Managing the Kubernetes API Server and Pods

INTRODUCTION AND USING THE KUBERNETES API

Anthony E. Nocentino
ENTERPRISE ARCHITECT @ CENTINO SYSTEMS

@nocentino www.centinosystems.com

Course Overview

Using the Kubernetes API

Managing Objects with Labels, Annotations, and Namespaces

Running and Managing Pods

Overview

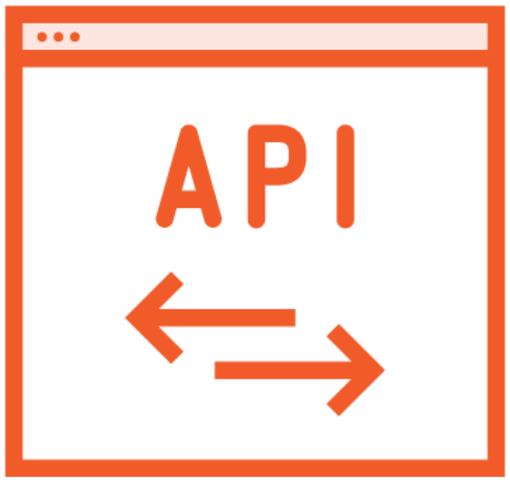
The Kubernetes API and API Server

Working with Kubernetes Objects

- Defining objects
- API Groups
- API Versioning

Anatomy of an API Request

Kubernetes API and API Server



Single surface area over the resources in your data center

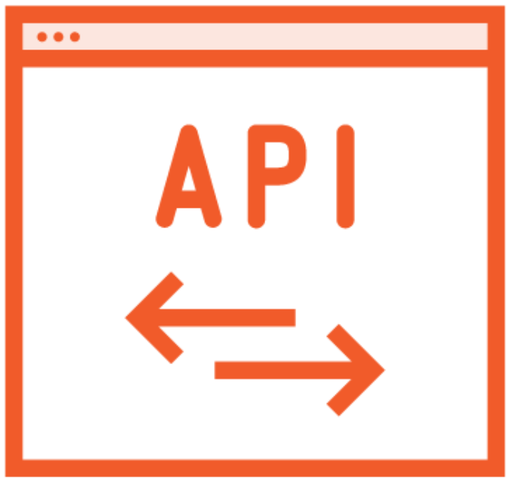
API Objects

- Collection of primitives to represent your system's state
- Enables configuration of state

API Server

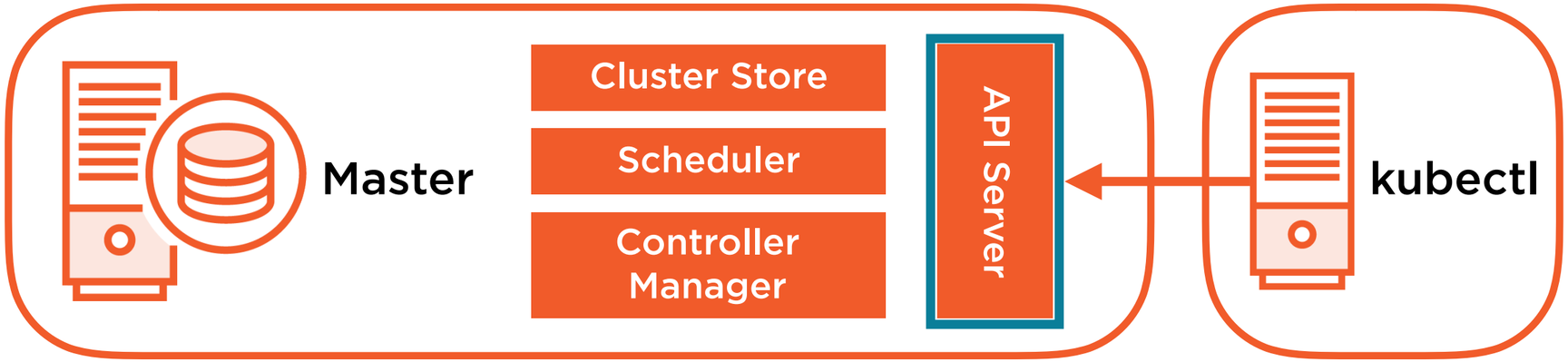
- The sole way to interact with your cluster
- The sole way Kubernetes interacts with your cluster

