https://github.com/operator-framework/operator-sdk/

Kubernetes Operators made with Ansible

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1. What is Kubernetes

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: example-app
  labels:
    app: example-app
spec:
  containers:
  - name: example
    image: companyname/example:v1.2.0
    ports:
    - containerPort: 8000
```

```yaml
apiVersion: v1
kind: Service
metadata:
  name: example-service
spec:
  selector:
    app: example-app
  ports:
  - protocol: TCP
    port: 80
    targetPort: 8000
```

2. Ansible k8s module

K8s YAML

```yaml
apiVersion: v1
kind: ConfigMap
metadata:
  name: foo
  namespace: default
data:
  color: red
```

Ansible Task

```yaml
---
- name: create foo configmap
  k8s:
    definition:
      apiVersion: v1
      kind: ConfigMap
      metadata:
        name: foo
        namespace: default
      data:
        color: “{{ color }}”
```

Ansible Template

```
---
- name: create foo configmap
  k8s:
    definition: "{{ lookup('template', 'foo.yaml.j2') }}"
```

Ansible Role

- Packages related Ansible code for **re-use**
- Create a Role that deploys and manages your application
- Ansible Galaxy: central location to share Roles with the world

```
memcached/
├── defaults
│   └── main.yml
├── files
├── handlers
│   └── main.yml
├── meta
│   └── main.yml
├── README.md
├── tasks
│   └── main.yml
├── templates
├── tests
