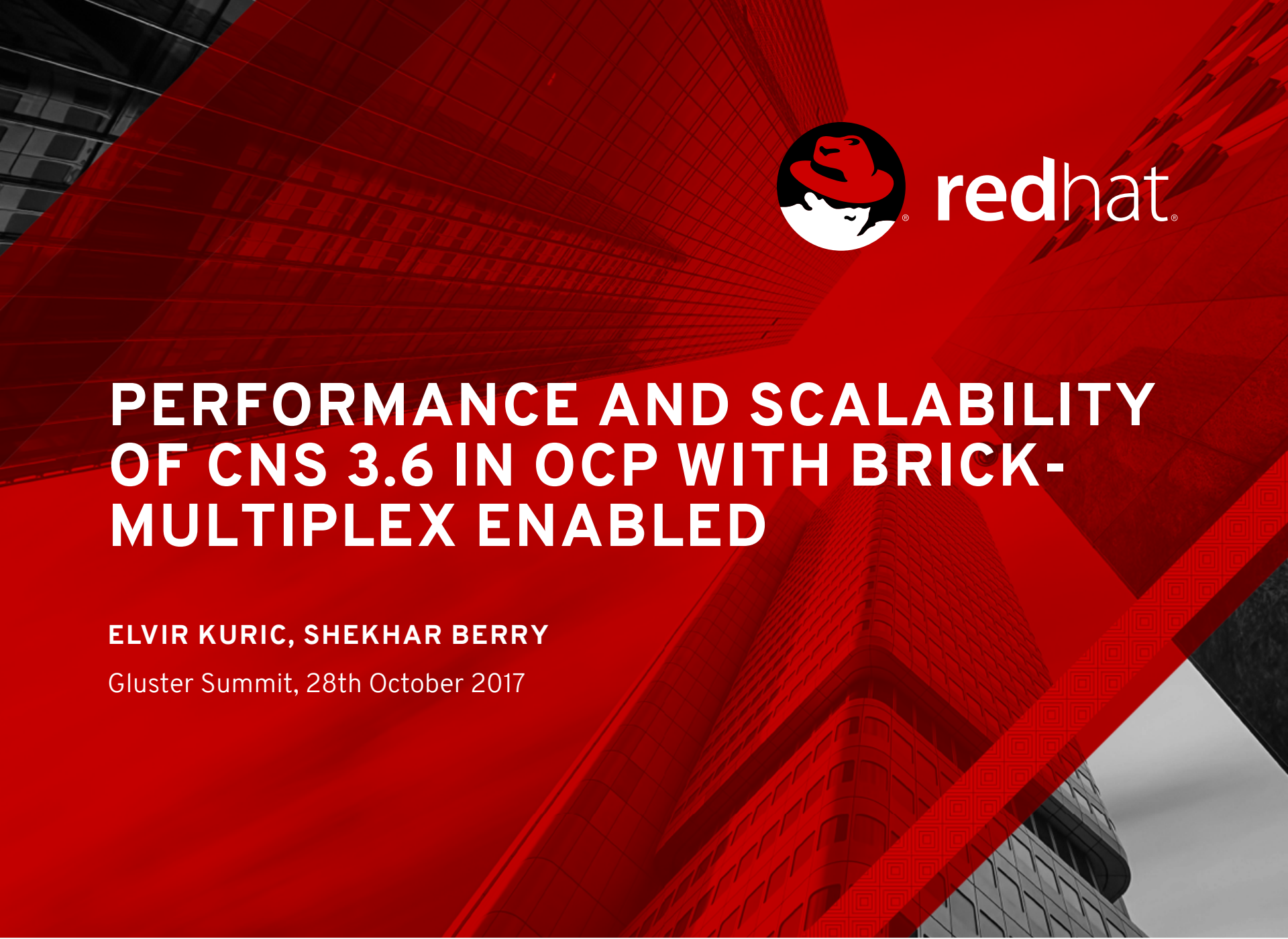

PERFORMANCE AND SCALABILITY OF CNS 3.6 IN OCP WITH BRICK-MULTIPLEX ENABLED

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- Introduction/Motivation
- What is Brick Multiplexing
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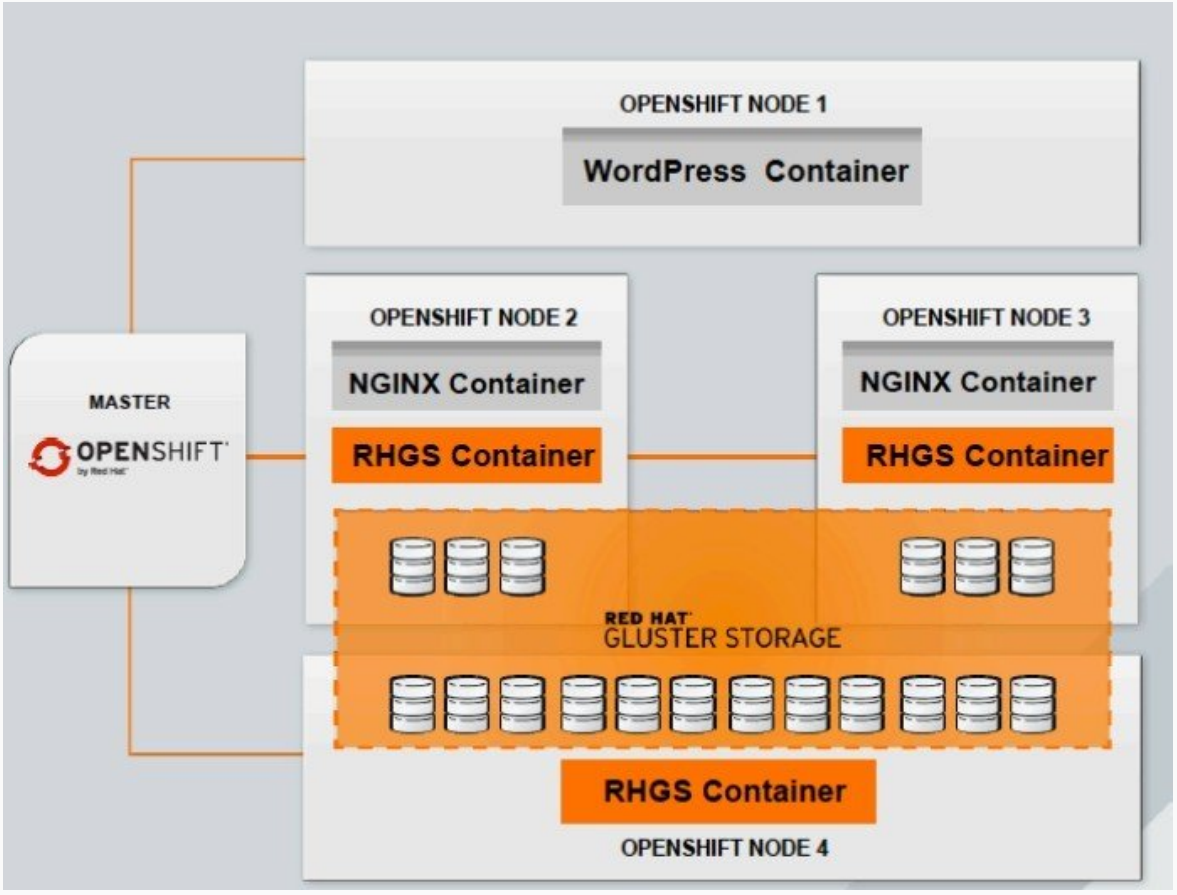
- Next Steps
- Conclusion

INTRODUCTION

- OpenShift Container Platform (OCP) is an application platform (aka PaaS) by Red Hat.
- This is essentially Kubernetes + add ons which is used for automating deployment, management and orchestration of containerized application
- CNS (Container Native Storage) is way to run gluster inside Openshift pods