Kubernetes API Server

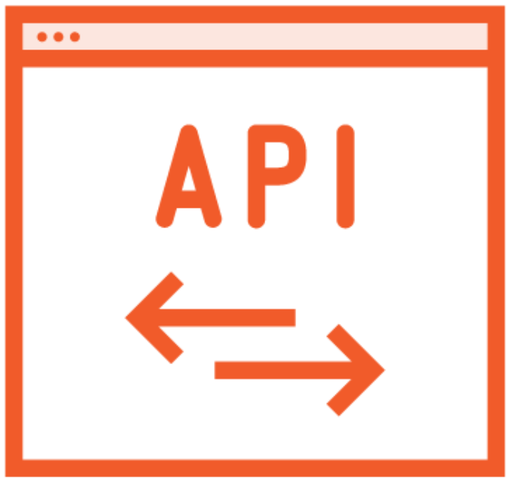


- Client/Server architecture
  - RESTful API over HTTP using JSON
  - Client submits requests over HTTP/HTTPS
  - Server responds to the request
- Stateless
- Serialized and persisted in the cluster store

Master Node - Control Plane



Kubernetes API Objects



Persistent entities in Kubernetes

Representing the state of your system

Objects are organized by

Kind - `Pod`, `Service`, `Deployment`

Group - core, apps, storage

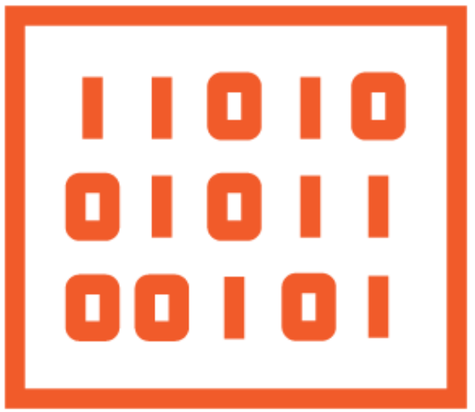
Version - v1, `beta`, `alpha`

Kubernetes API Objects (Kind)

Pods

Deployments

Services



PersistentVolumes

Not an exhaustive list, but these are the key players

Working with Kubernetes Objects

Imperative configuration

Declarative configuration

- **Define our desired state in code**
- **Manifest**
- **YAML or JSON**

```
kubectl apply -f deployment.yaml
```

