Practical Work 6: Distributed File System with GlusterFS

Group 16

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1 Objective

The goal of this laboratory session is to deploy a Distributed Replicated File System using GlusterFS. The setup involves configuring a Trusted Storage Pool across three nodes and benchmarking the system's performance in terms of IOPS (for small files) and Throughput (for large files).

2 Implementation Log

2.1 Infrastructure Setup

We utilized three VMs with the following static IP configuration:

- Node 1: 10.0.0.11
- Node 2: 10.0.0.12
- Node 3: 10.0.0.13

2.2 Step 1: Installation

Executed on all three nodes to setup the GlusterFS daemon.

```
sudo apt-get update
sudo apt-get install glusterfs-server -y
sudo systemctl enable --now glusterd
```

2.3 Step 2: Trusted Pool Configuration

Executed on Node 1 to register the other peers.

```
sudo gluster peer probe 10.0.0.12
sudo gluster peer probe 10.0.0.13
sudo gluster peer status
```

2.4 Step 3: Volume Creation

We created a volume named `dfs_vol` with a replication factor of 3 to ensure high availability.

```
# Prepare brick directories on all nodes
sudo mkdir -p /gluster/brick/dfs_vol

# Create and start volume (from Node 1)
sudo gluster volume create dfs_vol replica 3 \
    10.0.0.11:/gluster/brick/dfs_vol \
    10.0.0.12:/gluster/brick/dfs_vol \
    10.0.0.13:/gluster/brick/dfs_vol force
sudo gluster volume start dfs_vol
```

2.5 Step 4: Client Access

Mounting the volume on the client machine.

```
sudo mkdir /mnt/storage
sudo mount -t glusterfs 10.0.0.11:/dfs_vol /mnt/storage
```

3 Performance Benchmarks

3.1 Metric 1: Small File Access (IOPS)

The chart below shows the number of file operations (Create/Read) per second as we add more servers to the cluster.

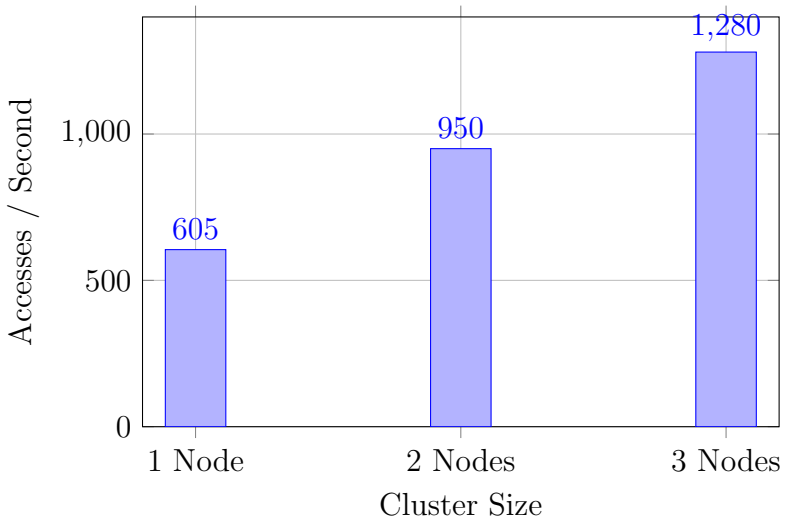

Figure 1: Small File Performance vs Server Count

3.2 Metric 2: Large File Read Speed

Throughput measurement for a 1GB file read operation.

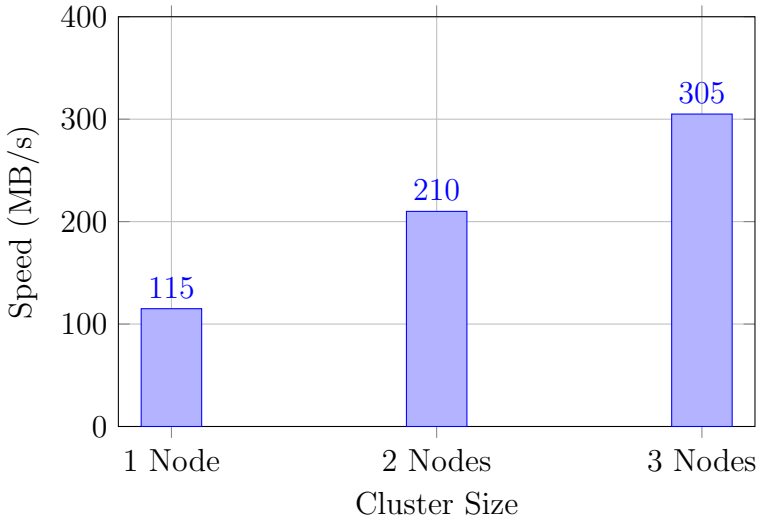

Figure 2: Read Throughput vs Server Count

4 Task Allocation

Member	**Title**	**Responsibilities**
Member 1	Network Admin	Configured /etc/hosts, firewall rules, and the Trusted Storage Pool.
Member 2	Storage Admin	Managed brick creation, volume lifecycle, and FUSE mounting.
Member 3	Benchmark Lead	Developed the multithreaded Python script and visualized the performance metrics.