



Welcome to the Melbourne OpenShift Online Meetup



OPENSIFT



ANSIBLE

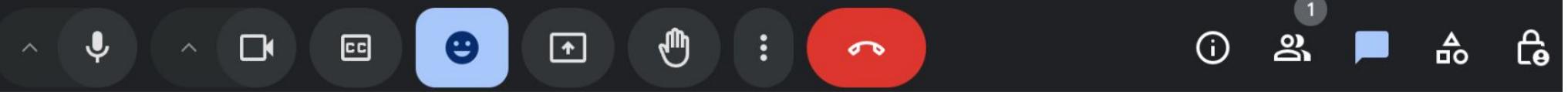


Red Hat
Enterprise Linux AI



Red Hat
OpenShift AI

Send a message to everyone



What you asked for ?

- Openshift cluster commands
- Advanced concepts
- AI
- Openshift new features
- Use and configuration
- Virtualization in Openshift



Agenda:

- ▶ What's New in OpenShift, AI, and Virtualization? (?? /Chris Butler)
 - A deep dive into the latest trends and updates.
- ▶ OpenShift Automation (Stu Bernstein / Chris Butler)
 - Explore how automation is transforming the way we use OpenShift.
- ▶ General Discussion
- ▶ Building an Operator: How Challenging is it? (Ben/Simon)
 - We'll take a closer look at the process and complexity of creating an Operator.



What's New?

Kubernetes 1.31

“Elli”

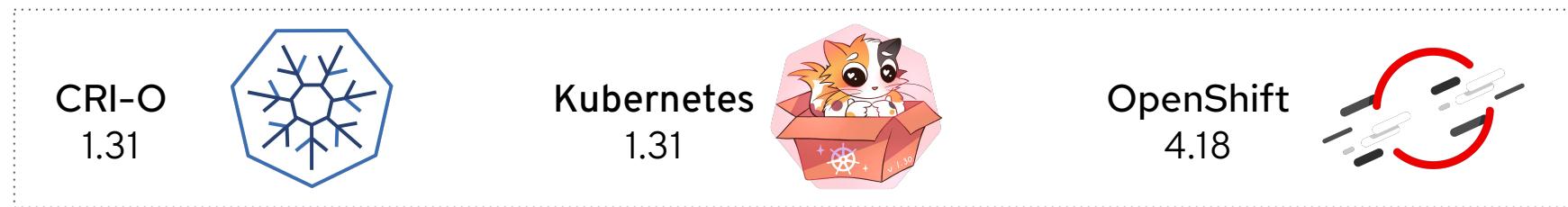


Notable Stable Features

- ▶ Improved Ingress Connectivity Reliability for kube-proxy
- ▶ Unhealthy Pod eviction policy for PodDisruptionBudget
- ▶ Random Pod selection on ReplicaSet downscaling
- ▶ Persistent Volume last phase transition time
- ▶ Elastic Indexed Jobs

Notable Beta Features

- ▶ Always honor PersistentVolume Reclaim Policies
- ▶ nftables backend for kube-proxy
- ▶ Multiple Service CIDRs
- ▶ Traffic distribution for Services
- ▶ Kubernetes VolumeAttributesClass ModifyVolume



Notable Top RFEs and Components

Top Requests for Enhancement (RFEs)



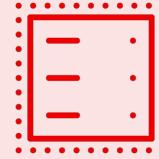
- ▶ Support for Server Message Block CSI driver via Operator - [RFE-512](#)
- ▶ User Defined Networks for OpenShift Virtualization - [RFE-6390](#)
- ▶ Support custom IPv4 subnets on OVN for BYO VPC deployments - [RFE-3981](#)
- ▶ OpenShift on Baremetal and OpenShift Virtualization on GCP - [RFE-5176](#)
- ▶ OpenShift on Baremetal and OpenShift Virtualization on Oracle Cloud - [RFE-3635](#)
- ▶ Allow disabling over-provisioning in LVMS as day 2 operation - [RFE-5490](#)

Red Hat OpenShift 4.18 Highlights



Core

- Enhanced User Defined Networks including BGP for UDN
- Operator Lifecycle Management v1
- oc-mirror v2 with Helm charts and proxy support
- OpenShift on bare metal in Google Cloud Platform (GA)
- OpenShift on Oracle Cloud: bare metal shapes on OCI (GA), Oracle Cloud@Customer and Oracle Private Cloud Appliance



Virtualization

- OpenShift Virtualization Engine
- VM friendly networking with User Defined Networks
- VM storage migration (GA)
- OpenShift Virtualization in Google Cloud Platform (TP)
- OpenShift Virtualization in Oracle Cloud Infrastructure (TP)



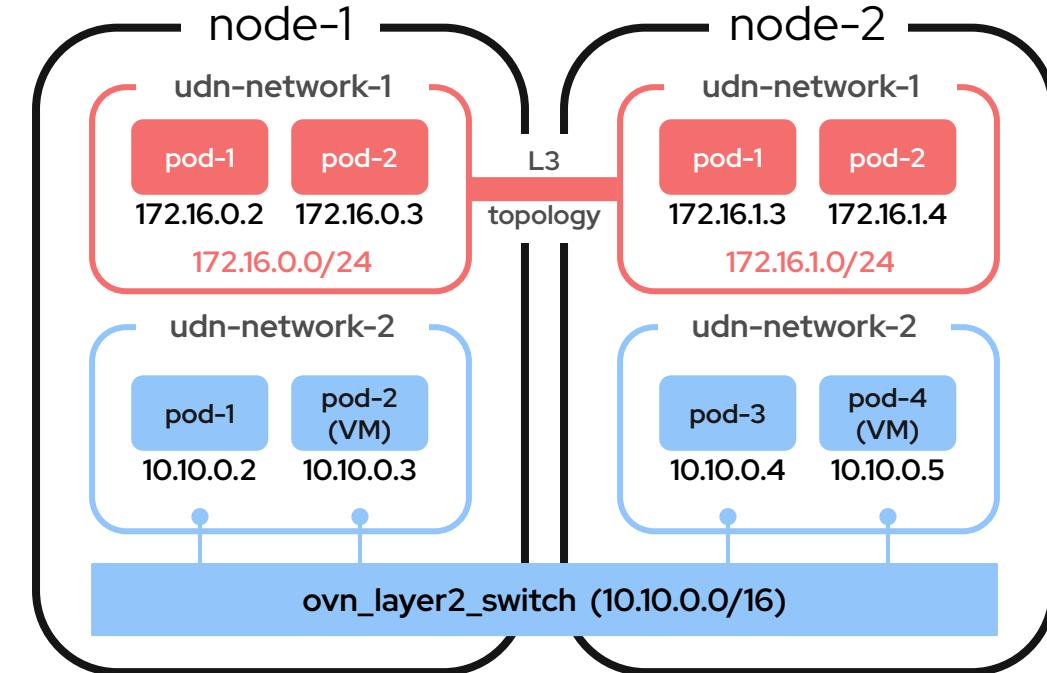
Security

- Secret Store CSI Driver (GA)
- Streamline secrets handling with Secret Store CSI Driver in OpenShift GitOps and OpenShift Pipelines workflows
- Secure OpenShift Service Mesh secrets with cert-manager (TP)
- Automated certificate recovery after cluster hibernation

Native Network Isolation for Namespaces

A better solution for the monolithic layer 3 Kubernetes pod network

- ▶ **User Defined Network (UDN)** support in OVN-Kubernetes
- ▶ A default network for OVN-Kubernetes components + VRF support for additional **isolated-by-default** UDNs
- ▶ One or more namespaces in each UDN (tenant)
- ▶ A namespace can be connected to different UDNs, each meant for a specific purpose
- ▶ Support for:
 - OpenShift Virtualization
 - static IP assignments for the life of VMs (for OCP Virt)
 - L2, L3 & localnet UDN topologies
 - overlapping pod IPs across UDNs
 - Kubernetes Network Policy
 - clusterIP services and external services
 - BGP (GAs in a 4.18.z, EVPN integration targeting 4.19)
- ▶ Extend UDN into provider networks, so a VM can be directly referenced by its (static) L2 network address, rather than requiring NAT translation at the cluster edge
- ▶ Existing secondary networks (Multus) are not impacted



Openshift Lightspeed v0.3

Technology Preview

- ::



Red Hat OpenShift Lightspeed

Explore deeper insights, engage in meaningful discussions, and unlock new possibilities with Red Hat OpenShift Lightspeed. Answers are provided by generative AI technology, please use appropriate caution when following recommendations.

Important

OpenShift Lightspeed can answer questions related to OpenShift. Do not include personal or business sensitive information in your input. Interactions with OpenShift Lightspeed may be reviewed and used to improve our products and services.



Send a message...



Always check AI/LLM generated responses for accuracy prior to use.



► **OpenShift 4.18 knowledge**

OpenShift Lightspeed 0.3 incorporates OpenShift 4.18 product knowledge

► **Arm support**

Deploy on Arm-based CPUs for greater flexibility

► **Faster responses**

Experience faster answers with line-by-line live streaming from the LLM provider

► **Designed for FIPS**

Meets FIPS security standards for secure deployments

► **OpenShift Virtualization Virtual Machine page aware**

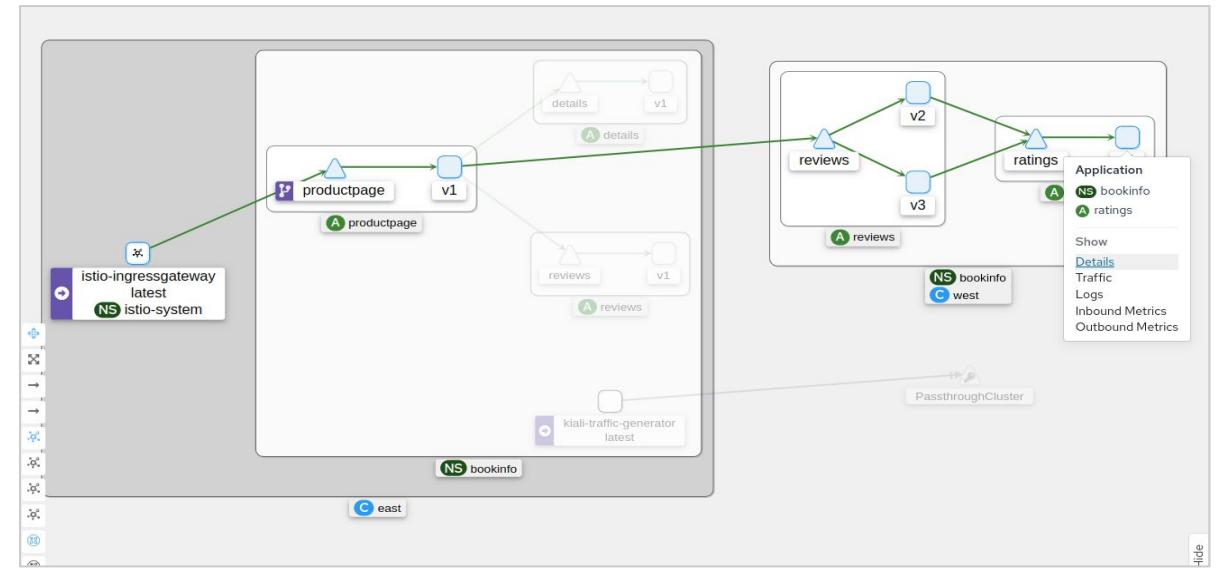
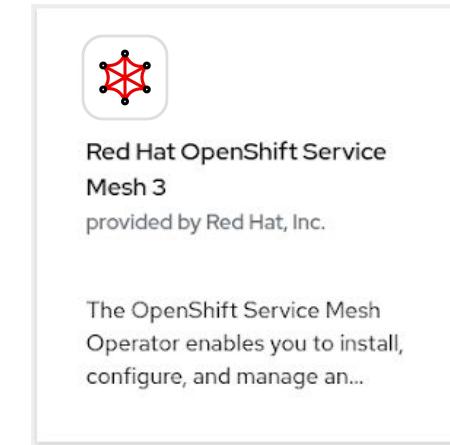
Imports YAML, logs, events, and alerts directly from VMs in OpenShift Virtualization