│   ├── inventory
│   └── test.yml
└── vars
    └── main.yml
```

Why use Ansible with Kubernetes

- Similar patterns of writing declarative/idempotent YAML
- Many ops teams are already familiar with Ansible
- Easy to learn, uses Jinja templating
- Capable of full day-2 management

3. Operators

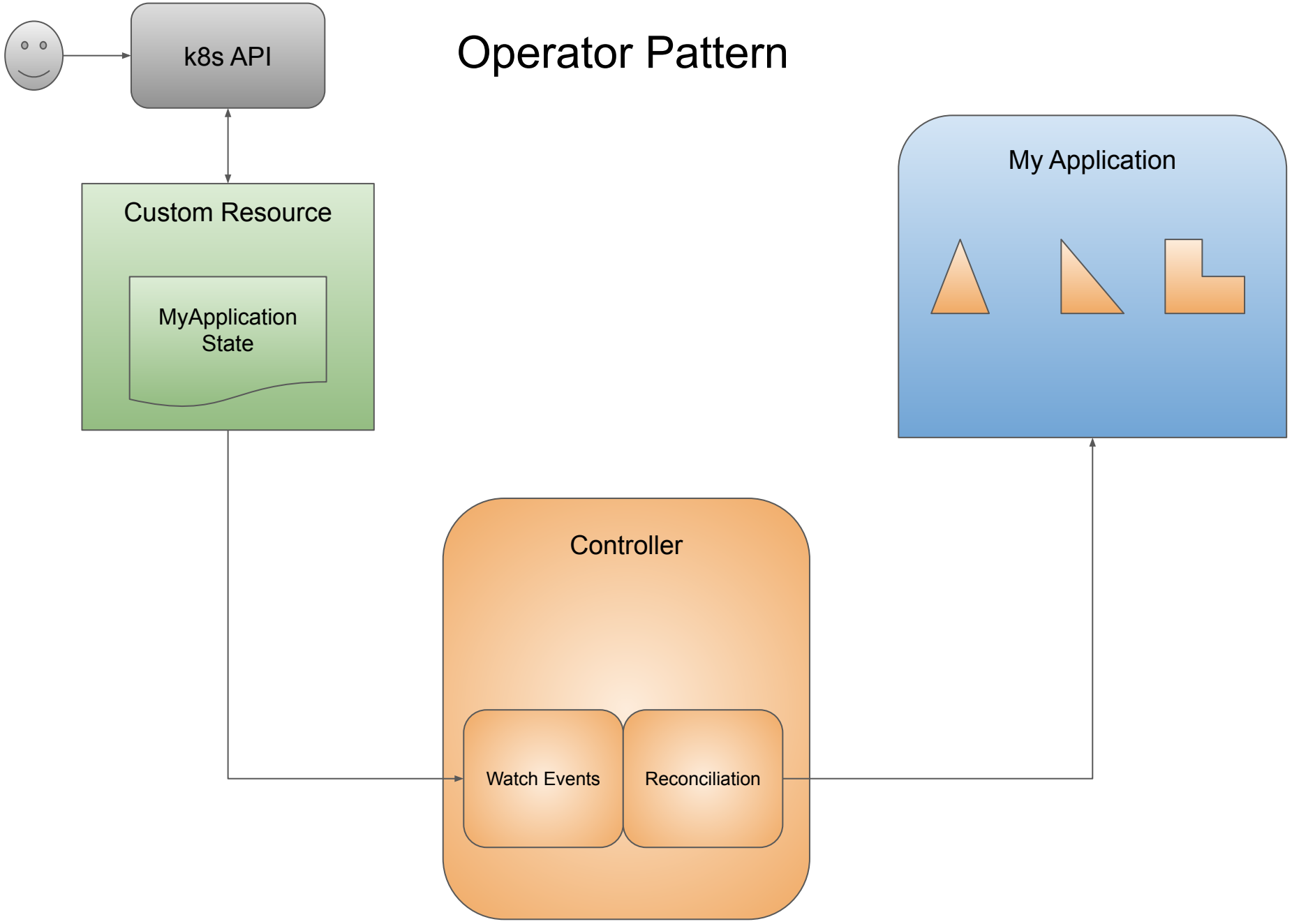
What is an Operator?

- Kubernetes Controller
- Deploys and manages an application
- Human operational knowledge in code
  - Deploy
  - Upgrade
  - Scale
  - Backup
  - Repair
  - ...

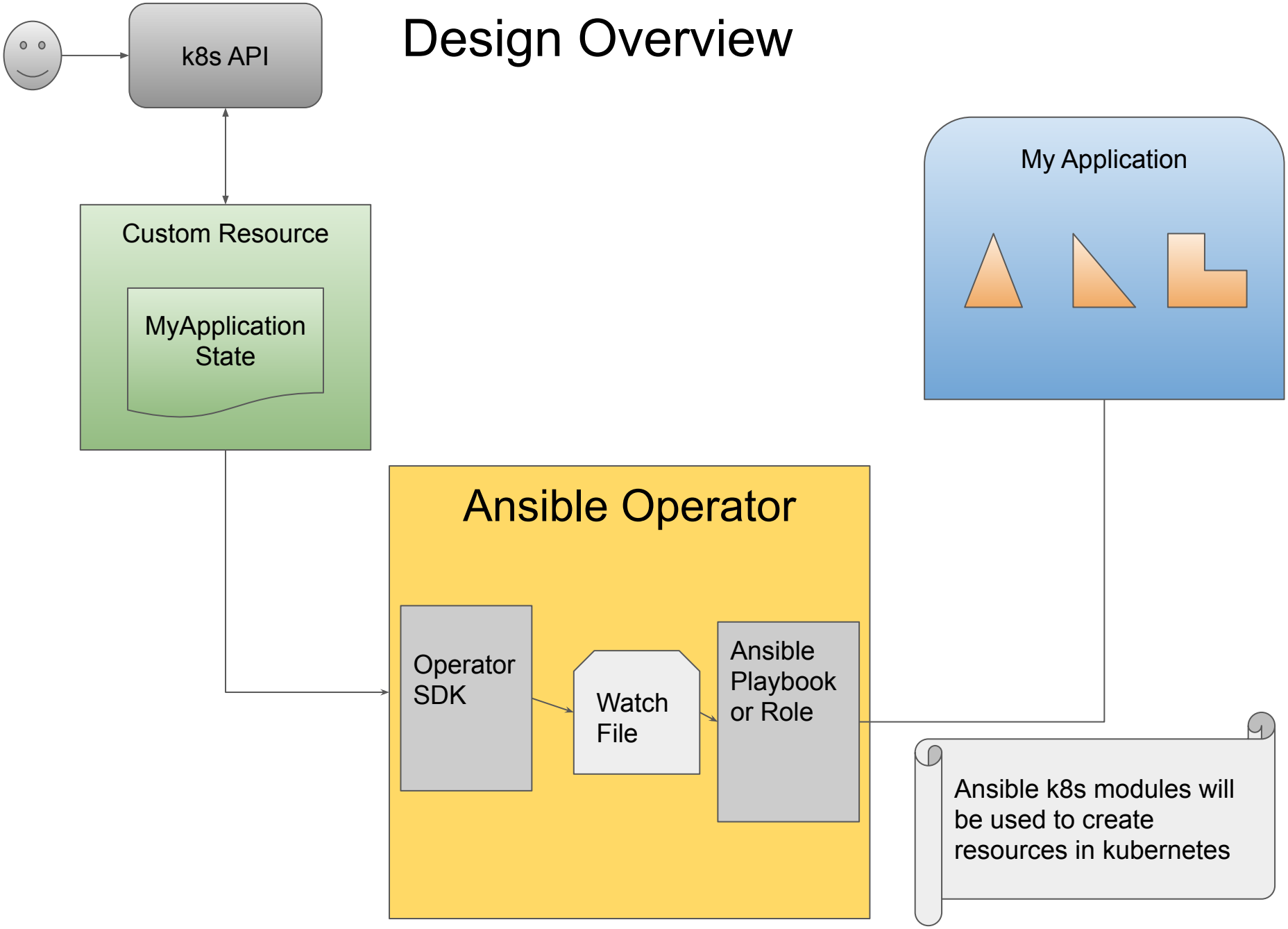
Extending the Kubernetes API

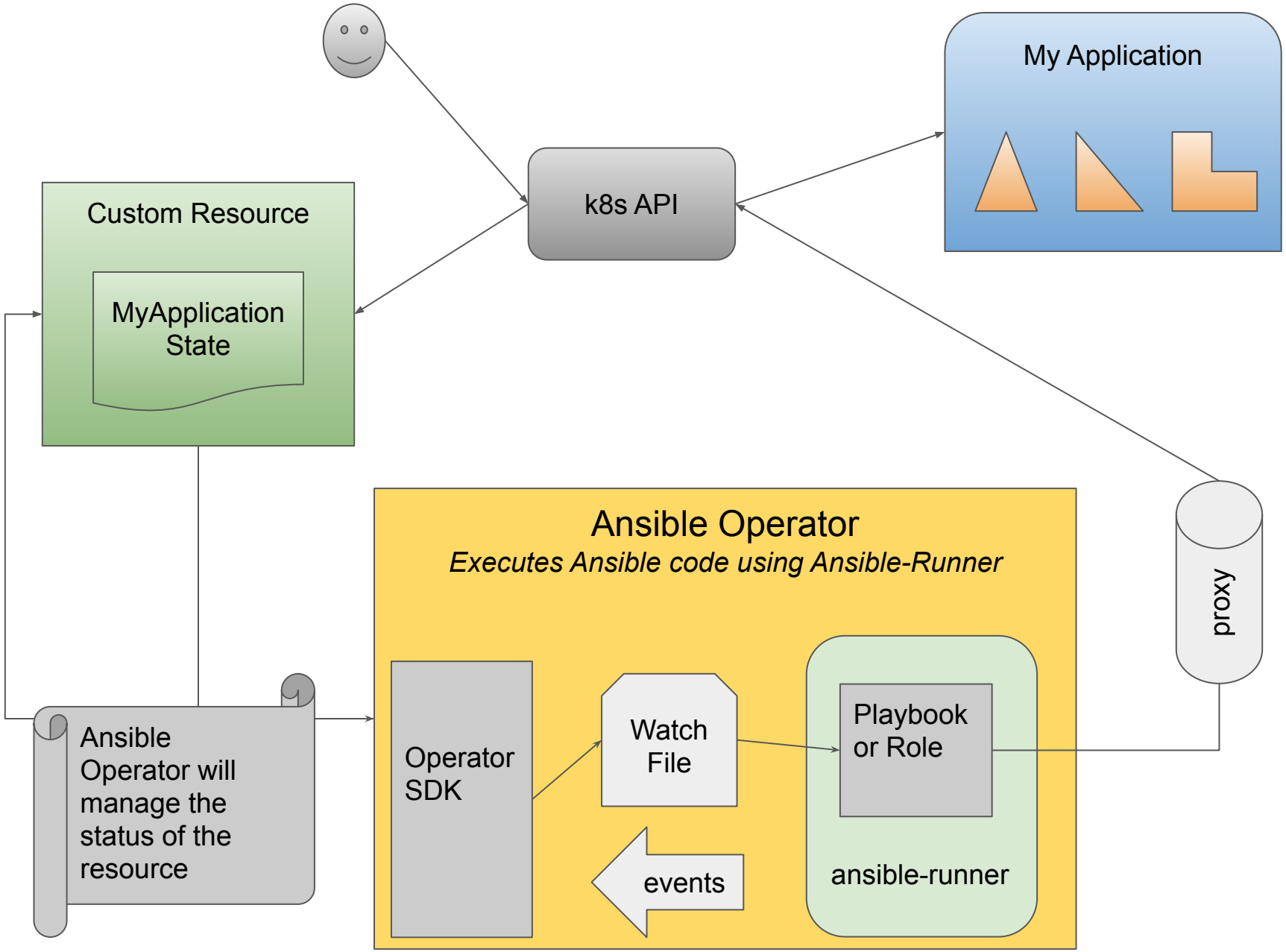
- You can define Custom Resources
- Choose what fields a user can “specify”

