

Event Driven Kubernetes with Ansible



10 Sep 2024

meetup.com/k8s-sg

We'll be discussing...

- The need for event-driven operations
- Introduction to Event-Driven Ansible
- Kubernetes Event Sources and Triggers
- Integration with Ansible Automation Platform
- Use Cases in Kubernetes Environments
- Demo: Event-Driven Automation with Ansible
- Q&A



```
$ whoami
```

```
> Gineesh Madapparambath
```

```
$ cat ~/about.txt
```

```
> Automation and Containerization Learner
```

```
> Author of "Ansible for Real Life Automation"
```

```
> Co-author of "The Kubernetes Bible - Second Edition"
```


```
> Editor at techbeatly.com
```

```
> Videos: youtube.com/techbeatly
```

```
$ echo $INTERESTS
```

```
> ansible, openshift, kubernetes, IaC, "open source"
```

```
> Write at techbeatly.com and Red Hat EnableSysadmin
```



Available in
Paperback and eBook

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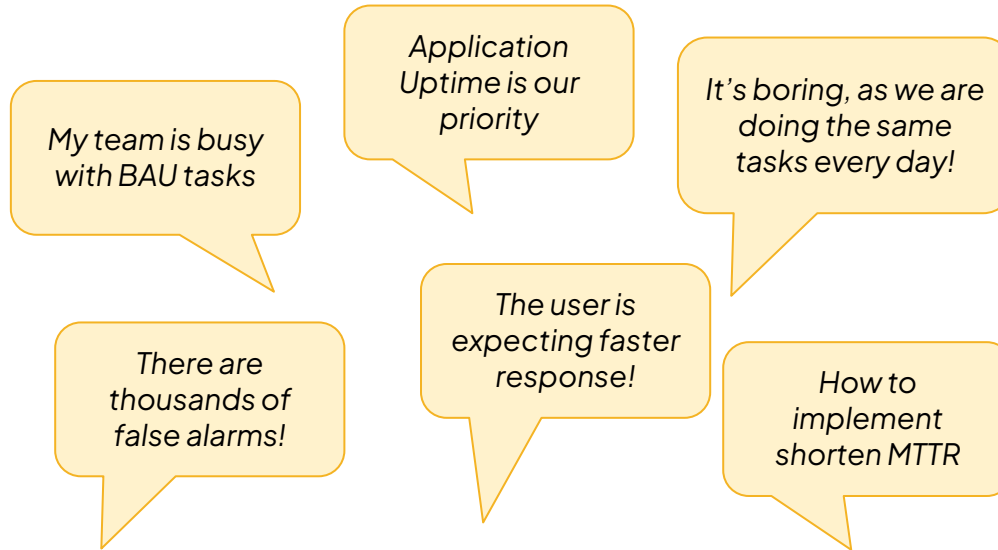
iamgini.com techbeatly.com/youtube
bit.ly/x8sbible bit.ly/ansiblebook

Gineesh Madapparambath (He/Him)
Automation and Containerization Guy, Author of Kubernetes and
Ansible books, techbeatly.com/youtube
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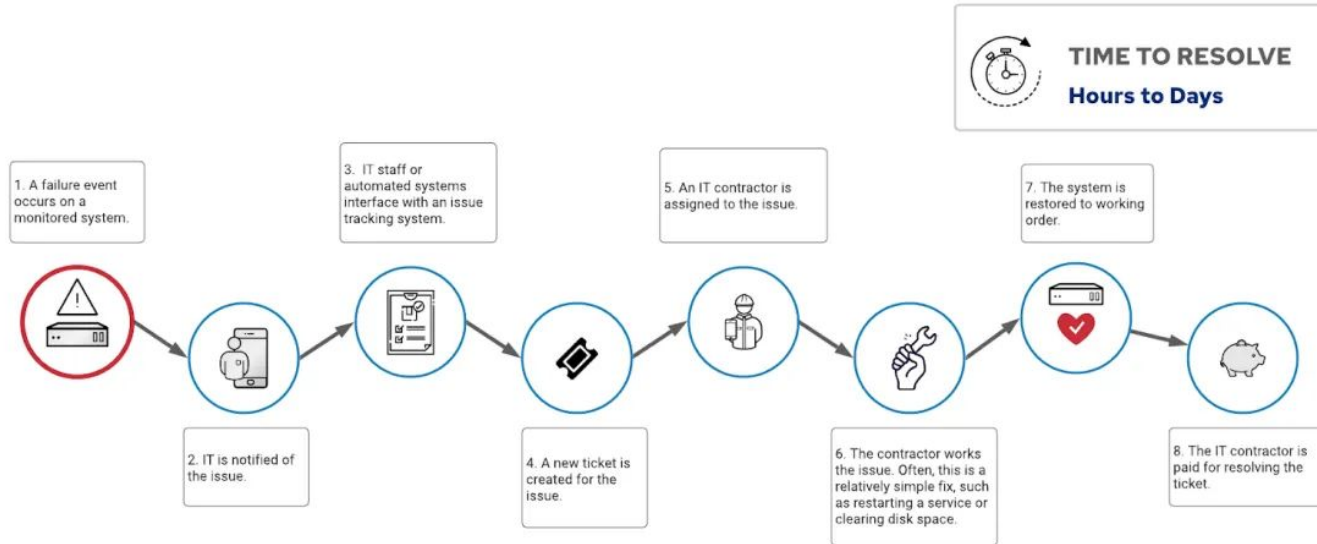
The Kubernetes Bible
The definitive guide to Kubernetes administration
Second Edition
Gineesh Madapparambath, Packt Publishing