► **Import YAML from OLS into OpenShift UI YAML editor**

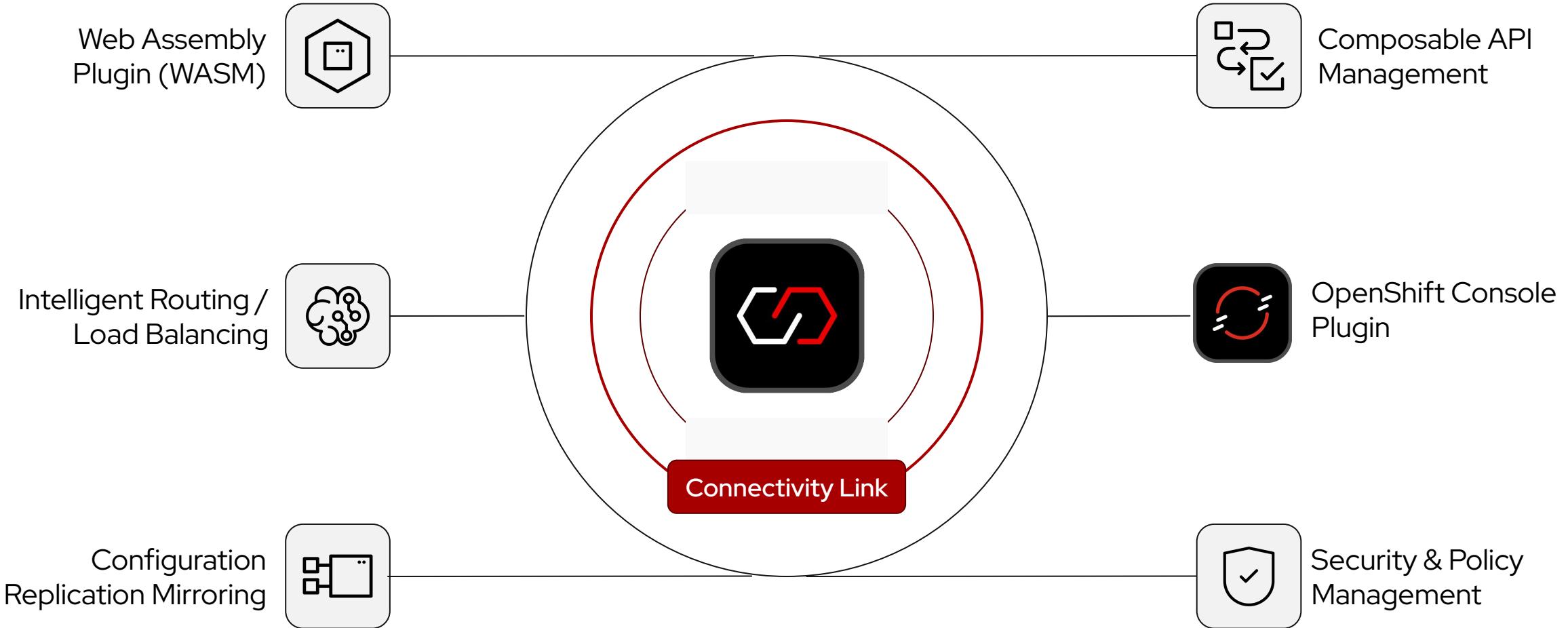
Imports OpenShift Lightspeed generated YAML into the OpenShift Console YAML editor with one click

OpenShift Service Mesh

- ▶ OpenShift **Service Mesh 3.0 General Availability:**
 - ▶ Based Istio 1.24 and Kiali 2.1
 - ▶ Managed by a **new Istio operator** based on community Istio - the "[Sail Operator](#)"
 - ▶ New [Service Mesh 3.0 documentation](#)
 - ▶ Supported migration paths from OpenShift Service Mesh 2.6
 - ▶ New included features:
 - **Istio's multi-cluster topologies**
 - Canary control plane upgrades
 - Istioctl command line utility
 - ▶ "sidecar-less" **ambient mode developer preview**
- ▶ OpenShift Service Mesh 3.0 will be supported on OCP 4.14+.



