Fully Distributed Cloud Storage
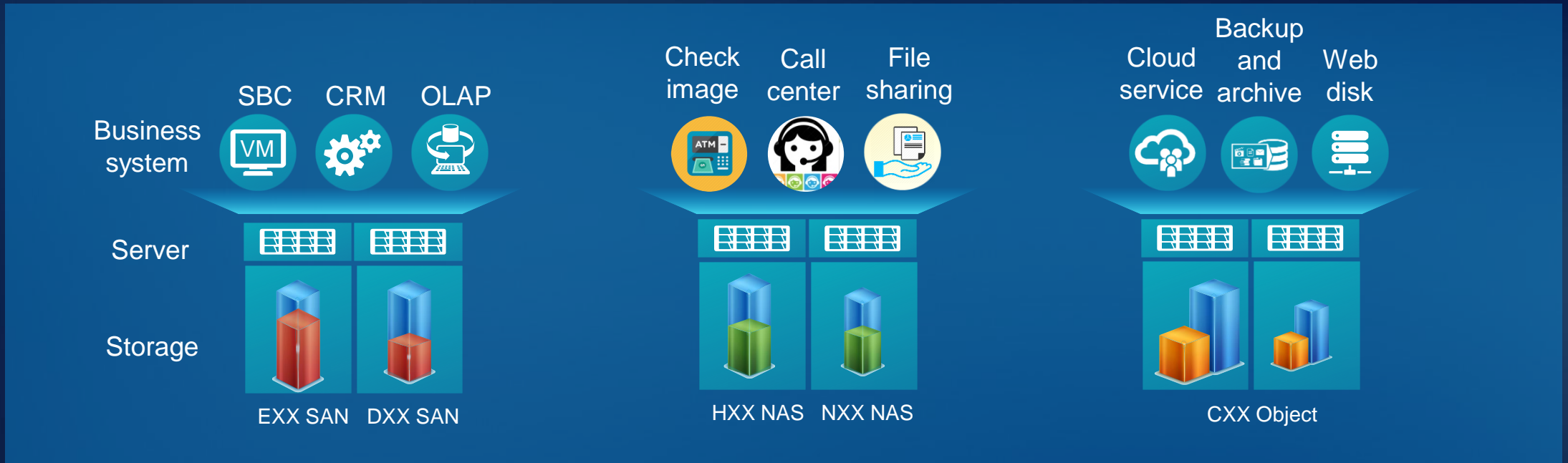
Huawei FusionStorage

Data on Demand

Contents

Development Trends of Cloud Storage

Are Storage Systems at Your Data Center Still Like This in the Cloud era?
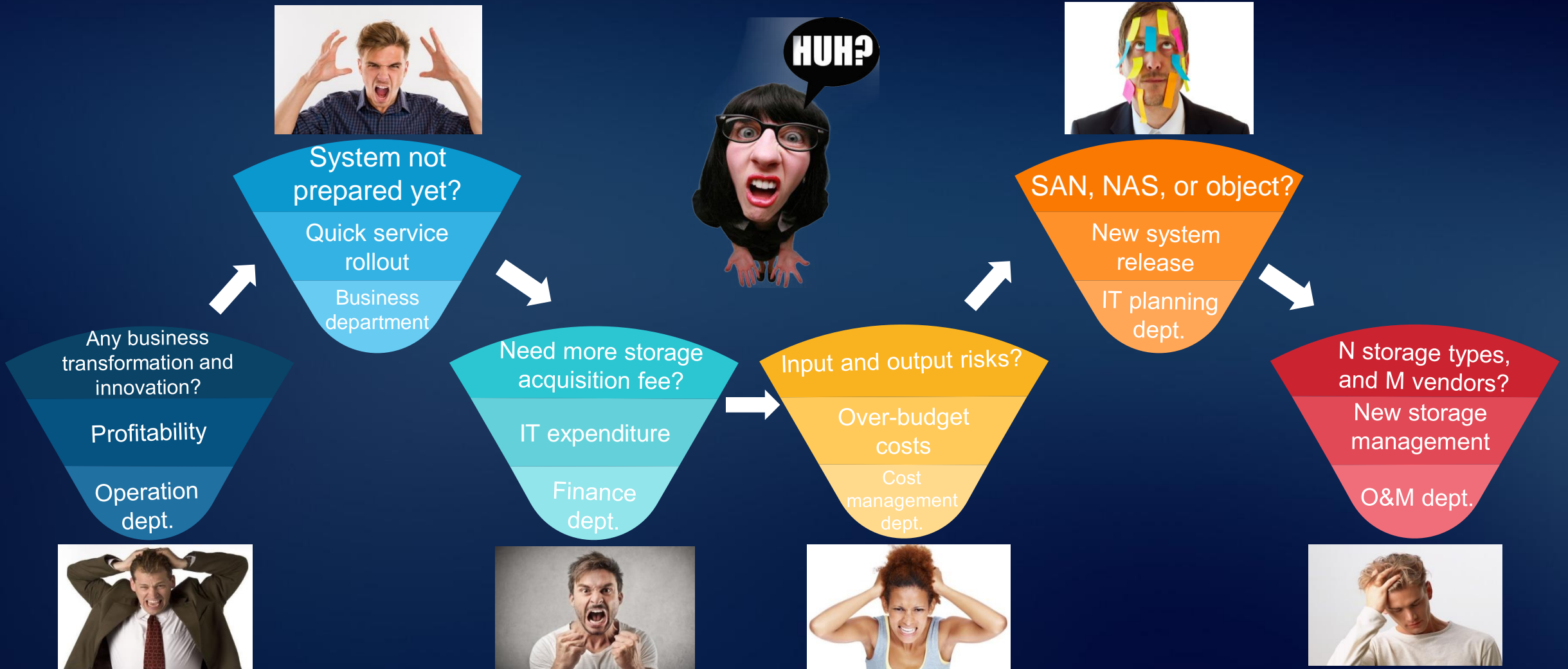
Enterprise Data Center

- ☐ The uncertainty of business expansion creates storage **planning difficulties and disorderly construction**.

- ☐ The traditional scale-out architecture makes the performance optimization and capacity **expansion difficult**.