PRE ORDER NOW

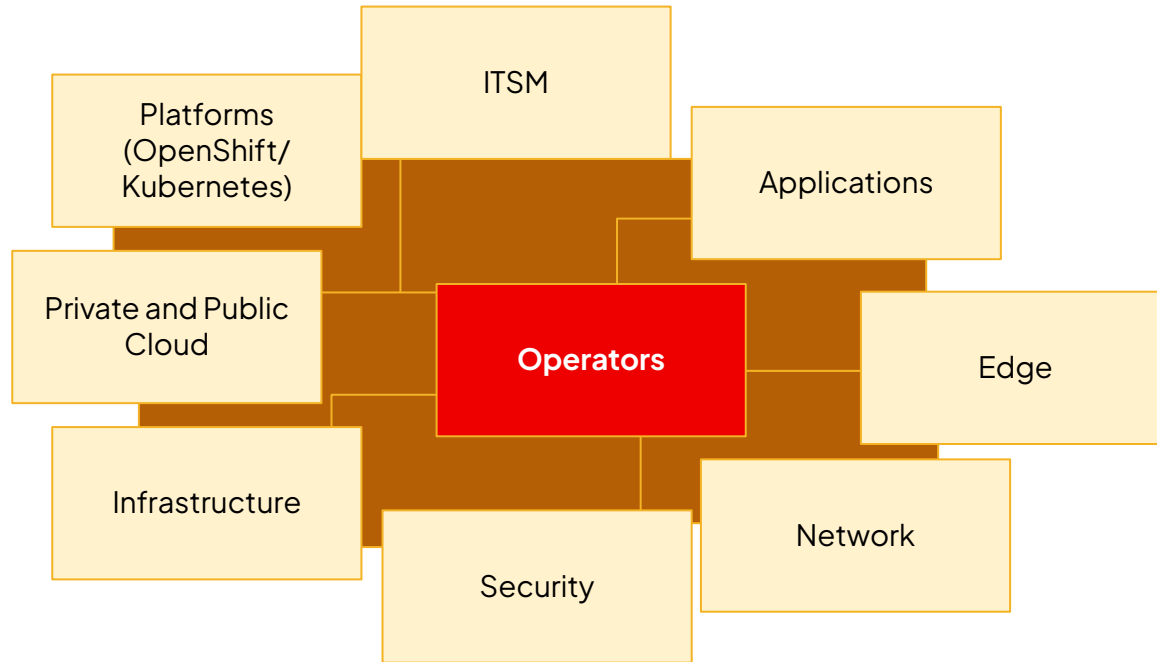
Environmental Challenges



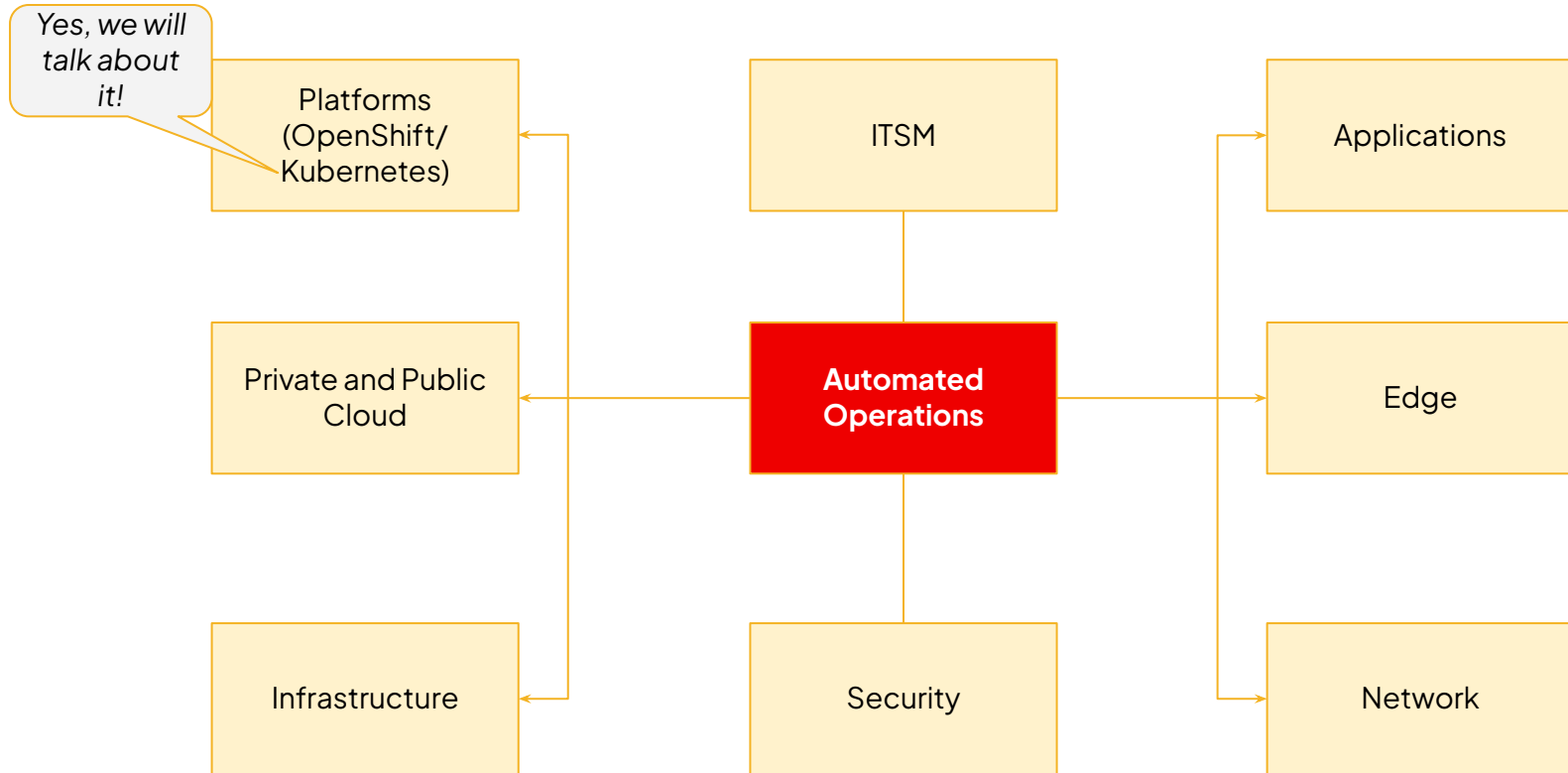
The manual workflow!



