WHOBBS: An Object-based Distributed Hybrid Storage Providing Block Storage for Virtual Machines

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Contents

➢ **Background and Motivation**

➢ **System Design**

➢ **Detail Design**

➢ **Evaluation and Conclusion**

Background and Motivation

Background

virtualization

Amazon EBS General Purpose (SSD) volumes
* $0.10 per GB-month of provisioned storage

Amazon EBS Provisioned IOPS (SSD) volumes
* $0.125 per GB-month of provisioned storage
* $0.065 per provisioned IOPS-month

Amazon EBS Magnetic volumes
* $0.05 per GB-month of provisioned storage
* $0.05 per 1 million I/O requests

| IOPS	1318	150
Cost/Volume	1.137$	0.068$

SSD vs. HDD

**Random IO Workload**
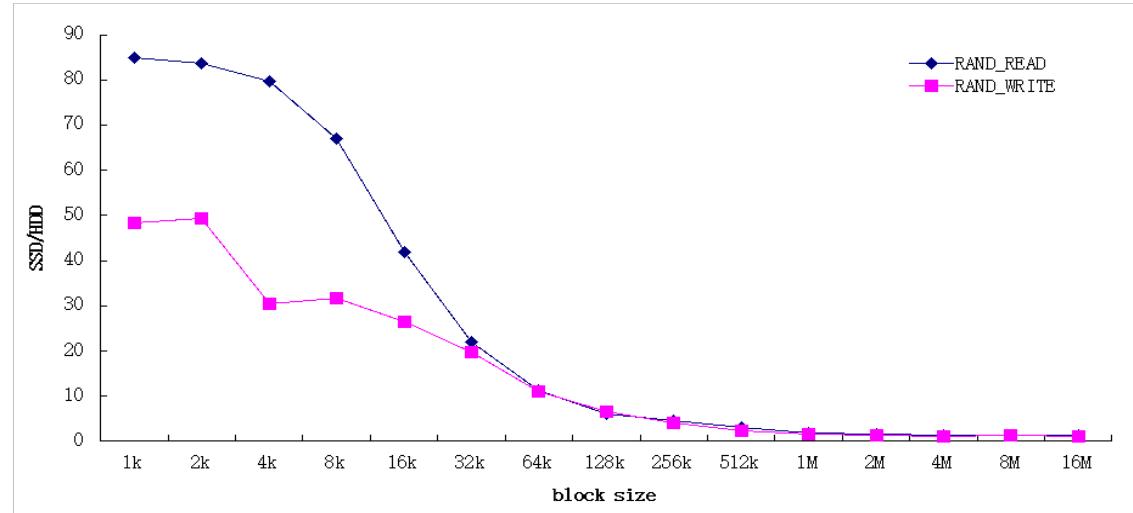

Sequence IO Workload
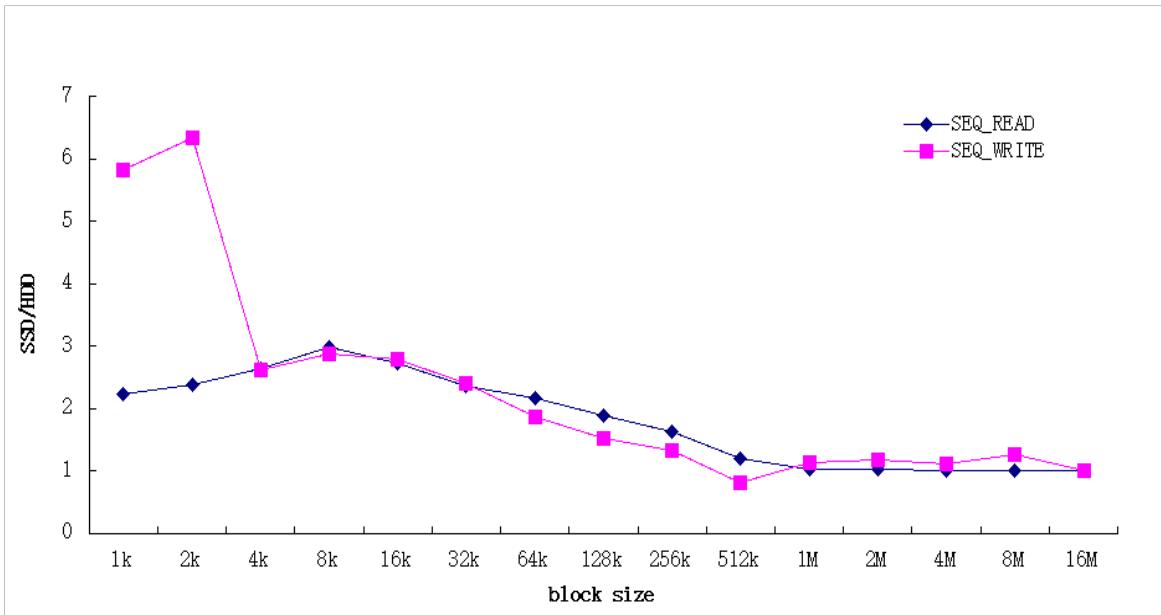
Object Storage
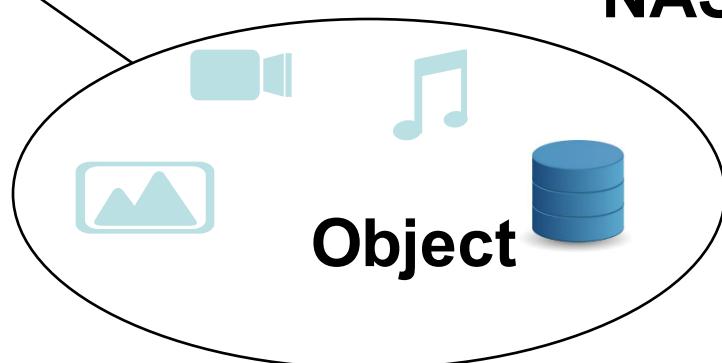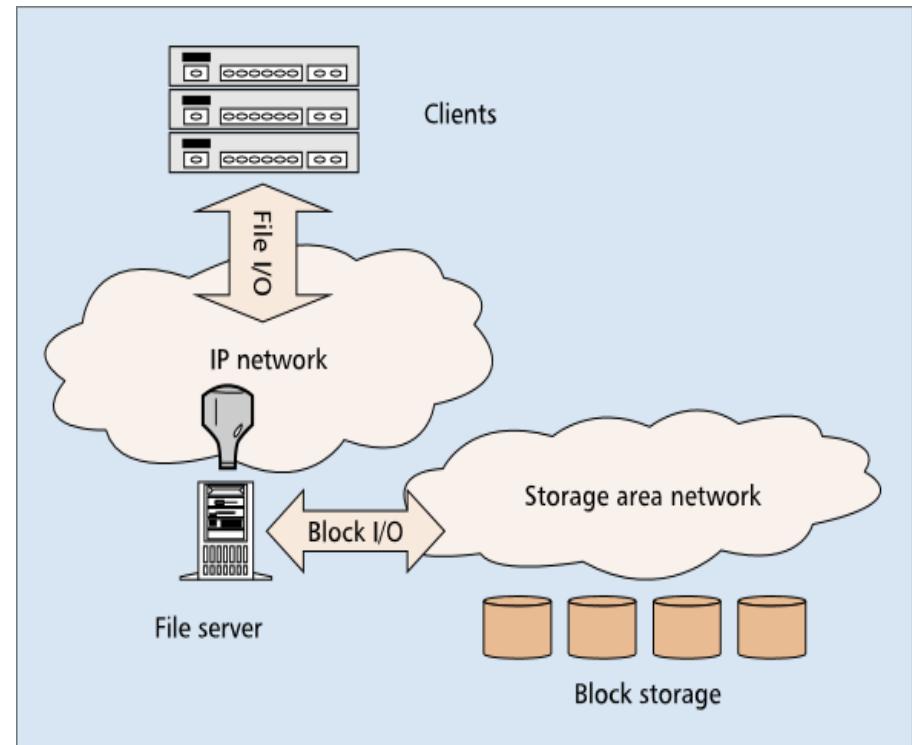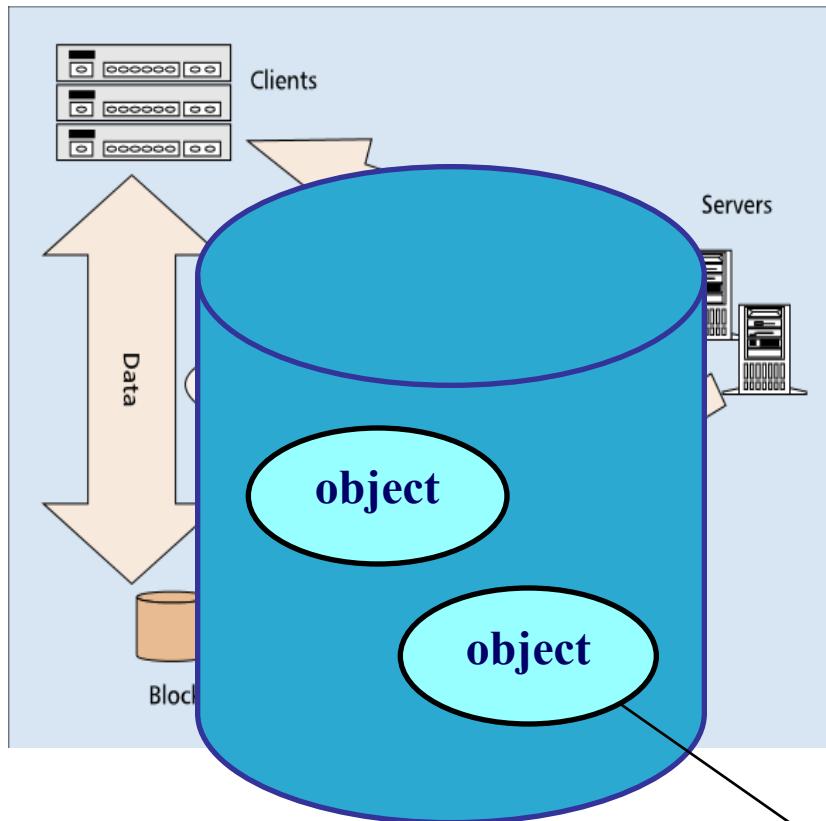
Original Hybrid Storage on Ceph