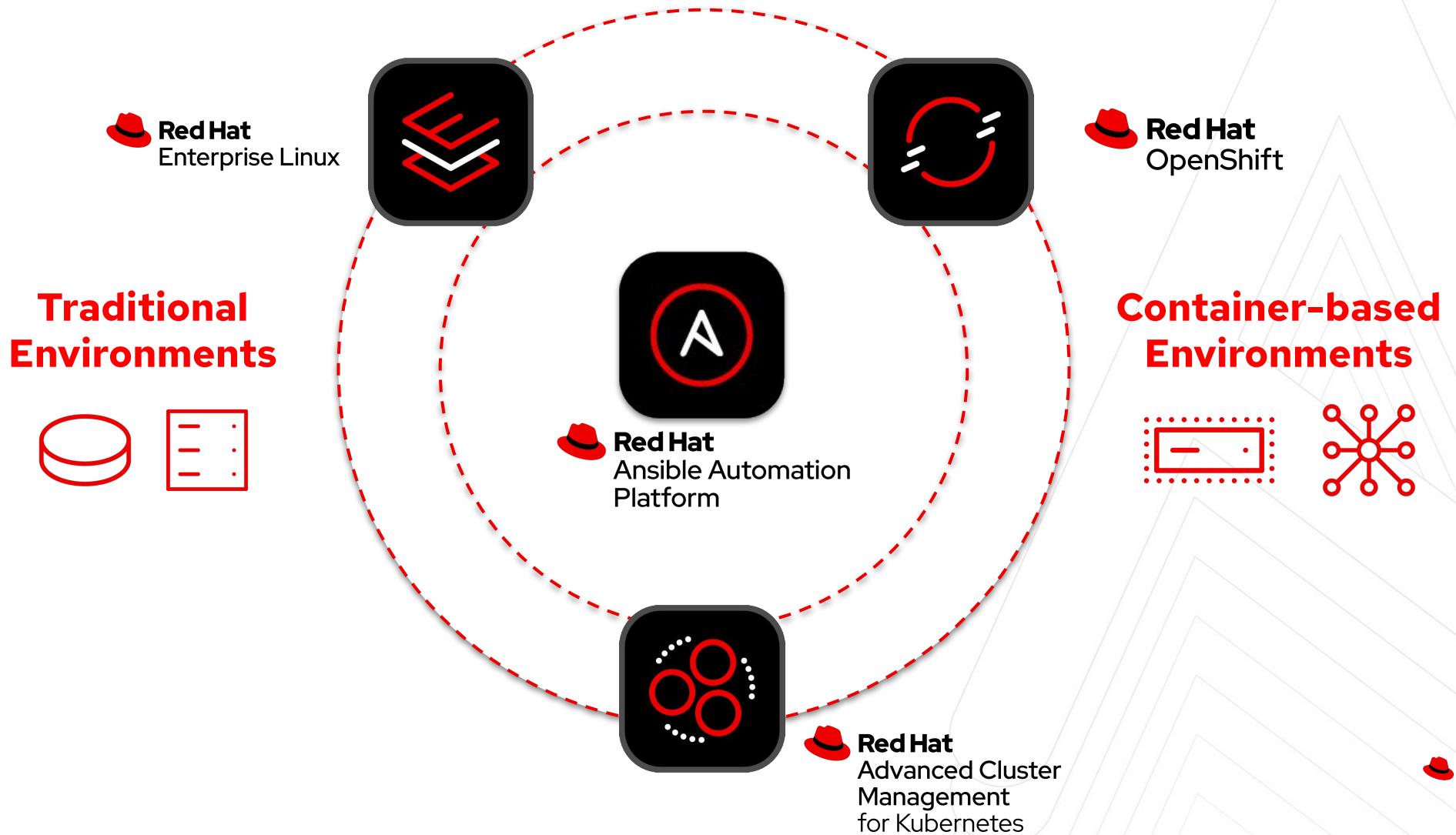
Introducing Red Hat Connectivity Link





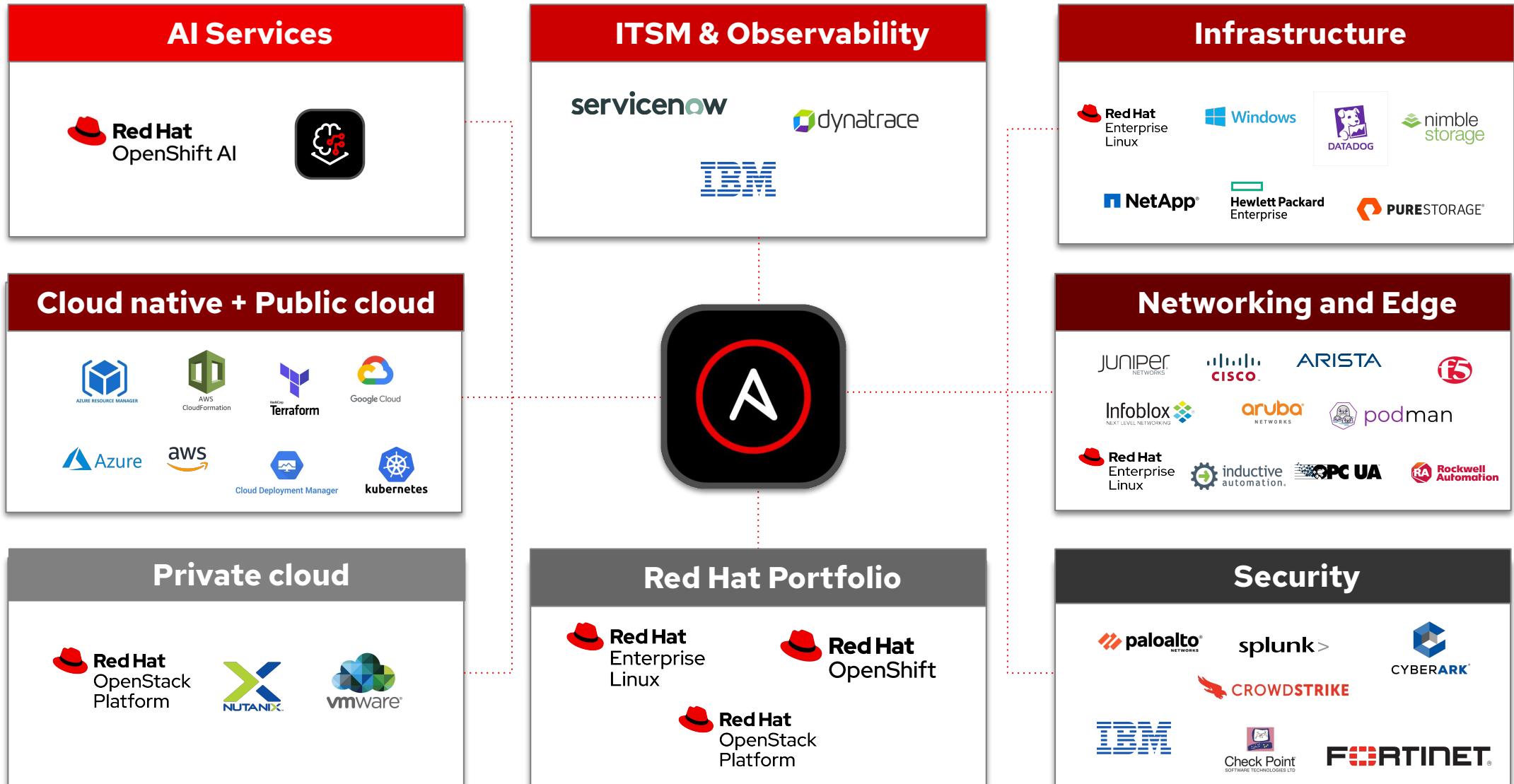
OpenShift Automation

Red Hat Ansible Automation Platform is the "glue" for hybrid IT automation



A platform at the center of a robust ecosystem

Orchestration, collaboration, and governance from a single solution



Ansible Automation Platform and OpenShift Virtualization



Better together

Ansible Automation Platform for OpenShift
Virtualization enables organizations to manage and
automate the lifecycle of virtual machines, orchestrating
them with the broader IT infrastructure and simplify the
migration process of legacy platforms.



What is Ansible Automation Platform for OpenShift Virtualization?

A unified platform for VM automation



Ansible Automation Platform for OpenShift Virtualization

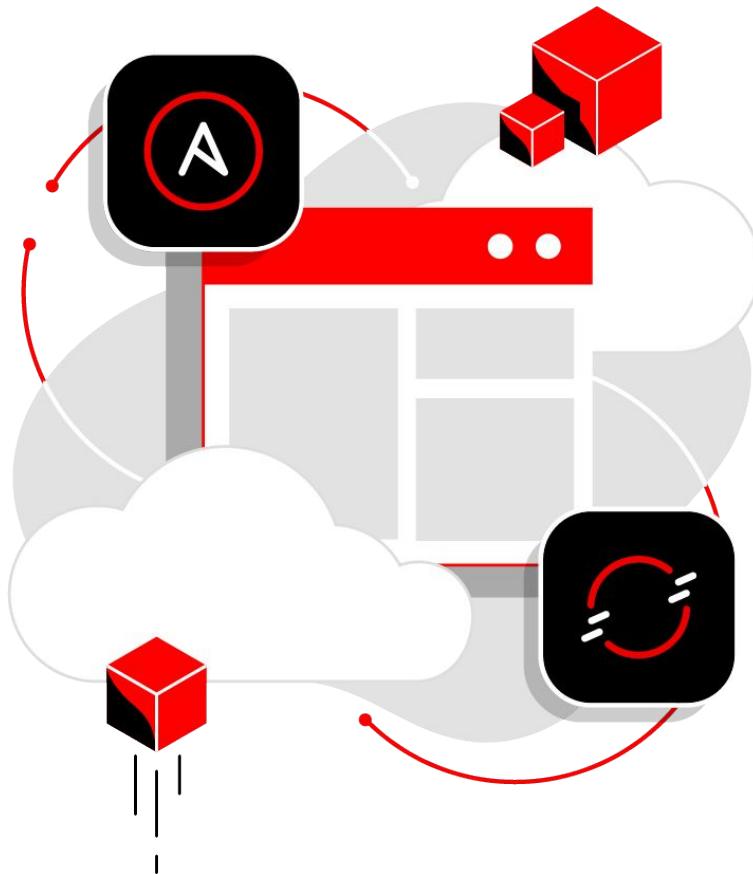


An integration with OpenShift features such as OpenShift Virtualization and Migration ToolKit for Virtualization



Set of Ansible® Automation Platform Validated Content designed to operationalize the VM lifecycle

Create and support Mission Critical Virtualization and LCM with AAP



Virtualization Operations

Automate daily activities (remediation)

- ▶ Application deployments and CI/CD pipelines
- ▶ Life cycle management and enforcement
- ▶ OS patching (Windows and Linux) and maintenance
- ▶ Event Driven Remediation



Deployment and retirement

Provision, configure and teardown virtual instances

- ▶ Create turn key deployments for infrastructure teams
- ▶ Govern instance creation and enforce retirements
- ▶ Create service catalog items for ordering environments



Virtual Machine migration

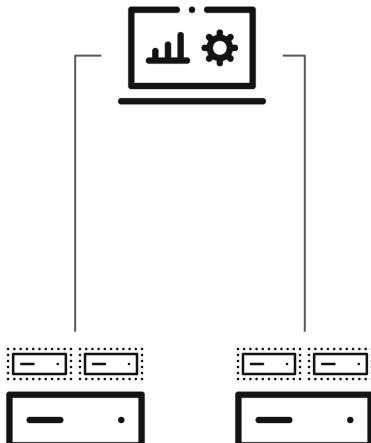
Move workloads to OpenShift safely

- ▶ Pre and Post processing for VM Migration from vSphere
- ▶ Last mile configuration checks