Operations – Ad hoc and Manual



Streamlines Operations

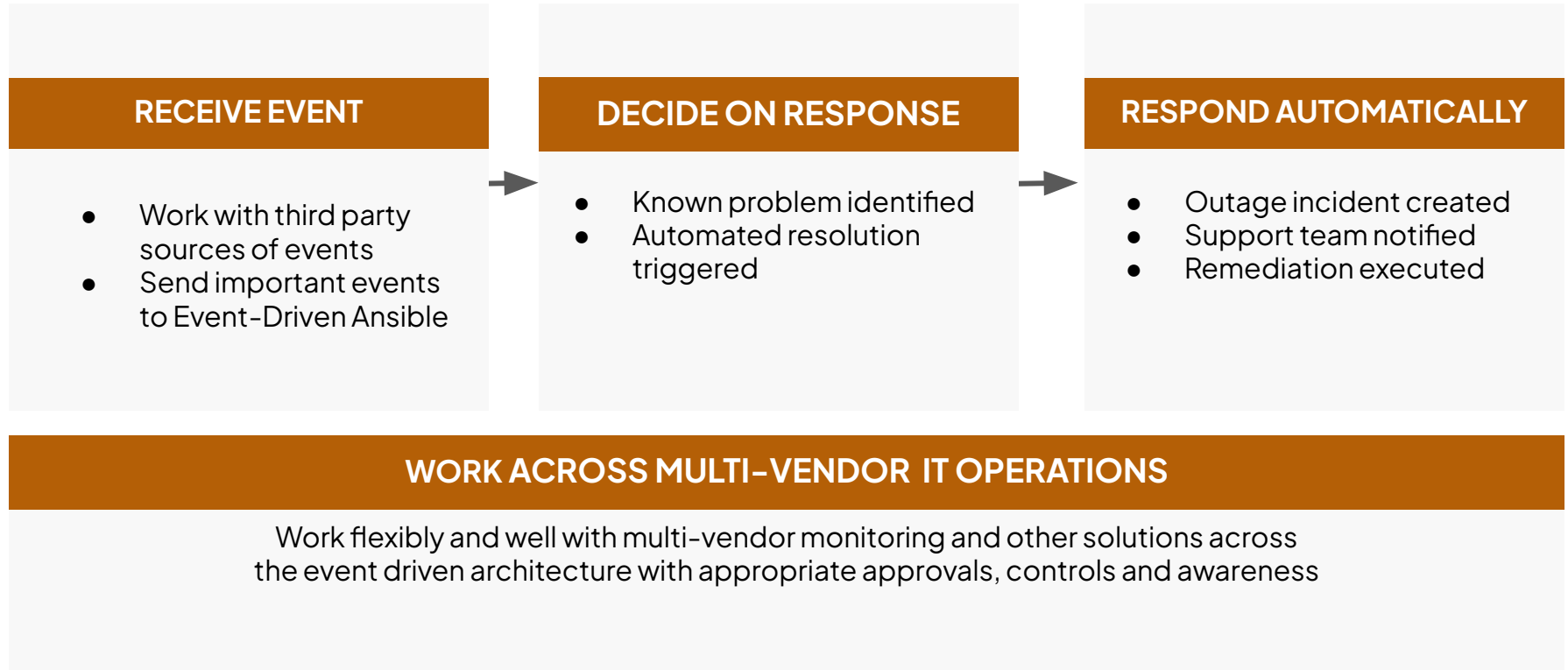


Introduction to Event-Driven Ansible

- **What is Ansible?**
 - Open-source automation platform
 - Configuration management, deployment, and orchestration.
 - YAML-based playbooks
 - Agentless execution via SSH, WinRM or API
 - Supports a wide range of integrations.
- **What is Event-Driven Ansible?**
 - Automates tasks in response to real-time events.
 - Reduces MTTR (Mean Time to Resolution) by triggering actions based on conditions.

The ability to connect intelligence, analytics and service requests for an IT solution to automated actions so that activities can take place in a single motion.

A typical event driven automation process



Key Components of Event-Driven Ansible

Sources

Plugins like Kubernetes, Prometheus, and custom webhooks.

Rules

Conditions that match specific events (e.g., `event.payload.cpu > 80%`).