32GB VMDI 8192 objects

Weight Rate (SSD/HDD)	SSD Objects	HDD Objects
0.1	954	7238
1	4100	4092
2	5517	2675
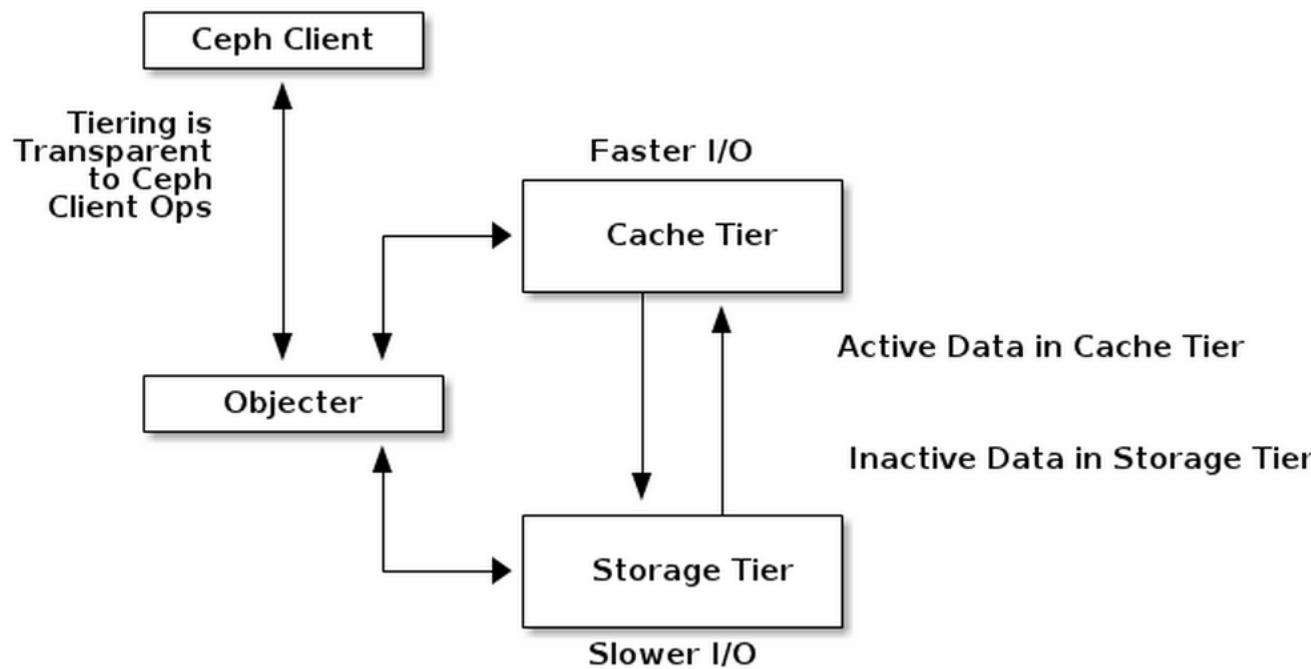
System Design