- ☐ Silo-like construction, **unbalanced resource usage, and unavailable sharing** cause serious resource waste.
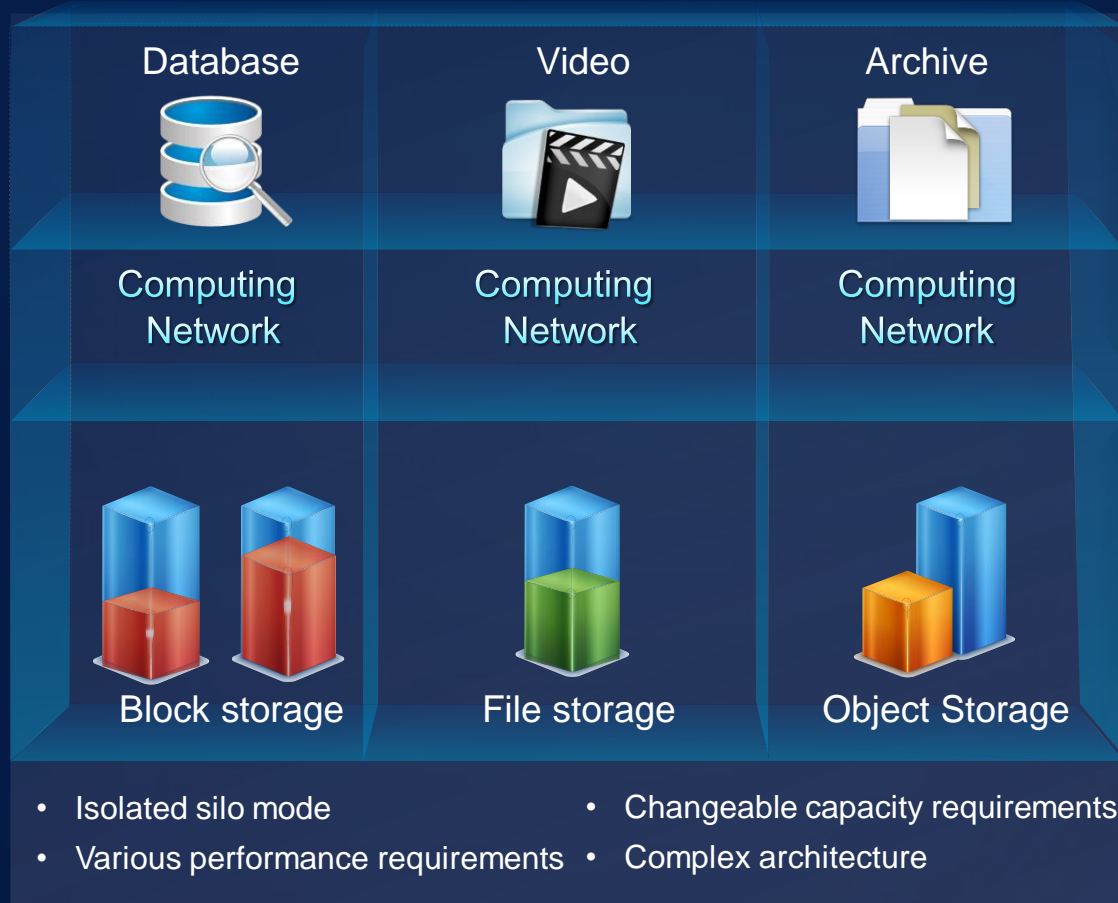
- ☐ Co-existence of storage systems from multiple vendors makes **management and maintenance complicated.**

HUAWEI

Problems

System not prepared yet?
Quick service rollout
Business department

SAN, NAS, or object?
New system release
IT planning dept.

Any business transformation and innovation?
Profitability
Operation dept.

Need more storage acquisition fee?
IT expenditure
Finance dept.

Input and output risks?
Over-budget costs
Cost management dept.

N storage types, and M vendors?
New storage management
O&M dept.

New Business Requires for New Resource Supply Modes

Chimney style

Database	Video	Archive
Computing Network	Computing Network	Computing Network
Block storage	File storage	Object Storage

- Isolated silo mode
- Various performance requirements
- Changeable capacity requirements
- Complex architecture

