RED HAT SUMMIT

Wicked fast PaaS: Performance tuning of OpenShift 3.5 and Docker 1.12

Red Hat OpenShift Engineering
Jeremy Eder and Mike Fiedler, 2017-05-03

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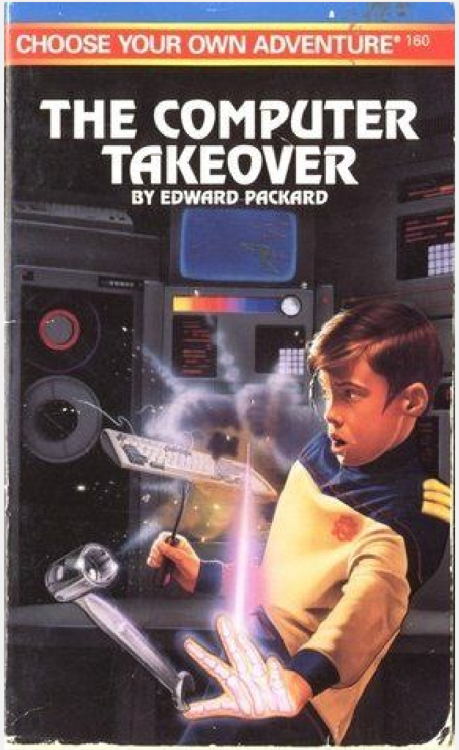

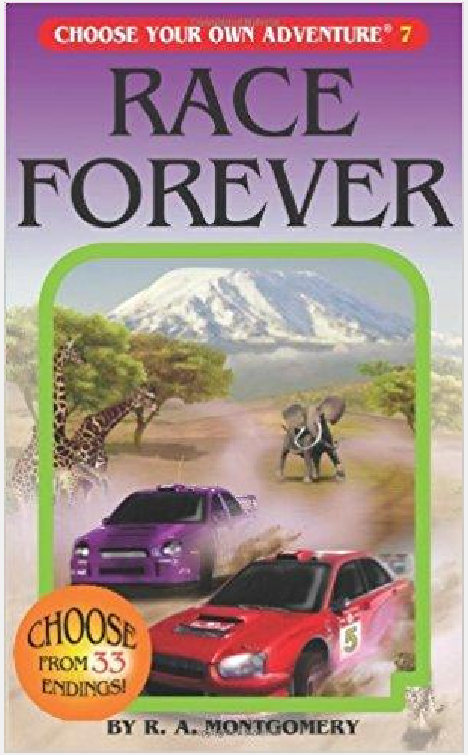

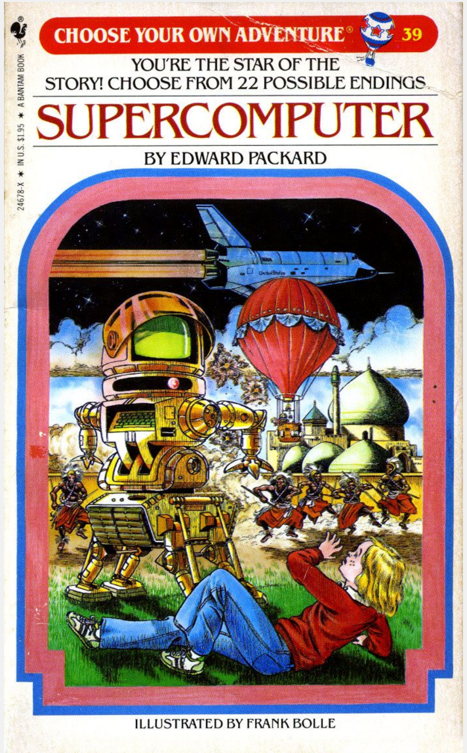
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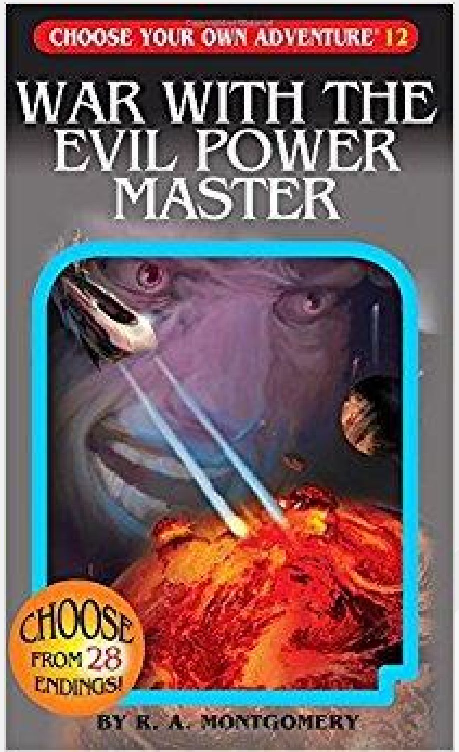
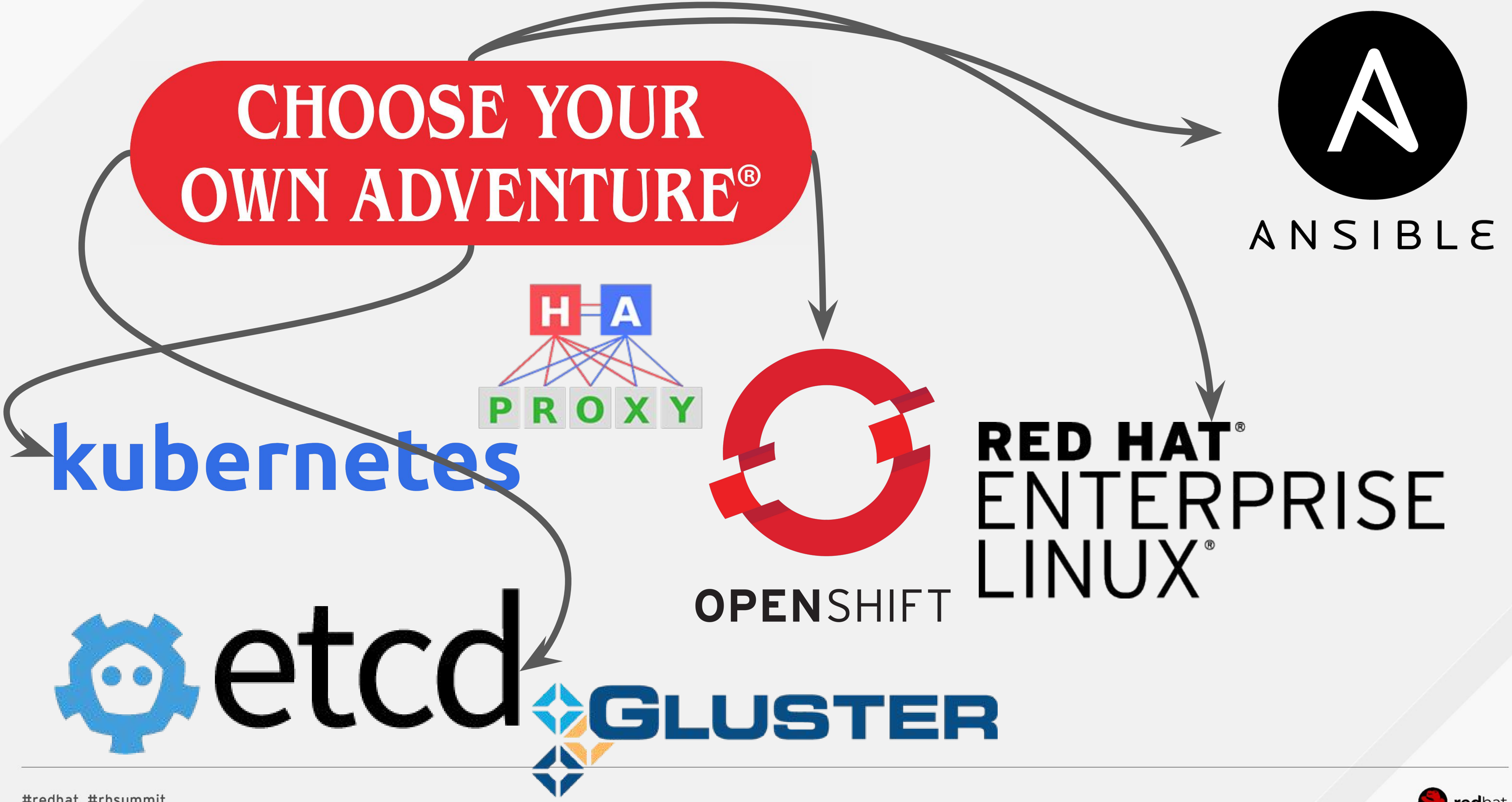