System Architecture
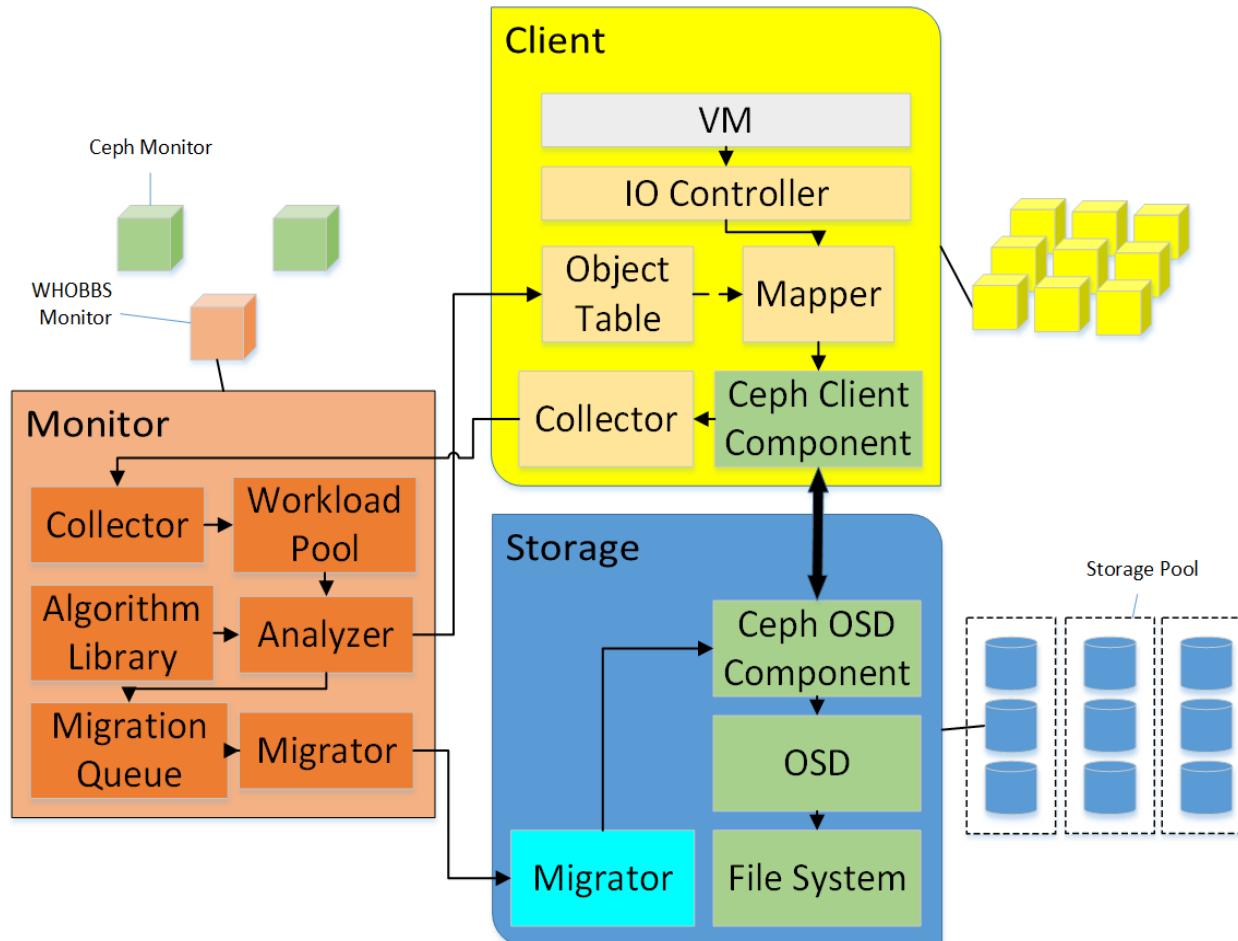
Client
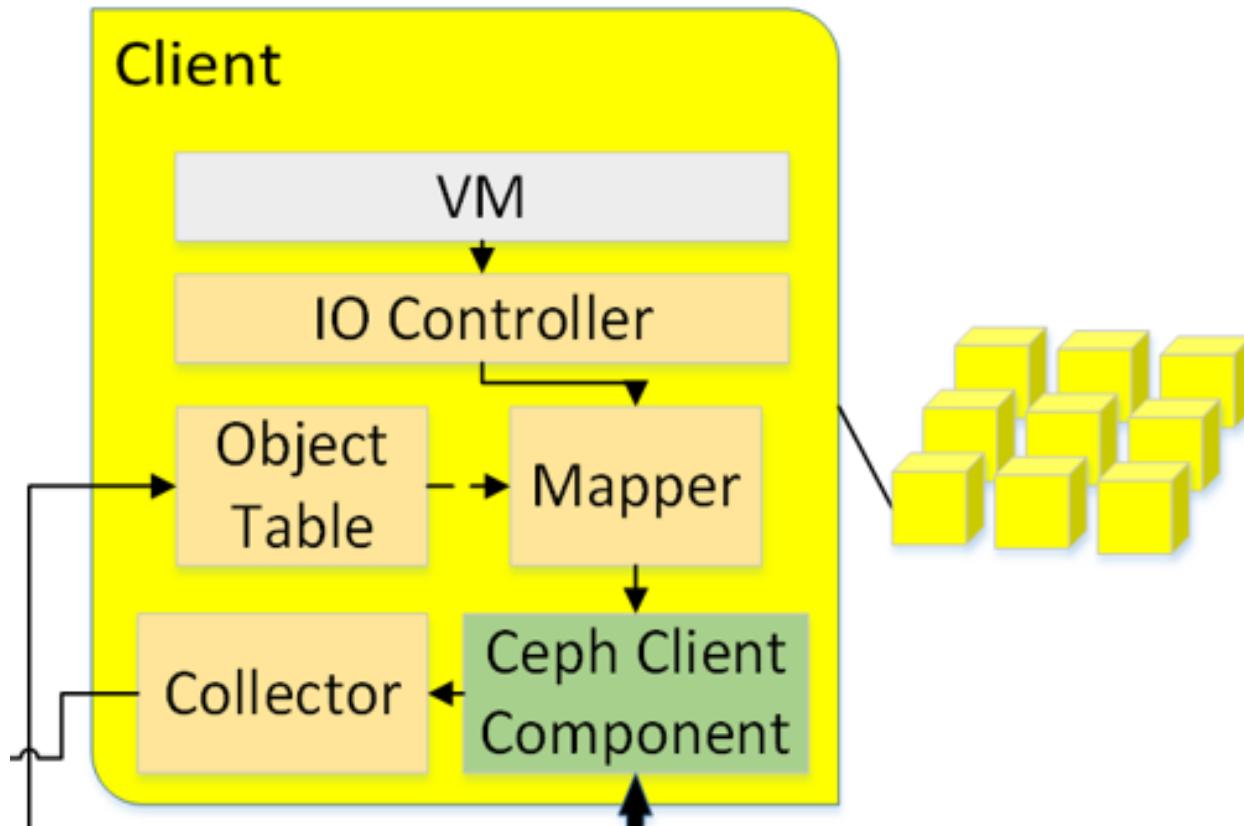
