.meta.result.records[0].key}}"
```

## Playbook: Provision NFS Share

- 1 Task :Provision File share  
FileShareModule
- 2 Task: Find Export Policy  
Export Policy Module
- 3 Task: Provision NFS share  
NFS share Module

# Playbook to Provision Stoarge and Mount Same @host

Provision  
NFS share

Mount  
&Start NFS

4

```
name: shell execution
local_action:
  module: vmware_vm_shell
  hostname: 10.195.51.15
  username: "administrator@vsphere.local"
  password: "netapp1!"
  datacenter: VC-openlab
  validate_certs: no
  vm_id: "{{ inventory_hostname }}"
  vm_username: root
  vm_password: "netapp1!"
  vm_shell: /usr/sbin/service
  vm_shell_args: " nfs start "
  vm_shell_env:
    - "PATH=/usr/sbin"
    - "VAR=test"
  vm_shell_cwd: "/tmp"

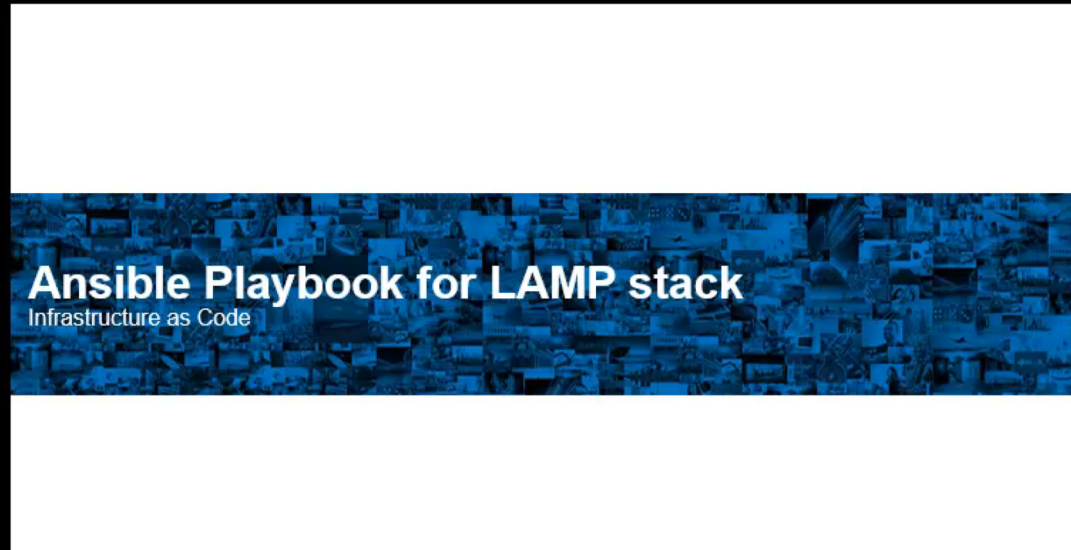
tasks:
  - name: shell execution
    local_action:
      module: vmware_vm_shell
      hostname: 10.195.51.15
      username: "administrator@vsphere.local"
      password: "netapp1!"
      datacenter: VC-openlab
      validate_certs: no
      vm_id: "{{ inventory_hostname }}"
      vm_username: root
      vm_password: "netapp1!"