CHOOSE YOUR OWN ADVENTURE®

ANSIBLE

HA PROXY

kubernetes

OPENSHIFT

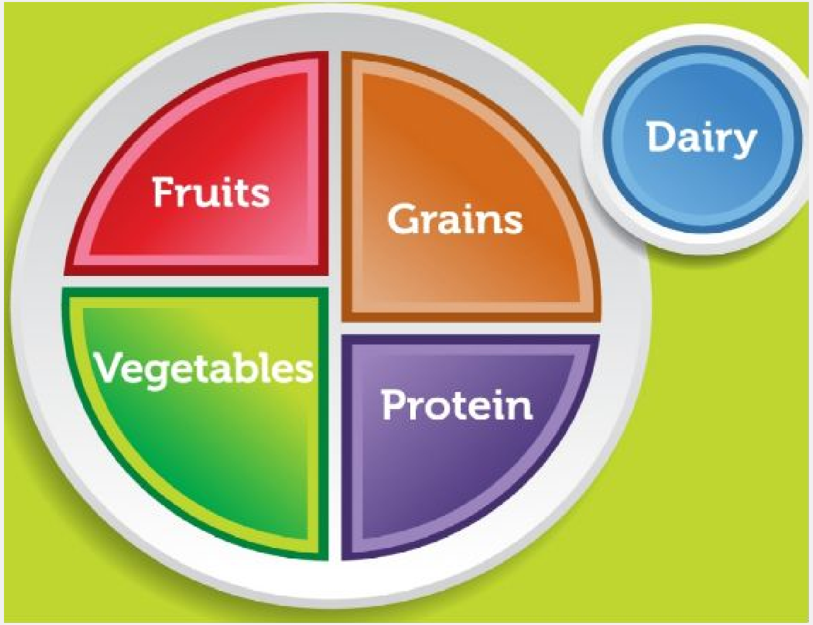
RED HAT® ENTERPRISE LINUX®

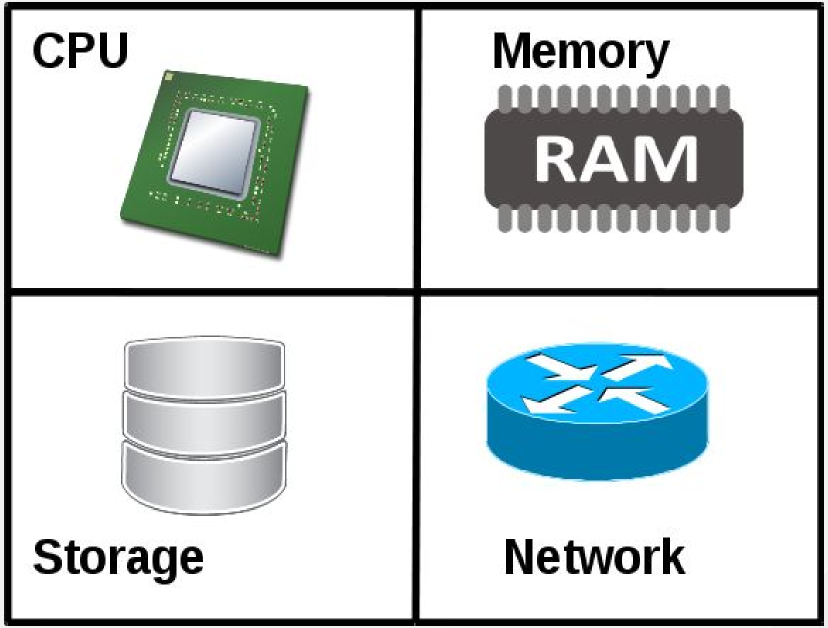
etcd

GLUSTER

```
if [ “$containers” = “linux” ];
   then
   echo “fundamentals don’t change”
fi
```