Cloud

IoT   Mobile Web   Big Data

BIG DATA

Virtualized

On-demand

Elastic

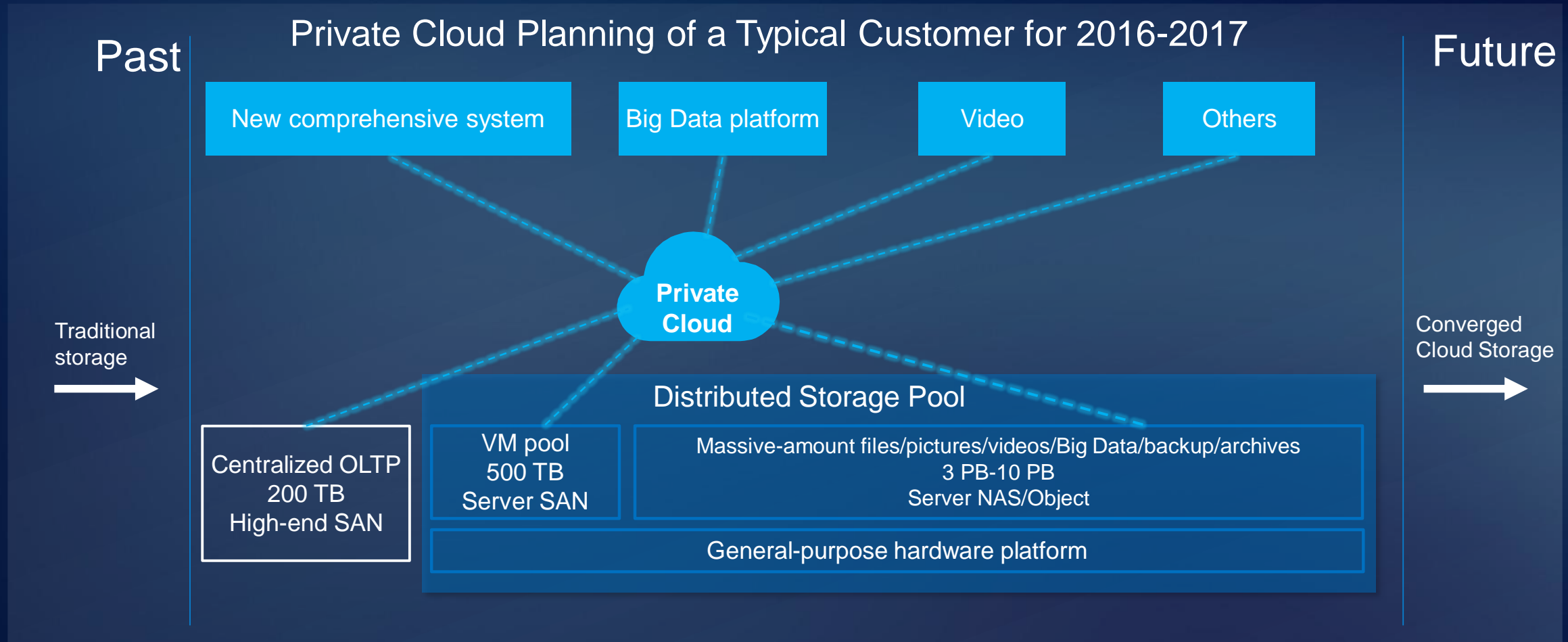Scale-out

Resource-as-a-Service

Key value in the cloud mode

An Enterprise's IT Data Storage Roadmap

Fully Distributed Structure, Unified Management, Standard Hardware, and Orientation to the Future

Private Cloud Planning of a Typical Customer for 2016-2017

Past

Future

New comprehensive system

Big Data platform

Video

Others

Private Cloud

Traditional storage

Converged Cloud Storage

Centralized OLTP
200 TB
High-end SAN

Distributed Storage Pool

VM pool
500 TB
Server SAN

Massive-amount files/pictures/videos/Big Data/backup/archives
3 PB-10 PB
Server NAS/Object

General-purpose hardware platform

HUAWEI

Contents

Huawei FusionStorage Cloud Storage

Huawei FusionStorage: Fully Distributed Cloud Storage System

Traditional Apps

New Apps

FusionSphere   vmware   OpenStack   S3   hadoop

iSCSI | SCSI | NFS | CIFS | FTP | HDFS | NDMP | S3/Swift

Block storage service

File storage service

Object storage service

FusionStorage

General-purpose hardware platform

Reliable Elastic Open

FusionStorage 6.0

- On-demand **block, file, and object storage** services
- Fully distributed architecture
- Based on Huawei's general-purpose hardware platform
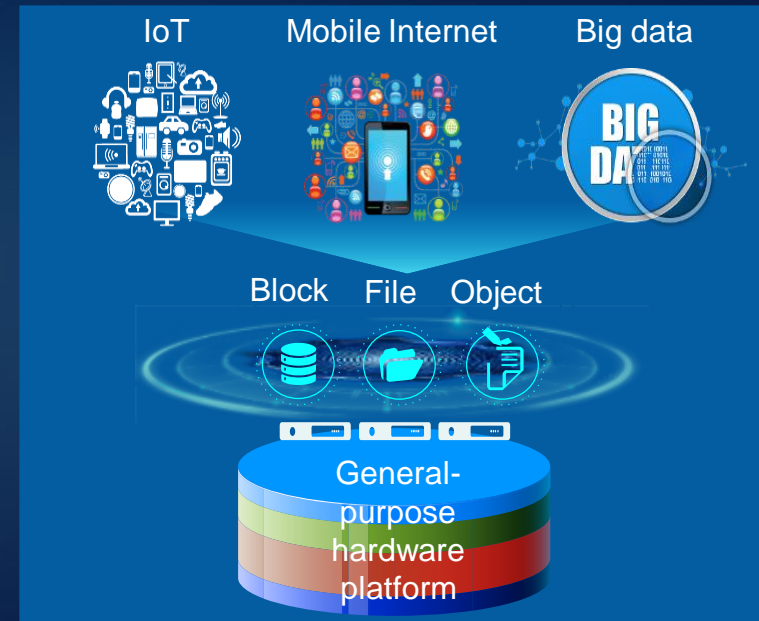
HUAWEI

Logical Architecture of FusionStorage

Cloud Infrastructure

Cloud-Native Applications

VM resource pool

Development testing

Desktop cloud

Infrastructure as a Service

Cloud web disk

Cloud backup and archiving

Cloud video media

Big Data analytics

Application market

IaaS	BKaaS	DRaaS

SCSI	iSCSI	NFS	CIFS	Swift	S3	HDFS

Cloud service platform

Multiple protocols

Toolkit

- Unified deployment
- Unified upgrade
- Unified expansion
- Routine inspection
- Information collection
- Log analysis
- Unified network planning
- ...

System management & OMS

Mgmt.

| Service configuration | Service provisioning | | Alarming | Resource management |
| User management | Resource management | | Topology | Reporting |

Unified NBI

Distributed block storage

Distributed file storage

Distributed object storage

Data service layer

| A-A | Thin provision |
| Linked Clone | Snapshot |

| Snapshot | Quota | Tiering | QoS | WORM |
| Transmit acceleration | Anti-virus | Asynchronous replication | | |

Synchronous replication

Quota | Deduplication

Resource pool layer

| Multi-copies | Online EC | Load balancing | Data layout | Data restoration |

General-purpose hardware

HUAWEI

Intensive Construction Brings Long-term Benefits

Traditional Mode:
Silo-Like

New Mode:
Storage Pool

Database	Video	Archive

Block storage — **File storage** — **Object storage**

IoT — Mobile Internet — Big data

BIG DATA

Block — File — Object

General-purpose hardware platform

- Dispersed resources and information silos; various types of dedicated hardware with reliability of different levels

- Resource pooling and sharing; Unified hardware platform; end-to-end reliability

Non-unified construction → **Intensive construction**

HUAWEI

A Wide Range of API Protocols for Various Business Scenarios

SCSI iSCSI NFS CIFS FTP

HTTP HDFS S3 Swift

Cinder RESTful API Manila

FusionStorage
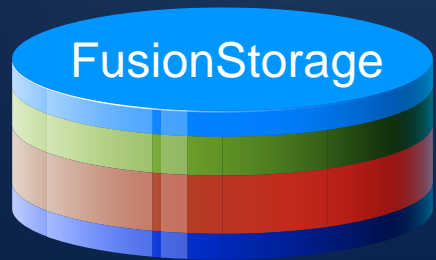
Various Access APIs

- Traditional APIs: **SCSI, iSCSI (**only in VMware and Hyper-V scenarios**), NFS, CIFS, FTP, and S3/Swift**
- **HDFS: Seamlessly interconnection with Hadoop,** efficient storage and analysis