Monitor
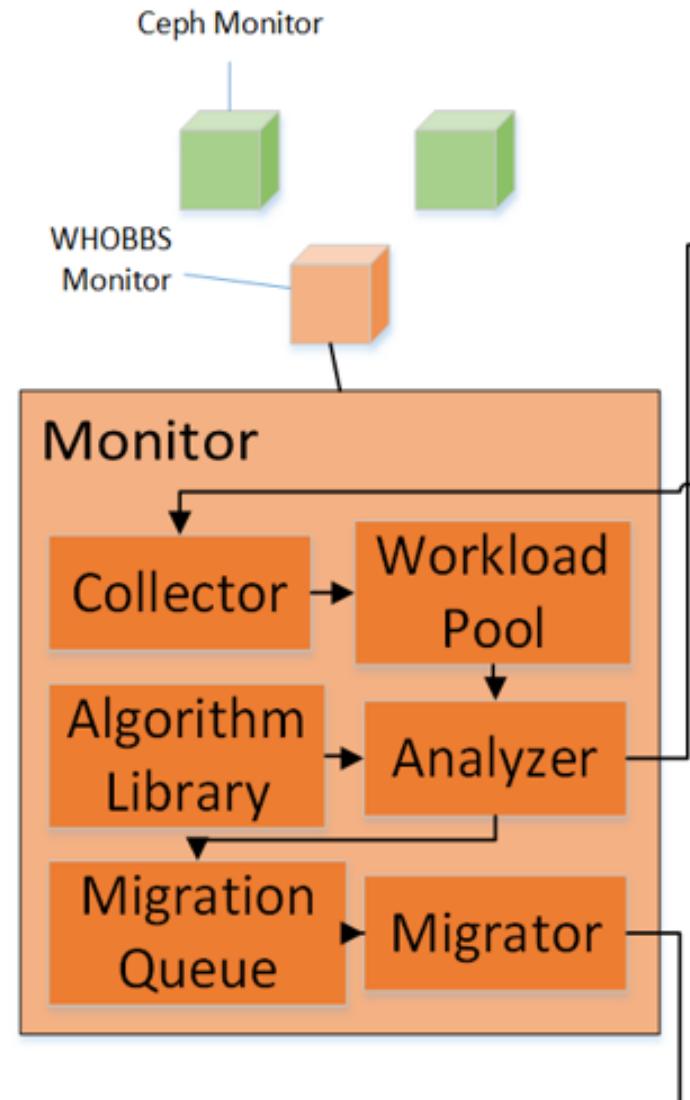
Storage
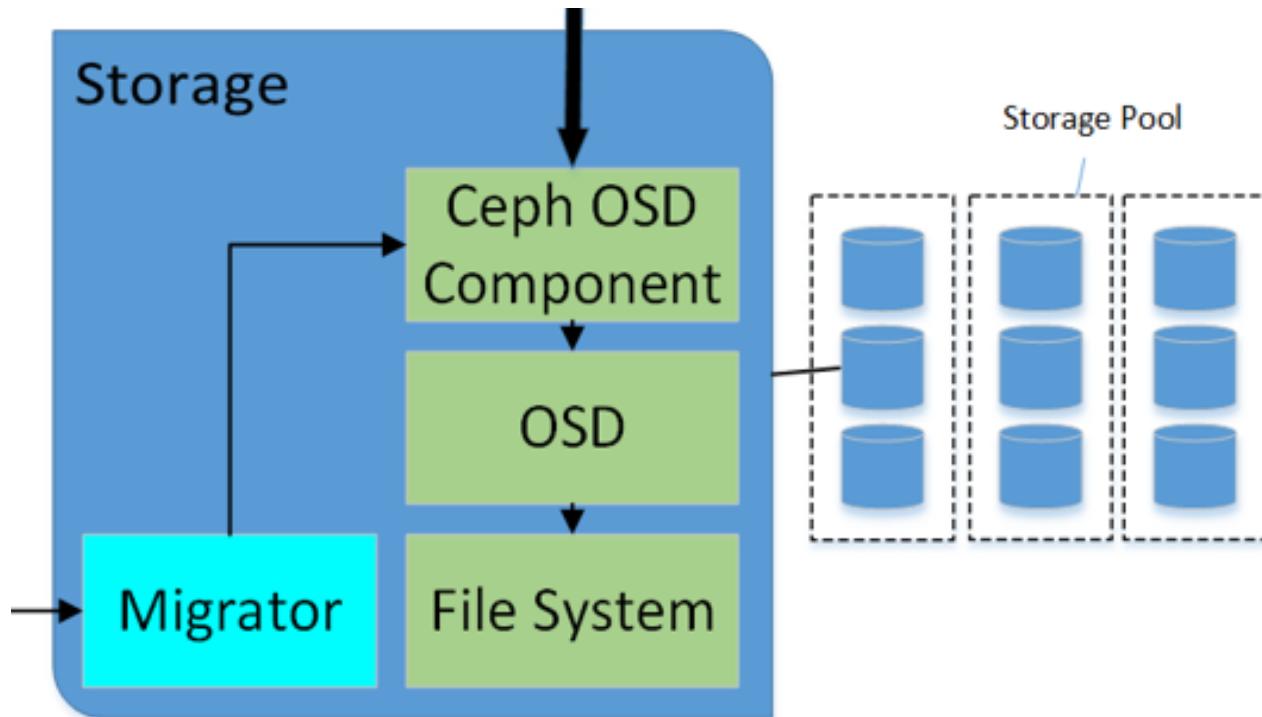
Detail Design