Subsystem Food Groups





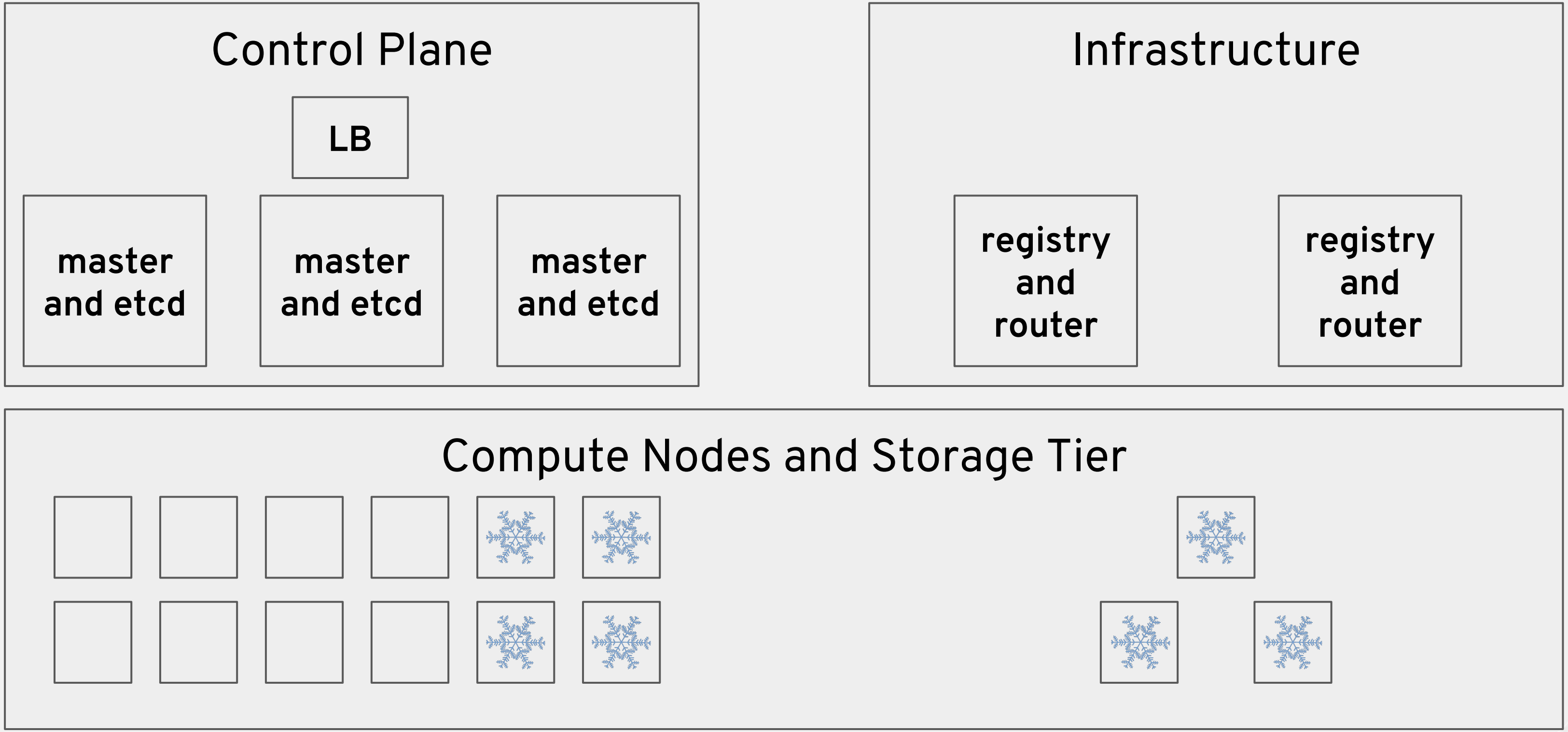
CPU

Memory

Storage

Network

Terminology Overview



Control Plane

LB

master and etcd

master and etcd

master and etcd

Infrastructure

registry and router

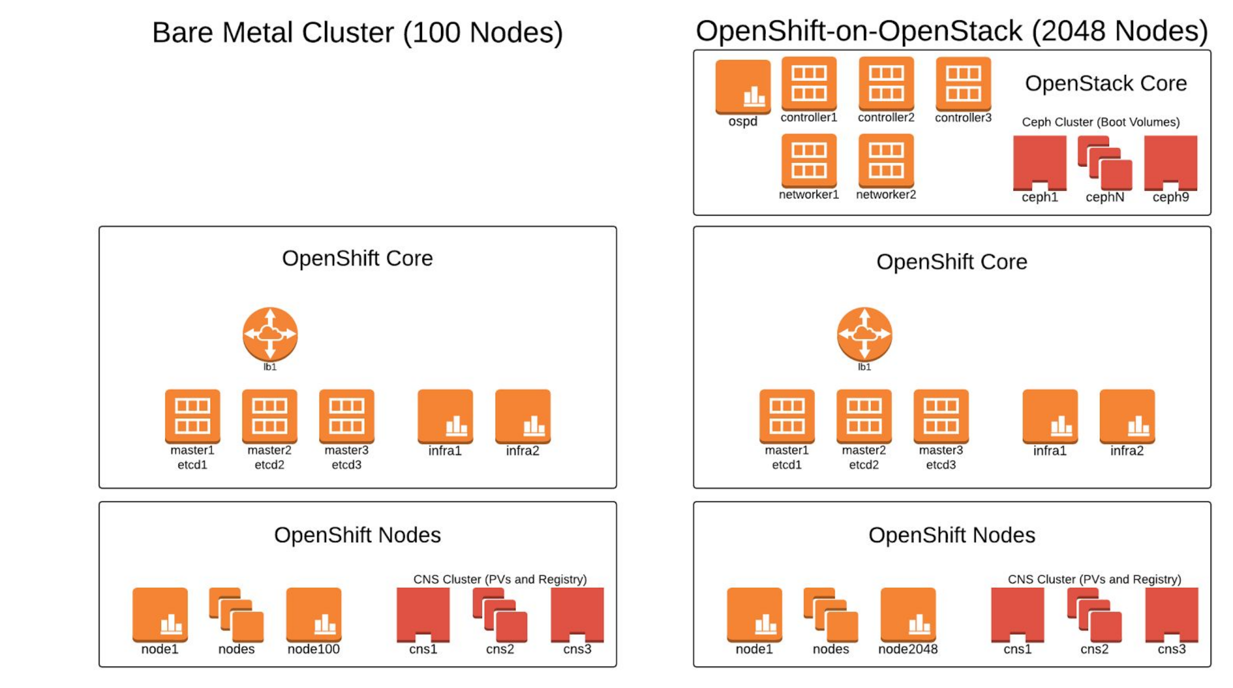
registry and router

Compute Nodes and Storage Tier

Let’s just get this out of the way

- We’re talking about OCP 3.5 or later
- Slides: https://www.slideshare.net/jeremyeder/
- Code: https://github.com/openshift/svt
- There’s no video recording of this.

Deploying 2048 OpenShift nodes on the CNCF Cluster



https://www.cncf.io/blog/2017/03/28/deploying-2048-openshift-nodes-cncf-cluster-part-2/