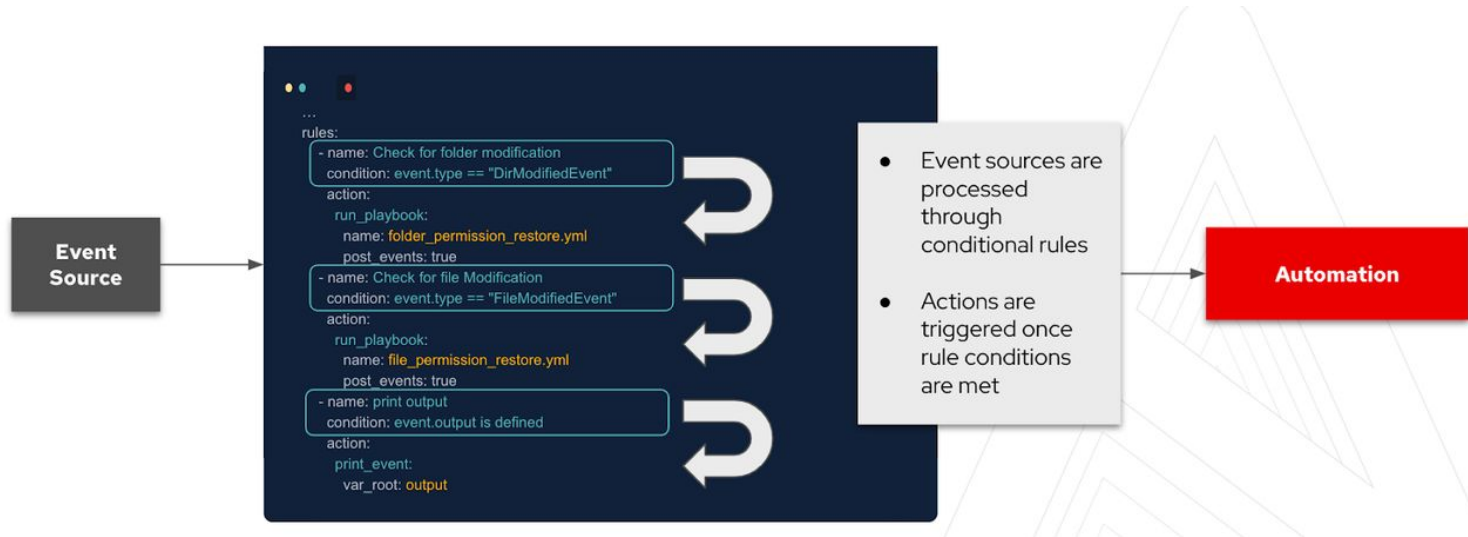
Actions

Trigger playbooks, modules, or tasks (e.g., `run_playbook`).

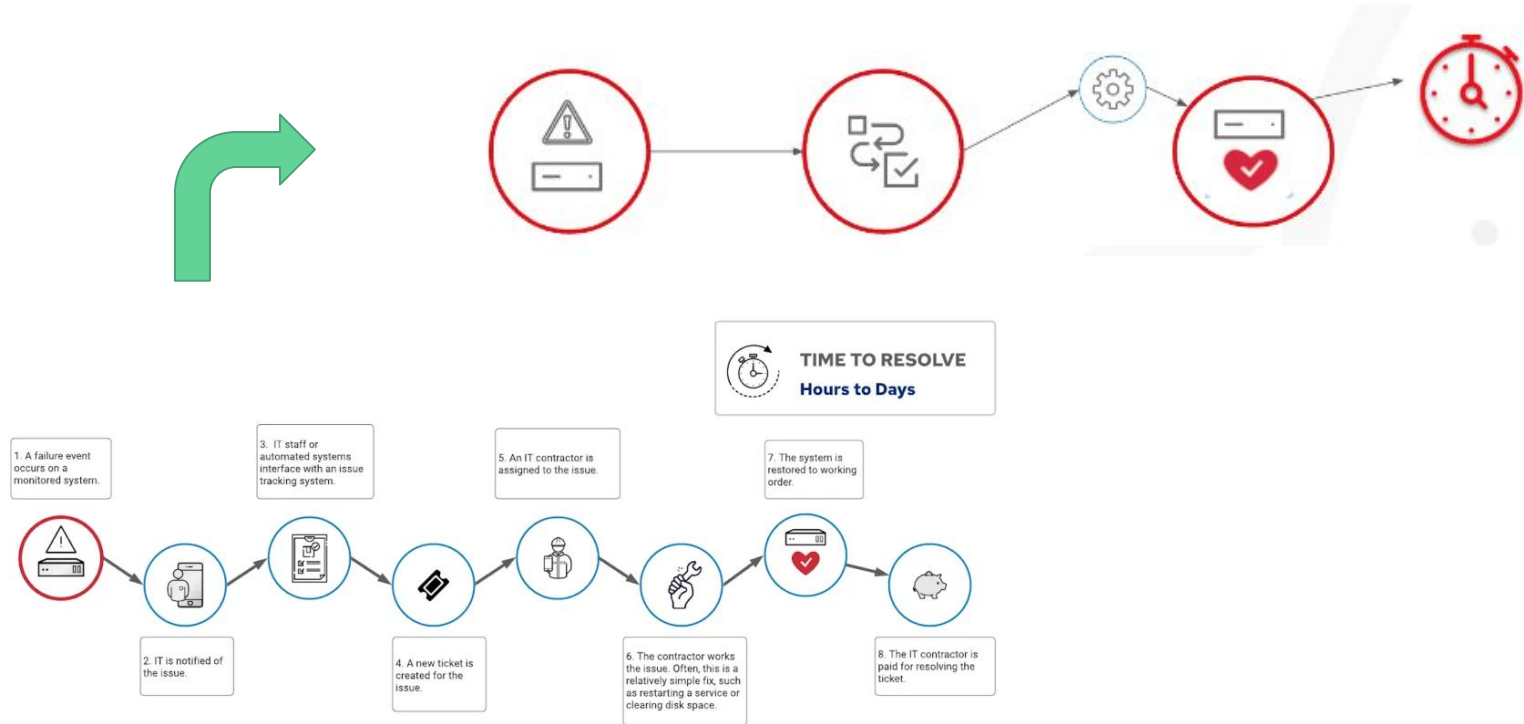
Rulebooks

- Define event sources and conditions.
- Use “If-This-Then-That” logic to create actions.