```
apiVersion: cache.example.com/v1alpha1
kind: Memcached
metadata:
  name: example-memcached
spec:
  size: 3
```


Operator Pattern
k8s API
Custom Resource
MyApplication
State
My Application
Controller
Watch Events
Reconciliation

Design Overview




My Application
k8s API
Custom Resource
MyApplication
State
proxy
Ansible Operator
Executes Ansible code using Ansible-Runner
Ansible
Operator will
manage the
status of the
resource
Operator
SDK
Watch
File
Playbook
or Role
events
ansible-runner

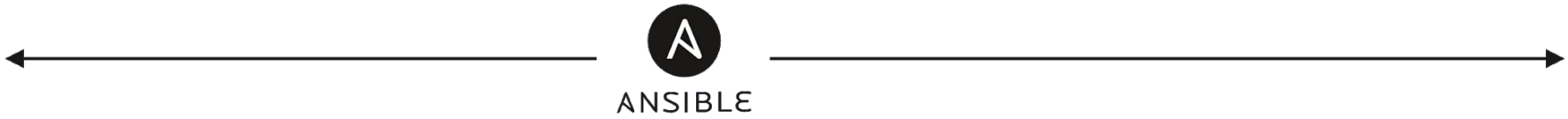
watches.yaml

- Maps a Group Version Kind (GVK) to a role or playbook.