redhat.openshift_virtualization modules

Two major categories for automating VMs with OpenShift Virtualization

Red Hat OpenShift Virtualization



Virtual machines



Modules

Create, delete, and describe KubeVirt VirtualMachine resources

`kubevirt_vm`

Create or delete KubeVirt
VirtualMachines

`kubevirt_vm_info`

Describe KubeVirt VirtualMachines

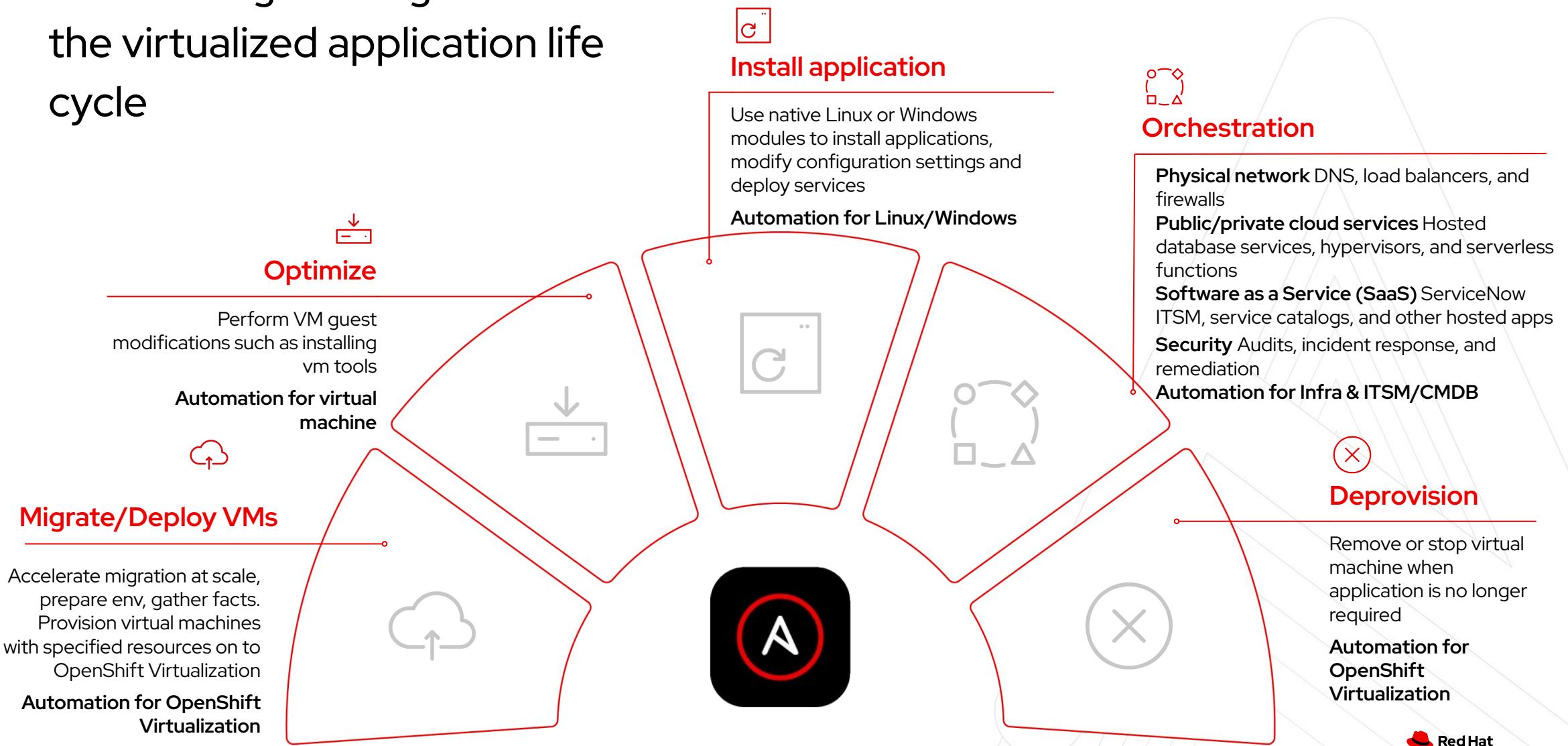
Plugins

Fetch running VirtualMachineInstances for one or more namespaces

`kubevirt`

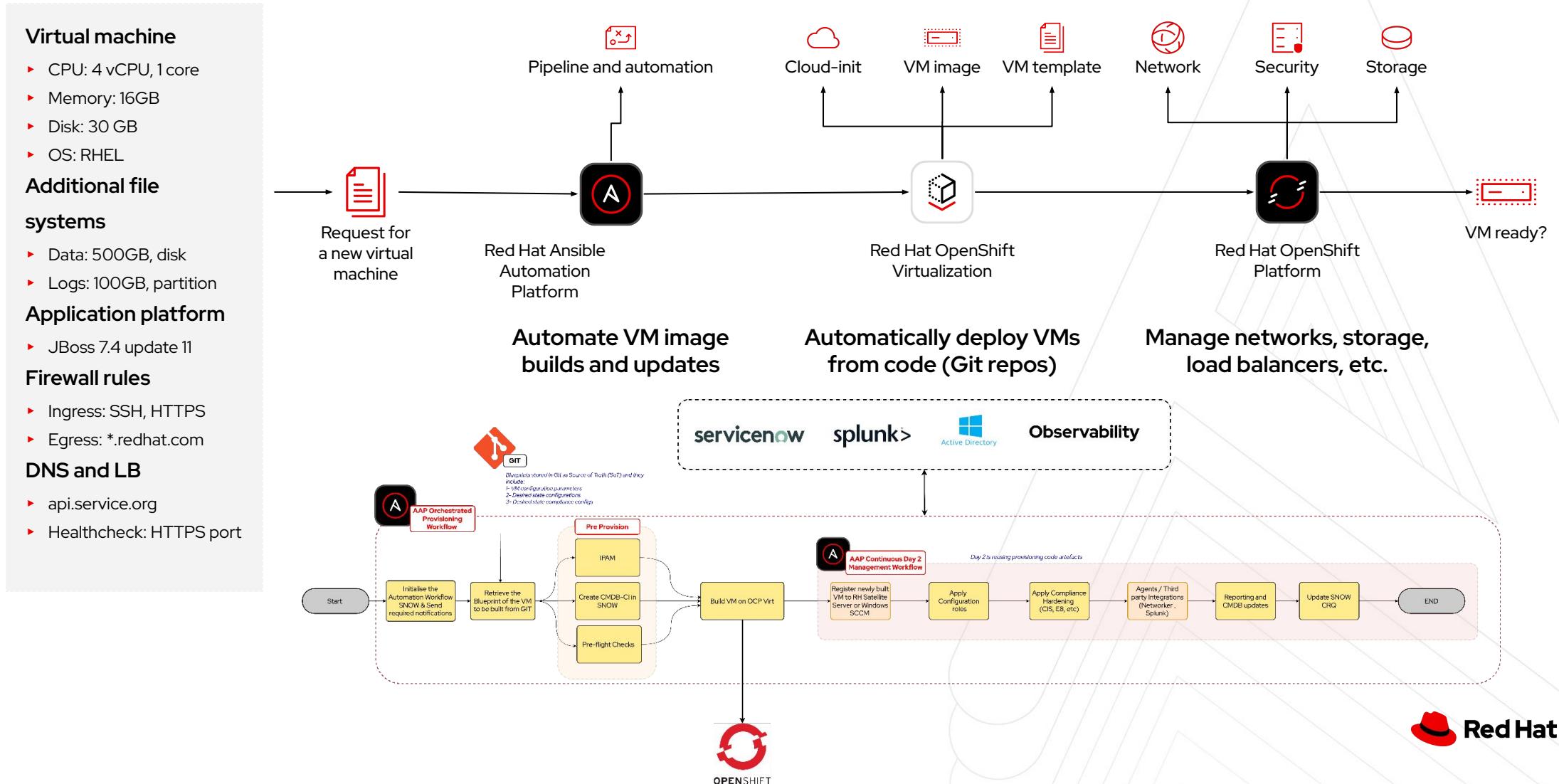
Inventory source for KubeVirt
VirtualMachines

Automating VM migration and the virtualized application life cycle



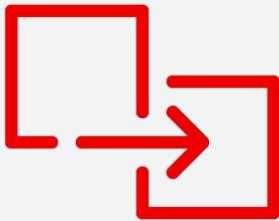
Next-generation approach to Virtual Machine migration

IaC and enable a process and pipeline that can be optimized down to a few minutes



OpenShift Virtualisation migration automation

How do we further streamline, scale, succeed with automated migrations



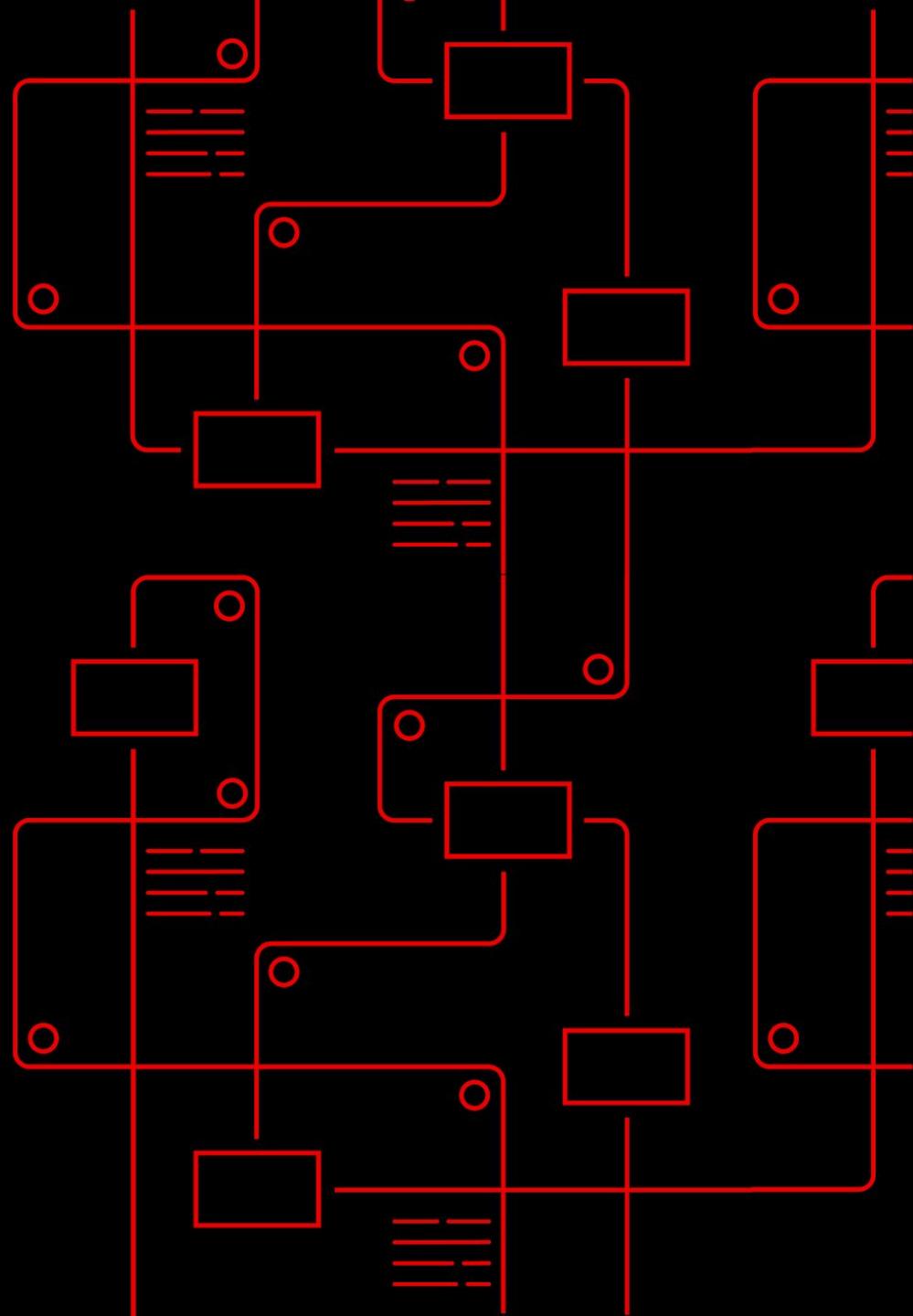
Why is it important?

- ▶ **Accelerated Migrations:** Automate and speed up the migration process (not limited to just one OpenShift cluster)
- ▶ **Scalable Operations:** Efficiently manage and schedule migrations
- ▶ **Reduced Errors:** Ensure reliability and consistency

Why Red Hat Ansible Automation Platform?

- ▶ **Centralized Automation:** AAP simplifies IT management by providing a unified and centralized automation solution.
- ▶ **Adaptability & Integration:** Offers extensive modules & integrations, making it easy to ensure a successful migration process in a proven, tested and validated manner.
- ▶ **Ansible surveys:** Pre-populated surveys to simplify the amount of input required from users

OpenShift Virtualization Ansible Migration Factory



Migration Factory

Ansible automation tooling to support the assessment, migration and lifecycle of Virtual Machines within OpenShift Virtualization on Ansible Automation Platform

Spoiler: it's primarily the
[infra.virt_migration_factory](#)
Collection



Ansible Automation Content

Ansible based content (Playbooks, Collections, and more) dedicated to support OpenShift Virtualization and the Migration Toolkit for Virtualization and related activities

Ansible Automation Platform Integration

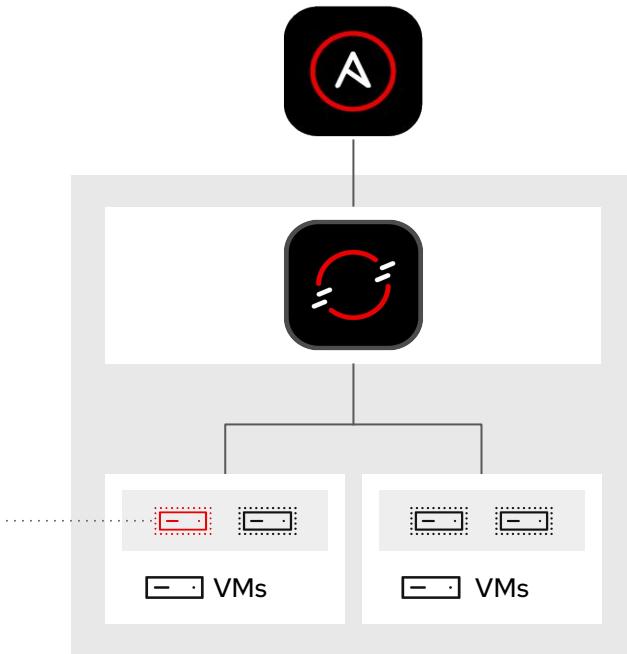
Seamlessly integrates into Ansible Automation Platform

Addresses Real World Use Cases

Built by those working directly with customers migrating to OpenShift Virtualization and incorporates activities from the field

