Hewlett Packard
Enterprise

8.10.2016

An Introduction to Kubernetes

Premys Kafka

premysl.kafka@hpe.com  kafkapre  https://github.com/kafkapre

{ History }

- ???? - Virtual Machines
- 2008 - Linux containers (LXC)
- 2013 - Docker
- 2013 - CoreOS stack
- 2014 - Kubernetes

{ Distributed systems }

- Collection of computers that act, work, and appear as one large computer
- **Advantages:**
  - scalable horizontally, reliable, extensible, cheaper computers, geographic distribution, …
- **Problems:**
  - network can fail, bandwidth, consistency, workload allocation, security issues, …

{ Overview }

- Kubernetes is an open-source system for automating deployment, scaling, and management of containerized applications.
- Name Kubernetes is from Greek word *kybernētēs* which means "helmsman" or "governor“
- Firstly announced by Google in 2014
- Influenced by Google's Borg
- Many contributors (Google, RedHat, IBM, Cisco, VMware)

{ Overview }

- Commonly referred to as "k8s"
- Apache License 2.0
- Written in Go
- Cross-platform (POC for Windows)
- Kubernetes v1.0 was released on July 21, 2015
- Google Container Engine runs k8s

{ Features }

- Automatic binpacking
- Horizontal scaling
- Self-healing
- Storage orchestration
- Service discovery and load balancing
- Secret and configuration management

{ Pod }

- A group of one or more containers with shared storage
- Containers also share an IP address and port space, and can find each other via localhost
- Treated as one logical object
- Deployed on one machine together
- Life cycle
  - Bound to a node, restart in place
  - Can die, cannot be reborn with same ID

{ Replication Controller }

- Creates and destroys Pods dynamically
- Ensures that a pod or particular set of pods are always up and available
  - pods are automatically replaced if they fail
- Scaling Pods
- Recommend to use Replication Controller even when you want to create one Pod

{ Service }

- An abstraction which defines a logical set of Pods and a policy by which to access them
- Pods are targeted and determined by a Label Selector

{ Service Types }

- **ExternalName:** map the service to the contents of the externalName field e.g. example.com
- **ClusterIP:** use a cluster-internal IP only
- **NodePort:** on top of having a cluster-internal IP, expose the service on a port on each node of the cluster
- **LoadBalancer:** on top of having a cluster-internal IP and exposing service on a NodePort also, ask the cloud provider for a load balancer which forwards to the Service

{ Labels }

- Key/value pairs that are attached to objects, such as pods
- Can be used to organize and to select subsets of objects
- Each Key must be unique for a given object
- Loose coupling
- Can be added dynamically