OpenShift 3.5: Installation

ANSIBLE

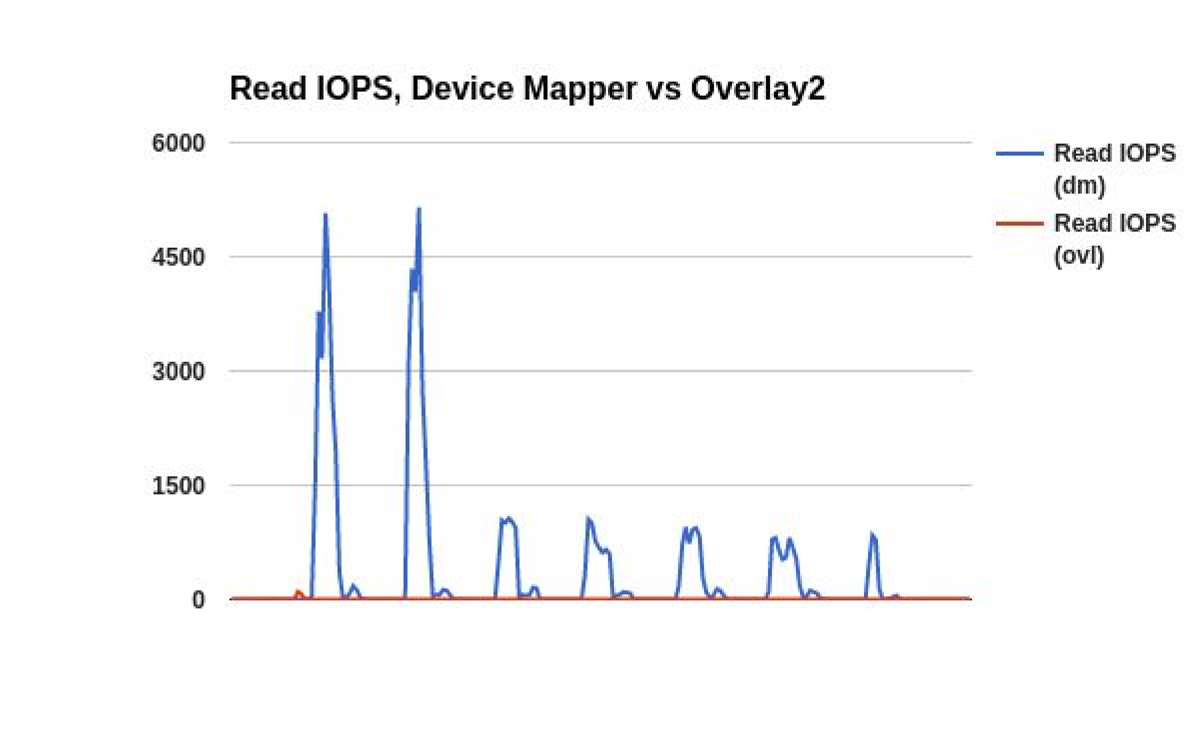
```
[defaults]
forks = 20
gathering = smart
fact_caching = jsonfile
fact_caching_timeout = 600
callback_whitelist = profile_tasks

[ssh_connection]
ssh_args = -o ControlMaster=auto -o
ControlPersist=600s
control_path = %(directory)s/%%h-%%r
pipelining = True
timeout = 10
```

https://docs.openshift.org/latest/scaling_performance/install_practices.html

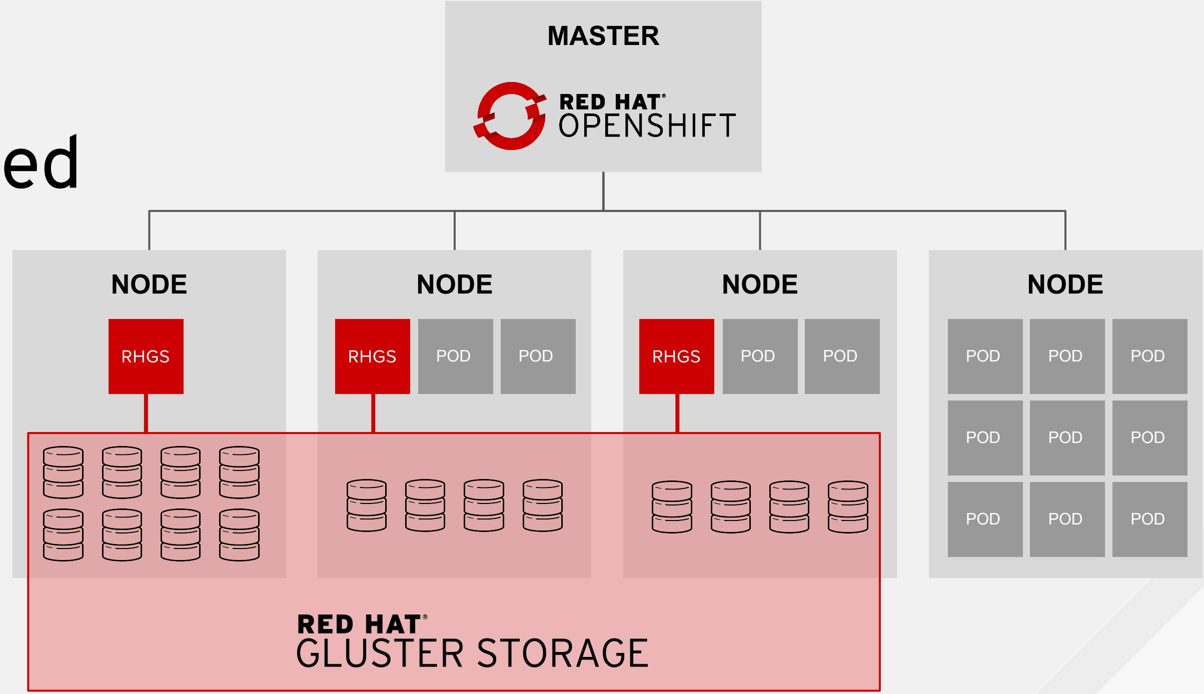
Docker Graph Driver: devicemapper vs overlay2

- RHEL 7.4
- SELinux
- Overlay2



Container Native Storage

- Dynamic
- Hyperconverged
- Scalable
- Performant



CNS Session Thu 11:30a, Rm 157A

Container Native Storage: StorageClasses

```
apiVersion: storage.k8s.io/v1beta1
kind: StorageClass
metadata:
  name: cnsclass
provisioner: kubernetes.io/glusterfs
parameters:
  resturl: "http://172.25.87.92:8080"
  restuser: "admin"
```

```
apiVersion: storage.k8s.io/v1beta1
kind: StorageClass
metadata:
  name: ec2class
provisioner: kubernetes.io/aws-ebs
parameters:
  type: io1
  zone: us-west-2b
```