Simple platforms satisfy multi-scenario requirements

- General-purpose hardware platform
- Extensive API definitions apply to structured, semi-structured, and unstructured data processing

HUAWEI

On-Demand Scalability for Resource Usage

Traditional Architecture

Scale-up, with limited scalability

Performance

Limited increase
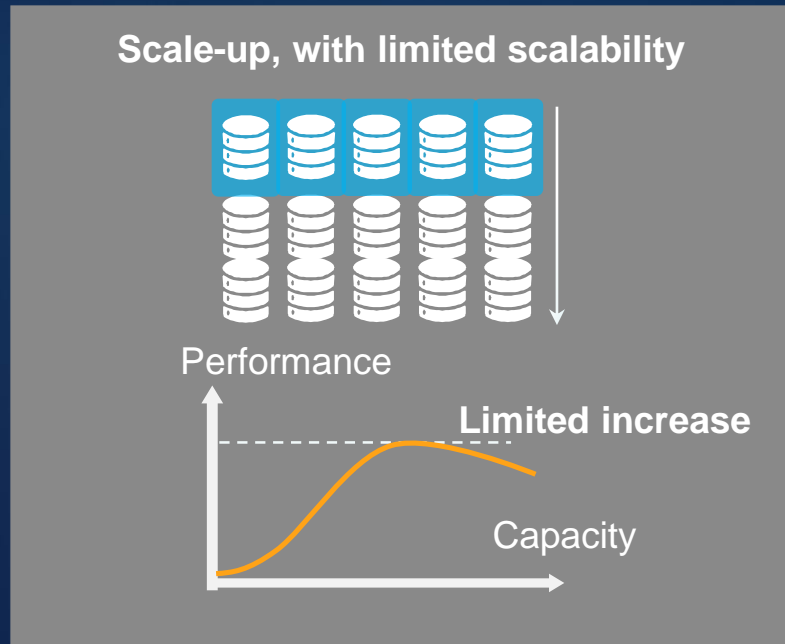
Capacity

- Scale-up architecture only supports a maximum of dozens of controllers, with limited performance and capacity. Dedicated software requires a long-term to purchase. Its long-tem scalability conflicts with quick service rollout.

Cloud Storage Architecture

Scale-out, with massive and flexible scalability

Performance

Linear growth
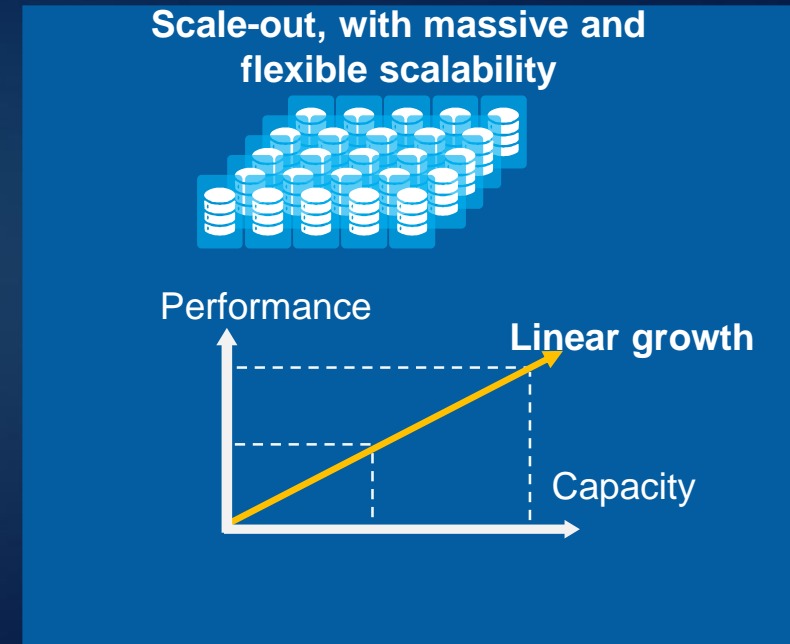
Capacity

- Distributed architecture enables on-demand deployment, elastic expansion, and linear growth; on-demand provisioning of storage types, and capacity and performance services.

Difficult expansion → On-demand expansion

HUAWEI

Largest Scalability in the Industry Enables Worry-Free Cloud Business Expansion
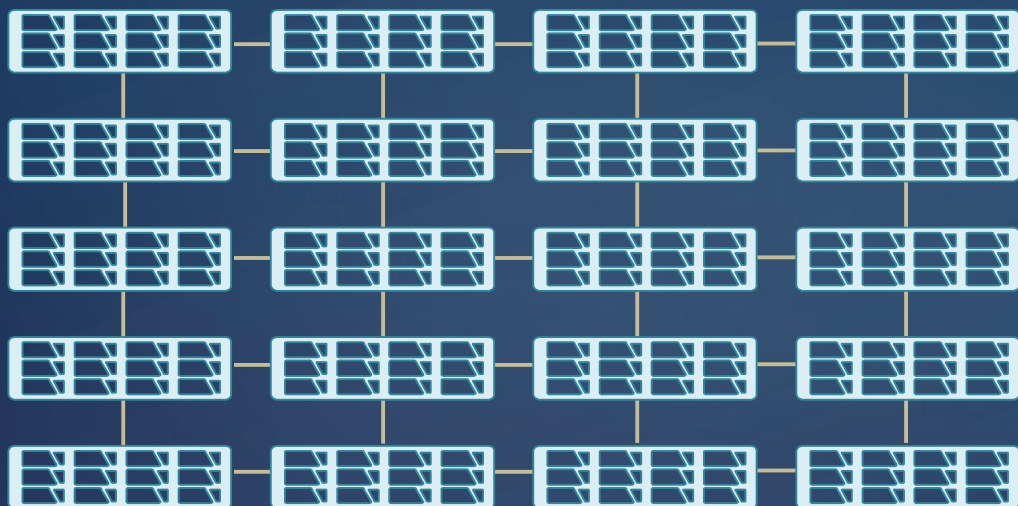
Stack expansion and automatic data load balancing

Largest scalability in the industry

- **49,152** disks for block storage and **288** nodes for file/object storage, supporting large-scale cloud business expansion

Trustworthy: Large-scale commercial deployment

- Two enterprise-class distributed storage platforms with **more than 600 PB of capacity**, the largest in the industry
- **Dozens of PB-level** cases, unique in the industry