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
spec:
  containers:
  - name: nginx
    image: nginx
```

Basic Manifest - Pod

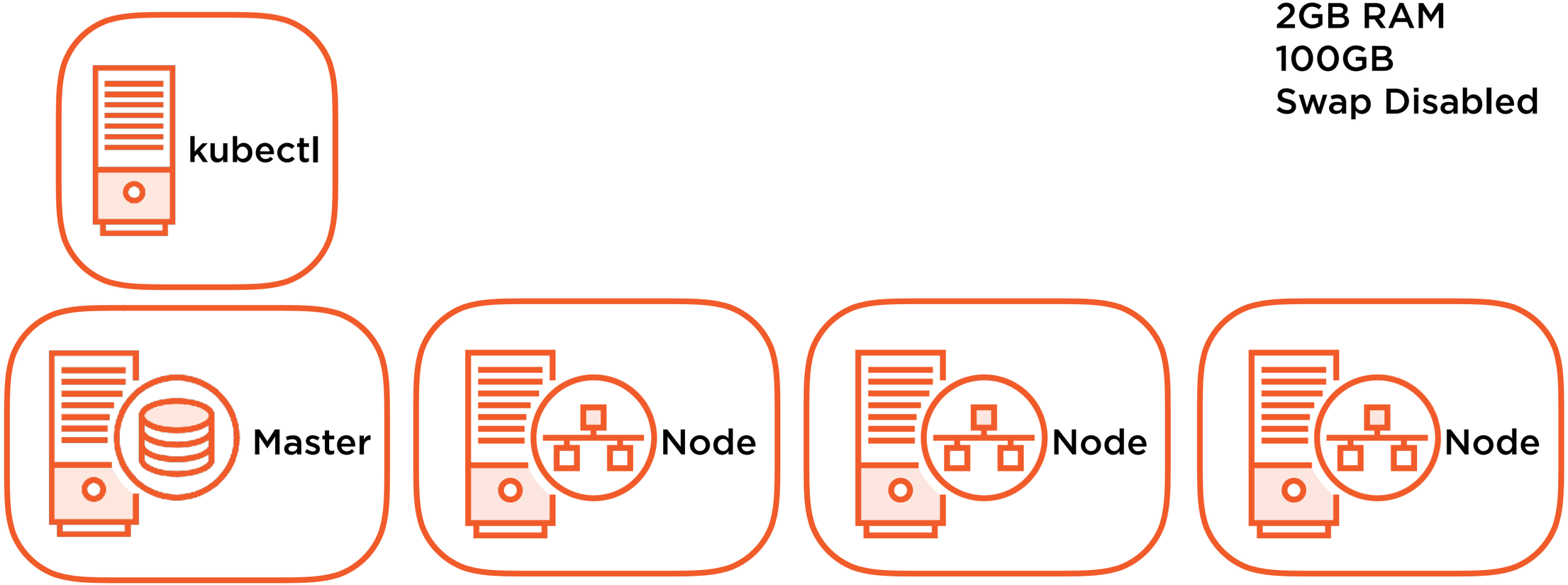
```
kubectl apply -f nginx.yaml
```

https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.14/

Hostnames set
Host file on each

Lab Environment

Ubuntu 16.0.4
VMware Fusion VMs
2vCPU
2GB RAM
100GB
Swap Disabled



c1-master1	c1-node1	c1-node2	c1-node3
172.16.94.10	172.16.94.11	172.16.94.12	172.16.94.13

Demo

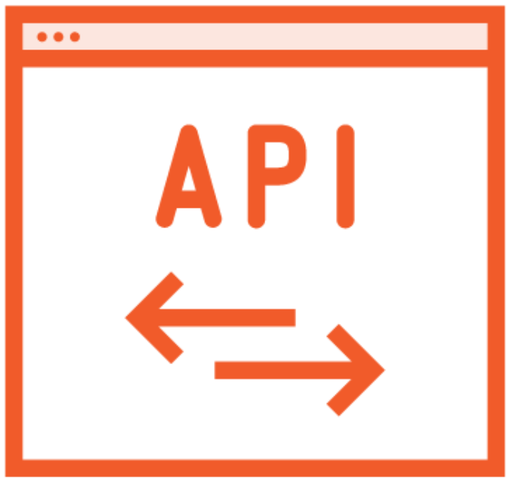
API Server Discovery

Listing Available API Resources

Using `kubectl explain`

Defining objects in YAML

API Groups



Organization of resources

API Groups

- Core API (Legacy Group)
- Named API Groups

Part of the API Object's URL in API Requests

API Groups

Core (Legacy)

Pod

Node

Namespace

PersistentVolume