Container Native Storage

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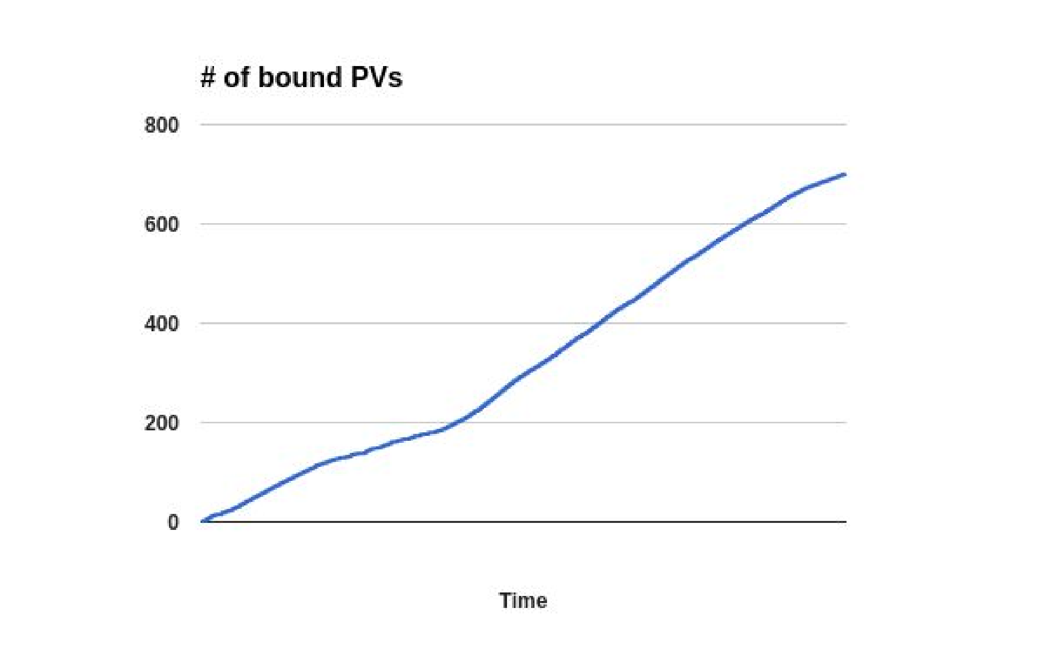
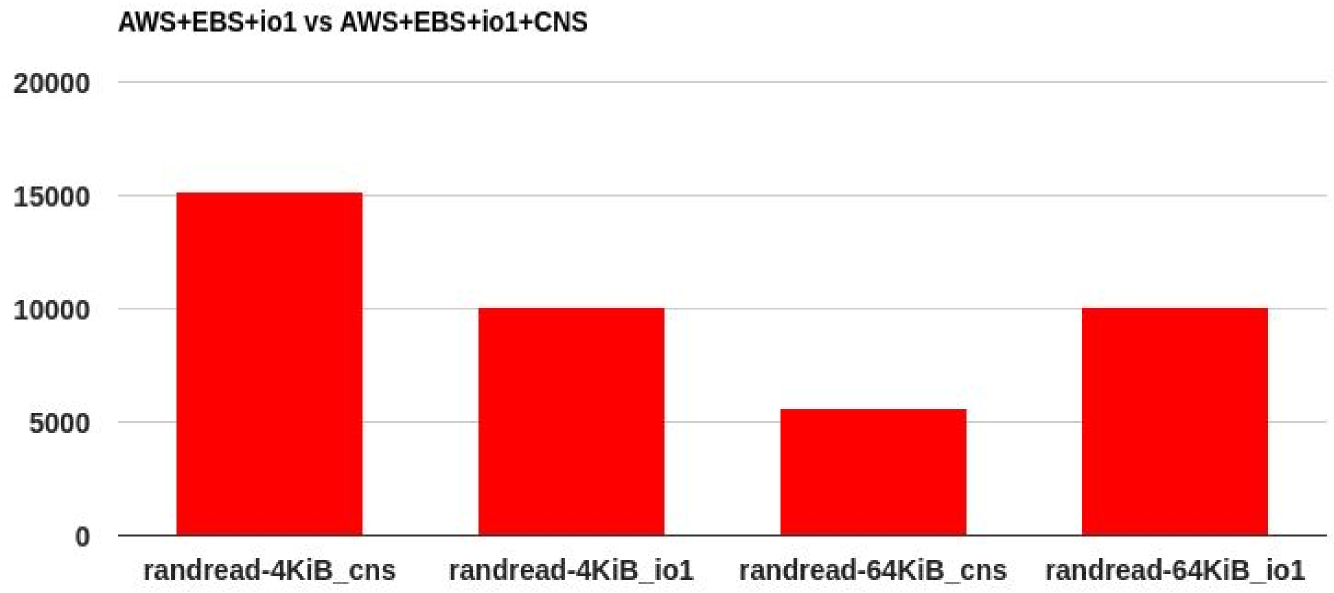


Container Native Storage



etcd

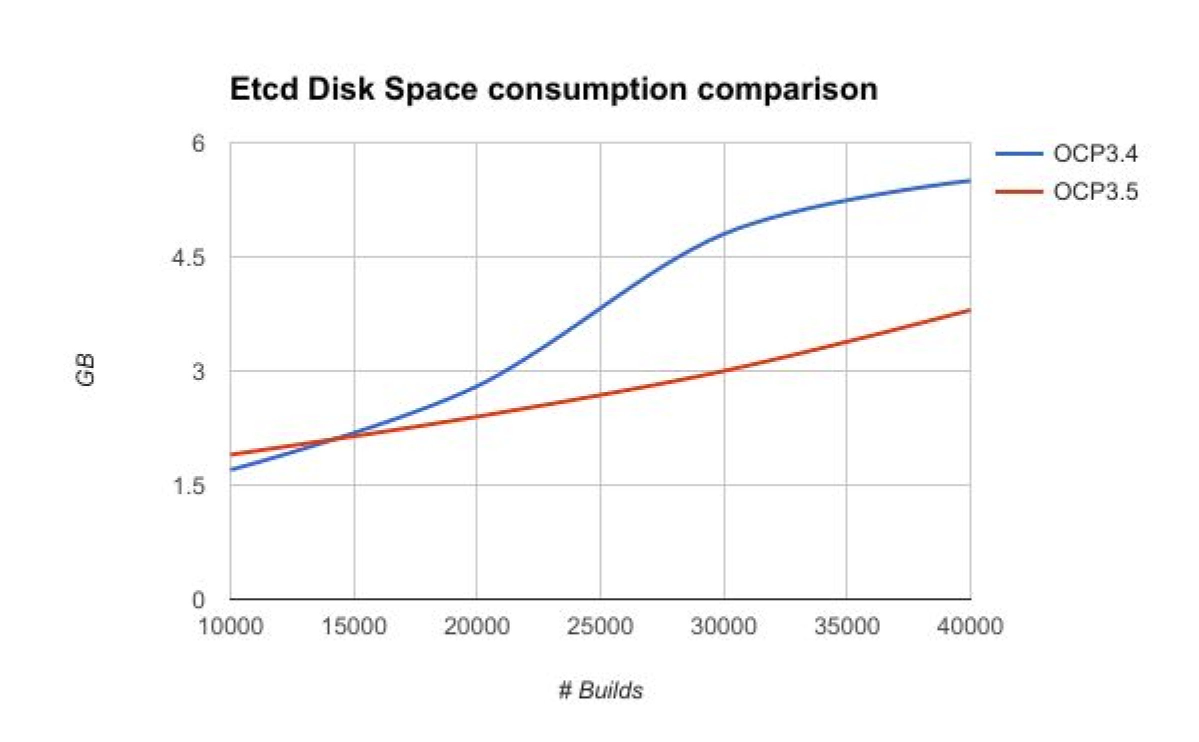
distributed key value store that provides a reliable way to store data across a cluster of machines