`infra.virt_migration_factory` Ansible Collection

Integrated automation resources to manage the full lifecycle of Virtual Machines and environments



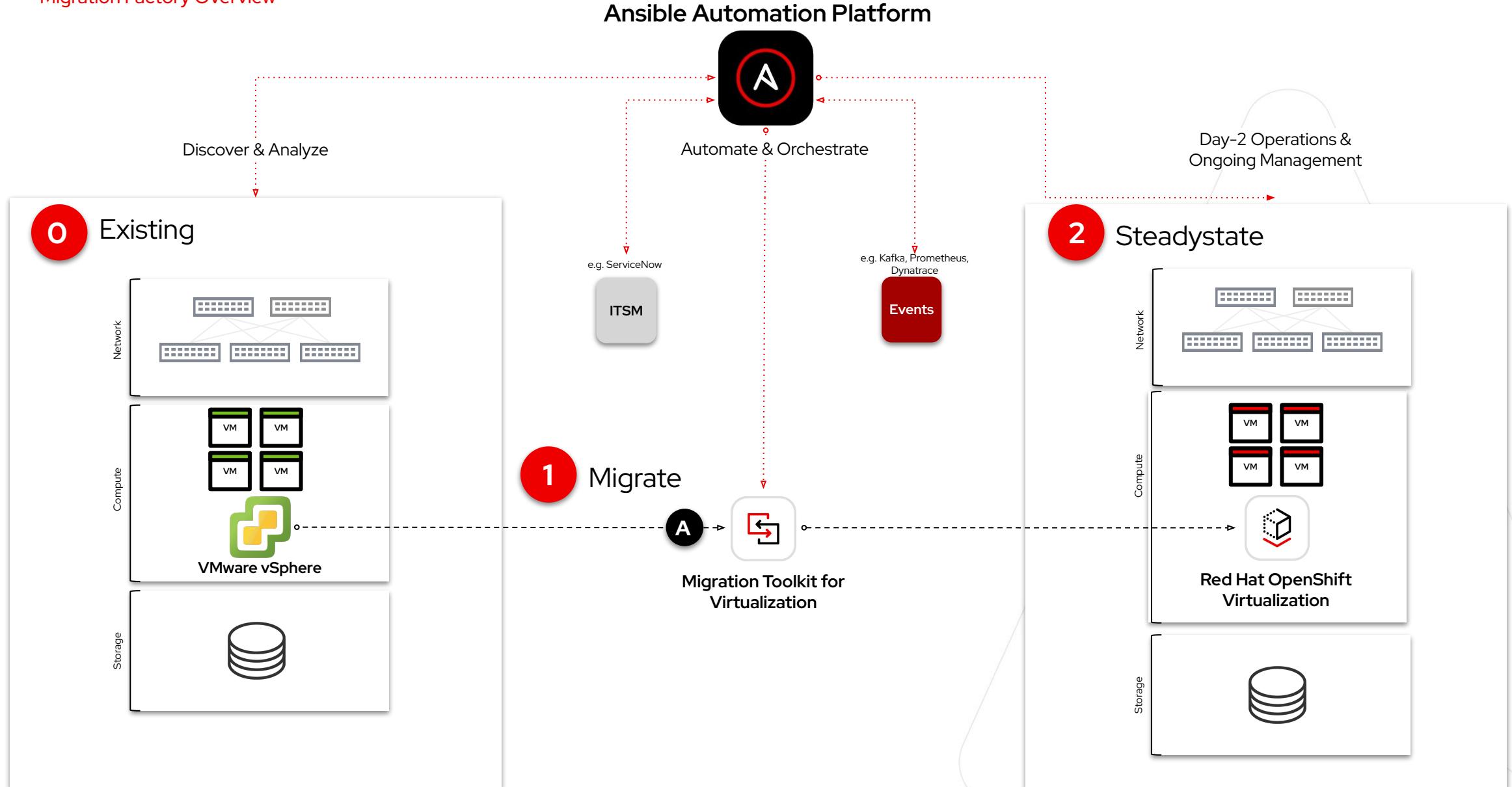
Included Ansible Roles at a Glance

`aap_deploy`
`migration_targets`
`mtv_management`
`mtv_migrate`
`mtv_provider`
`nmstate`
`operator_management`
`pre_config`

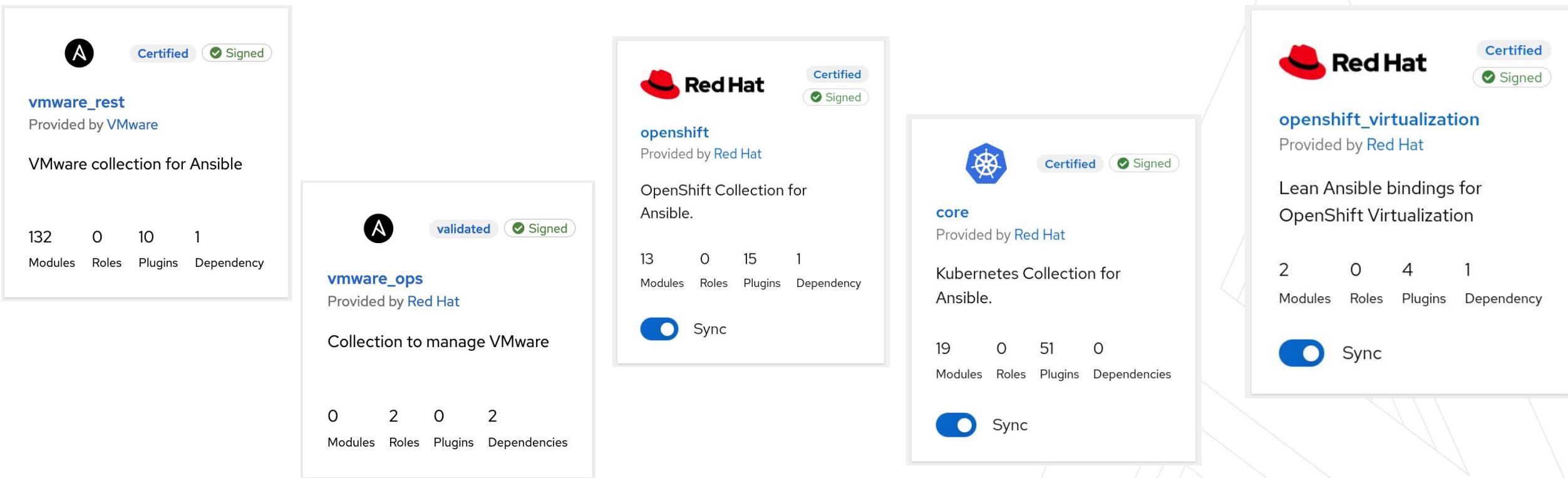
`tor_switch_gather`
`tor_switch_migrate`
`validate_migration`
`virt_plan`
`vm_backup_restore`
`vm_networking`
`vm_patching`

And more...!

Migration Factory Overview



Encompassing virtualized platform and application lifecycles

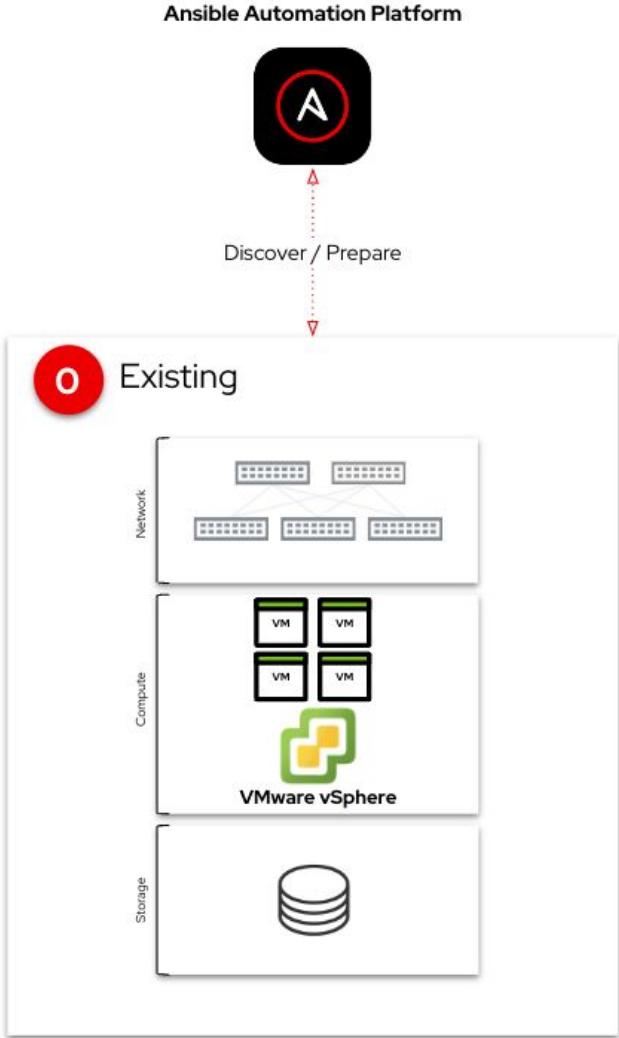


Certified Collections enable broad collaborative and integration enablement

https://console.redhat.com/ansible/automation-hub?page_size=10&view_type=null&sort=name&keywords=openshift&page=1



Pre Configuration for Migration



- ▶ Inventory/Discovery of existing and/or replacement hardware & configurations and creations of reusable facts
- ▶ Pulls configuration info from:
 - VMware Vcenter
 - Compute BMC and/or Redfish compatible BIOS
- ▶ VMware pre-configuration for Migration Toolkit for Virtualization
 - Validates all of the prerequisites are configured on VMware vSphere for Migration Toolkit for Virtualization