      vm_shell: /usr/bin/mount
      vm_shell_args: " -t nfs 10.195.51.16:/ansibleFileShare4 /NFSmnt -o nfsvers=3 > /tmp/mounted"
      vm_shell_env:
        - "PATH=/usr/sbin"
        - "VAR=test"
      vm_shell_cwd: "/tmp"
```

## Playbook: Provision NFS Share

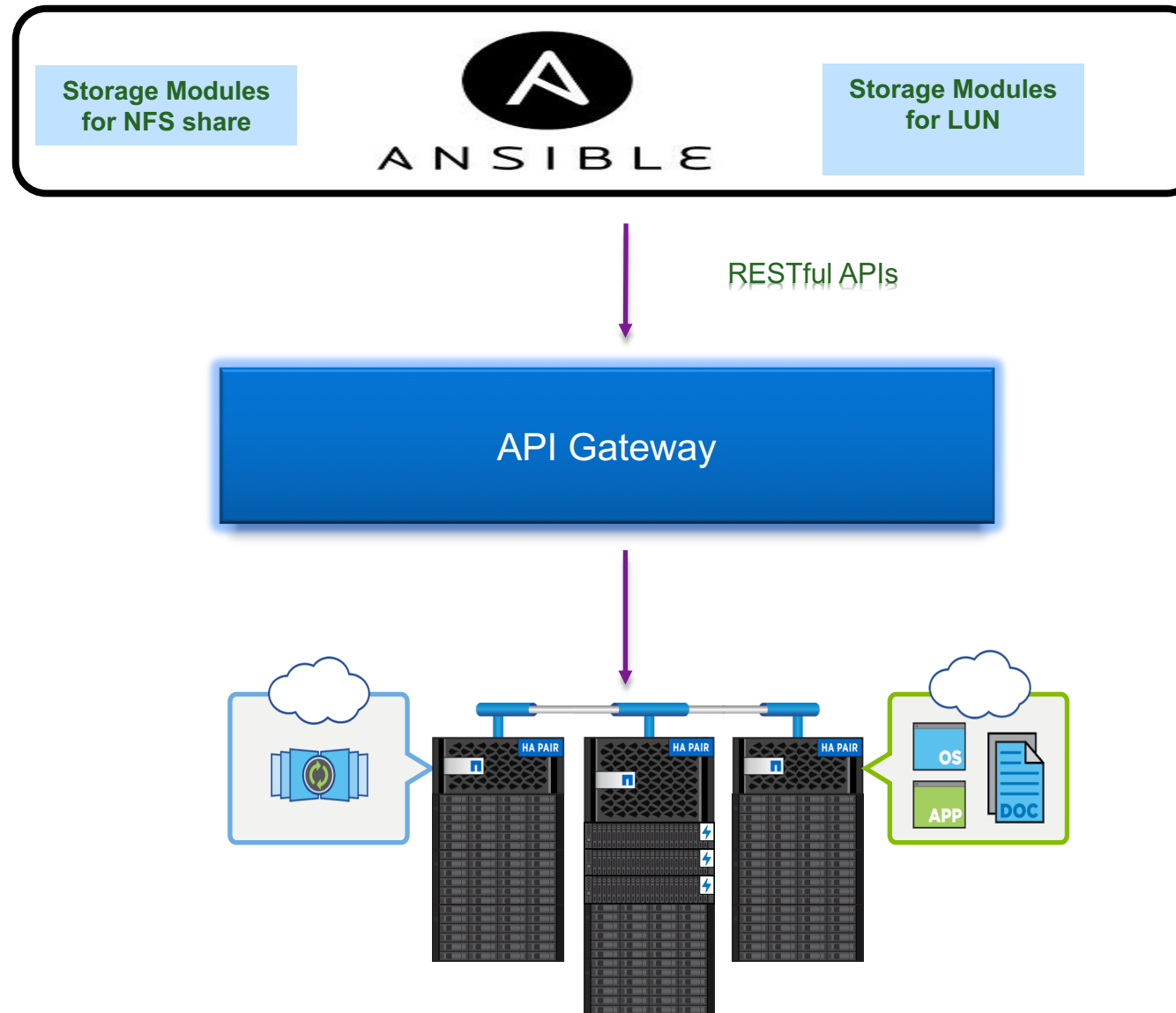
- 1.Task :Provision 2 NFS share
2. Task : Start NFS service
3. Task : Mount NFS Share @host

# Quickly provision LAMP Stack: Demo

Provision storage for application with APIs

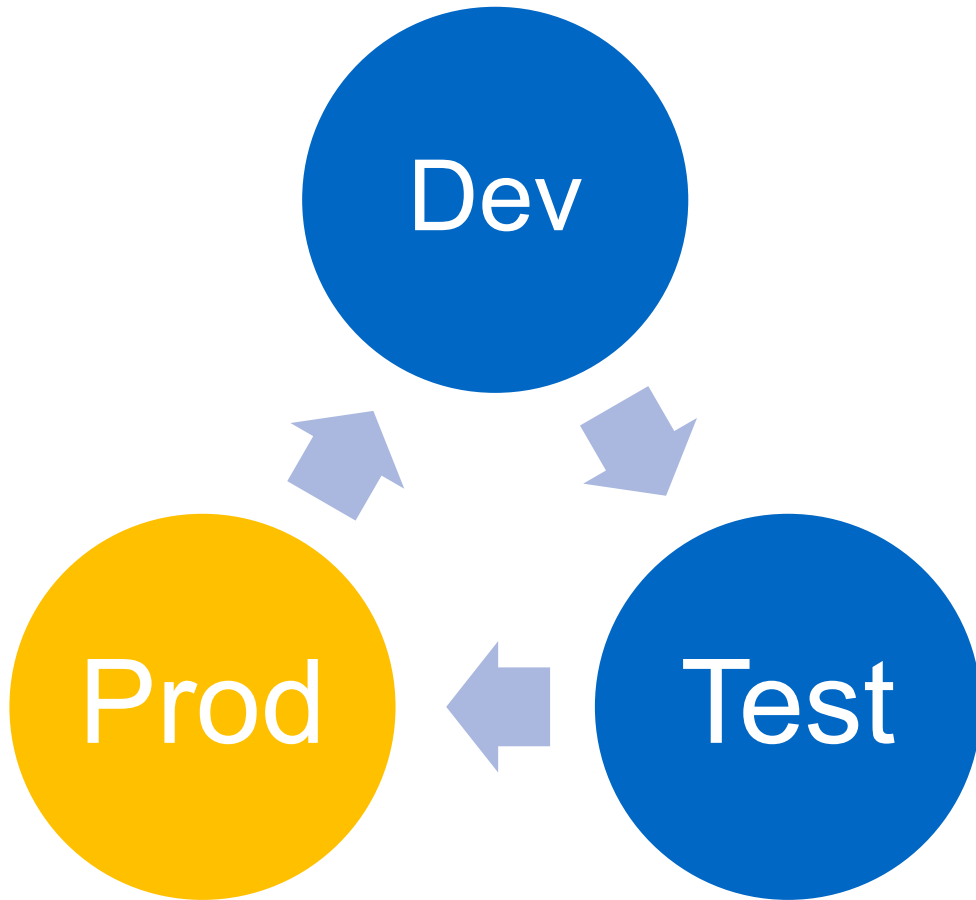