# Hybrid Tiered Storage Architecture
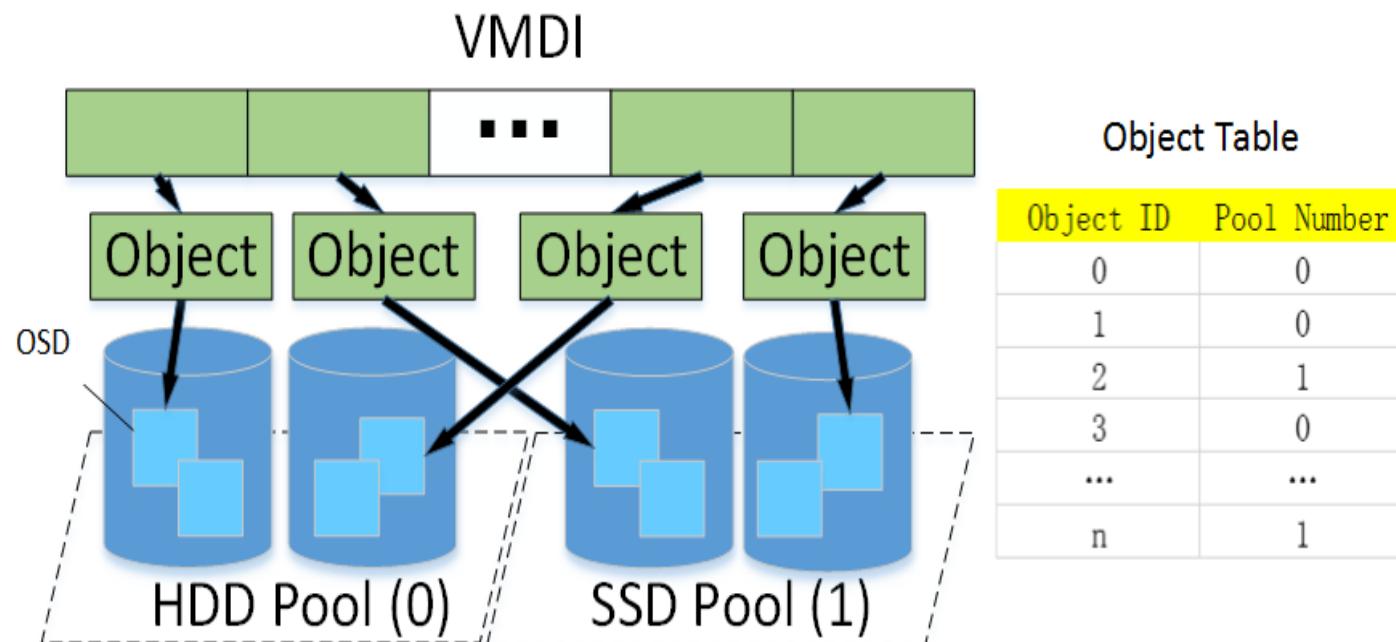
Real-time VM Workload Detection
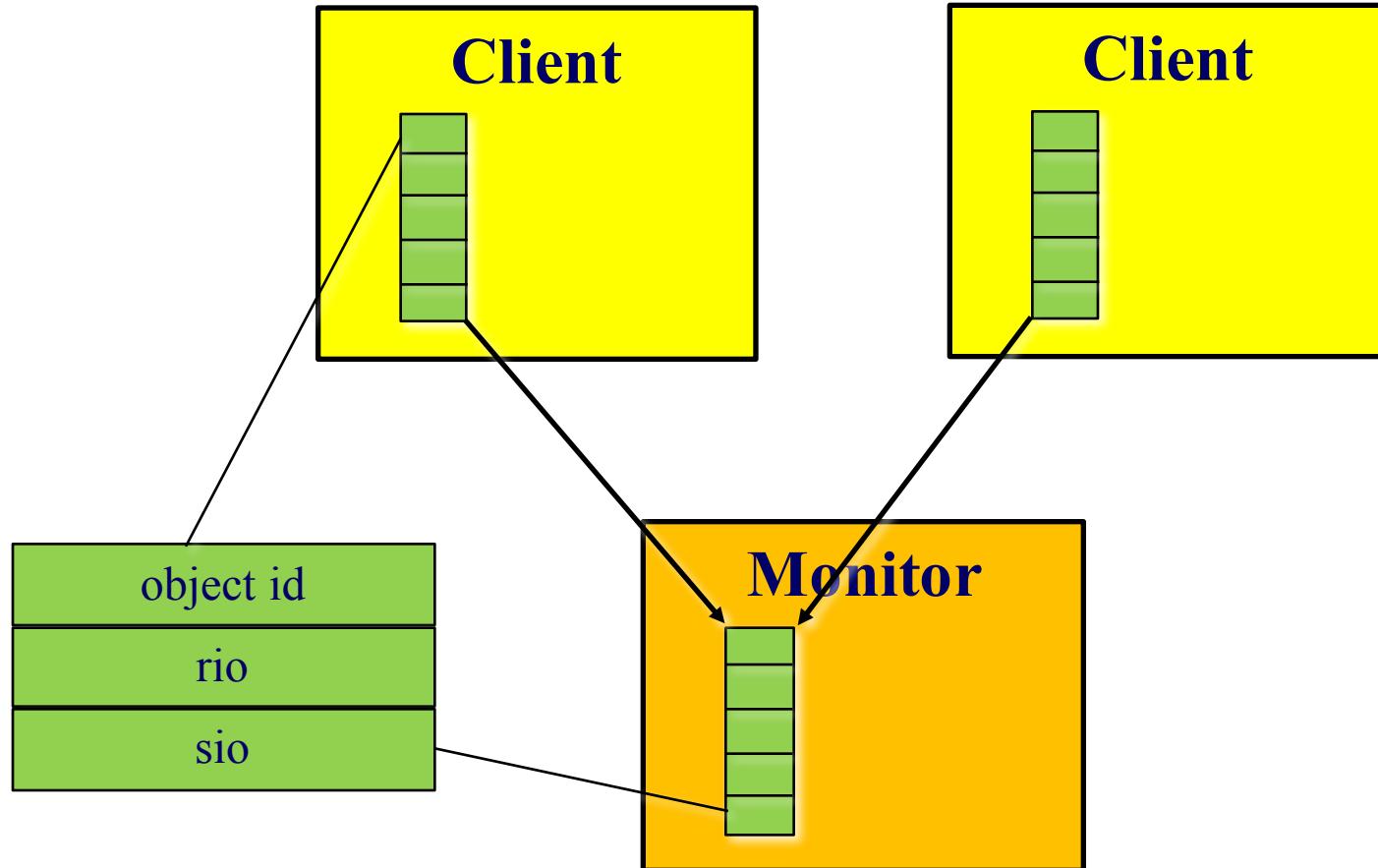
VM Workload Analysis