AAP provides the discovery functions

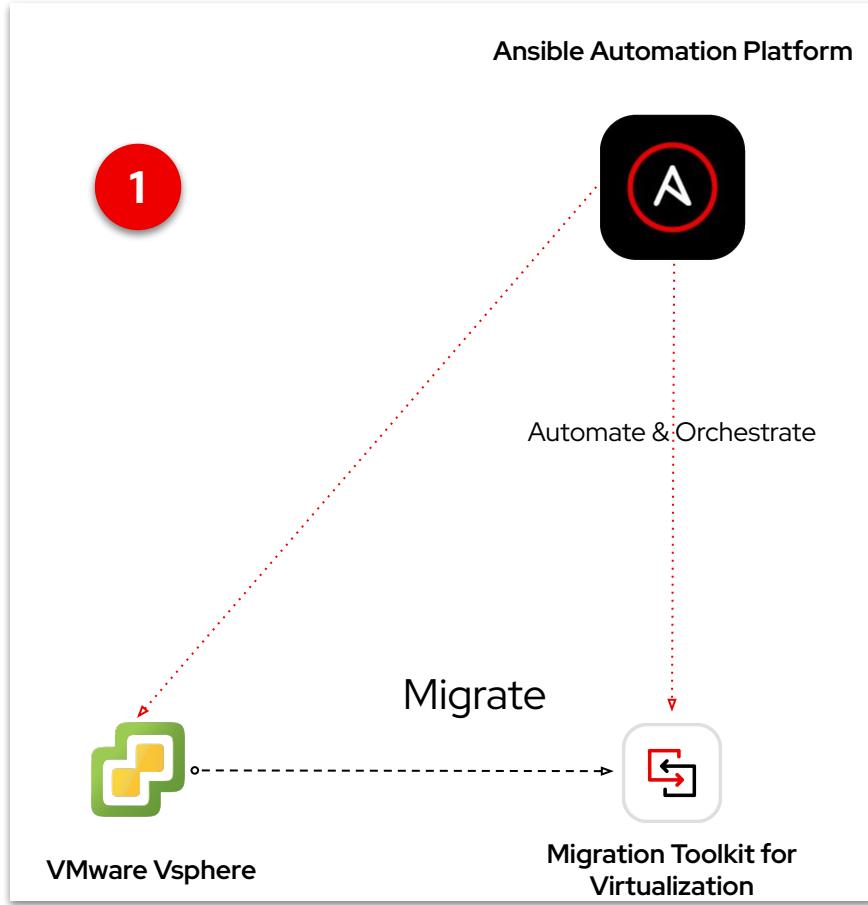
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Pre Configuration for Migration

④ playbook.yml

```
1  ---
2  - name: Playbook for OpenShift virt
3    hosts: localhost
4    collections:
5      - xxxx.ocp_virt
6
7    roles:
8    #  - {role: xxxx.ocp_virt.validation}
9    - {role: xxxx.ocp_virt.providers}
10   - {role: xxxx.ocp_virt.virt_plan}
```

```
④ 10_create_virt_plan.yml
1  - name: Build a list of all the folders
2    vmware.vmware_rest.vcenter_folder_info:
3      register: all_folders
4
5  - name: Filter VM folders
6    ansible.builtin.set_fact:
7      | vm_folders: "{{ all_folders.value | selectattr('type', 'equalto', 'VIRTUAL_MACHINE') | list }}"
8
9  - name: Check each VM folder for VMs
10   vmware.vmware_rest.vcenter_vm_info:
11     | folders: "{{ item.folder }}"
12     register: vm_folders_with_vms
13     loop: "{{ vm_folders }}"
14     when: vm_folders | length > 0
15
16  - name: Display VM names and IDs
17    ansible.builtin.debug:
18      | msg: "VM Name: {{ item.name }}, VM ID: {{ item.vm }}"
19    loop: "{{ vm_folders_with_vms.results | map(attribute='value') | flatten }}"
20    when: item | length > 0
21    loop_control:
22      | label: "{{ item.name }}"
23
24  - name: Collect VM names and IDs
25    ansible.builtin.set_fact:
26      | vm_name_id_pairs: "{{ vm_name_id_pairs | default([]) + [ {'name': item.name, 'vm': item.vm} ] }}"
27    loop: "{{ vm_folders_with_vms.results | map(attribute='value') | flatten }}"
28    when: item | length > 0
29
30  - name: Prepare VMs for Plan spec
31    ansible.builtin.set_fact:
32      | vms_for_plan_spec: "{{ vms_for_plan_spec | default([]) + [ {'hooks': [], 'id': vm_id.vm} ] }}"
33    loop: "{{ vm_name_id_pairs }}"
34    loop_control:
35      | loop_var: vm_id
36    when: vm_id.name in user_selected_vm_names.split('\n')
37
38  - name: Get information for the distributed port group 'segment-migrating-to-ocpvirt'
39    vmware.vmware_rest.vcenter_network_info:
40      | filter_types: DISTRIBUTED_PORTGROUP
41    register: my_portgroup
42
43  - name: Capture the distributed portgroup id to make network mappings
44    ansible.builtin.set_fact:
45      | portgroup_id: "{{ my_portgroup.value[0].network }}"
```



Migration and Inventory

- Migration Toolkit for Virtualization (aka MTV) automation
 - Batch migrations of virtual machines via collection/MTV Plans
- Create inventories to be used for bulk migrations via MTV Plans
 - VMware VMs
 - OpenShift Virt VMs + supporting resources
 - VLANs
 - Storage

And then provisions the NetWork and Storage Maps ...

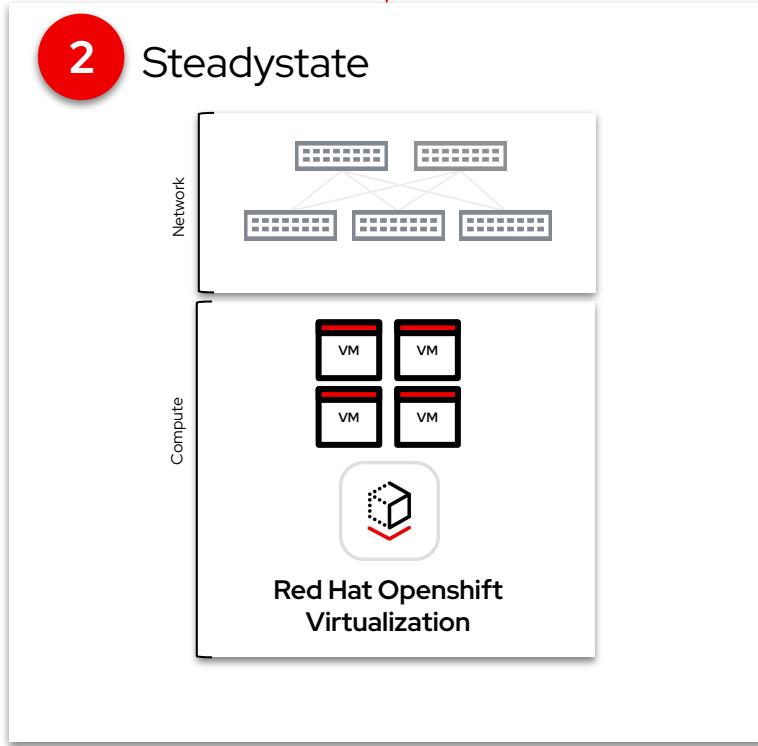
```
45 portgroup_id: "{{ my_portgroup.value[0].network }}"
46
47 - name: Create or update a NetworkMap
48   redhat.openshift.k8s:
49     state: present
50     definition:
51       apiVersion: forklift.konveyor.io/v1beta1
52       kind: NetworkMap
53       metadata:
54         name: "{{ networkmap_name }}"
55         namespace: openshift-mtv
56       spec:
57         map:
58           - destination:
59             type: pod
60             source:
61               id: "{{ portgroup_id }}"
62             provider:
63               destination:
64                 name: host
65                 namespace: openshift-mtv
66               source:
67                 name: vmware
68                 namespace: openshift-mtv
69
70 - name: Build a list of all the datastores
71   vmware.vmware_rest.vcenter_datastore_info:
72     register: all_the_datastores
73
74 - name: Capture the datastore id
75   set_fact:
76     datastore_id: "{{ all_the_datastores.value[0].datastore }}"
77
78 - name: Create or update a StorageMap
79   redhat.openshift.k8s:
80     state: present
81     definition:
82       apiVersion: forklift.konveyor.io/v1beta1
83       kind: StorageMap
84       metadata:
85         name: "{{ storagemap_name }}"
86
```

1 Migrate

requirements.yml

collections:

- name: redhat.openshift
- name: vmware.vmware_rest
- name: community.general
- name: kubevirt.core



Day 2 Operations

- Dynamic inventory of running VMs
 - VM snapshots or backup of VM for rollback
 - Migrate to another host
- Virtual Machine activities / life cycle
 - Gather Facts
 - Power off, reboot, power on
 - Memory, storage, vCPUs allocation
- Network adapter settings
 - Verify Operator is installed
 - Create Resources
 - Configure NIC
 - Create Bond
 - NAD Definitions (project scoped)
 - Add Secondary NIC to VM

Let's see the Migration Factory working

Technical Demonstration



VMware
vSphere

+



Ansible Automation
Platform

+



OpenShift
Virtualization

DEMO

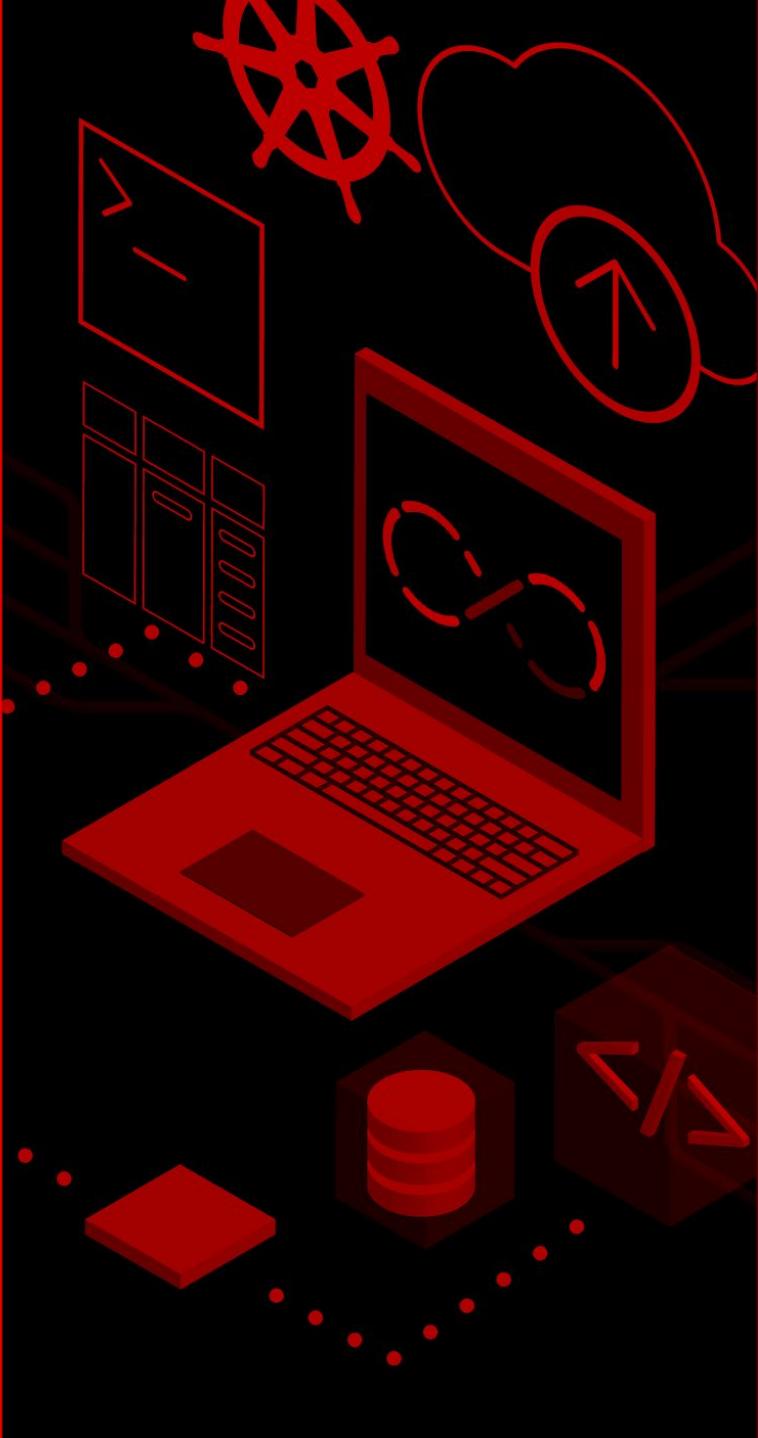
CLOUD MIGRATION:

Migration of virtual machines running on VMware
to Red Hat OpenShift Virtualization



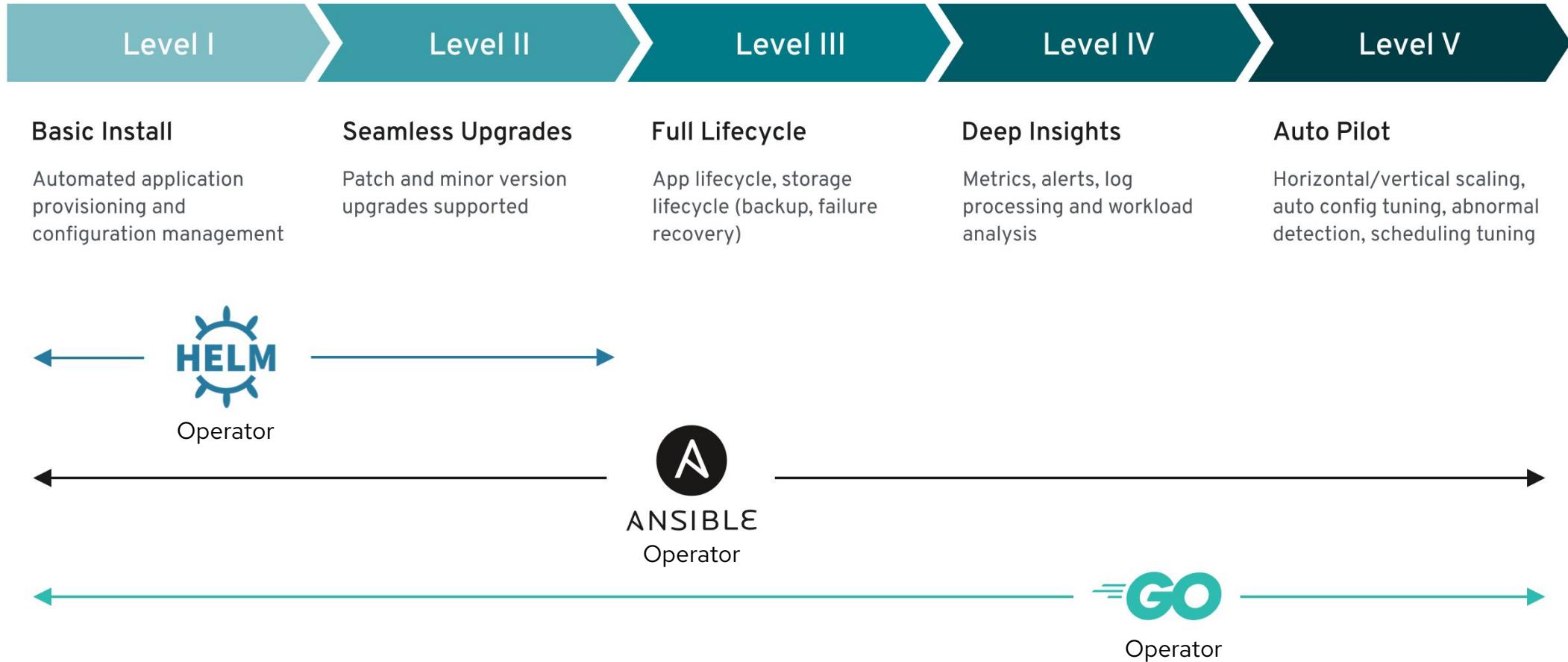
Red Hat

Red Hat
Ansible Automation
Platform



Building an Operator: How Challenging is it?

Supported Operator Types



Choosing the right tool

HELM

- Implementation is declarative and simple
- Operator functionality is limited to Helm features
- Operator manifest bundle files (CRD, RBAC, Operator Deployment) are automatically generated



ANSIBLE

- Implementation is declarative and human-readable
- Ansible can express almost any operator functionality
- Operator manifest bundle files (CRD, RBAC, Operator Deployment) are automatically generated



GO

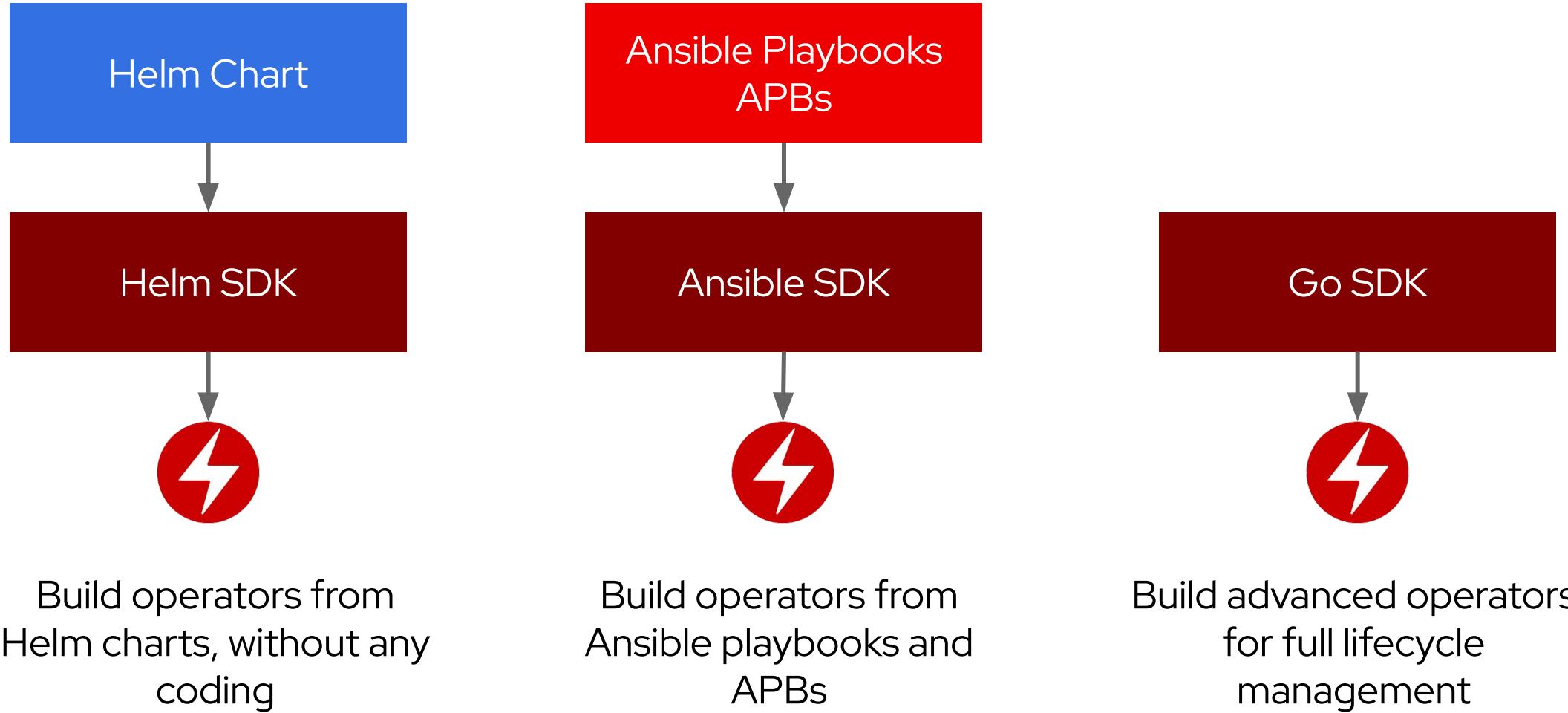
- Implementation is imperative and more complex
- There is no limit on the functionality you want to implement
- Operator manifest bundle files (CRD, RBAC, Operator Deployment) are generated from the Go source code