The Rules



From Ops to AIOps



Ansible Rulebooks

```
- name: Automatic Remediation of a web server
  hosts: all
  sources:
    - name: listen for alerts
      ansible.eda.alertmanager:
        host: 0.0.0.0
        port: 8000
  rules:
    - name: restart web server
      condition: event.alert.labels.job == "fastapi" and event.alert.status == "firing"
      action:
        run_playbook:
          name: ansible.eda.start_app
```

Ansible Rulebook, one more

```
source:
  - name: watchdog
    ansible.eda.watchdog:
      path: "{{src_path}}"
      recursive: true
      ignore_regexes: ['.*\pytest.*', '.*__pycache__.*', '.*/.git.*']
rules:
  - name: Check for folder modification
    condition: event.type == "DirModifiedEvent"
    action:
      run_playbook:
        name: folder_permission_restore.yml
        post_events: true
  - name: Check for file Modification
    condition: event.type == "FileModifiedEvent"
    action:
      run_playbook:
        name: file_permission_restore.yml
        post_events: true
```

EDA Use Cases

- ITSM and Event ticket automation
- Automated troubleshooting and remediation
- Automated workload management
- Cluster scaling
- Security audit, remediation and compliance

Kubernetes can do automation, then why Ansible?

- Extended Scope **Beyond Kubernetes**
- **Cross-Platform** Automation
- Comprehensive **Configuration Management**
- **Event Handling** Outside Kubernetes
- Advanced **Workflows** and Custom Logic
- **Unified** Automation Language
- Integrating with **Legacy** Systems
- **Centralized** Automation Management
- Node management and OS management

Event-Driven Kubernetes

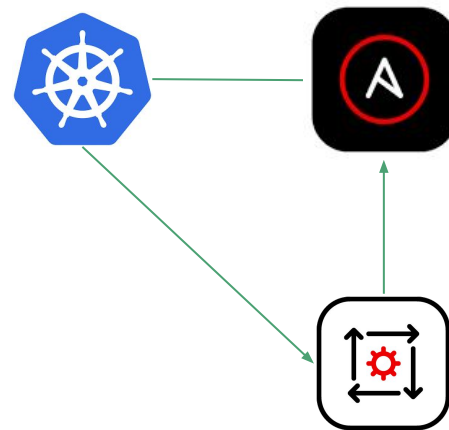
- **How it Works in Kubernetes**

- Watches for Kubernetes and external events (e.g., pod failure, CPU thresholds, etc.).
- Automates remediation, scaling, or alerting in response to events.

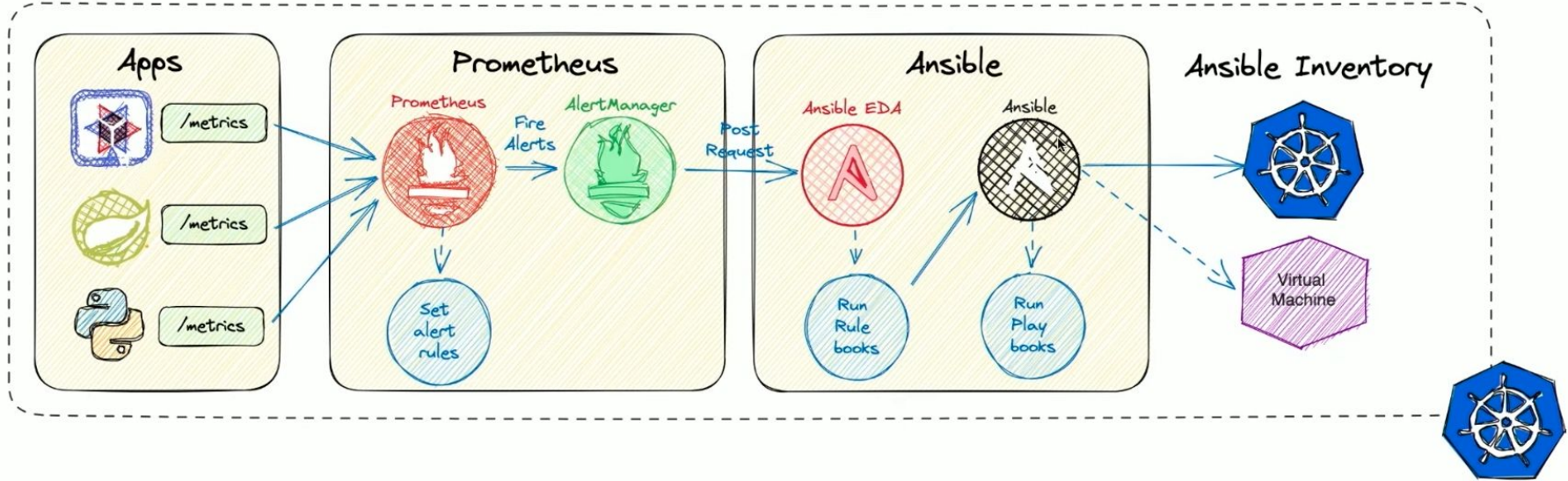
Not clear? Let's think about a simple use case

Automating Pod Redeployment on ConfigMap Update with Event-Driven Ansible

- **Challenge:** Kubernetes does not automatically redeploy Pods when a ConfigMap changes, requiring manual intervention.
- **Event-Driven Ansible Solution:**
 - Source: Monitor Kubernetes ConfigMap changes (using k8s event source plugin).
 - Action: Upon detecting an "MODIFIED" event for the ConfigMap, run an Ansible playbook to:
 - Scale down and up the deployment (rolling restart)
 - Or trigger a specific redeployment task
- **Benefits:**
 - No manual redeployment needed.
 - Ensures consistent updates across pods.
 - Fully automated response to configuration changes.