Random IO Workload
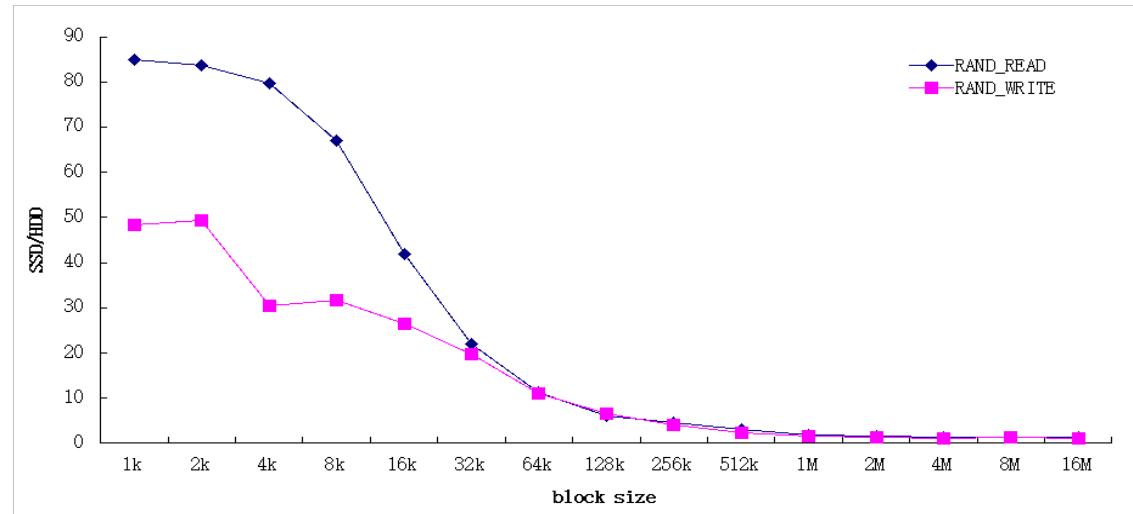
Sequence IO Workload
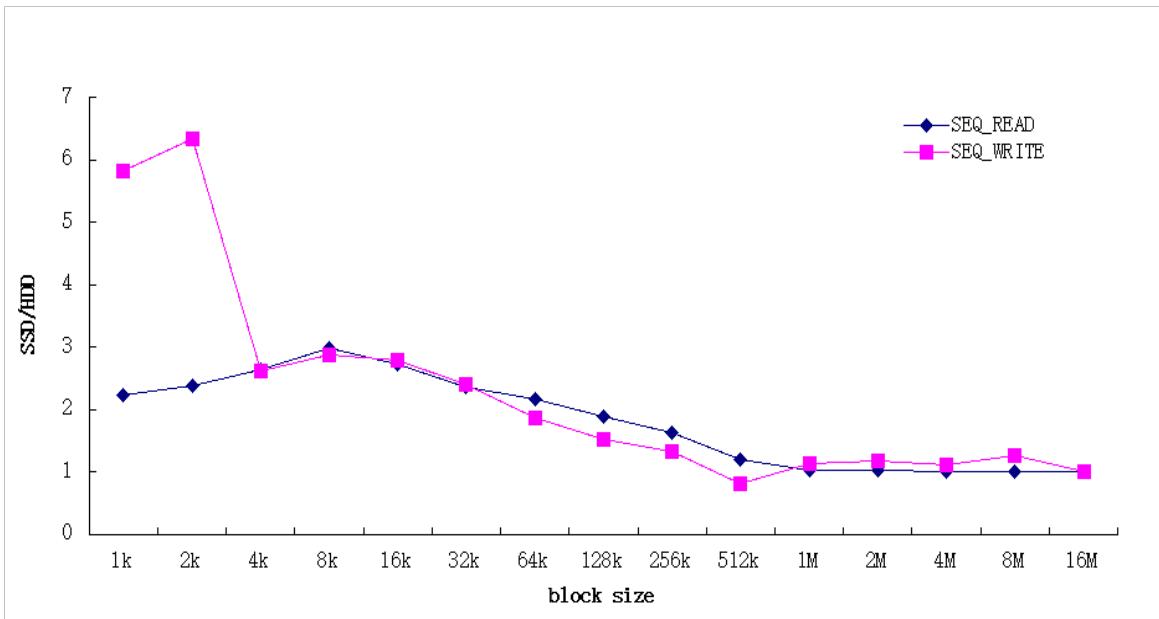
VM Workload Analysis