```
# watches.yaml
---
 -  version: v1alpha1
    group: cache.example.com
    kind: Memcached
    playbook: /path/to/playbook
```

- Helps you create an operator
- Write using Go, Ansible, or Helm
- https://github.com/operator-framework/operator-sdk/

Phase I	Phase II	Phase III	Phase IV	Phase V
Basic Install	**Seamless Upgrades**	**Full Lifecycle**	**Deep Insights**	**Auto Pilot**
Automated application provisioning and configuration management	Patch and minor version upgrades supported	App lifecycle, storage lifecycle (backup, failure recovery)	Metrics, alerts, log processing and workload analysis	Horizontal/vertical scaling, auto config tuning, abnormal detection, scheduling tuning



Spec To Parameters

Custom Resource

```
apiVersion: <Group/Version>
kind: <kind>
metadata:
  name: <name>
spec:
   <key>: <value>
   ….
status:
  <key>: <value>
  ….
```

Ansible Operator

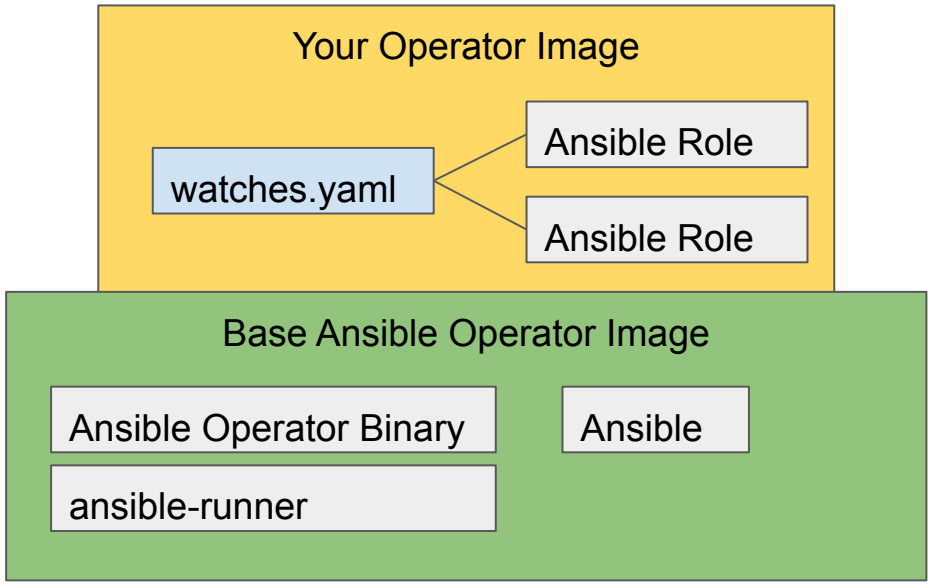
Spec values will be translated to Ansible extra vars.