HUAWEI

Proven Industry-Leading Performance

1.6x Better Single-Node Performance
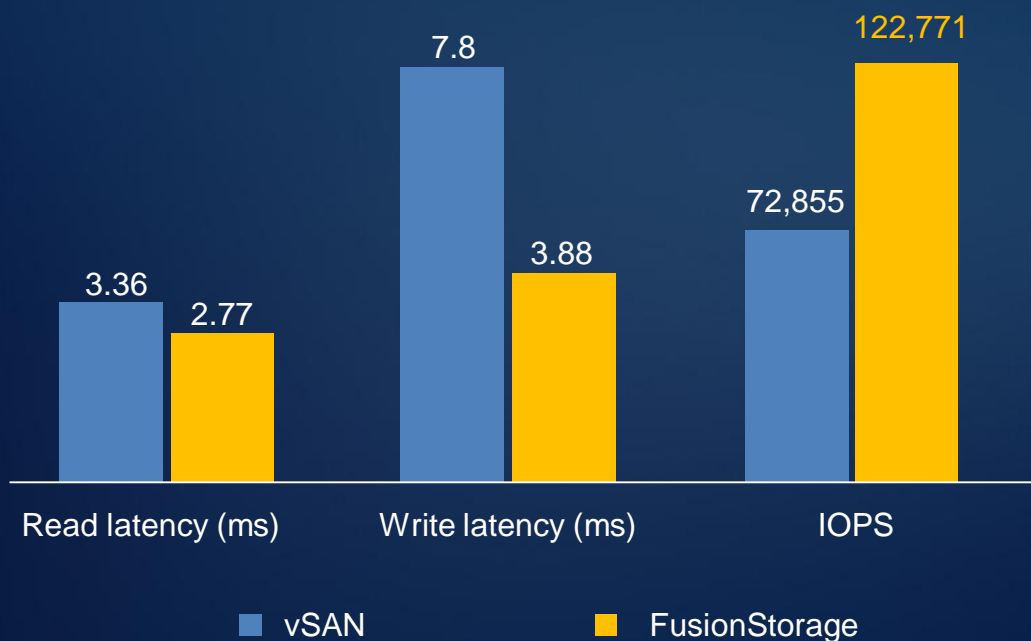
Performance comparison (8 KB random reads and writes, read/write: 7:3)

No.1 System Performance (SPC-1)

4.5 M IOPS@0.78 ms
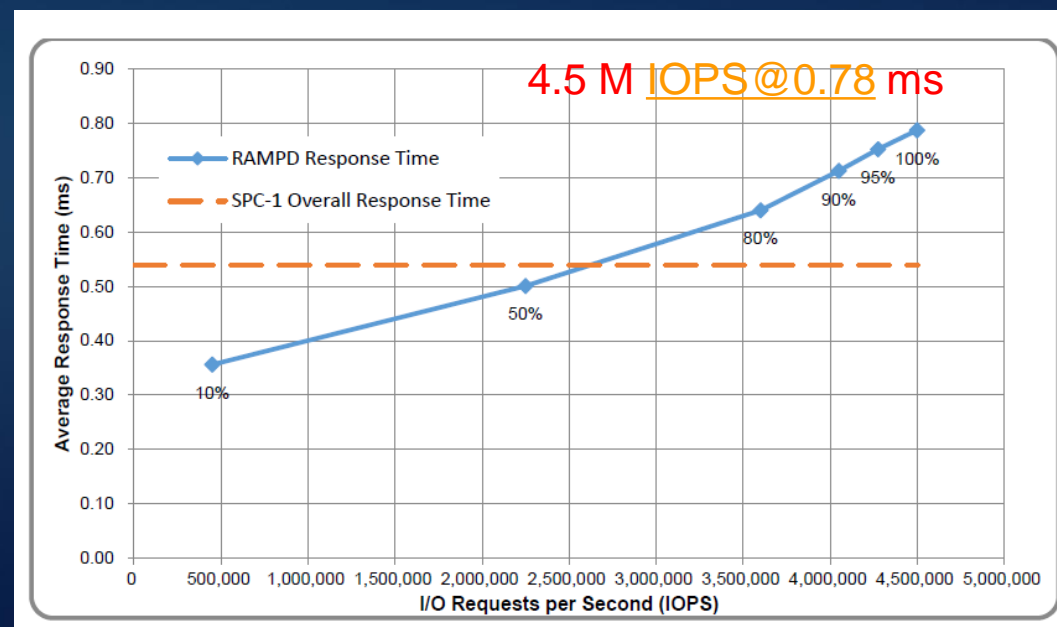
http://www.storageperformance.org/results/results_spc1_v3/spc1_v3_active#a31007

HUAWEI

Maximized Hardware Use Under the same Available Capacity

The number of physical disks reduced by **59%**

Hybrid storage

Disk quantity

- ■ Ceph three copies
- ■ VSAN three copies
- ■ FusionStorage EC
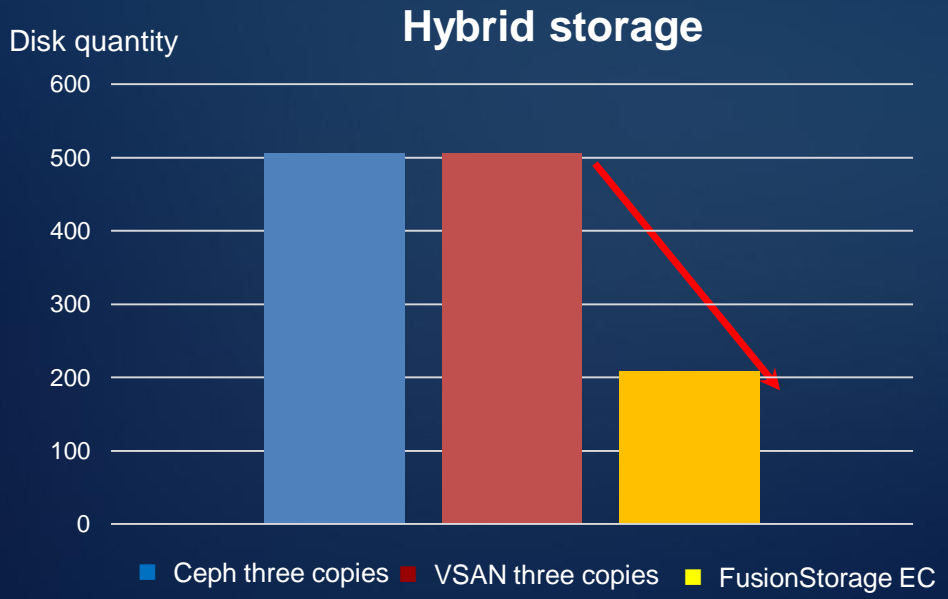
1 PB of available capacity + Equivalent reliability, 6 TB SATA disks