Demo

Operator SDK

Operator SDK

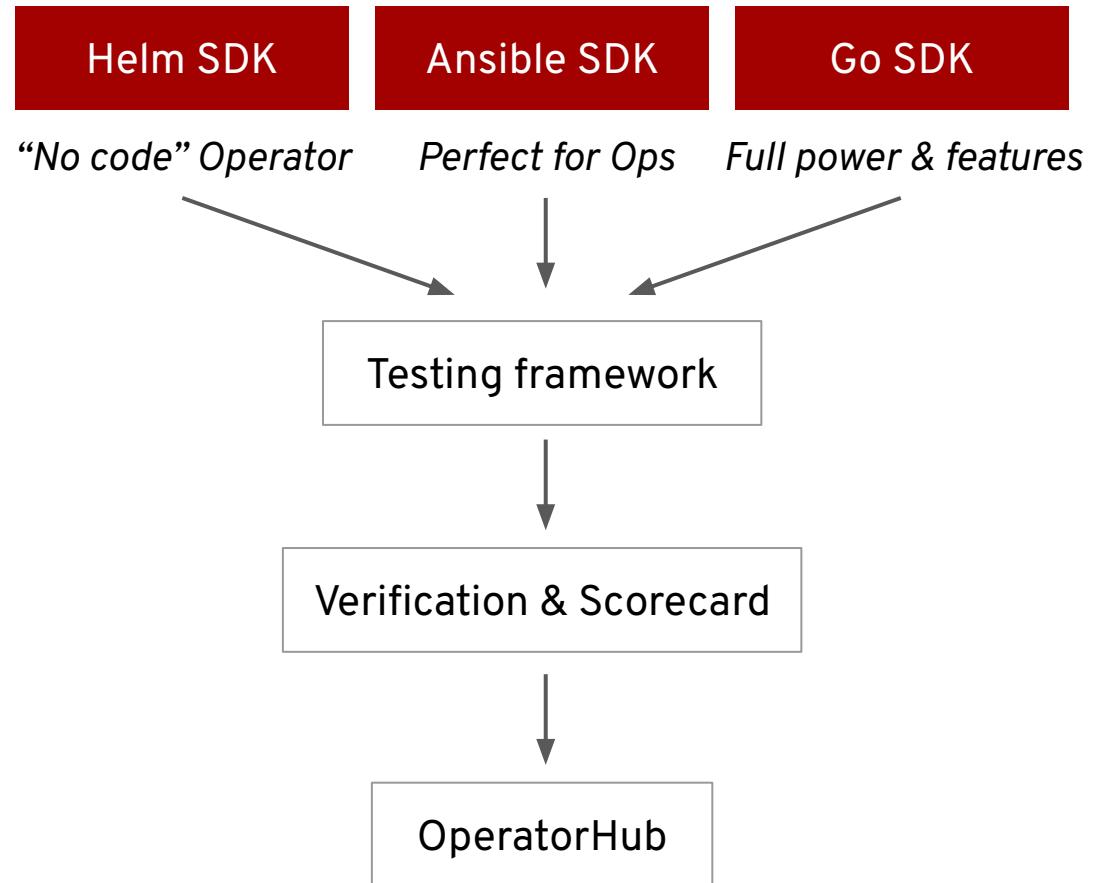


Operator SDK

- APIs and abstractions which make it easier to create an Operator
 - Go, Ansible, Helm
 - Scaffolding and code generation tools for bootstrapping
- Operator logic
 - Manager - the primary control loop
 - `CustomResourceDefinition` (CRD) APIs - definition of the API endpoints and properties
 - Controller - watches and reacts to changes of instances of the custom resource
- Controller reconcile loop contains the logic for actions, defined by the developer, expressed in the custom resource spec
 - Create, modify, or destroy Kubernetes objects (`Pods`, `Secrets`, `ConfigMaps`, `PVCs`, etc.)
 - “Complex” operations, e.g. update / upgrade logic
 - Anything!

OPERATOR SDK

- “No code” improvements to Helm SDK user experience
- Testing is extremely important for Operators, we have a testing framework built in
- SDK includes a “scorecard” to ensure your Operator is technically correct

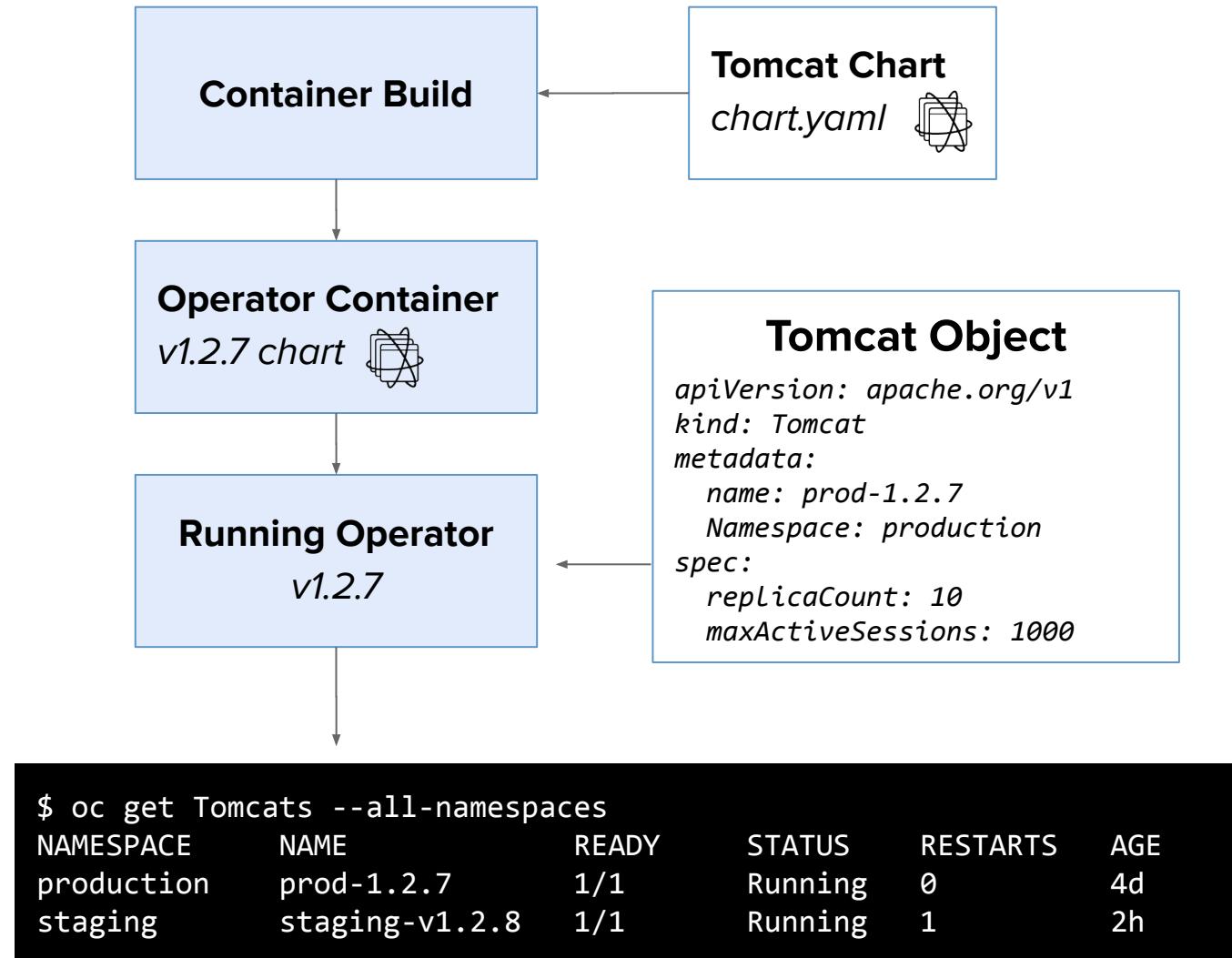


HELM SDK

- Easiest way to get started – “no code”
- Use templating from Helm
- Connect values.yaml to Kubernetes object

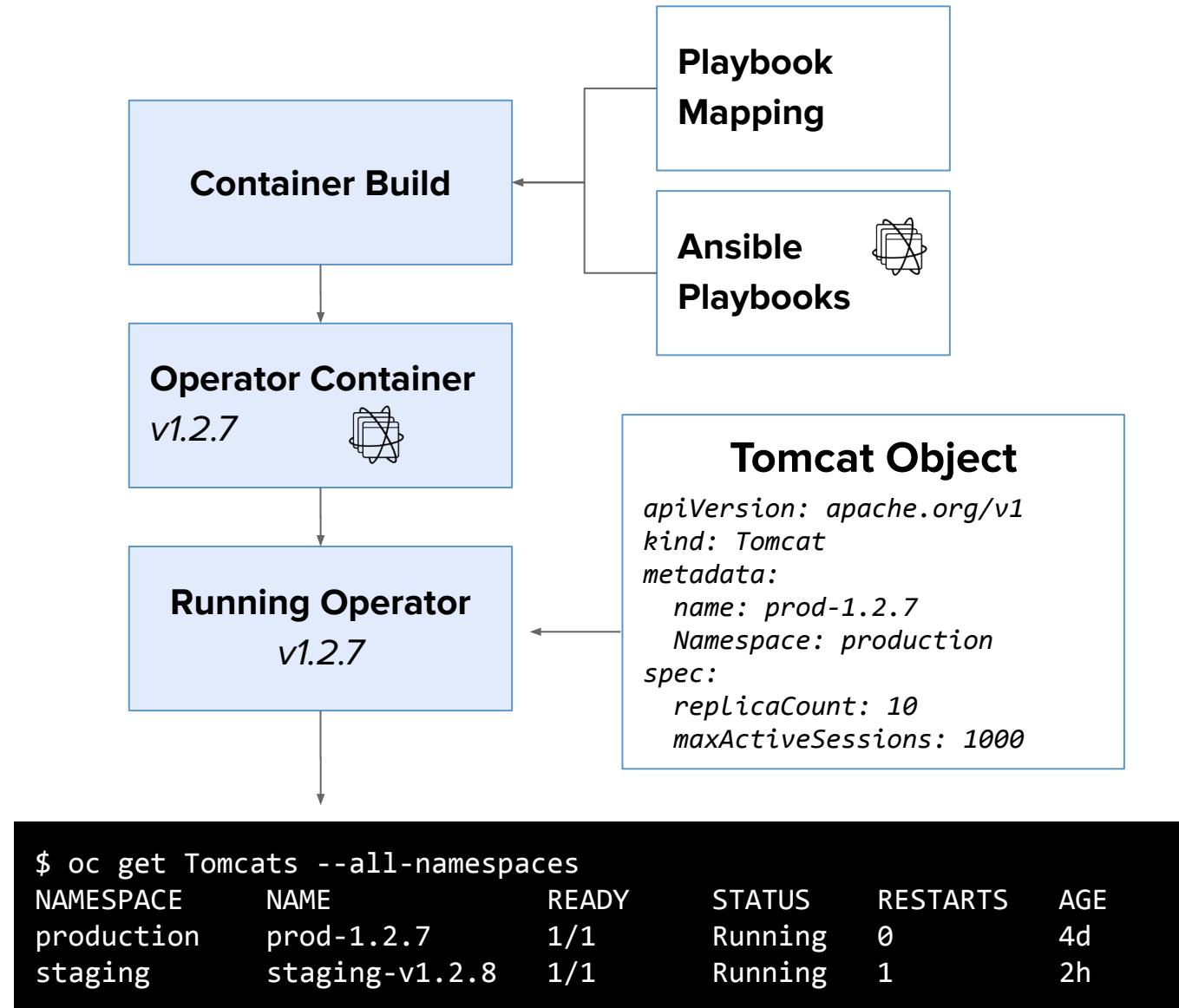
```
$ operator-sdk new tomcat-operator  
--type=helm  
--helm-chart=stable/tomcat
```

HELM SDK



ANSIBLE SDK

- Use Ansible Roles in an Operator
- Great for teams that don't have Go devs
- Takes the human out of the loop
- Connects the playbooks to Kubernetes events like Node failures
- Ansible ecosystem of modules and plugins available via Operator SDK



GO SDK

- Best way to get to a Level 5 “Auto Pilot” Operator
- Use the same tools Kubernetes developers use upstream
- Popular for database & storage vendors
- Built-in testing framework

```
if tomcats.length != desired {  
    //initial deployment  
}  
  
foreach tomcats as tomcat {  
    if tomcat.Spec.Replicas != size {  
        //fix size  
    }  
}
```

Links to get started

<https://sdk.operatorframework.io>

<https://developers.redhat.com/courses/openshift-operators/go>

<https://developers.redhat.com/courses/openshift-operators/helm>

Thank you

 [linkedin.com/company/red-hat](https://www.linkedin.com/company/red-hat)

 [youtube.com/user/RedHatVideo
s](https://www.youtube.com/user/RedHatVideos)

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