# Ansible with APIs Integration

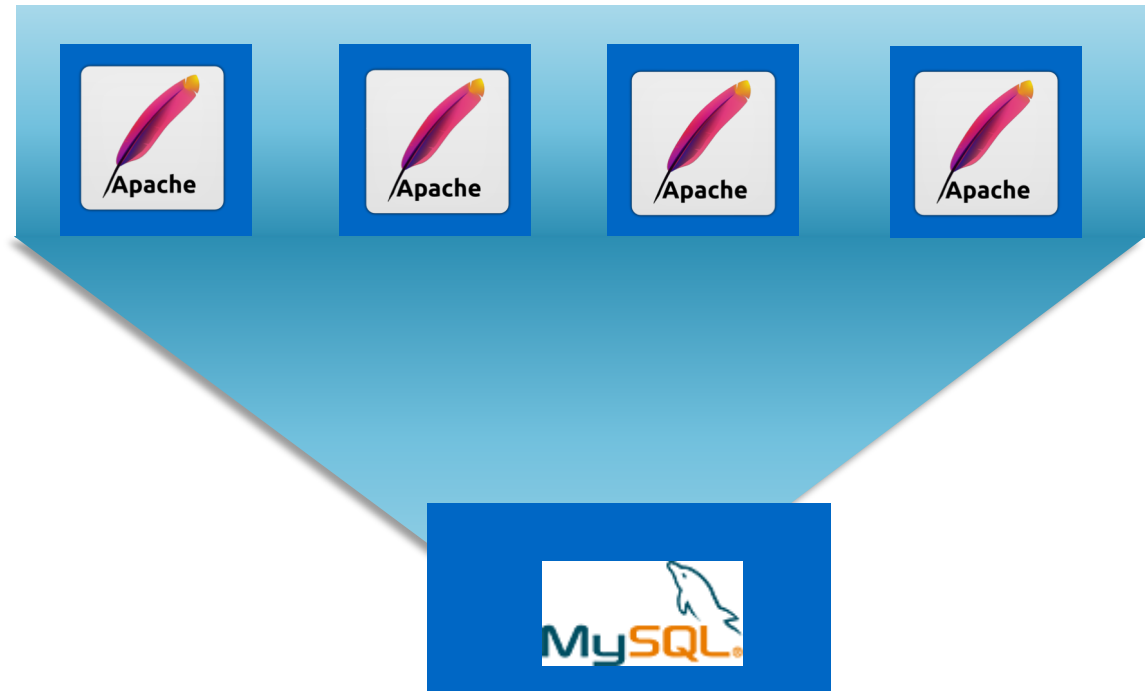




# Infrastructure as Code: Production Use case



## ■ Scaled Setup





# Challenges and Solutions

# What's required

Challenges	Possible solution
Less control to Storage Admin	Policies based APIs
Securing the production environment	Multitenancy
Poor resource Utilization	Define resource consumption Limits(QoS)
Need to meet SLA	Service catalogue and



Find out how to offer Storage as a Service !

<https://devnet.netapp.com/nslm>

U can also write to me @ [pmunshi@netapp.com](mailto:pmunshi@netapp.com)