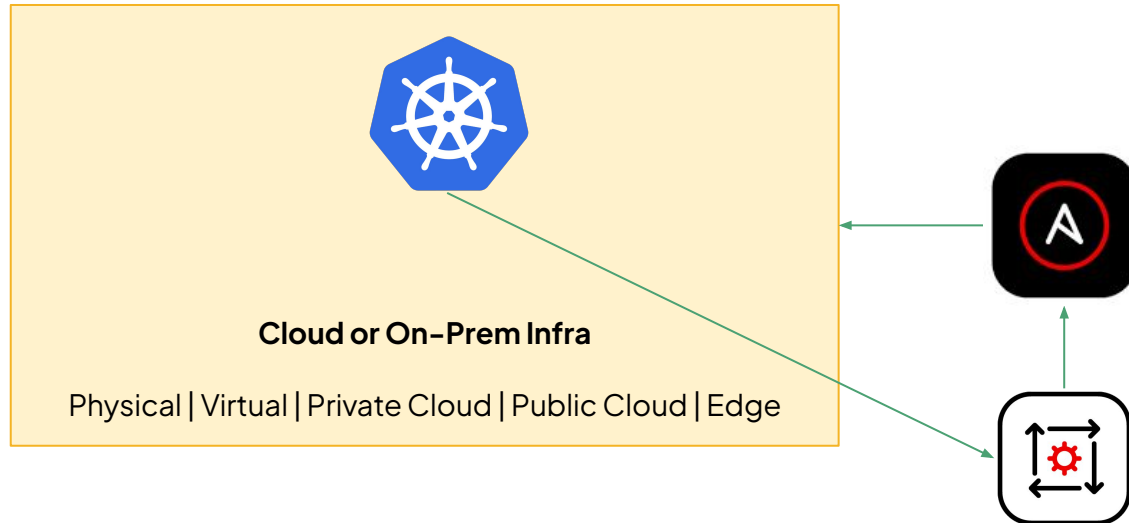


EDA + Kubernetes > Some more clarity

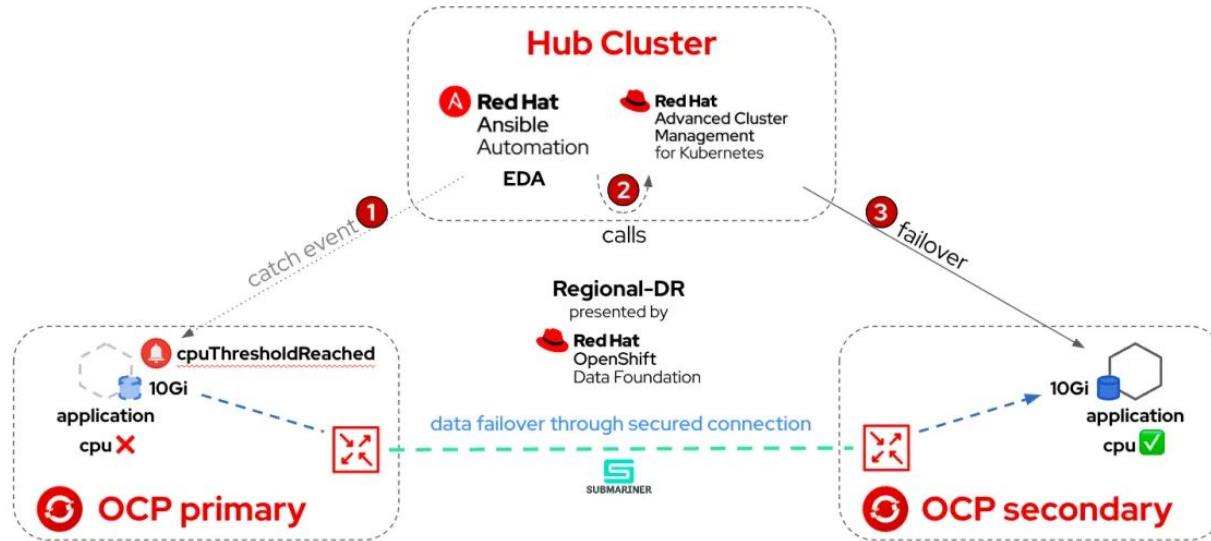


EDA for Kubernetes Cluster Management

- Node scaling for cloud and on-prem scenarios
- Integrate with external metrics and monitoring



Event-driven disaster recovery



Event Driven Kubernetes with Ansible

Use Cases and Scenarios

Automated Remediation	Trigger playbook to fix failing pods (restart pods, reschedule, etc.).
Proactive Scaling Based on Metrics	Respond to CPU/Memory thresholds using Prometheus alerts. Automatically scaling applications based on resource utilization Monitoring metrics and adjusting deployments in real-time
Continuous Deployment Pipelines	Streamlining CI/CD processes with event triggers Enhancing deployment speed and reliability
Failover Between Clusters	Triggering failover processes based on cluster health Use Advanced Cluster Management to automate failover during outages.
Configuration Drift Detection	Automate configuration fixes when drift is detected (ConfigMaps or Secrets). Ensuring consistency across clusters
Security Incident Response	Detecting and responding to security breaches Automating remediation steps Automatically lock down nodes or containers if a security anomaly is detected.
Compliance and Auditing	Enforcing compliance policies automatically Generating audit reports based on events Certificate renewal