OpenShift 3.5: etcd-3.1.x

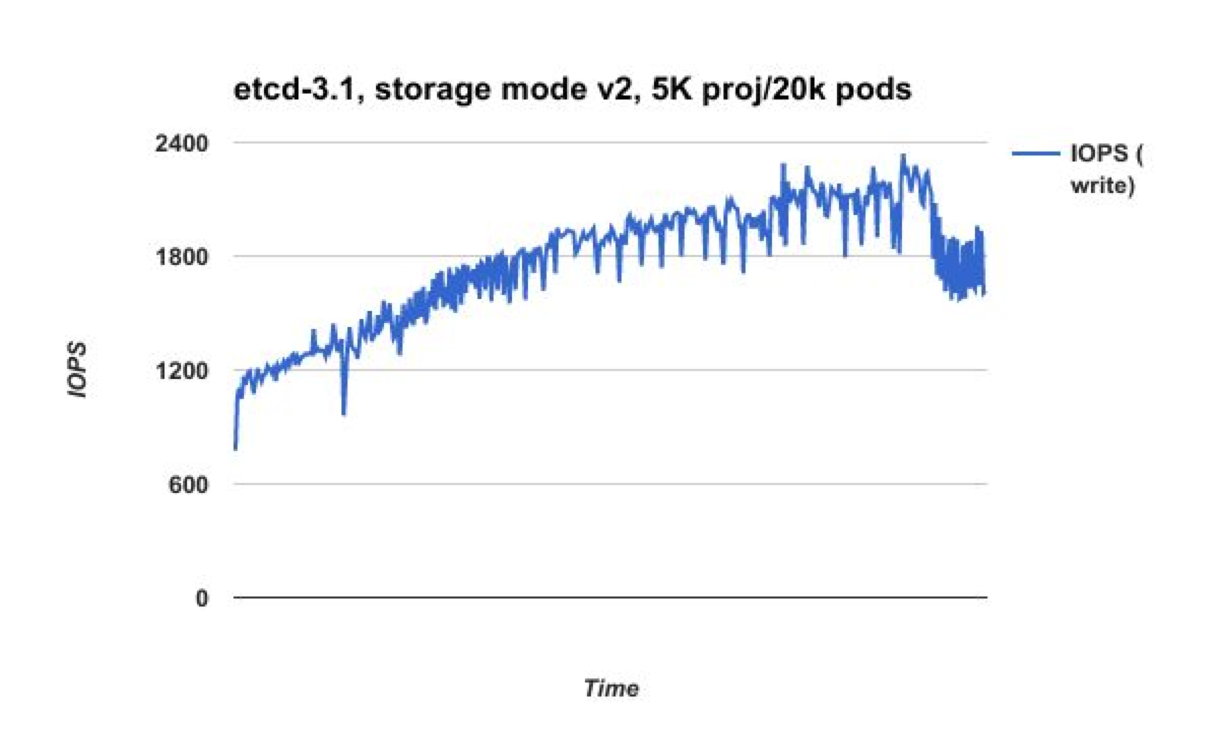
- etcd-2.x limited node scalability
- etcd-3.x gets us to 2000+ nodes comfortably
- Image metadata moved from etcd to registry in 3.4.z and 3.5.

https://www.cncf.io/blog/2017/03/28/deploying-2048-openshift-nodes-cncf-cluster-part-2/