MOTIVATION

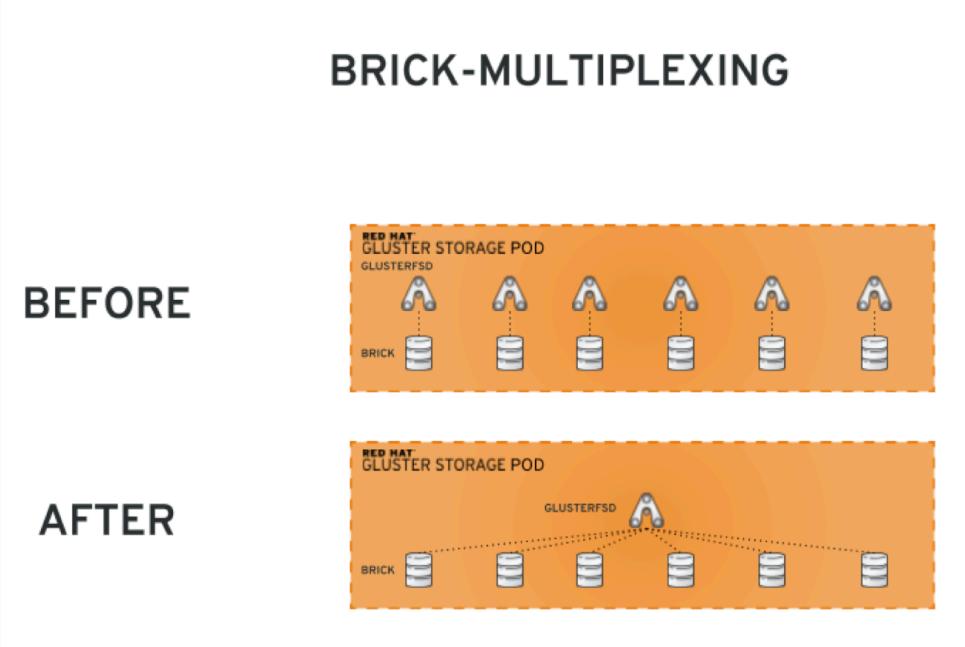
- Brick Multiplexing is a salient feature of Gluster 3.10

OBJECTIVES OF THIS TESTING:

- To find out effect of brick multiplexing on IO performance.
- Compare performance between brick multiplex enabled and disabled environment
- To observe how brick multiplex helps in scaling of persistent volume
- To find out resource consumption at highest scale and compare with brick multiplex disabled environment

BRICK MULTIPLEXING

- All storage in Gluster is managed as bricks, which are just directories on servers
- The consistency of volumes across all its bricks is handled by the glusterfsd process, which is what consumes the memory.
- In older releases of Glusterfs , there was one such process per brick on each host.
- With brick-multiplexing, only one glusterfsd process is governing the bricks, such that the amount of memory consumption of GlusterFS pods is drastically reduced and the scalability is significantly improved.



BRICK MULTIPLEXING

RESOURCE CONSTRAINTS SEEN PRIOR TO BRICK MULTIPLEXING:

- Ports
- Memory
- CPU

Brick multiplexing puts multiple bricks into one process. Thus, many bricks can consume *__one__* port, *__one__* set of global data structures, and *__one__* pool of global threads reducing resource consumption and contention.

PERFORMANCE ANALYSIS

TEST ENVIRONMENT

- 8 Nodes (3 Dedicated CNS nodes, 5 App nodes including master)
- 48 GB RAM, 2 CPU sockets with 6 cores each, 12 processors in total on all 8 servers
- 3 CNS nodes comprised 12 7200 RPMs Hard Drives of 930GB capacity. Total capacity of ~11TB
- 10GbE Ethernet link was used for IO and 1GbE was used for management
- OCP v3.6 , kubernetes 1.6
- glusterfs-3.8.44, heketi-5.0.0-1
- docker images: rhgs3/rhgs-server-rhel7:3.3.0-24,: rhgs3/rhgs-volmanager-rhel7:3.3.0-27