PersistentVolumeClaim

Named API Groups

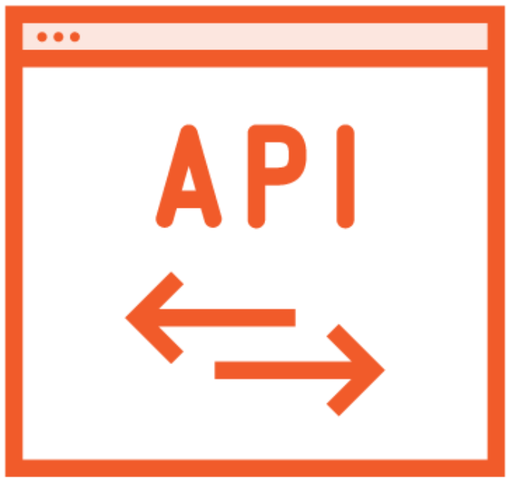
apps - **Deployment**

storage.k8s.io - **StorageClass**

rbac.authorization.k8s.io - **Role**

https://kubernetes.io/docs/reference/generated/kubernetes-api/v1.14/

API Versioning



API is versioned

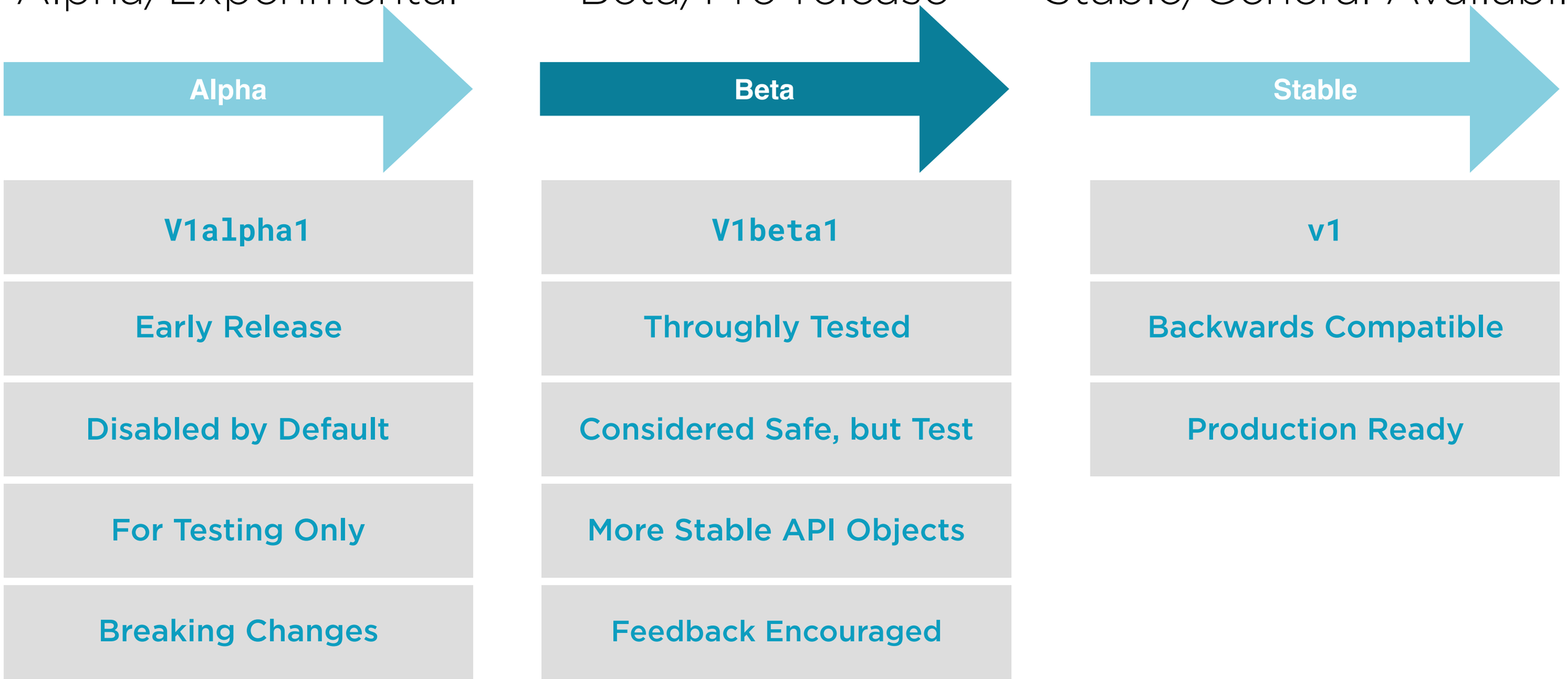
Provide stability for existing implementations

Enable forward change

Alpha -> Beta -> Stable

No direct relation to release versions

API Versioning

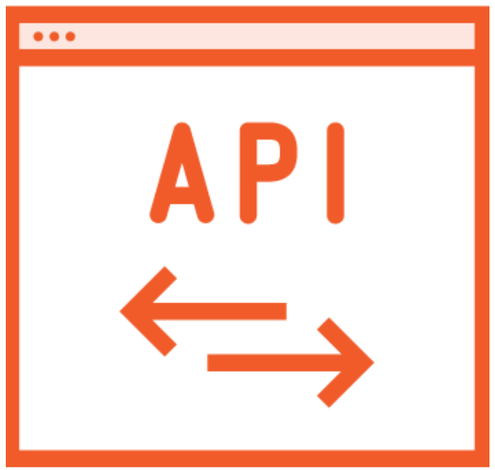


Demo

API Object Discovery

- Examining API Groups
- Examining Different API Versions

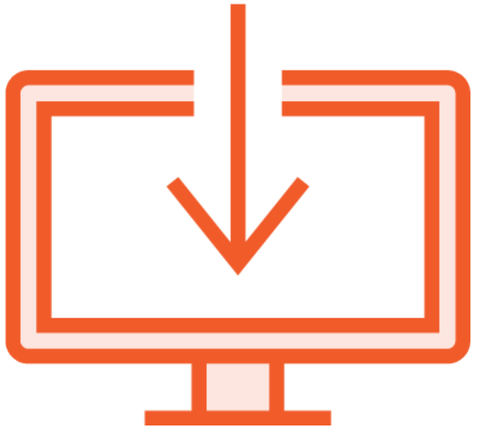
Anatomy of an API Request



API Request

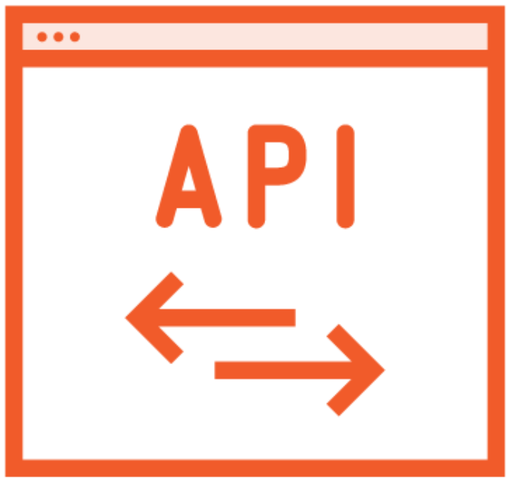
API Paths

Read/Write Objects to/from Cluster Store



Send Response Back to the Client

Anatomy of an API Request