Ansible for Kubernetes

- **kubernetes.core** collection

A GALAXY

English ? Login

Thanks for trying out the new and improved Galaxy, please share your feedback on forum.ansible.com

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kubernetes.core

Version

5.0.0 updated 3 months ago (lat... ▼

 Last updated 3 months ago ⓘ 4.4 📄 22,160,148 Downloads

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Install

Documentation

Contents

Import log

Dependencies

🔍 Find content

Showing:

All (70)

Module (19)

Module_utils (22)

Action (16)

Connection (1)

Doc_fragments (8)

Filter (1)

Inventory (1)

Name	Type	Description
helm	module	Manages Kubernetes packages with the Helm package manager
helm_info	module	Get information from Helm package deployed inside the cluster
helm_plugin	module	Manage Helm plugins
helm_plugin_info	module	Gather information about Helm plugins
helm_pull	module	download a chart from a repository and (optionally) unpack it in local directory.
helm_repository	module	Manage Helm repositories.
helm_template	module	Render chart templates
k8s	module	Manage Kubernetes (K8s) objects
k8s_cluster_info	module	Describe Kubernetes (K8s) cluster, APIs available and their respective versions
k8s_cp	module	Copy files and directories to and from pod.
k8s_drain	module	Drain, Cordon, or Uncordon node in k8s cluster

Ansible to Kubernetes Connection

- Username/Password
- Token

```
# Method 2: Using username & password
```

```
- name: Get a list of all pods from openshift-apiserer
  kubernetes.core.k8s_info:
    host: https://api.cluster-wx549.wx549.sandbox2812.opentlc.com:6443
    username: "{{ lookup('ansible.builtin.env', 'OPENSIFT_LOGIN_USERNAME') }}"
    password: "{{ lookup('ansible.builtin.env', 'OPENSIFT_LOGIN_PASSWORD') }}"
    kind: Pod
    namespace: openshift-apiserer
    validate_certs: false
  register: pod_list
  ignore_errors: true
```

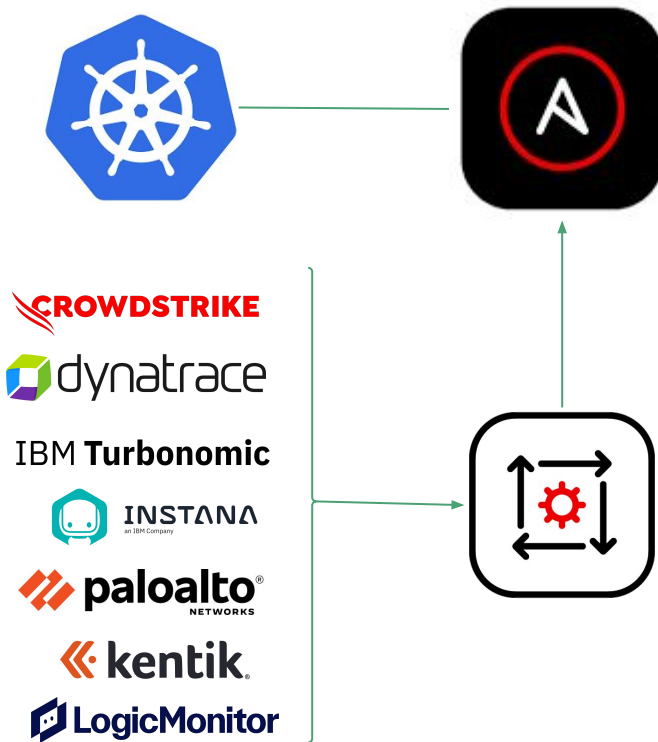
```
# Method 1: Username & password to fetch the Token
```

```
- name: Log in to OCP to obtain access token
  redhat.openshift.openshift_auth:
    host: "{{ ocp_host_api }}"
    username: "{{ lookup('ansible.builtin.env', 'OPENSIFT_LOGIN_USERNAME') }}"
    password: "{{ lookup('ansible.builtin.env', 'OPENSIFT_LOGIN_PASSWORD') }}"
    validate_certs: false
  register: openshift_auth_results

- name: Get a list of all pods from openshift-apiserer
  kubernetes.core.k8s_info:
    host: "{{ ocp_host_api }}"
    api_key: "{{ openshift_auth_results.openshift_auth.api_key }}"
    kind: Pod
    namespace: openshift-apiserer
    validate_certs: false
  register: pod_list
```