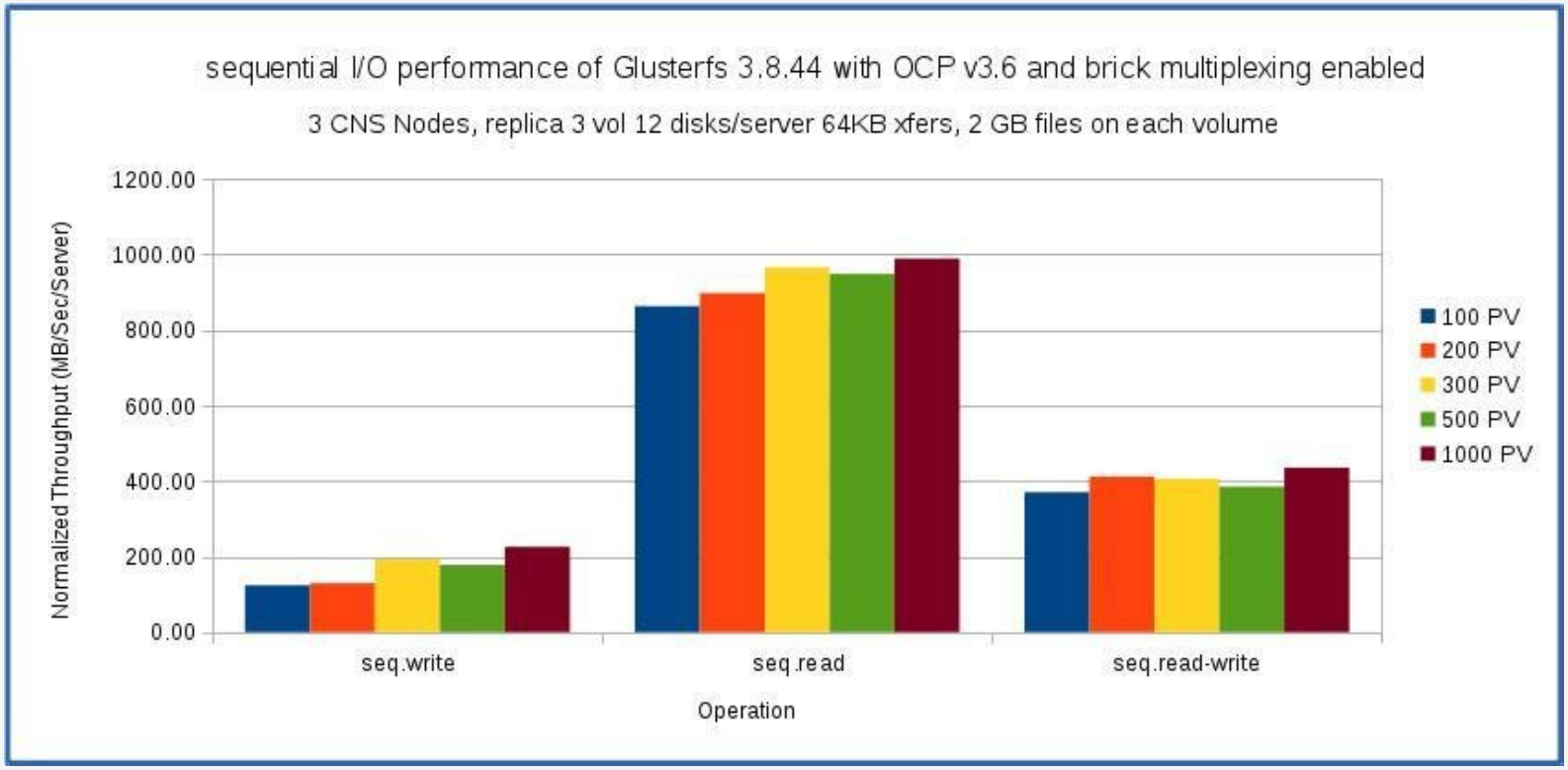
PERFORMANCE ANALYSIS

TEST PROCEDURE

- Persistent Volumes were scaled from 100,200,300,500 to 1000 in brick-multiplexed environment and mounted inside application pod
- pbench-fio was used to run concurrent sequential and random workload on the persistent volumes mounted inside pod
- Tests were repeated to get reproducible numbers
- Performance comparison between brick multiplex enabled and disabled was done for a particular number of persistent volumes

