Data Lake and Elastic Cloud by EMC Federation

EMC Japan
Nobuyasu Wakamatsu
EMC’s Mission

To lead customers on a journey to cloud computing by enabling them to store, manage, protect, and analyze their most valuable asset – INFORMATION – in a more agile, trusted, and cost-efficient way.

EMC - Who we are

Founded 1979
Employees 68000
Revenue 24.4*
R&D p.a. 3.0*
Presence 86
Virtualization 92%

(*) Revenue and R&D spendings in 2014 in Mrd. US$
EMC ACQUISITIONS 1999 – 2014
Investment Continues

As of November 2014

© Copyright 2015 EMC Corporation. All rights reserved.
A UNIQUE FEDERATION OF COMPANIES
Data Growth and Silo

- **2015**: 71EB
- **2016**: 106EB
- **2017**: 133EB

Source: March 2014, IDC Structured vs. Unstructured Data, The balance of power continues to shift

Workload Boost

- **EXPERIMENTAL WORKLOAD**

- **COST EFFICIENCY** for storage and data management
- **FAST DATA ANALYSIS**
- **ELASTIC COMPUTE & STORAGE RESOURCE**

© Copyright 2015 EMC Corporation. All rights reserved.
REDEFINE IT

Data Growth and Silo

- **COST EFFICIENCY**
  - FOR STORAGE AND DATA MANAGEMENT
- **FAST RESEARCH & ANALYSIS**

Total Capacity Shipped, WW

Source: March 2014, IDC Structured vs. Unstructured Data, The balance of power continues to shift

Silod Data

- Materials analysis
- Radiation safety
- Waste management
- Environmental research
- Nuclear Medicine
- Nuclear astrophysics

Law Data / Experimental Data / Evaluated Data, Analytics Data...

(Data Lake)

Source: March 2014, IDC Structured vs. Unstructured Data, The balance of power continues to shift
DATA LAKE TECHNOLOGY

BUT...
HADOOP

- HADOOP DISTRIBUTED FILE SYSTEM
  - Highly scalable & portable
  - Apache Open Source Specification
  - Structured and unstructured data
  - Analytics API interface standard
  - Storage hardware flexibility
  - Performance optimized for large file access

- HDFS TRADE-OFFS
  - Optimized for streaming writes; poor for random seeks
  - Write once file system
  - Hardware failure results in reduced performance
  - Specialized file system, not designed for general use
Operational data is the focus (it is in memory, mostly)

Continue to work with RDBs

All data, history in HDFS

HDFS data files directly accessible inside Hadoop
Analytic results routed to memory tier
EMC Isilon

5,800+ Isilon Customers

25% YoY Growth

Gartner
IDC

Scale-Out NAS leader

#1 Market Leader in Hadoop Shared Storage

600+ Analytics Customers

Pivotal, Cloudera, Hortonworks
HADOOP ARCHITECTURE – DAS VS ISILON

Data Node + Compute Node

Data Node + Compute Node

Data Node + Compute Node

Data Node + Compute Node

NameNode

Meta Data

Ethernet

Compute Node

Compute Node

Compute Node

Compute Node

Ethernet

Meta Data

Name node

Name node

Name node

Name node
Fixed ratio of resource

20-90% of HDFS I/O go through Ethernet

Local disk usage is shared between shuffle I/O (50-75% of all I/O during terasort) and HDFS I/O
The number of compute and Isilon nodes can be adjusted independently to achieve the optimal ratio of compute and I/O bandwidth.

HDFS I/O ALWAYS comes through a rack-local Isilon node which collects data blocks from all other Isilon nodes across the InfiniBand fabric.

Shuffle I/O (65% of all I/O during terasort) remains on local storage. This can be flash for optimal performance.
HADOOP ARCHITECTURE
— ISILON FOR HDFS + SHUFFLE

The number of compute and Isilon nodes can be adjusted independently to achieve the optimal ratio of compute and I/O bandwidth.

HDFS I/O ALWAYS comes through a rack-local Isilon node which collects data blocks from all other Isilon nodes across the InfiniBand fabric.

Shuffle I/O is also on an Isilon cluster. It can be a standalone Isilon cluster or tier with one node per rack. This will support the high stream count needed for optimal merge sort operations.
EMC Isilon: Massively Scalable with Simple & Ease of Use

Isilon scales from 16TB to 50PB in a single file system, single volume cluster

- Under 60 seconds to scale with no downtime
- **NO** manual intervention
- **NO** reconfiguration
- **NO** server or client mount point or application changes
- **NO** data migrations
- **NO** RAID

Multi-Protocol

- NFS
- SMB
- HTTP
- FTP

HDFS for Hadoop

Swift/REST for Object

© Copyright 2015 EMC Corporation. All rights reserved.
EMC Isilon Scale-Out NAS Product Family

Linear Scaling Of Performance And Capacity

- **S-Series**
  - High Transactional Platform

- **X-Series**
  - High Throughput Platform

- **NL-Series**
  - Nearline Storage Platform

- **HD-Series**
  - High Density Platform
Computing Centre of the National Institute of Nuclear and Particle Physics