Status will be a generic status defined by the operator. This will use ansible runner output to generate meaningful output for the user.

Anatomy of Operator Image

From a base Ansible Operator image:

- Add **watches.yaml**, which is a mapping of Group-Version-Kinds to a playbook or role.
- Add one or more **Ansible roles**.



Ansible Developer Experience

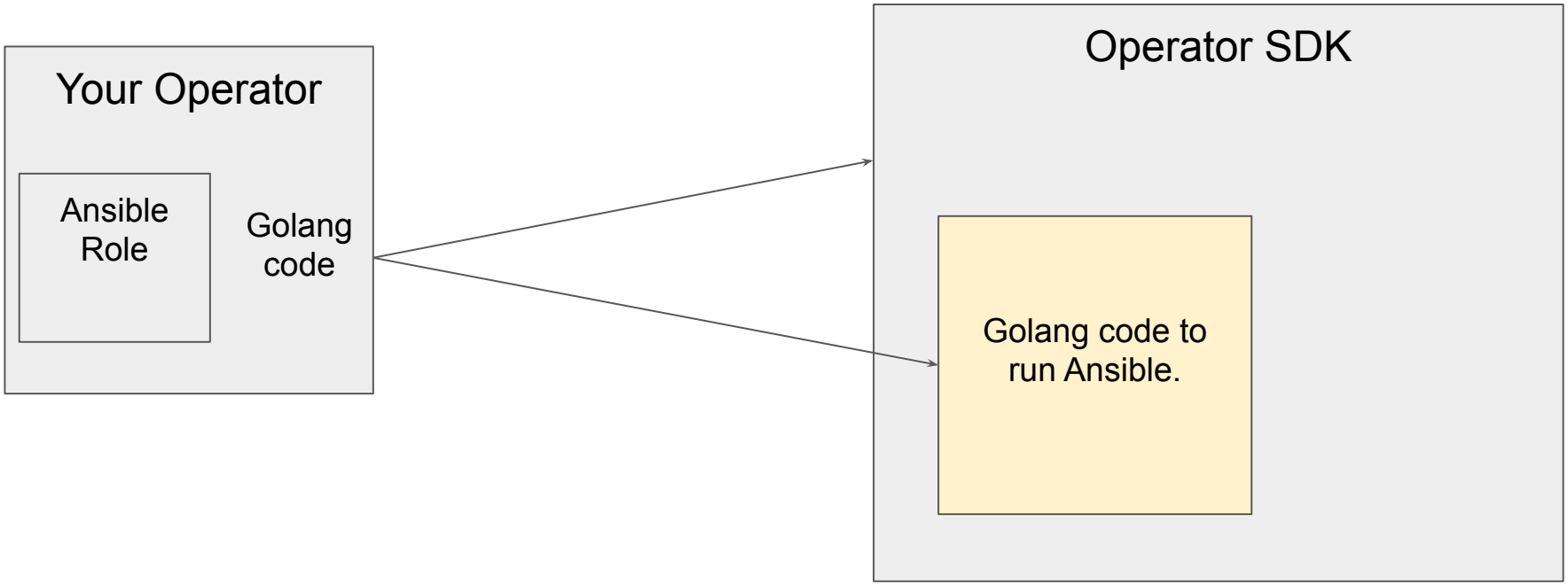
```
$ operator-sdk new memcached-operator
--api-version=cache.example.com/v1alpha1 --kind=Memcached
--type=ansible
```

Creates:

- Ansible Role
- Mapping File (watches.yaml)
- Custom Resource Definition
- Deploy manifest for the new Operator

Hybrid Use Case

- The Ansible Operator is a first class citizen of operator-sdk.
- You can extend/change your operator with golang code to make a hybrid.
- Allows you to change, compose, or reuse the Ansible Operator.



4. Advanced Patterns

Finalizers

- A way to run code before an object gets deleted.