PERFORMANCE ANALYSIS

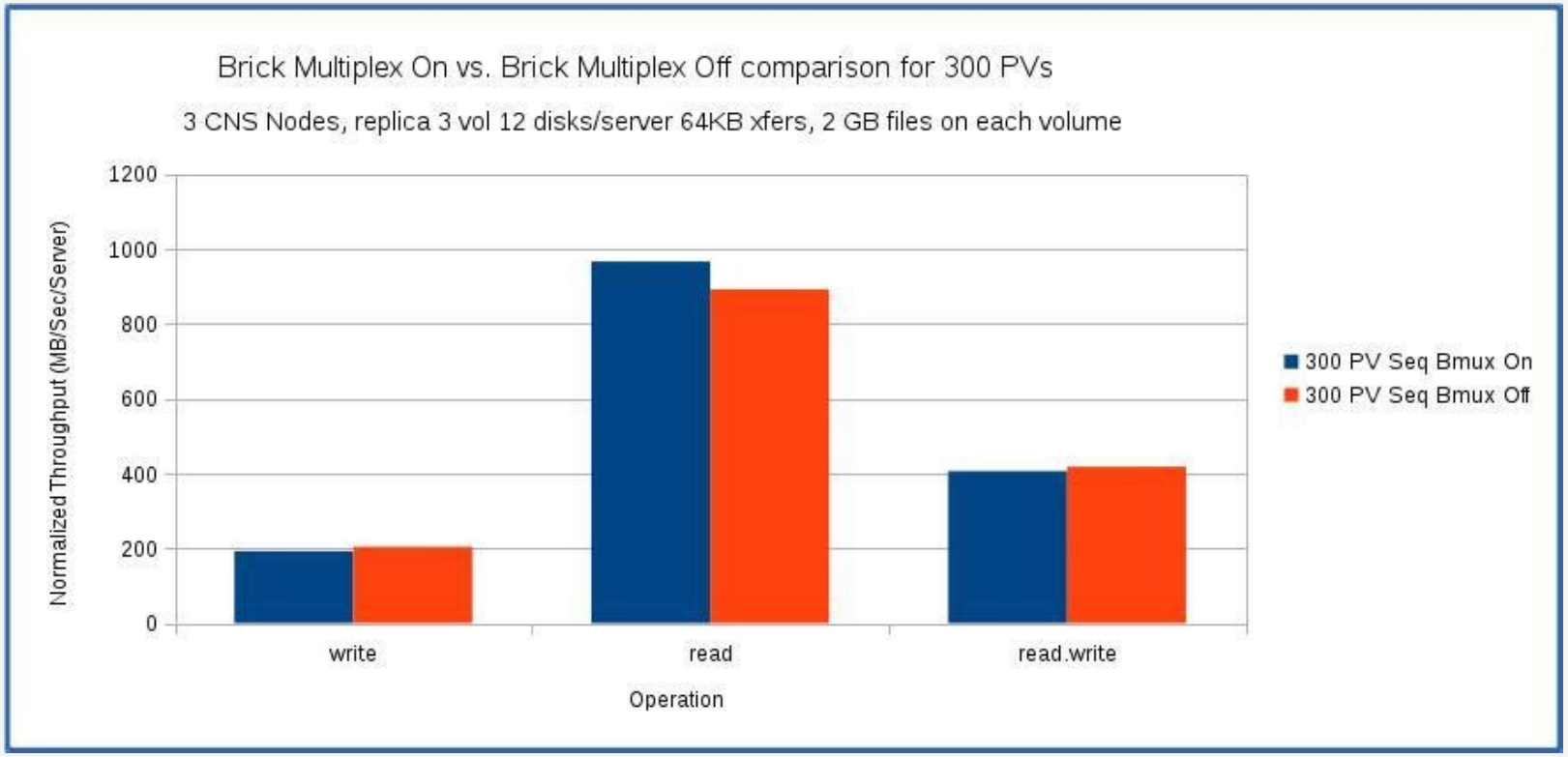
TEST RESULTS



- Performs better at higher scale. Best performance is seen at 1000 PV where all drives are utilized
- Read performance is close to line speed
- Write performance is impacted by limited use of backend hard drives

PERFORMANCE ANALYSIS

TEST RESULTS



No performance drop is seen between brick-multiplex enabled environment and brick-multiplex disabled environment

SCALABILITY ANALYSIS

Gluster In Pre-Kubernetes/OpenShift Era

- Gluster volumes (Storage) were "static" - not many changes related to Gluster volumes happened (Change Request was necessary to do anything with gluster volume)
- Before : volume was in use for **days/months**
- Now : most of volumes are in use for **minutes/hours**
- Storage administrator vs Openshift administrator vs User
- Control over creating gluster volumes is moved to Openshift user

SCALABILITY ANALYSIS

TEST ENVIRONMENT

- 10 nodes (1x master, 2 infra nodes, 3 dedicated cns nodes, 5 app nodes)
- OCP/CNS nodes had more than 50 GB of memory per node
- 24 CPUs per node
- OCP v3.7 , kubernetes 1.7
- glusterfs-3.8.44, heketi-5.0.0-15
- docker images : rhgs3/rhgs-server-rhel7:3.3.0-360 / rhgs3/rhgs-volmanager-rhel7:3.3.0-360

SCALABILITY ANALYSIS

WHAT/HOW WAS TESTED?