The number of physical disks reduced by **18% to 37%**

All-flash storage

Disk quantity

- ■ Ceph two copies
- ■ VSAN EC
- ■ FusionStorage EC
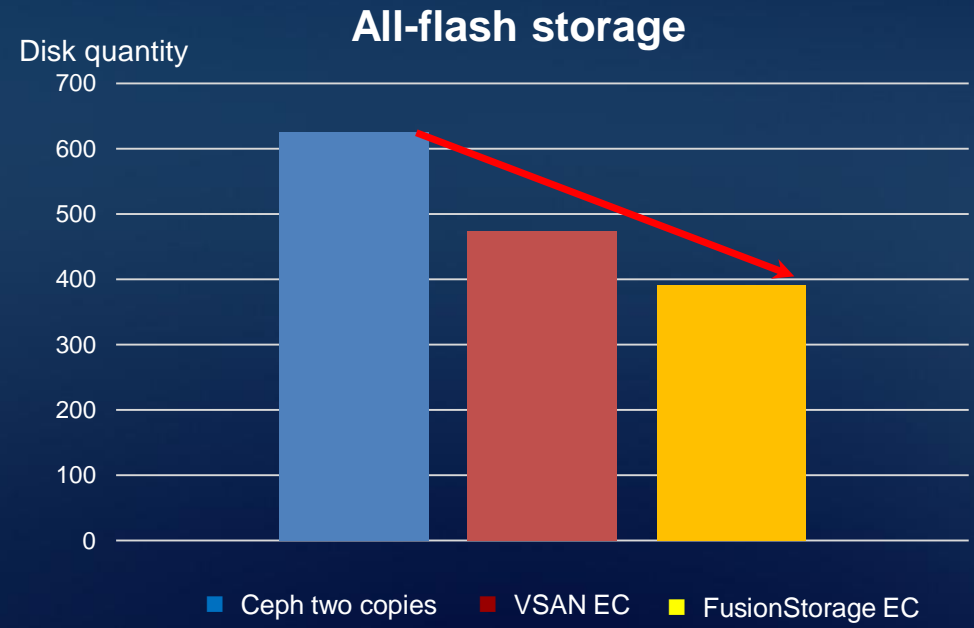
1 PB of available capacity, better reliability, 3.2 TB NVMe SSDs

HUAWEI

High Availability and Multi-Level Reliability Assurances

VMware

Oracle RAC

Active-Active
Asynchronous replication

FusionStorage

FusionStorage
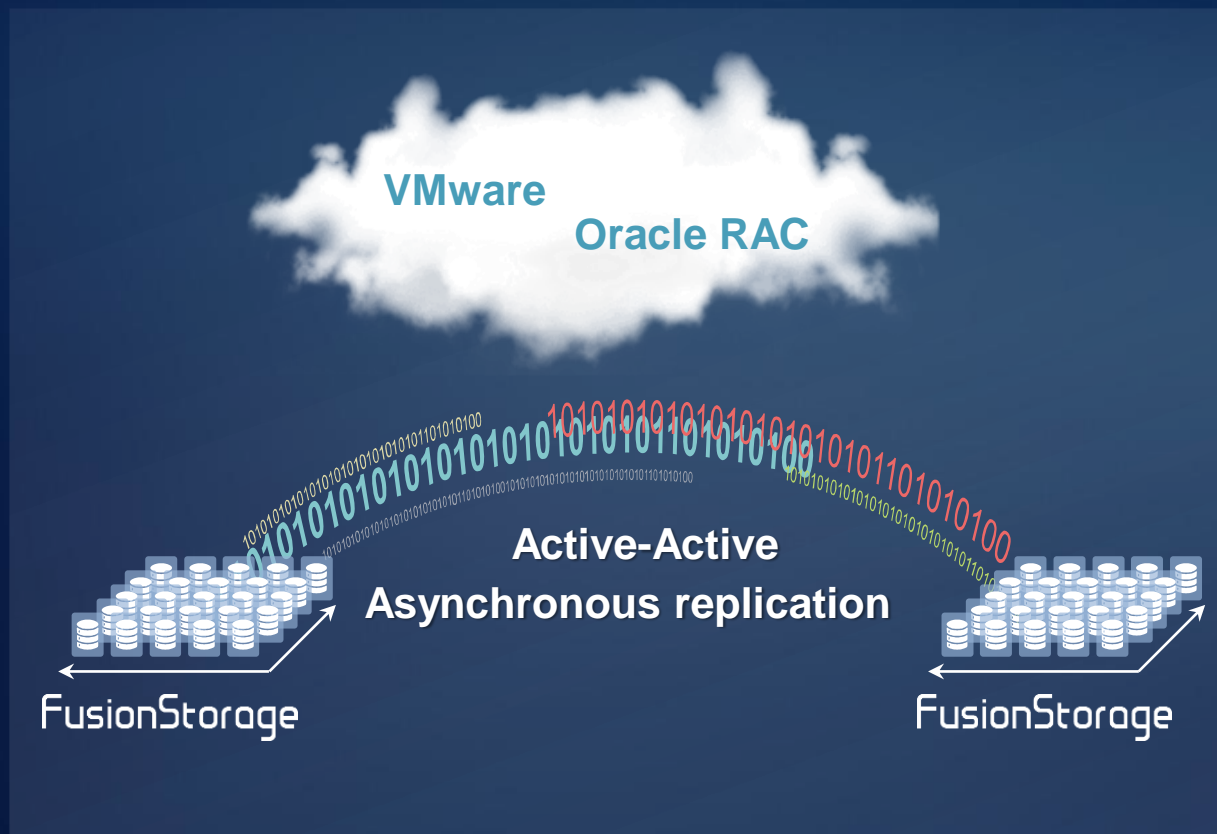
Data redundancy protection for system HA

- Multiple redundancy policies: **Multiple copies and EC** for block storage and **EC** for file/object storage