Using an EMC Isilon cluster to support cutting-edge research

**Challenge**
- Highly scalable data storage infrastructure
- On-demand cloud computing platform

**Solution**
- EMC Isilon X200

**Applications**
- Cloud Computing
- Infrastructure as a service

**Results**
- Infrastructure-as-a-service (IaaS) solution
- Implementation of a new “on-demand” computing platform
- Fully scalable in capacity and bandwidth

---

**BENOIT DELAUNAY**
Leader Network Infrastructure, system, storage team

“The EMC Isilon cluster has the capacity to fully accommodate the evolution requirements of our cloud computing platform in terms of storage capacity as well as bandwidth, as the ‘hot’ addition of modules is enabled without the need for any system downtime. Its rapid implementation and short learning curve translated into significant saving of time for our teams.”
EMC ECS Appliance

ECS Software

Multi-Cloud APIs

- Amazon S3
- EMC
- OpenStack Swift

HDFS

Object

Commodity

ECS Appliance

Shared storage

Geo-Replicated Data Protection

Geo-Replicated Data Protection

https://accesspoint.yourcompany.com
DSSD: RACK SCALE Flash STORAGE

Wicked fast, low latency persistent storage!
- Up to 144 TB in 5u
- ViPR controller

- 10-20 million IOPS
- 100 GB/s bandwidth
- <100μs latency
- New data access - flood datapath
- Direct app API interface
REDEFINE IT

Workload Boost

EXPERIMENTAL WORKLOAD

✓ ELASTIC COMPUTE & STORAGE RESOURCE

On-Premise Private Cloud
Software-Defined Elastic Storage
ScaleIO
Elastic Converged Storage

Hybrid Cloud
Enterprise Hybrid Cloud

© Copyright 2015 EMC Corporation. All rights reserved.
Software-Defined Elastic Storage

Hyper Convergence

- Media/Server/OS – agnostic
- Scale-Out of thousands of Servers
- Elastic – add/remove on the fly
- Performance – Massive I/O parallelism
- Integration – OpenStack Cinder
Before ScaleIO
With ScaleIO

1,000 IOPS  10 TB

2,000 IOPS  20 TB
ScaleIO: Auto-Rebalance

Add Nodes or Disks Dynamically
—System Automatically Migrates and Rebalances Storage

Remove Nodes or Disks Dynamically
—System Automatically Migrates and Rebalances Storage
ScaleIO: Configuration

Application Server

ScaleIO Data Server (SDS)

X86 Server (ScaleIO Node)

Ether/IB

ScaleIO Data Client (SDC)

X86 Server (ScaleIO Node)

X86 Server (ScaleIO Node)
ScaleIO: Architecture

ScaleIO Data Client (SDC)
- Block Devise Driver
- Exposes volumes to applications
- Service must run to provide access to volumes

ScaleIO Data Server (SDS)
- Abstracts storage media
- Contributes to storage pools
- Performs I/O operations

DAS

ETH/IB

© Copyright 2015 EMC Corporation. All rights reserved.
ScaleIO:
Fully Converged Configuration

ETH/IB
ScaleIO:
Two-Layer Configuration

ETH/IB

© Copyright 2015 EMC Corporation. All rights reserved.
ScaleIO:
Two-Layer Configuration
ScaleIO – Massive scalable Performance

**Configuration (per Node):**
- Cisco UCS C240M# Servers
  - 2 x E5-2680 (2.8GHz) w/64GB RAM
- Intel X520 Dual Port 10GbE Adapter
- 1 x 700GB SLC PCIe Flash Card
EMC Enterprise Hybrid Cloud (EHC)

Self Service Portal

Integrated Management & workflow

Private Cloud

- Pivotal CF (Cloud Foundry): Platform provisioning
- VMware vCloud: Integrated Cloud Management & Automation
- VMware SDC&SDN
- EMC Software-Defined Storage
- EMC, 3rd Party, Commodity

Public Cloud

- Pivotal CF (Cloud Foundry): Platform provisioning
- VMware vCloud: Integrated Cloud Management & Automation
- VMware SDC&SDN
- EMC Software-Defined Storage
- EMC, 3rd Party, Commodity

Application Mobility

VM Mobility

Data Mobility

© Copyright 2014 EMC Corporation. All rights reserved.
VM Mobility by EHC

- Migration per VM
- Migration VM Template

Powered by VMware

vCloud Connector

Expand Computing Resource

Expand Data Center

EHC PRIVATE CLOUD

EHC PUBLIC CLOUD

EMC Cloud Service Provider Partners

© Copyright 2015 EMC Corporation. All rights reserved.
Application Mobility by EHC
EHC and the beyond

FEDERATION SDCC EDITION
AVAILABLE NOW

MICROSOFT EDITION
2015

OPENSTACK EDITION
2015
Redefine IT by EMC Federation

- COST EFFICIENCY FOR STORAGE AND DATA MANAGEMENT
- FAST DATA ANALYSIS
- ELASTIC COMPUTE & STORAGE RESOURCE

Federation Data Lake

- Pivotal In-Memory Data Grid
- GemFire XD
- HDFS Storage

To accelerate data analytics in fast and cost efficient way

EMC ScaleIO

To utilize Elastic storage resource by commodity hardware

EMC Enterprise Hybrid Cloud

To Expand resource to hybrid cloud seamlessly
THANK YOU.