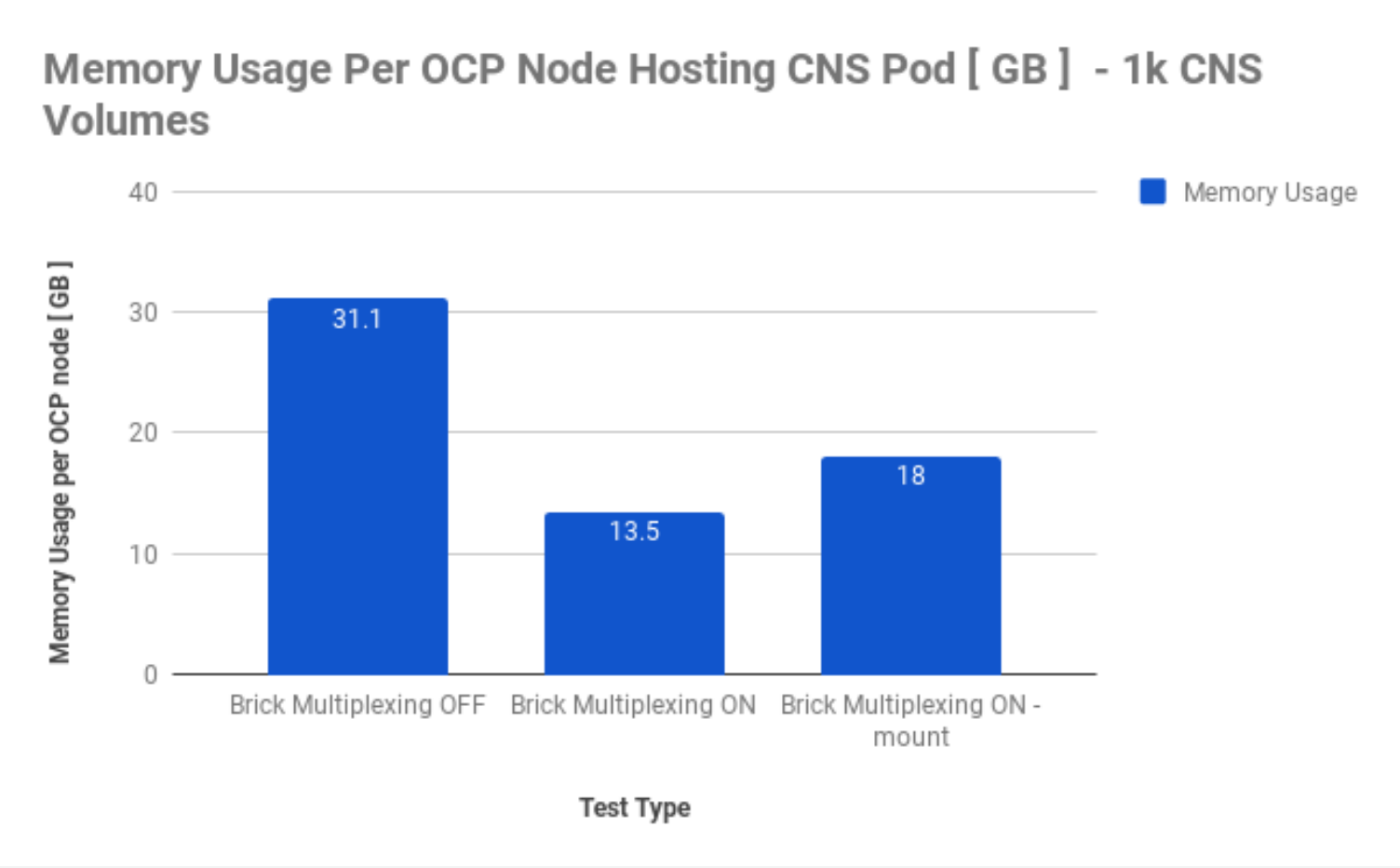
- Scalability of PVC creation on top of CNS
- Different number of PVC were tested (100,300,500,1000)
- We wanted to know memory footprint for different number of PVC/CNS volumes (with / without Brick Multiplexing)
- Bonus - how fast PVC are created

TOOLS USED

- Clusterloader https://github.com/openshift/svt/tree/master/openshift_scalability
- Pbench https://github.com/distributed-system-analysis/pbench
- heketivolumemonitor - https://github.com/ekuric/openshift/blob/master/cns/heketivolumemonitor.py