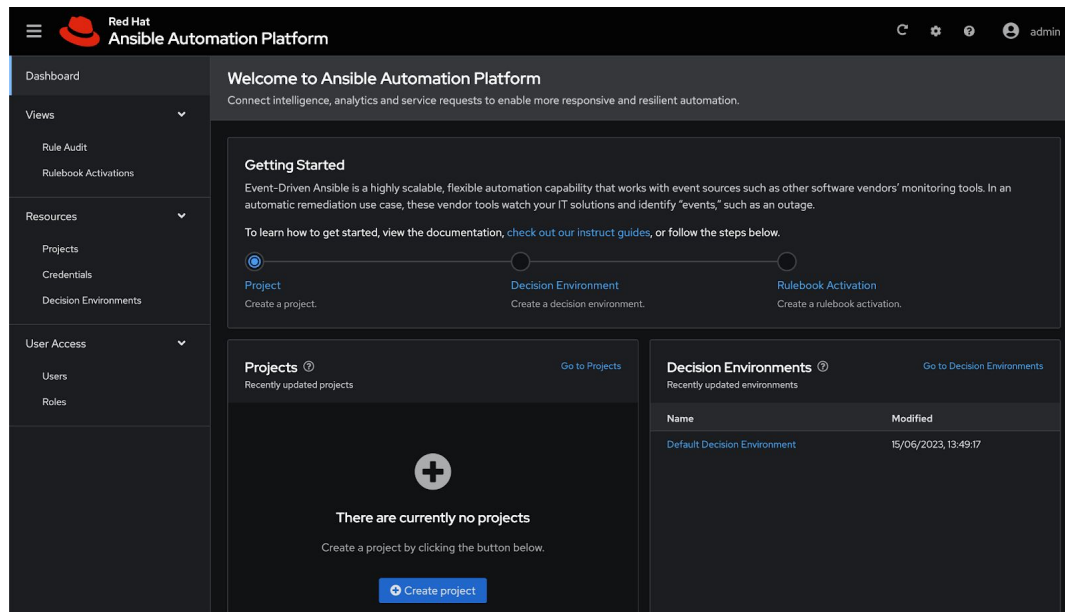

Event Sources and Triggers

- Event Sources
 - Native Kubernetes events: Pod failures, ConfigMap changes, Resource limits.
 - External sources: Prometheus alerts, Webhooks, Kafka messages.
- Triggers in Kubernetes
 - Node issues, resource constraints (CPU, memory).
 - Application-specific events (e.g., service downtime).



Integration with Ansible Automation Platform

- **Integration Overview**
 - Uses EDA and rulebook to watch Kubernetes events.
 - Ansible **automation controller** handles execution.
- **Benefits**
 - Centralized management.
 - Scalable automation across multiple clusters.



ansible-rulebook installation

Requirements

- Python ≥ 3.9
- Python 3 pip
- Java development kit ≥ 17

JAVA_HOME=/usr/lib/jvm/jre-17-openjdk

pip install ansible-rulebook ansible ansible-runner

Let us see them in Action

Demo

References 1/2

Event-Driven Ansible: <https://www.redhat.com/en/technologies/management/ansible/event-driven-ansible>

Introducing the Event-Driven Ansible developer preview: <https://www.ansible.com/blog/introducing-event-driven-ansible>

Free self-paced labs: <https://www.redhat.com/en/interactive-labs/ansible#event-driven-ansible>

Integrating Ansible with OpenShift & Kubernetes: <https://www.techbeatly.com/ansible-openshift-kubernetes>

Ansible Rulebook documentation: <https://ansible.readthedocs.io/projects/rulebook/en/latest>

Creating custom Event-Driven Ansible source plugins: <https://www.ansible.com/blog/creating-custom-event-driven-ansible-source-plugins>

Kubernetes Meets Event-Driven Ansible [Video]: <https://www.youtube.com/watch?v=-MlFqZvOX68>

EDA use case samples: <https://github.com/iamgini/ansible-eda-use-cases>

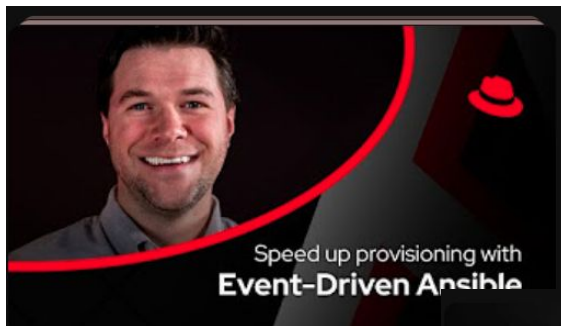
Automating Kubernetes with Event Driven Ansible - DevConf.CZ 2023: <https://www.youtube.com/watch?v=tHlsVG3KAzg>

References 2/2

Event-Driven Automation Playlist: https://www.youtube.com/watch?v=Bt2tZB_5F2U&list=PLdu06OJOEf2a3fFl6uaoyGV526ilwD97R

Event-driven Ansible + Gitops: <https://www.youtube.com/watch?v=Bb5lDftLbPE>

DEMO: OpenShift + Ansible: Event-Driven PVC Snapshots Made Easy: https://www.youtube.com/watch?v=lmj_nfgY40E



JUMP TO SECTION

- Getting Started
- Network and Edge
- Event-Driven Ansible
- Hybrid Cloud

Event-Driven Ansible

Automate routine tasks and deliver more efficient IT operations with Event-Driven Ansible.

Get started with Event-Driven Ansible and Ansible Rulebooks

Learn about the fundamental components of Event-Driven Ansible and go through some examples.

30 mins



GitOps with Event-Driven Ansible

Use Event-Driven Ansible to react to events generated by Git operations.

40 mins



Event-Driven Ansible and Arista NetOps

Use Event-Driven Ansible to react to Arista network events as well as work with ChatOps.

45 mins



Event-Driven Ansible and Cisco NetOps

Use Event-Driven Ansible to react to Cisco network events as well as work with ChatOps.

50 mins




Event-Driven Ansible controller: get up and running

Learn the basics of using Event-Driven Ansible controller—the graphical user interface for event-driven automation that enables the automated resolution of IT requests.

55 mins





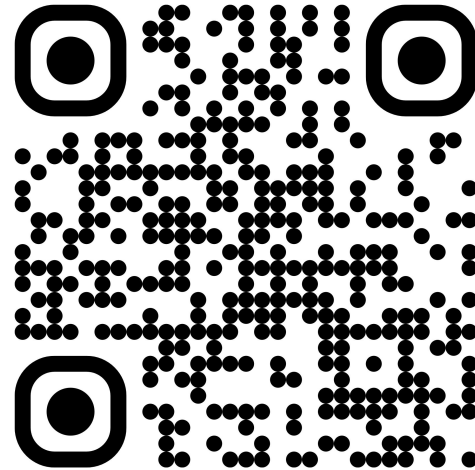
Questions & Feedback

Thank You

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