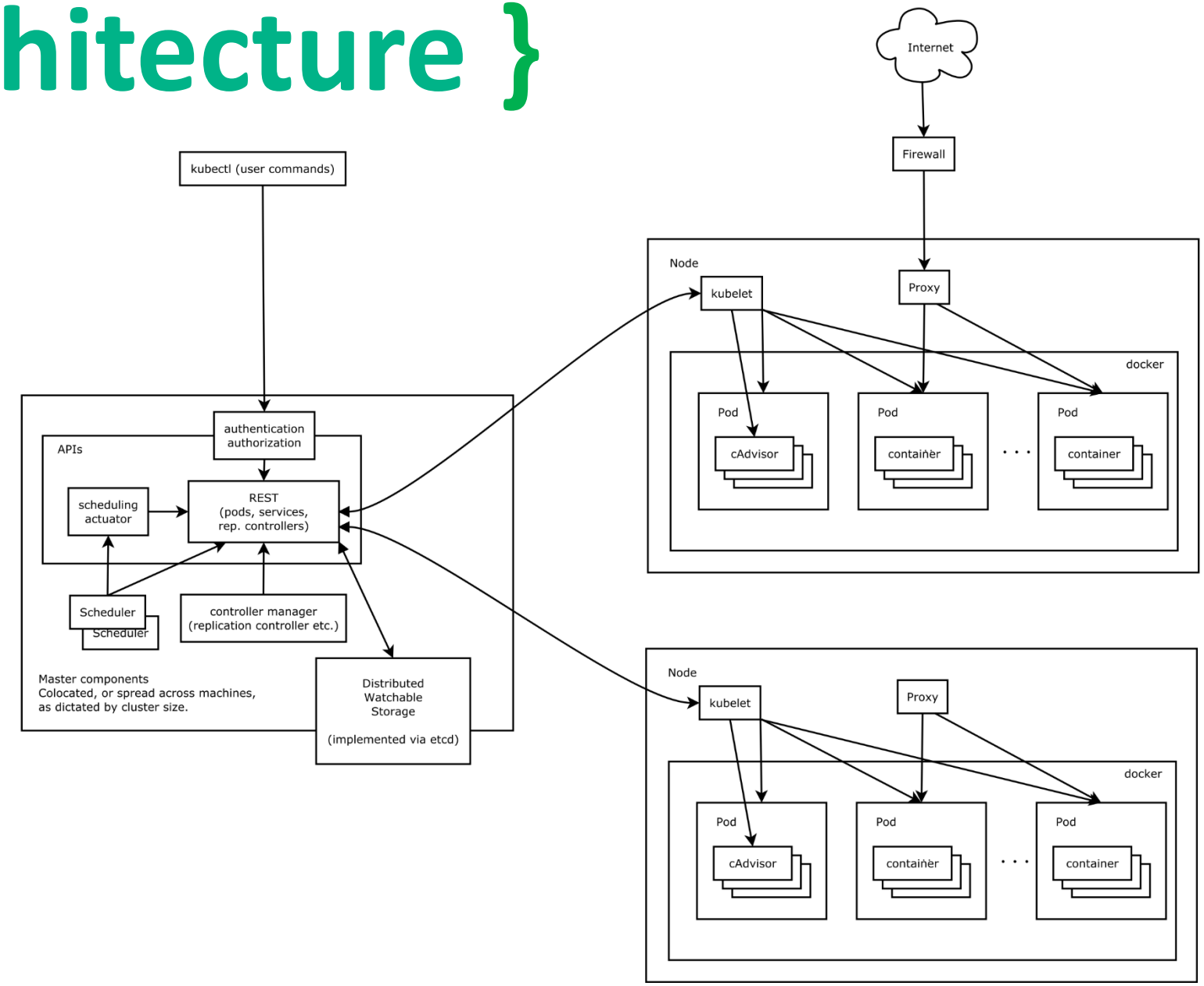
{ Architecture }

- **Two types of nodes**
  - Master node: Master components (APIs, scheduler, etc) are there
  - Worker node: Kubelet and containers are there
- **Kubelet**: takes a set of PodSpecs and ensures that the containers described are running and healthy
- **Kube-proxy**: reflects services on each node and can do simple TCP,UDP stream or round robin TCP,UDP forwarding across a set of backends
- **API Server:** Do business logic implemented in separate components or in plug-ins. Also processes REST operations, validates them, and updates the corresponding objects in persistence (Etcd)