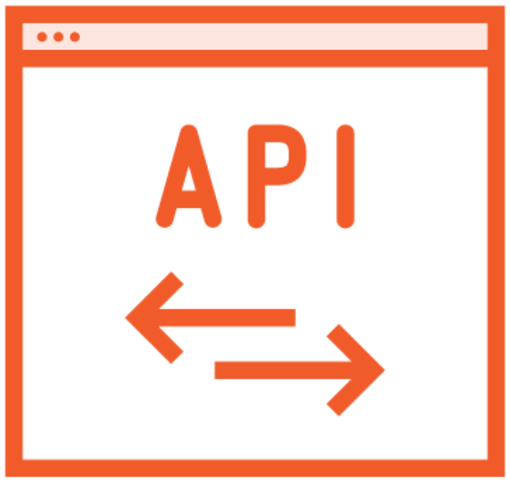
Client and Server architecture

`kubectl`

Any HTTP client that respects the API

`curl`

Anatomy of an API Request



HTTP based RESTful API

- **HTTP Verb**
- **Resource Location (URL/Path)**
- **Request = Verb + Resource Location**
- **Response Code**

RESTful API Verbs

GET	Get the data for a specified resource(s)
POST	Create a resource
DELETE	Delete a resource
PUT	Create or update entire existing resource
PATCH	Modify the specified fields of a resource

Special API Requests

LOG	Retrieve logs from a container in a Pod
EXEC	Exec a command in a container get the output
WATCH	Change notifications on a resource with streaming output

Each resource has a resourceVersion

Watches are started on that version

Notifications are sent to clients watching that version

API Resource Location (API Paths)

Core API (Legacy)