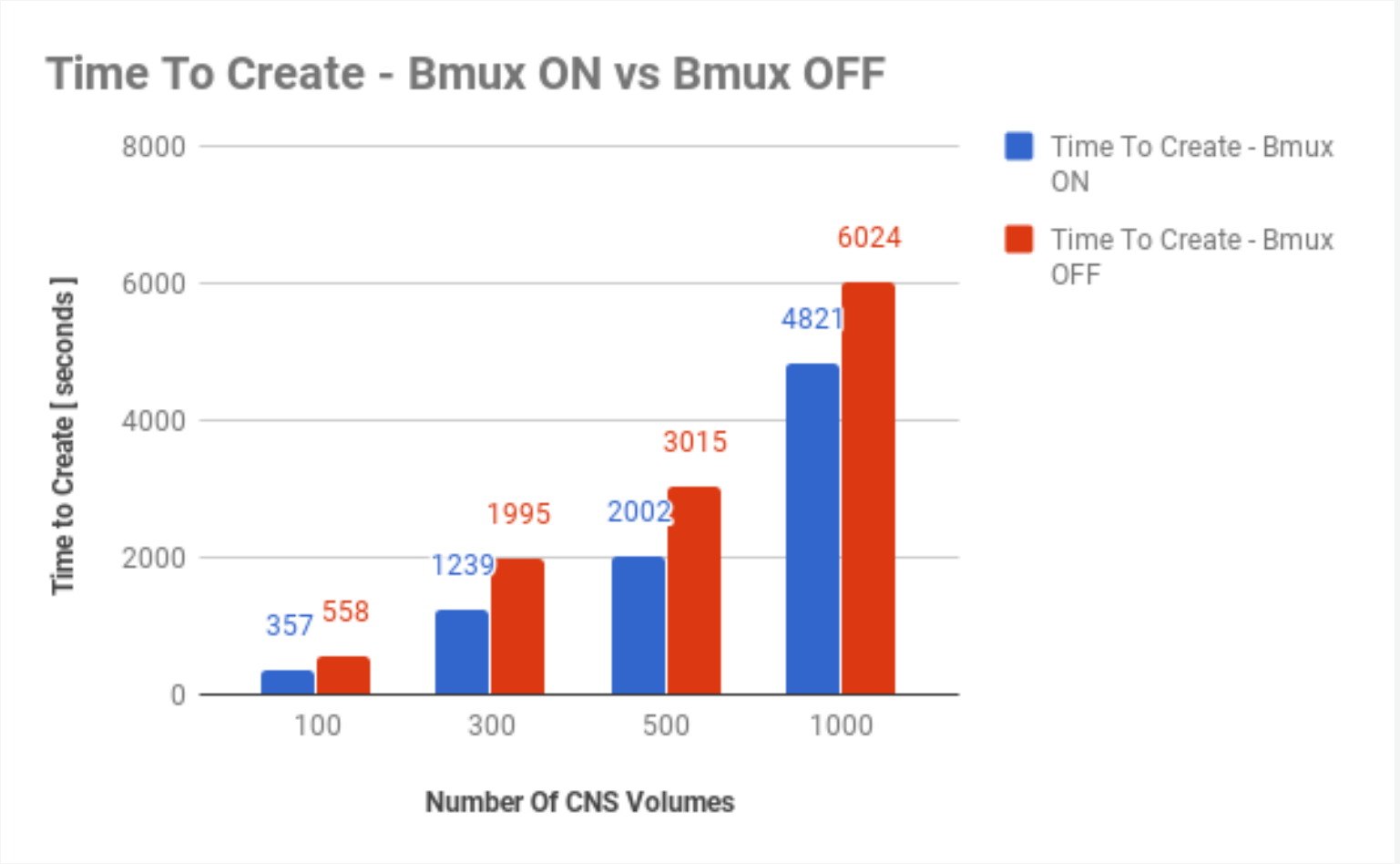
SCALABILITY ANALYSIS

MEMORY USAGE - WHEN 1000 CNS VOLUMES PRESENT IN CNS CLUSTER



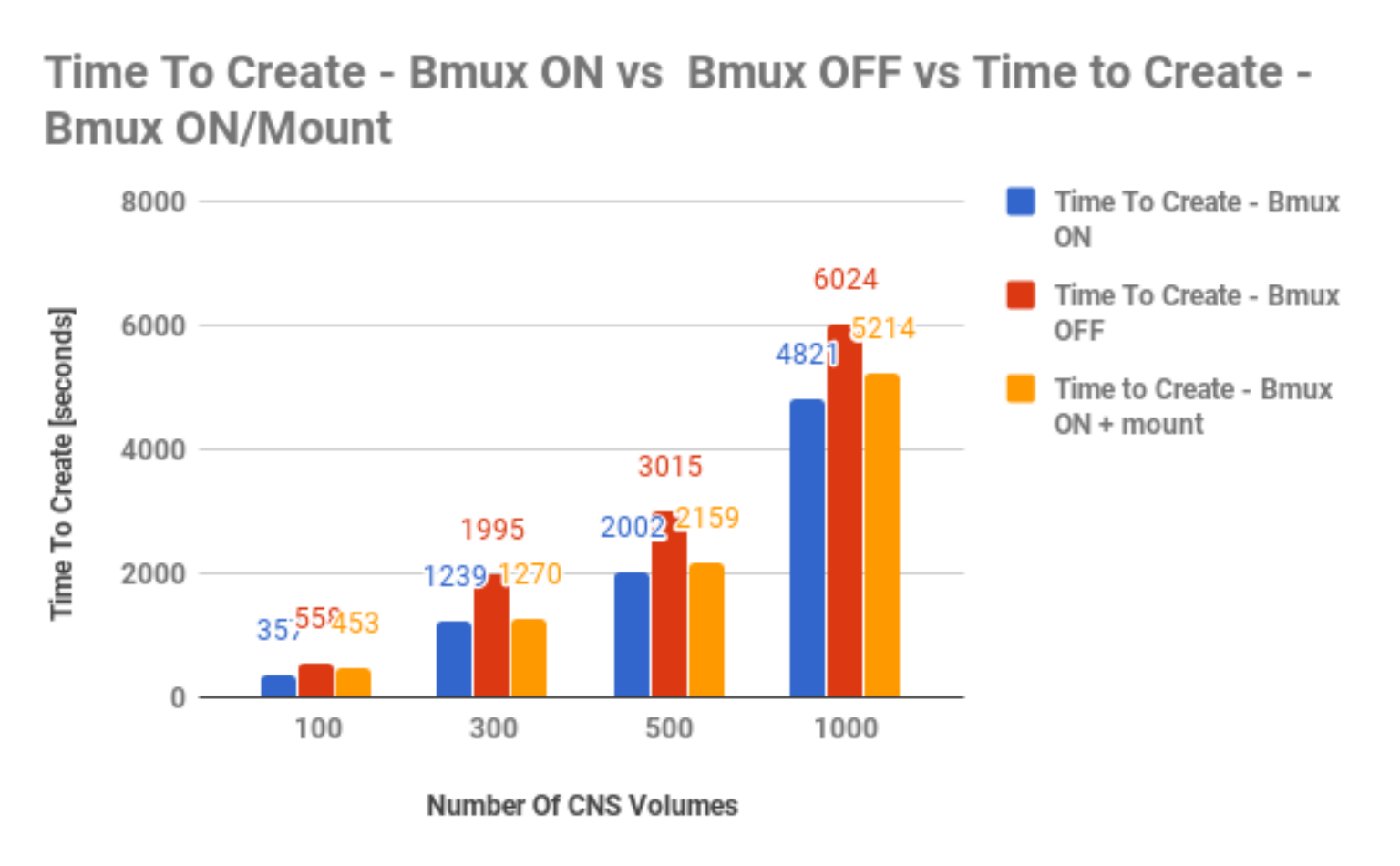
SCALABILITY ANALYSIS

TIME TO CREATE - BMUX ON / BMUX OFF



SCALABILITY ANALYSIS

TIME TO CREATE - BMUX ON / BMUX OFF / BMUX ON + MOUNT



SCALABILITY ANALYSIS

LVS

```
# heketi-cli volume list |wc -l
1000


# On every OCP node hosting CNS pods
#the number of LVSs will be 2x$(number_of_heketi_volumes)

# lvs | wc -l
2000
```

BEST PRACTICES

- Monitor OCP nodes hosting CNS pods (memory / cpu)
- If possible give CNS pods dedicated nodes
- Stay inside supported boundaries for specific OCP/CNS release regarding number of volumes
- CNS pods are important pods

NEXT STEPS

- Random performance is captured but its skewed in CNS environment. Smallfile workload performance will be captured as well.
- CNS block device feature - **scale test / IO test**
- OCP infra apps using CNS (file/block) **OCP metrics/logging**
- Cassandra/MariaDB/MongoDB (CNS block)

CONCLUSIONS

- No Performance degradation is seen with brick multiplexing enabled for large file workload
- Brick Multiplexing brings improvements from memory usage point of view
- Brick Multiplex helps to scale faster
- Possible to "pack" more CNS volumes on same HW with smaller memory footprint
- Brick Multiplexing is enabled by default - it is recommended not to disable it

QUESTIONS ??

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