$$Weight_t = \sum_{1}^{t} \frac{rio_i \times R + sio_i \times S}{a^{t-1}}$$

R = 1 S = 2 a = 2

oid	b
rio	0
sio	10

Client

10 * 1 + 10 * 2

b	10
a	2.5

Monitor

Efficient Data Migration
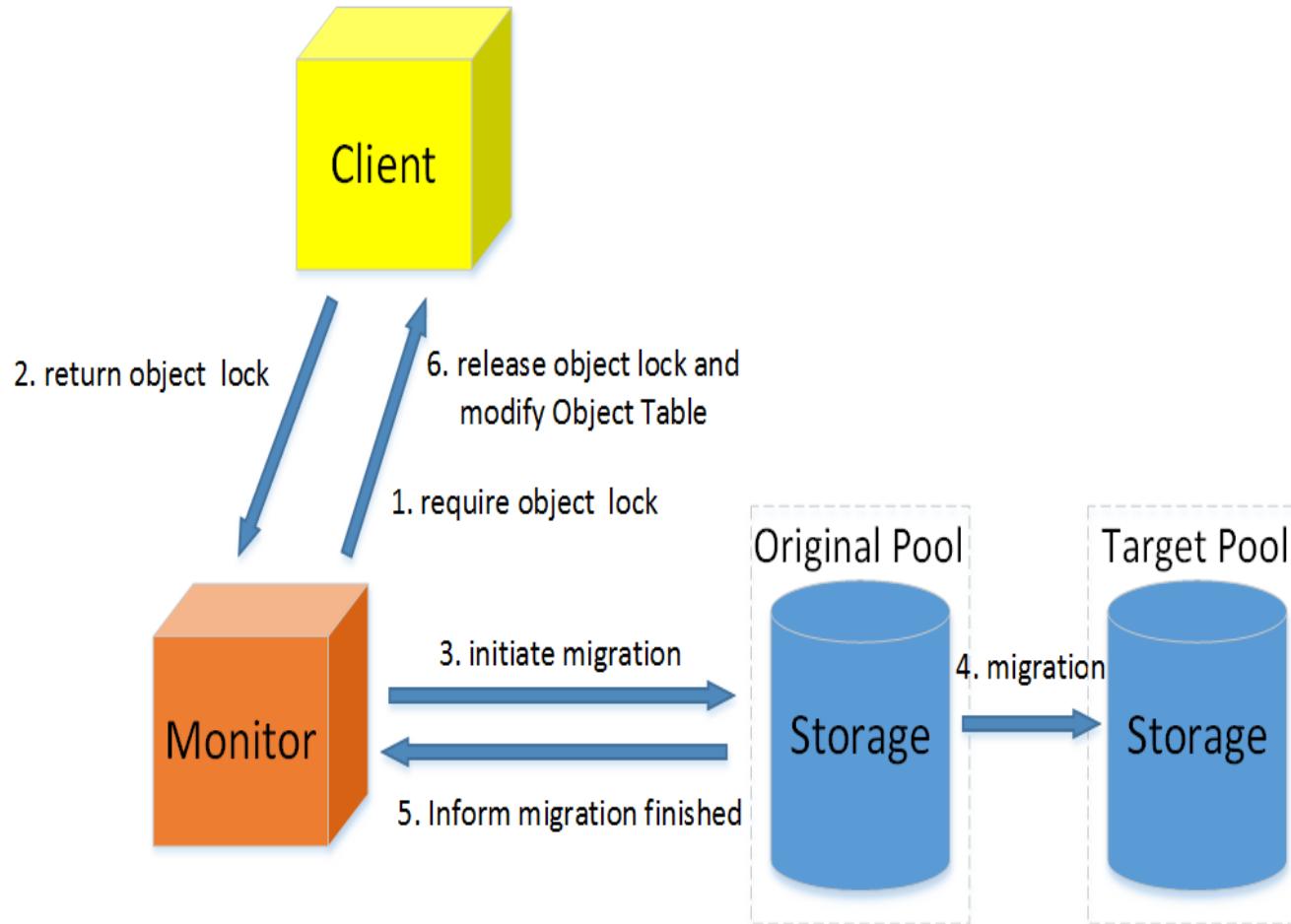
Efficient Data Migration
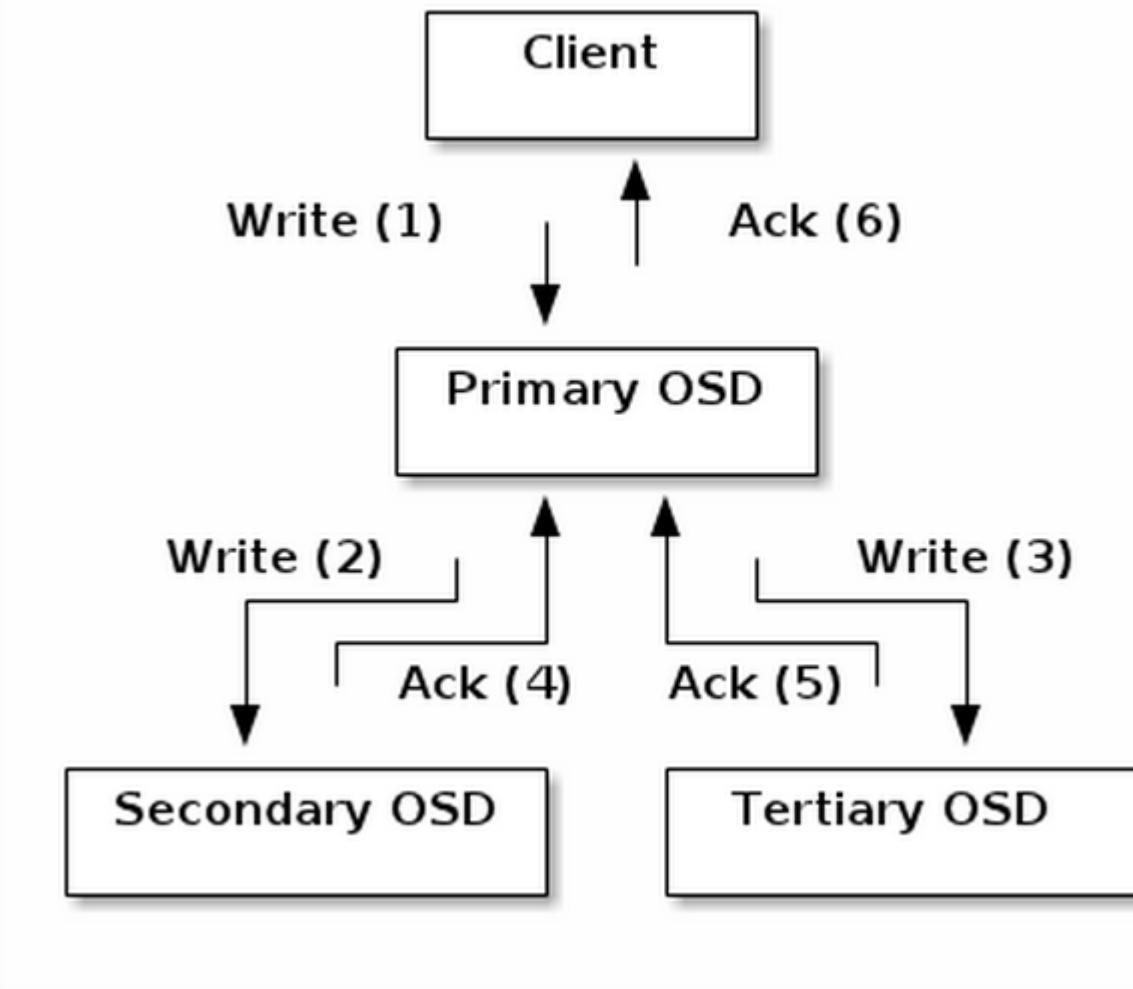
Evaluation and Conclusion

Environment

| HP Compaq Pro 6300 Microtower server	
CPU	Intel Core i3-3220 3.30GHz
DRAM	4G DDR3
SSD	120GB KINGSTON V300 SATA3
HDD	1T Seagate 520S SATA
OS	Ubuntu 12.04 Linux 3.13.0-32-generic