```
# watches.yaml
---
- version: v1alpha1
  group: cache.example.com
  kind: Memcached
  role: /opt/ansible/roles/memcached
  finalizer:
    name: finalizer.memcached.cache.example.com
    role: /opt/ansible/roles/memfin
```

This role will run while an object is being deleted.

Upgrade

Can be an expression using any available variables.

```
- when: version < 1.2
  block:
    - name: “run upgrade tool"
      shell: runupgrade.sh --version 1.2
    - name: “do more upgrade stuff"
      shell: ...
```

Backup / Restore

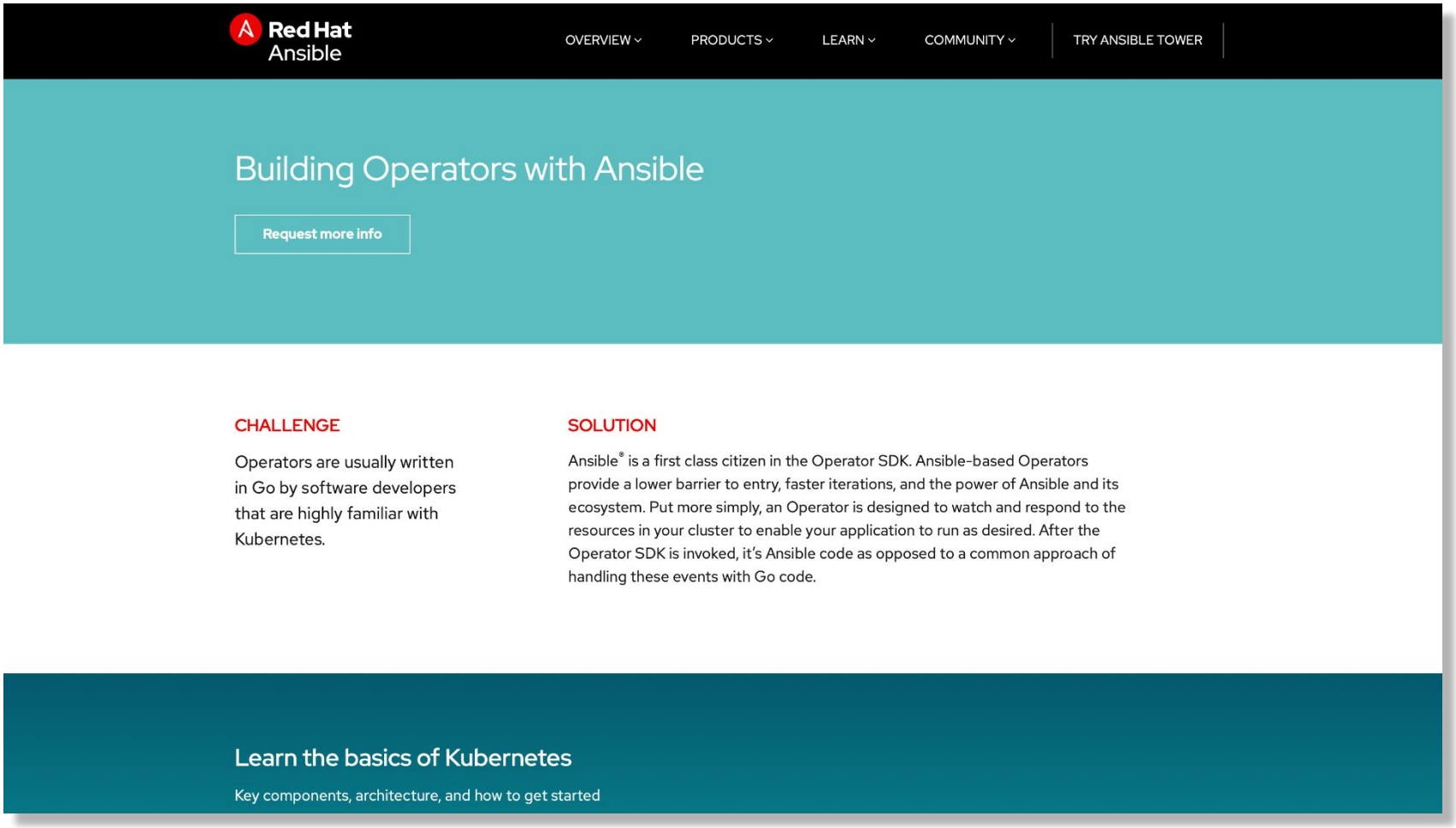
Create a CRD and Controller just for Backup

```
# watches.yaml
---
- version: v1beta2
  group: etcd.database.coreos.com
  kind: EtcdCluster
  playbook: /opt/ansible/playbook.yaml

- version: v1beta2
  group: etcd.database.coreos.com
  kind: EtcdBackup
  playbook: /opt/ansible/backup_playbook.yaml

- version: v1beta2
  group: etcd.database.coreos.com
  kind: EtcdRestore
  reconcilePeriod: 10h
  playbook: /opt/ansible/restore_playbook.yaml
```

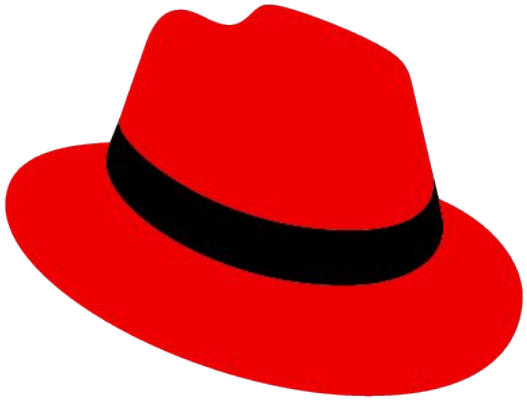
Defines how and when a backup should be created.

Defines workflow logic for backup.

ansible.com/operators



We are hiring!



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Questions

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