```
http://apiserver:port/api/$VERSION/$RESOURCE_TYPE

http://apiserver:port/api/$VERSION/namespaces/$NAMESPACE/$RESOURCE_TYPE/$RESOURCE_NAME
```

API Groups

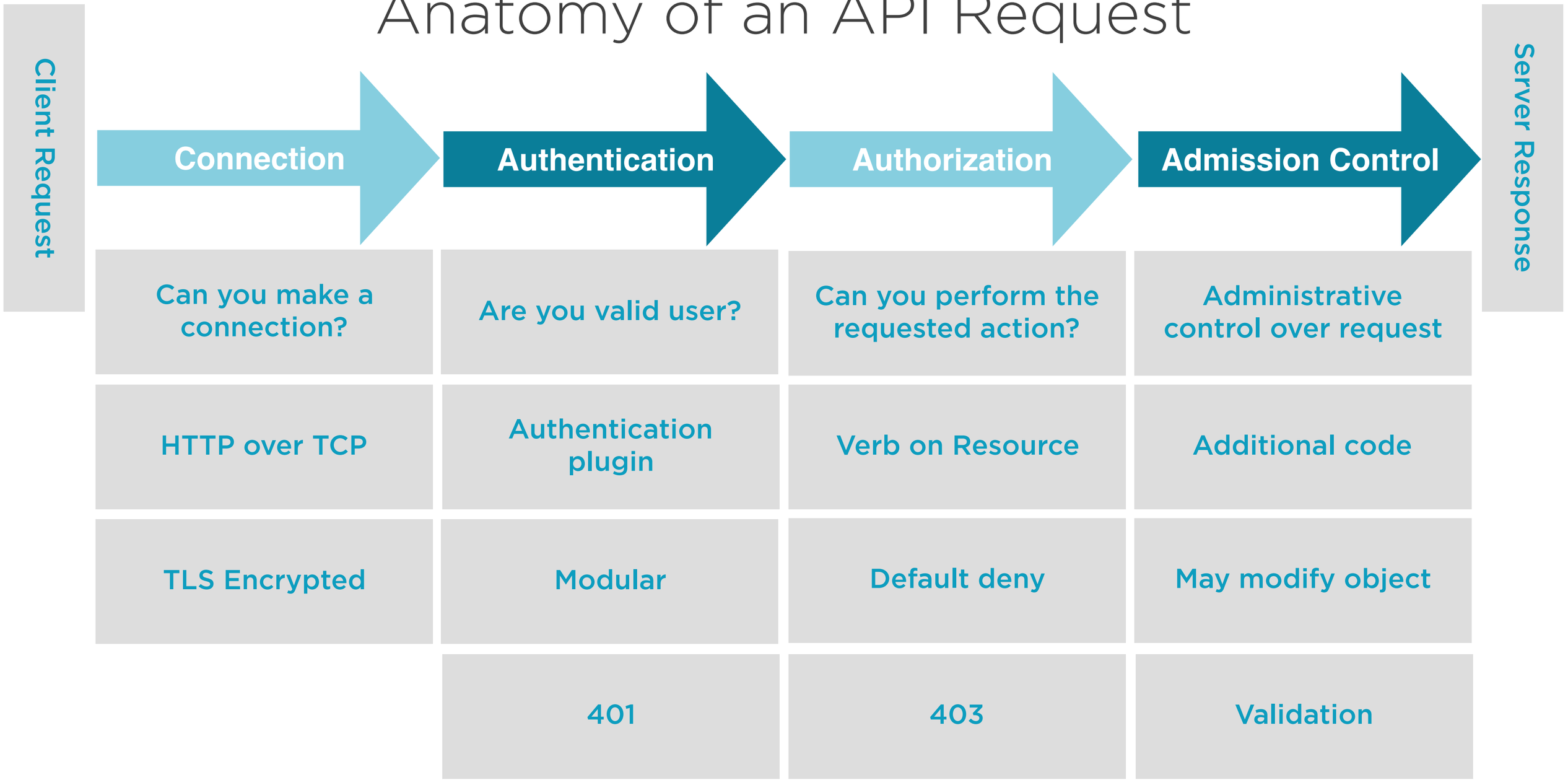
```
http://apiserver:port/apis/$GROUPNAME/$VERSION/$RESOURCE_TYPE

http://apiserver:port/apis/$GROUPNAME/$VERSION/namespaces/$NAMESPACE/$RESOURCE_TYPE/$RESOURCE_NAME
```

Response Codes from the API Server

Success (2xx)	Client Errors (4xx)	Server Errors (5xx)
200 - OK	401 - Unauthorized	500 - Internal Server Error
201 - Created	403 - Access Denied	
202 - Accepted	404 - Not Found	

Anatomy of an API Request



Demo

Anatomy of an API Request

Special API Requests - Watch, Exec and Log

Authentication Failure and Missing Resources

Creating Objects

Summary

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Anatomy of an API Request

What's Next!

Managing Objects with Labels, Annotations, and Namespaces