OpenShift 3.5: Image Metadata moved to Registry

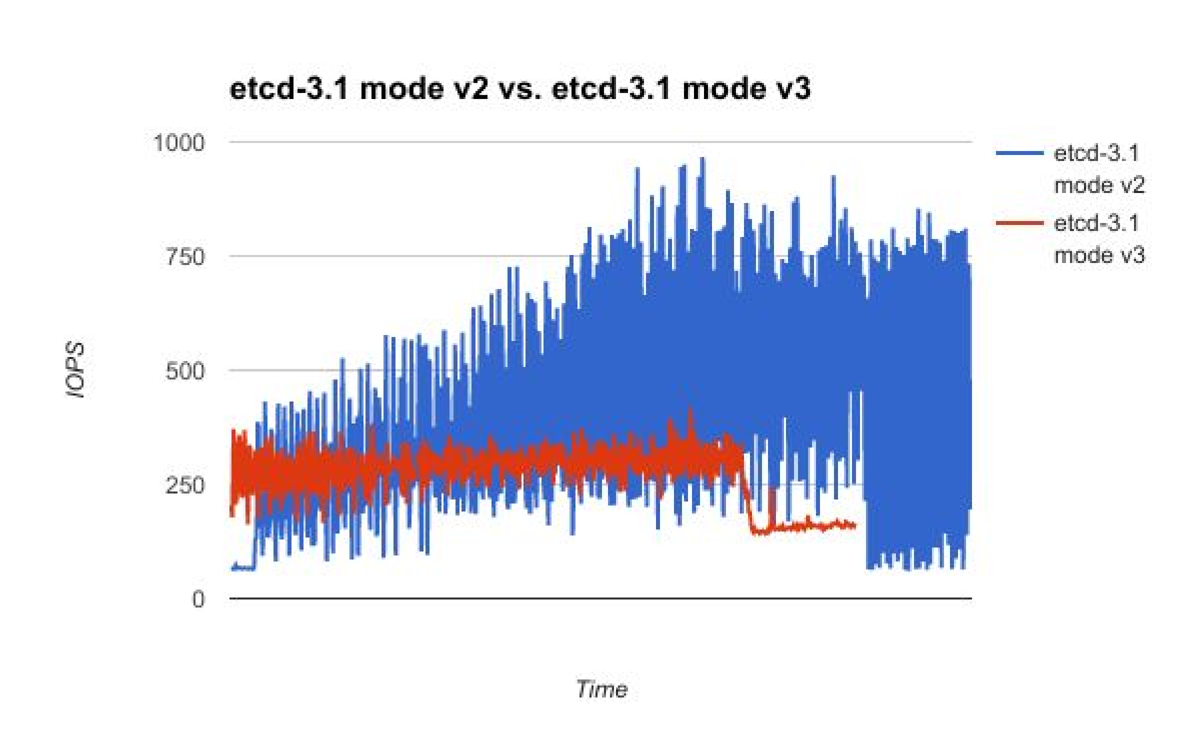


OpenShift 3.5: etcd-3.1, storage mode v2, 5K projects



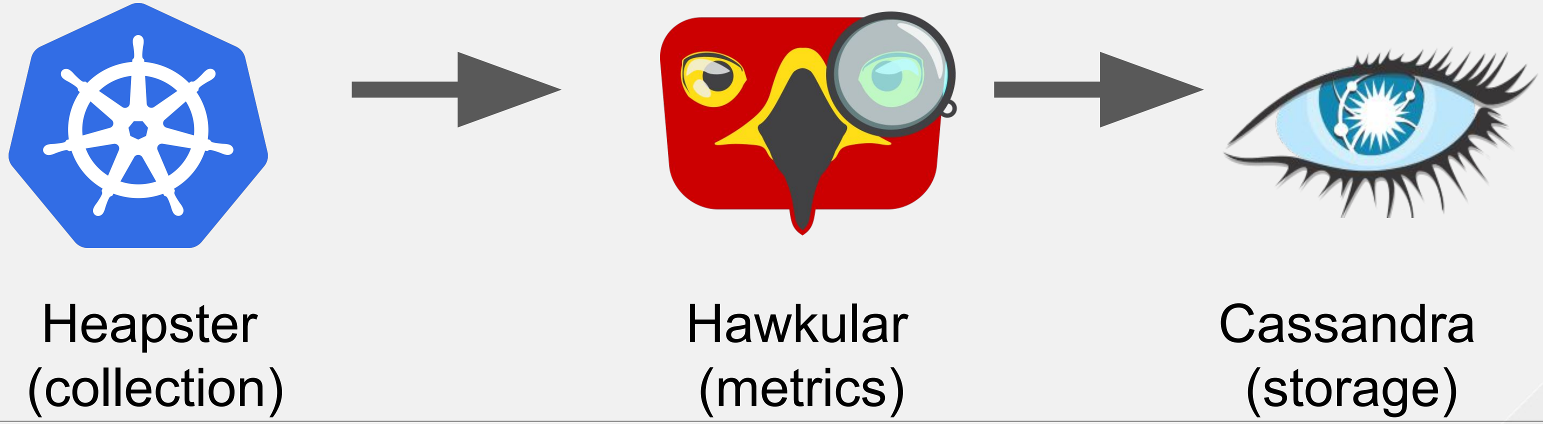
Quorum Reads added in OCP 3.4 for data safety

OpenShift 3.5: etcd-3.1.x, 1k proj/4k pods



OpenShift 3.5: Metrics

- Bump scalability limits 12,000 → 25,000 pods
- METRICS_DURATION=7, METRICS_RESOLUTION=30
- [Capacity Planning and Scalability docs]()



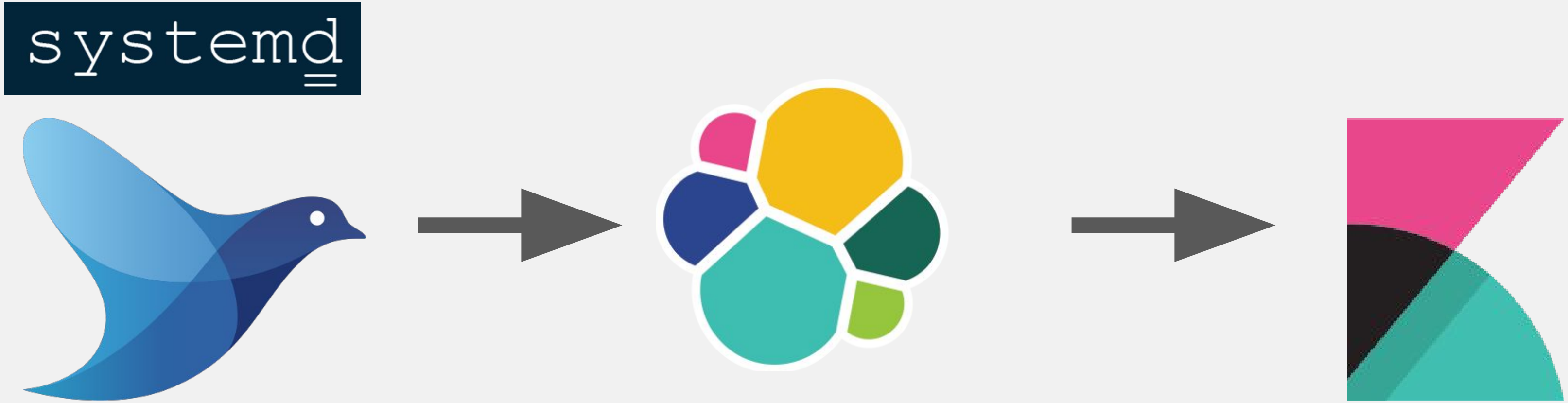
Heapster (collection)

Hawkular (metrics)

Cassandra (storage)

OpenShift 3.5: Logging (EFK)

- Logging Sizing Guidelines



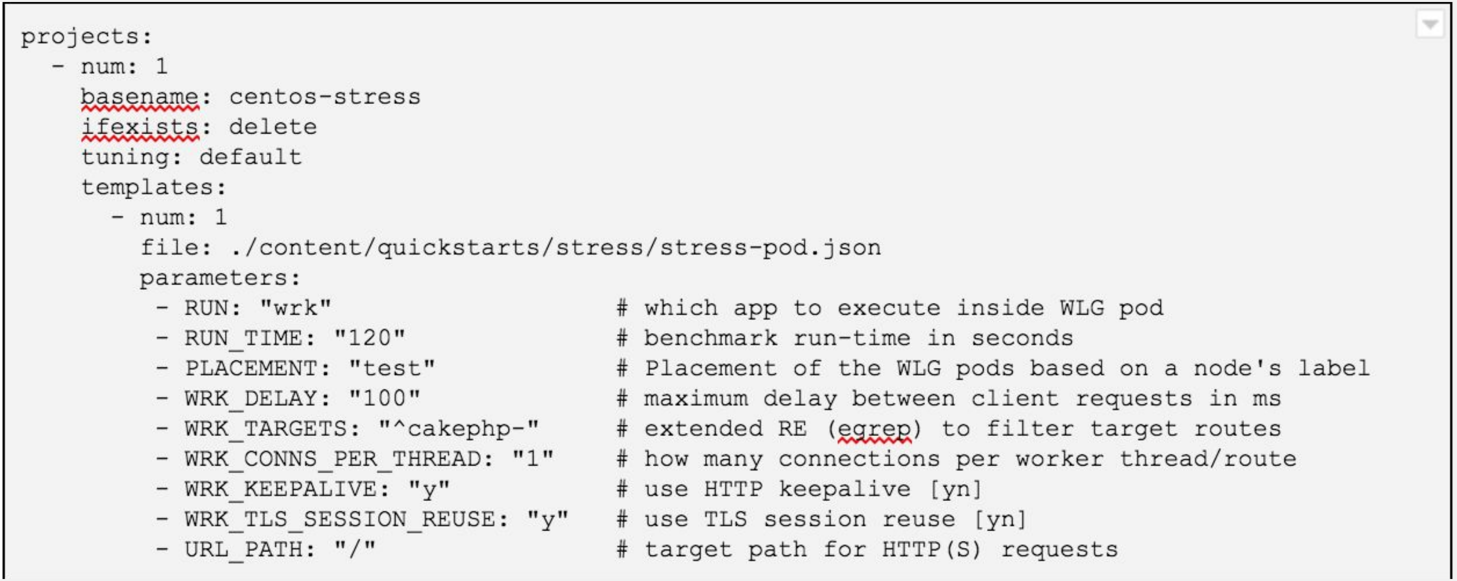
systemd/Fluentd
(collection)

Elasticsearch
(storage)

Kibana
(visualization)