Data center-level reliability assurances

- A variety of enterprise features for HA data center construction: **Active-active block/Asynchronous replication, synchronous object replication, and asynchronous file replication**

Ultra-Fast data recovery

- Concurrent data recovery: Up to **15 minutes/TB**, **40fold** faster than traditional RAID groups

HUAWEI

Extensive Openness and Compatibility
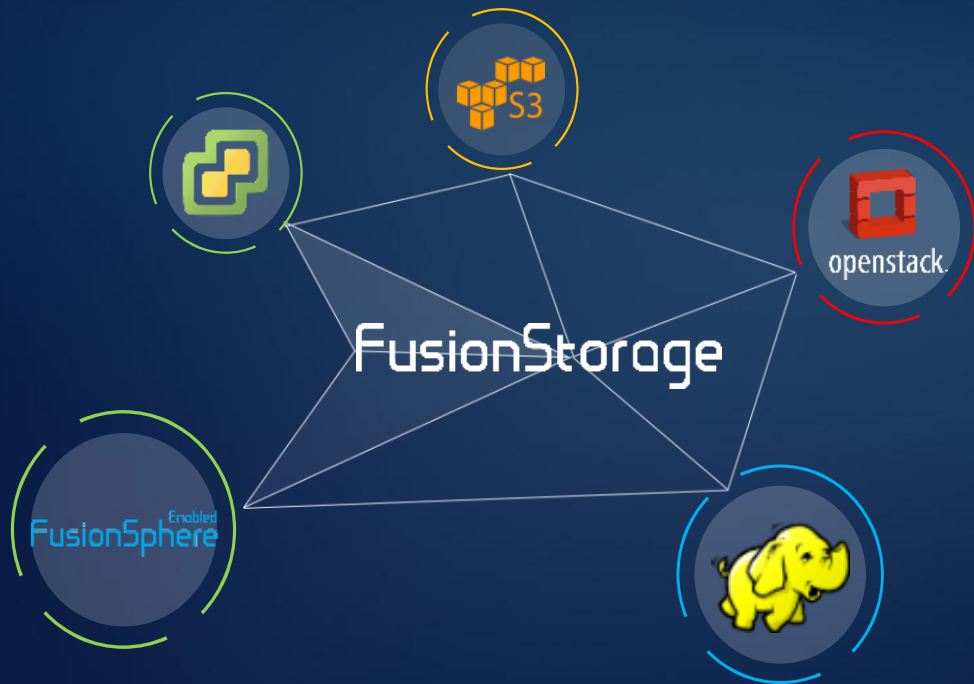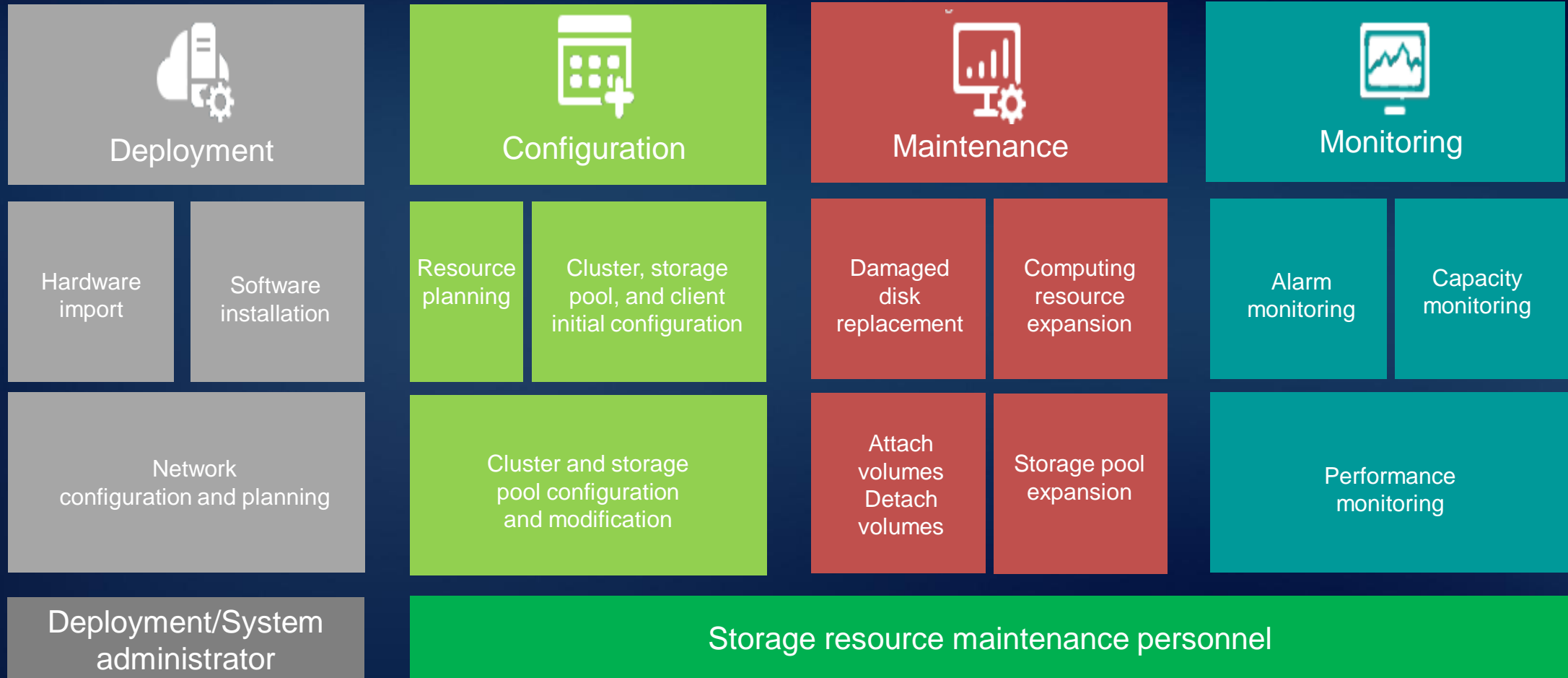

FusionStorage

Open storage platform

- Extensive compatibility with Hypervisor (VMware vSphere, KVM, FusionSphere, and XEN) allows customer to choose computing virtualization platforms based on requirements.

- Open APIs such as **Cinder, Manila, and Swift** are supported.