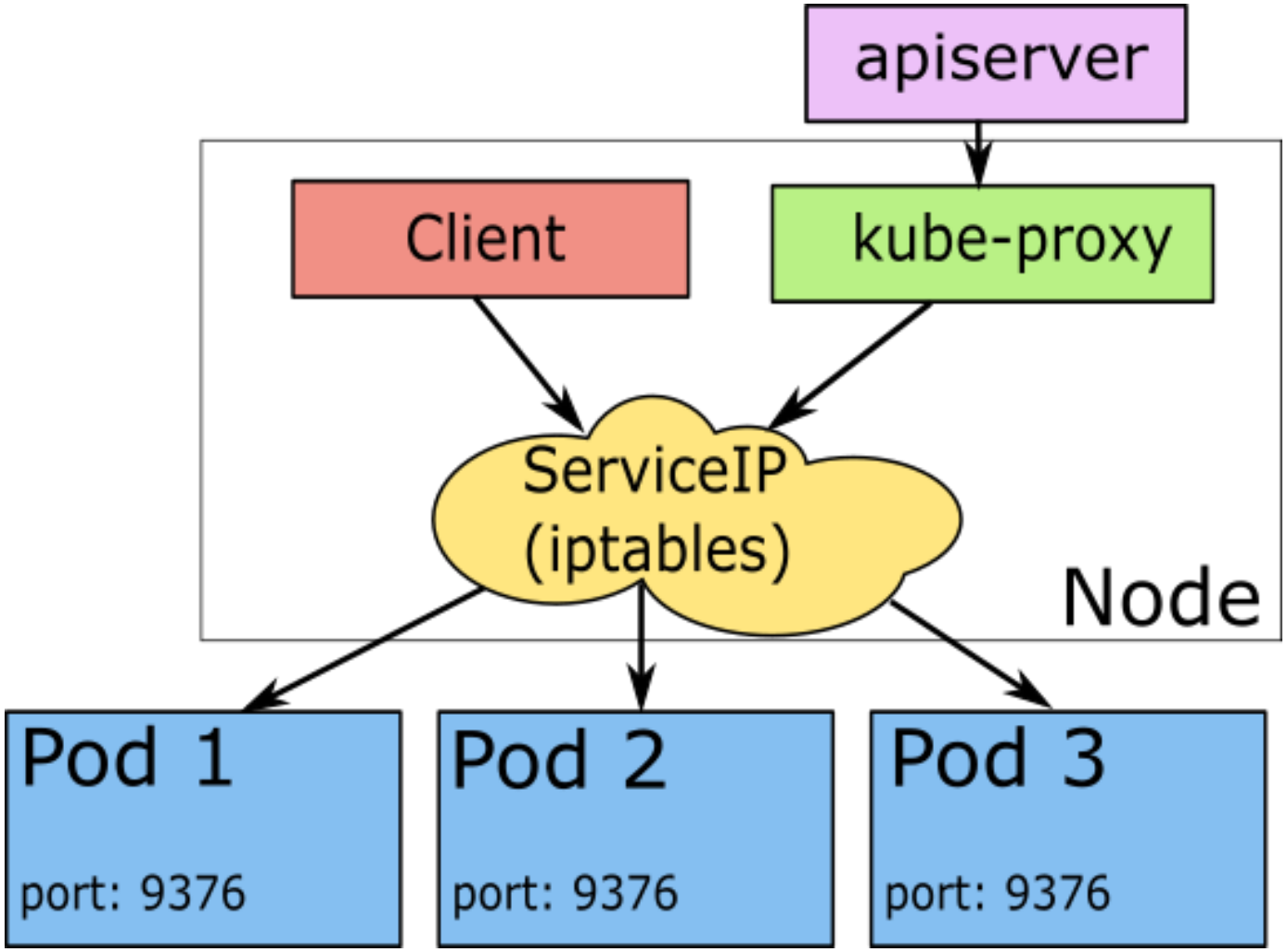
{ Architecture }

- **Scheduler:** binds unscheduled pods to node
- **Control Manager:** processes controllers like DaemonSet Controller, Replication Controller
- **Etcd:** distributed storage
- **Kubectl:** command line client

{ Architecture }



{ Service Schema }



{ Other Features }

- Volumes (Git, NFS, Flocker, some cloud provider storage)
- DNS
- Namespaces
- DaemonSet
- Jobs
- Secrets
- ConfigMaps
- Autoscaling
- Resource limitation

{ Try Kubernetes }

- Install it
  - Minikube – runs virtual machine with k8s
  - Kubeadm – installs k8s on your machine
- Model your application in k8s yamls
- Deploy and manage your application

{ Alternatives }

- Mesos
- Docker Swarm

{ Demo }

K8S DEMO

see: https://github.com/kafkapre/linuxdays2016-kubernetes-example

Hewlett Packard
Enterprise

Thank you!
Q & A

premysl.kafka@hpe.com

kafkapre

https://github.com/kafkapre