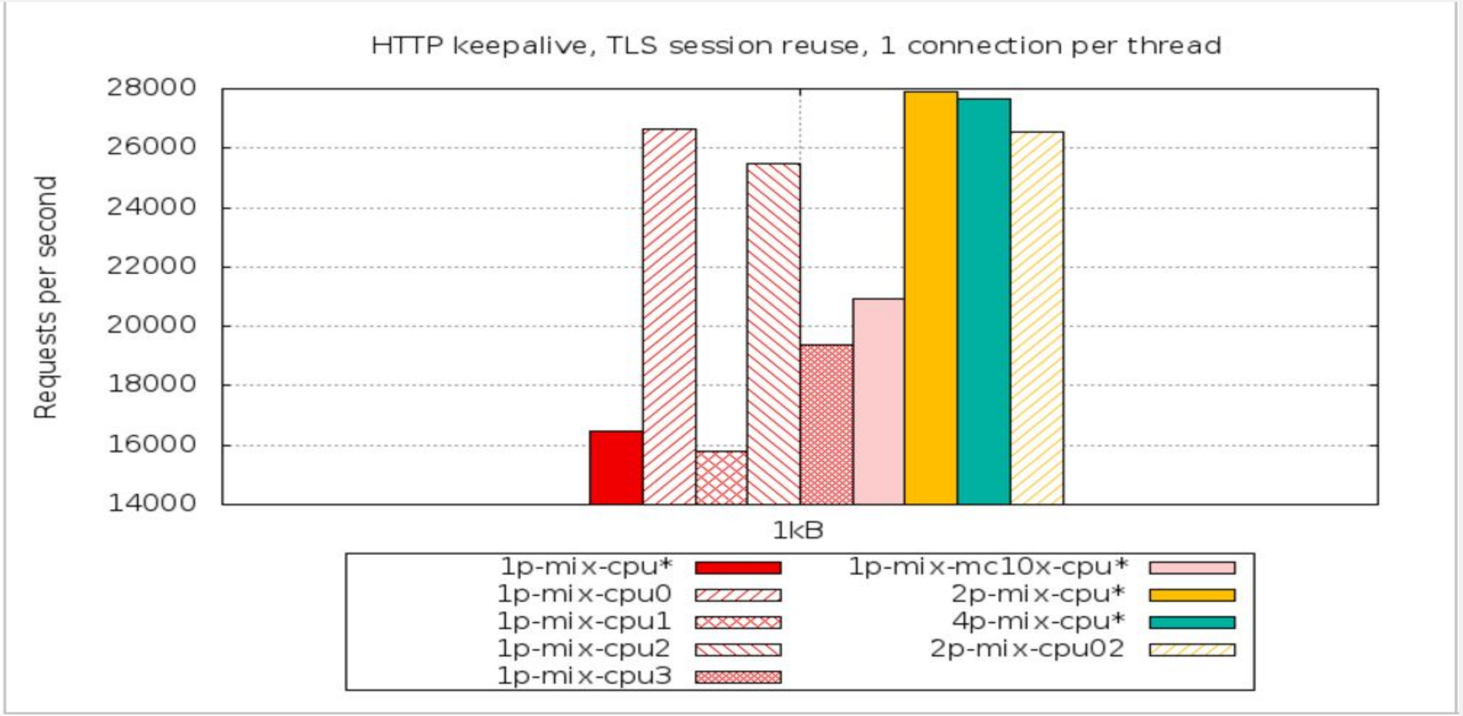
OpenShift 3.5: Routing/Network Ingress Tier

- HAProxy-based ingress tier (haproxy runs as a p



```
projects:
  - num: 1
    basename: centos-stress
    ifexists: delete
    tuning: default
    templates:
      - num: 1
        file: ./content/quickstarts/stress/stress-pod.json
        parameters:
         - RUN: "wrk"                   # which app to execute inside WLG pod
         - RUN_TIME: "120"              # benchmark run-time in seconds
         - PLACEMENT: "test"            # Placement of the WLG pods based on a node's label
         - WRK_DELAY: "100"             # maximum delay between client requests in ms
         - WRK_TARGETS: "^cakephp-"     # extended RE (egrep) to filter target routes
         - WRK_CONNS_PER_THREAD: "1"    # how many connections per worker thread/route
         - WRK_KEEPALIVE: "y"           # use HTTP keepalive [yn]
         - WRK_TLS_SESSION_REUSE: "y"   # use TLS session reuse [yn]
         - URL_PATH: "/"                # target path for HTTP(S) requests
```

OpenShift 3.5: Routing/Network Ingress Tier



OpenShift 3.5: Alpha Support for GPUs

- Works fine
- Mostly manual for now
- GA gated on finalizing resource management

https://blog.openshift.com/use-gpus-openshift-kubernetes/

Tooling

“I want an environment with thousands of deployments, pods (with persistent storage), build configurations, routes, services, secrets and more…”

http://sandeen.net/wordpress/uncategorized/coming-clean-on-o_ponies/

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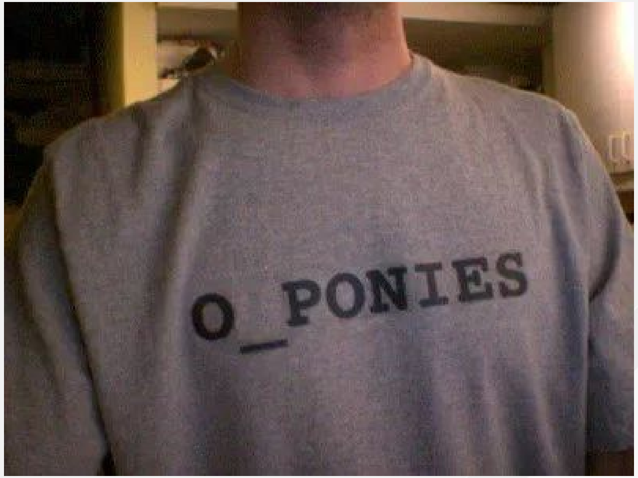

http://sandeen.net/wordpress/uncategorized/coming-clean-on-o_ponies/

OpenShift Scalability Testing

- Cluster horizontal scale
  - # of nodes, # of running pods across all nodes
  - application traffic
- Node vertical scale
  - # of pods running on a single node
  - work that 1 node can support (applications, builds, storage)
- Application scalability
  - Scale # of application replicas up/down

OpenShift Performance Tests

- Resource usage/response times for scenarios
  - Application workload and access performance
  - Builds (OpenShift)
  - Metrics and Log collection
- OpenShift infrastructure performance
  - Resource usage of processes under load
  - Network (SDN) throughput
  - Routing
  - Storage (EBS, Ceph, Gluster, Cinder, etc)

Tools

- https://github.com/openshift/svt
  - cluster load-up
  - traffic generation
  - concurrent builds, deployments, pod start/stop
  - reliability testing
  - network performance
  - logging and metrics tests

Cluster loader

- cluster-loader - python tool to quickly load clusters according to a YAML test specification.

- Can be used with Kubernetes or OpenShift

```
projects:
  - num: 1000
    basename: nginx-explorer
    tuning: default
    templates:
      - num: 10
        file:
cluster-loader/nginx.yaml
      - num: 20
        file:
cluster-loader/explorer-pod.yaml
```

Demo

RED HAT SUMMIT

THANK YOU

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