- **Compatible with Amazon S3 APIs**

Infrastructures built on demand

- On-demand choice of computing virtualization platforms based on requirements

- Seamless **integration into the OpenStack** cloud infrastructure

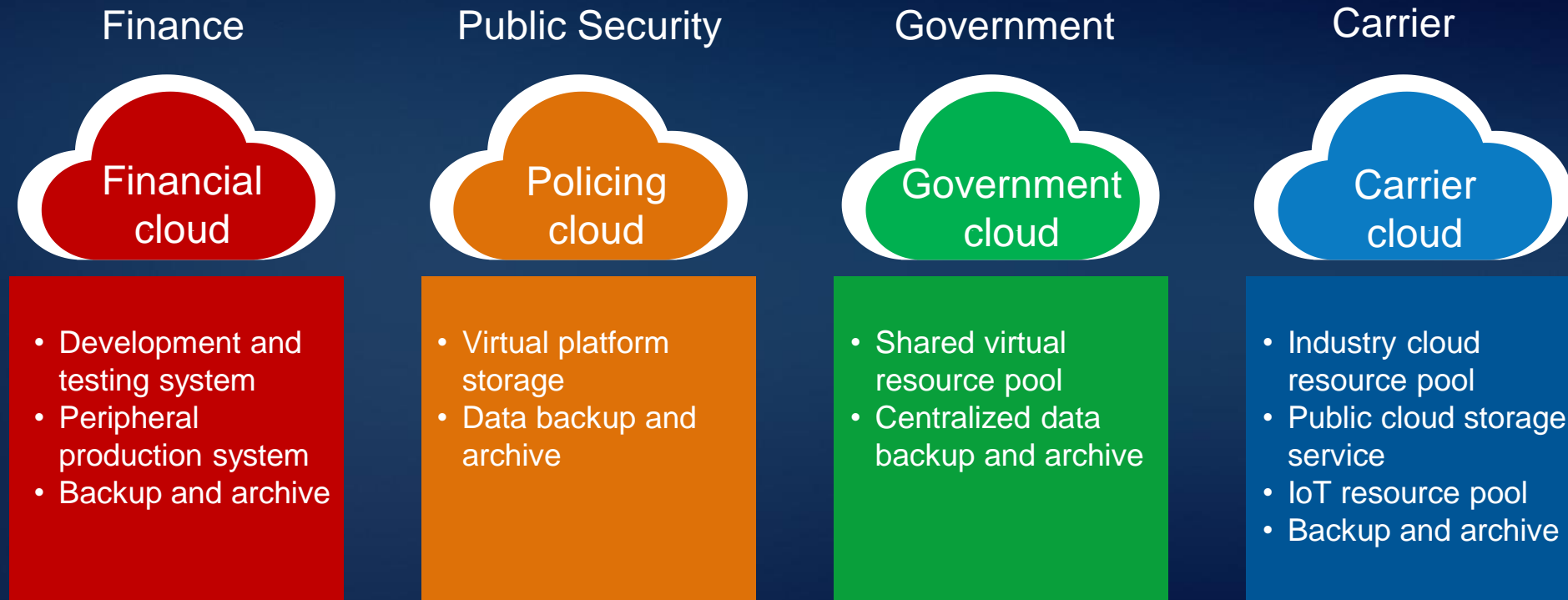- Flexible choice of public cloud or private cloud infrastructures

HUAWEI

Easy-to-Use Resource Management and O&M

Deployment	Configuration	Maintenance	Monitoring
Hardware import / Software installation	Resource planning / Cluster, storage pool, and client initial configuration	Damaged disk replacement / Computing resource expansion	Alarm monitoring / Capacity monitoring
Network configuration and planning	Cluster and storage pool configuration and modification	Attach volumes Detach volumes / Storage pool expansion	Performance monitoring

Deployment/System administrator	Storage resource maintenance personnel

HUAWEI

Contents

Typical Cases

Distributed Storage for Typical Industry Cloud Resource Pools

Finance

Financial cloud

- Development and testing system
- Peripheral production system
- Backup and archive

Public Security

Policing cloud

- Virtual platform storage
- Data backup and archive

Government

Government cloud

- Shared virtual resource pool
- Centralized data backup and archive

Carrier

Carrier cloud

- Industry cloud resource pool
- Public cloud storage service
- IoT resource pool
- Backup and archive

FusionStorage cloud storage

HUAWEI

CMB Has Used FusionStorage to Move Its Key **Database Business** to the Cloud

招商银行
CHINA MERCHANTS BANK

OLAP
Report business

OLTP
Database system

Big Data
Cloud-based big data platform

Development and Testing

108-node **FusionStorage serves four types of applications**

40% TCO savings

10 x faster resource provisioning (weeks > hours)

HUAWEI

Zhejiang Telecom Uses SDS to Build Cloud Resource Pools and Comprehensively Replace Traditional Storage

China Telecom: World's largest integrated operator with 215 million mobile subscribers and 123 million fixed network subscribers

	BSS		MSS	OSS	VAS	Hosting
Applications	Billing CRM	BI Report CDR	OA MSS Cloud	Signaling Logs NPO	S/MMS RBT WAP	Hosting
Time	--	2016	2016	2015	2014	2014
Capacity	400 TB	2111 TB	1,260 TB	1,882 TB	1024 TB	1,024 TB
Storage	Traditional high-end device	FusionStorage distributed storage				

7 PB, 3000 VMs

Replacement of 10+ traditional storage devices in the first phase
Traditional storage no longer purchased for non-core systems

1/9 Capacity Expansion Time

90 days shortened to 10 days
Performance growth in line with capacity expansion

1.3 Million IOPS

30K IOPS/VM
Easily meeting requirements of 120 applications

中国电信
CHINA TELECOM

HUAWEI

FusionStorage Enables ALL-CLOUD for Huawei's Data Centers

HUAWEI IT Data Center

700 PB Computing Cloud, 200 PB VDI

- Development and testing - Marketing experience - Operations support

Resource Provisioning Time Shortened to 1/36

- 12 hours -> 20 minutes - 2500 VMs in 5 minutes

2fold to 9fold Better Efficiency

-Version iteration: 8 weeks -> 3 weeks - Verification: 48 hours -> 5 hours

Virtual desktop

Continuous integration

Chip simulation

Development design

Verification testing

Antivirus

Quality analysis

Business analysis

Remote demonstration

Manufacturing

Sales support

Service delivery

HUAWEI

www.huawei.com