STORAGE FOR OPENShift CONTAINERS feat. RED HAT GLUSTER STORAGE

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LINUX CONTAINERS:
Software packaging concept that typically includes an application and all of its runtime dependencies

**BENEFITS**
- HIGHER quality software releases
- SHORTER test cycles
- EASIER application management
CONTAINERS V.S. VIRTUALIZATION

Containers
- Abstracts OS Kernel
- Limited to Linux
- One CPU and memory mgr
  - Up in seconds
  - 100s or 1000s
- Multiple copies of single app

Virtualization
- Abstracts entire device
- Any Operating System
- Two CPU and memory mgrs
  - Up in hours or days
  - 10s or 100s
- Multiple apps
WHY PERSISTENT STORAGE FOR CONTAINERS?

“For which workloads or application use cases have you used/do you anticipate to use containers?”

- Data Apps: 77%
- Cloud Apps: 71%
- Systems of Engagement: 62%
- Systems of Record: 62%
- Web and Commerce Software: 57%
- Mobile Apps: 52%
- Social Apps: 46%

Scalable, Cost Effective, Distributed Storage for Containers

Base: 194 IT operations and development decision-makers at enterprise in APAC, EMEA, and North America. Source: A commissioned study conducted by Forrester Consulting on behalf of Red Hat, January 2015.
# THE ROAD TO STORAGE AS A SERVICE

## Development Model
- Waterfall
- Agile
- DevOps

## Application Architecture
- Monolithic
- N-tier
- MicroServices

## Deployment & Packaging
- Bare Metal
- Virtual Servers
- Containers

## Application Infrastructure
- Data Center
- Hosted
- Hybrid Cloud

## Storage
- Scale Up
- Scale Out
- Storage as a Service
STORAGE INNOVATION FOR CONTAINERIZED APPLICATIONS

- Ceph RBD
- Amazon EBS
- Fiber Channel
- GCE
- iSCSI
- NFS
- GlusterFS

AUTOMATED CONFIGURATION

SINGLE CONTROL PANEL

CHOICE OF PERSISTENT STORAGE
CONTAINERIZED RED HAT GLUSTER STORAGE
CONTAINER-NATIVE STORAGE

- Lower TCO
- Unified Orchestration
- Ease of Use
- Greater control
THE RED HAT STACK – FROM PAAS TO STORAGE

- DevOps Tools and User Experience
- Language Runtimes and Middleware
- Databases and Other Services
- Container Orchestration and Management
- Container API
- Container Host
- Storage
CONTAINER-NATIVE STORAGE

CONVERGENCE OF STORAGE AND COMPUTE

CONVERGENCE OF STORAGE AND COMPUTE

CONTAINER READY STORAGE

RED HAT GLUSTER STORAGE

Nov 2015

- Dedicated storage cluster for containerized and PaaS environments
- Supported for OpenShift Enterprise

CONTAINERIZED RHGS

Mar 2016

- Containerized Red Hat Gluster Storage serving storage from a dedicated storage cluster
- Optimized for applications running on RHEL 7, OpenShift Enterprise, and RHEL Container Host

CONTAINER-NATIVE STORAGE

Summer 2016

- Containerized Red Hat Gluster Storage inside OpenShift Container Platform hyper converged with application containers
- Red Hat Gluster Storage cluster comprised of disks from multiple container cluster nodes
## RED HAT GLUSTER STORAGE ADVANTAGES

### OPEN
- Based on GlusterFS open source community project
- Uses proven local file system (XFS)
- Data is stored in native format

### SCALABLE
- No Metadata Server
- Uses an elastic hashing algorithm for data placement
- Uses local filesystem’s xattrs to store metadata
- Nothing shared scale-out architecture

### ACCESSIBLE
- Multi-Protocol the Same Data
- Global name space
- NFS, SMB, object, HDFS, Gluster native protocol
- Posix compliant

### MODULAR
- No Kernel Dependencies
- GlusterFS is based on filesystem in userspace (FUSE)
- Modular stackable arch allows easy addition of features
  ...without being tied to any kernel version

### ALWAYS-ON
- High-Availability across data, systems and applications
- Synchronous replication with self-healing for server failure
- Asynchronous geo-replication for site failure
HOW IS GLUSTER DEPLOYED?

Red Hat Gluster Storage

- **PHYSICAL**
  - **RED HAT® GLUSTER STORAGE**
  - **RED HAT® ENTERPRISE LINUX®**
  - **RED HAT® ENTERPRISE VIRTUALIZATION**

- **VIRTUAL**
  - **RED HAT® GLUSTER STORAGE**
  - **RED HAT® ENTERPRISE LINUX®**

- **CONTAINERS**
  - **RED HAT® GLUSTER STORAGE**
  - **RED HAT® ENTERPRISE LINUX® ATOMIC HOST**

- **CLOUD**
  - **RED HAT® GLUSTER STORAGE**
  - **RED HAT® ENTERPRISE LINUX®**
  - **OPENSHIFT ENTERPRISE by Red Hat®**
  - **Google Cloud Platform**
  - **Amazon Web Services®**
DATA PLACEMENT BEST PRACTICE

Distributed-Replicated Volume

MOUNT POINT

Creates a fault-tolerant distributed volume by mirroring the same file across 2 bricks.

FILE 1
server1
BRICK (exp 1)
FILE 1

FILE 1
server2
BRICK (exp 2)
FILE 1

FILE 2
server3
BRICK (exp 3)
FILE 2

FILE 2
server4
BRICK (exp 4)
DATA PLACEMENT FOR CONTAINER NATIVE

Replicated Volume

MOUNT POINT

REPLICATED VOLUME

- server1
  - BRICK
  - FILE 1
- server2
  - BRICK
  - FILE 1
- server3
  - BRICK
  - FILE 1
GlusterFS NATIVE CLIENT

- BASED ON FUSE KERNEL MODULE, which allows the file system to operate entirely in userspace
- SPECIFY MOUNT to any GlusterFS server
- NATIVE CLIENT fetches volfile from mount server, then communicates directly with all nodes to access data

Load inherently balanced across distributed volumes
Recommended for high concurrency & high write performance
A PEEK OVER THE HORIZON

Community Innovation

Greater Integration  Storage as a Microservice  Storage Communities

redhattechnicalseries.com/storage