Block IO Workload

write
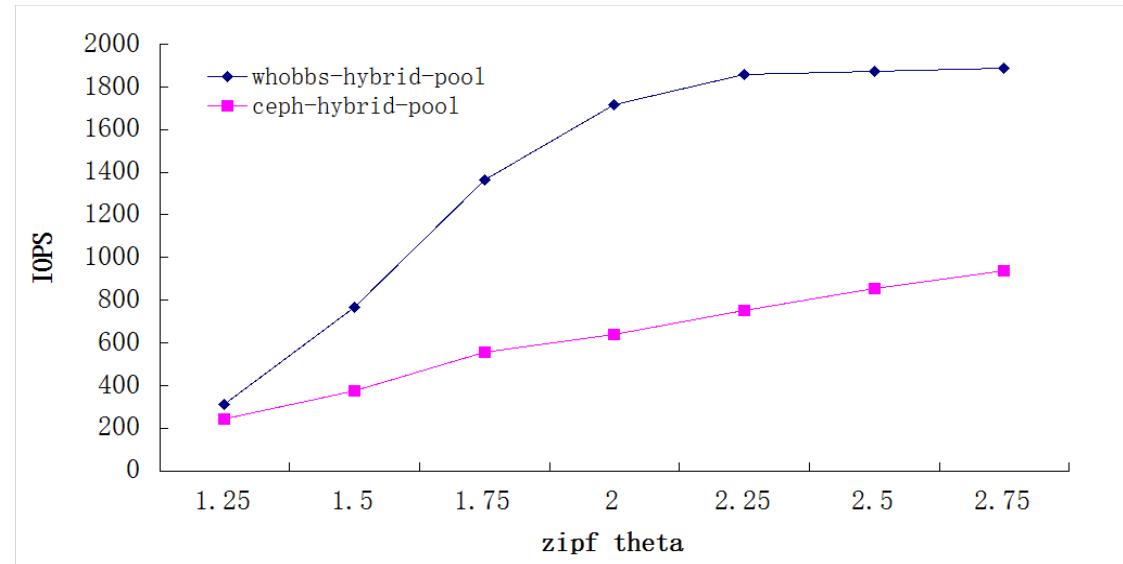
read
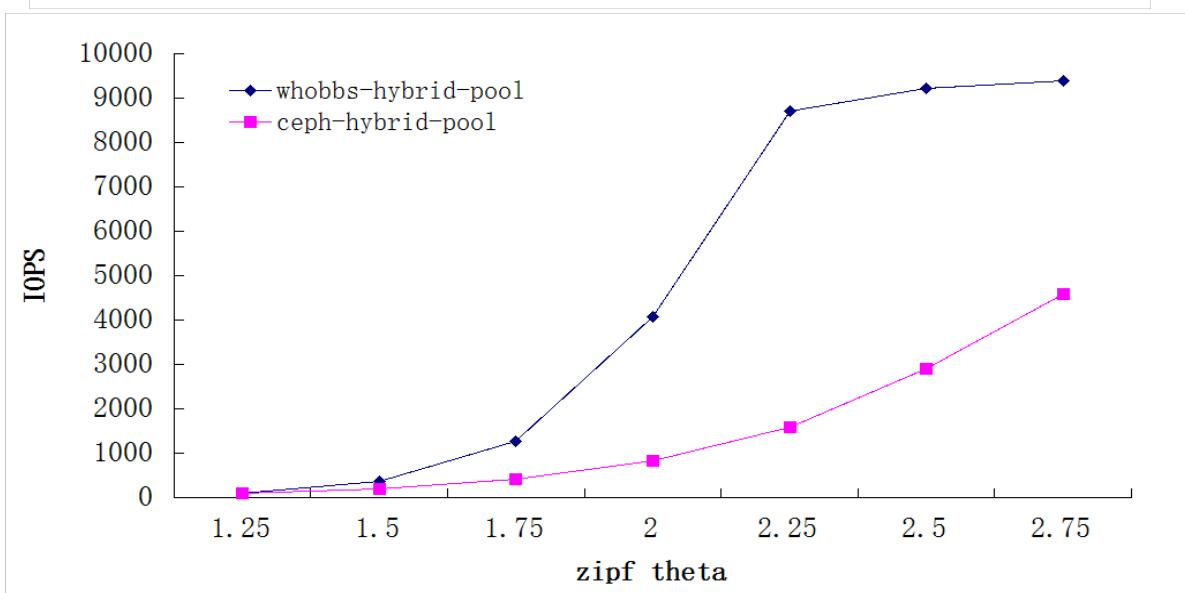
File System Workload
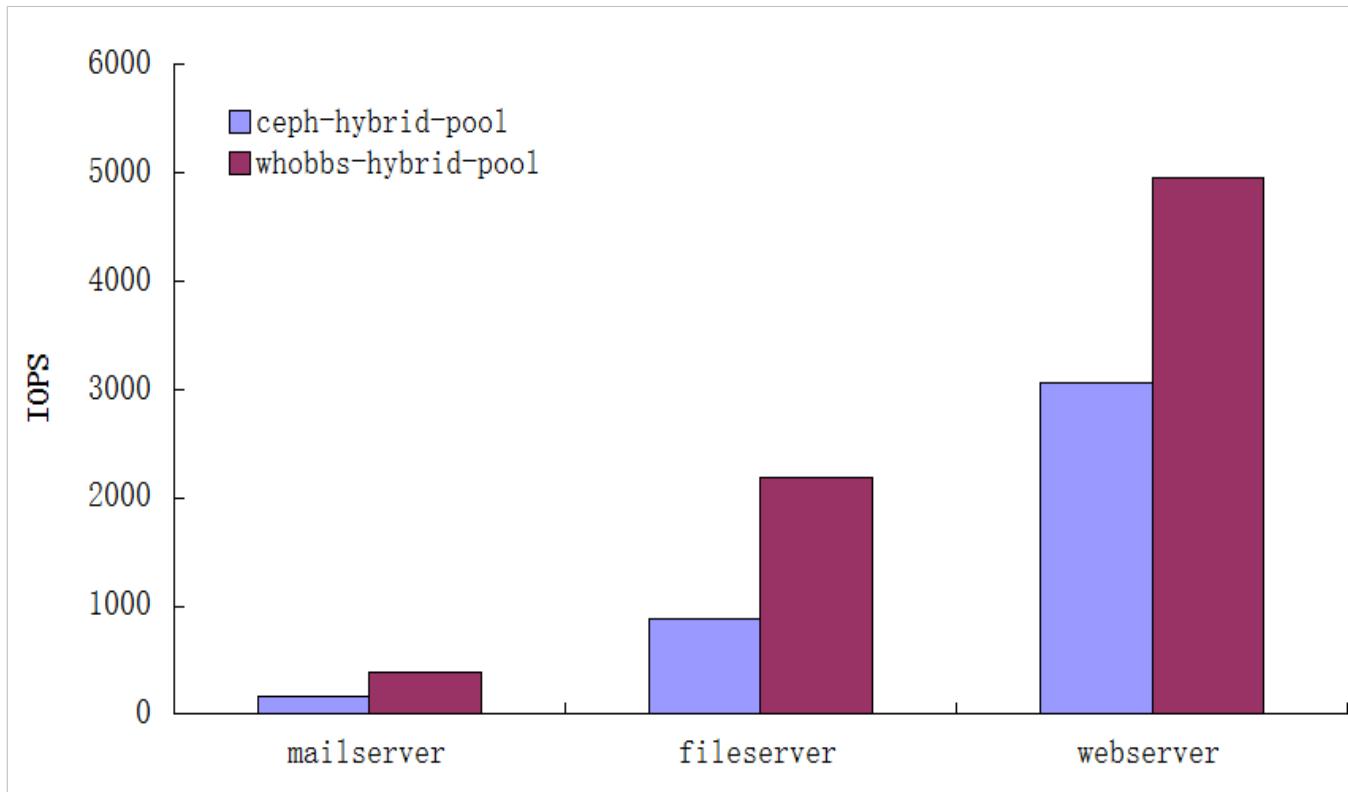
IOPS under real application workload

Monitor Resource Usage

Type	Bandwidth(KB/S)	Memory(MB)
Mail Server	5.397	4.644
File Server	19.003	4.650
Web Server	3.512	4.656

Conclusion

➢ **Object-based hybrid storage**

➢ **Three kinds of distributed nodes**

➢ **More efficient than original Ceph**

Q & A