JFE Steel Corporation Accelerates Growth and Globalization with OpenStack Cloud

April 26, 2016

JFE Steel Corporation
IBM Japan
1. JFE Steel's Challenge

2. J-OSCloud - Solution Architecture

3. Technology & Implementation

4. Future of JFE Steel and J-OSCloud
1

JFE Steel's Challenge
Birth of JFE Steel Corporation

- **Apr. 2001**: Announcement of merger between NKK & Kawasaki Steel
- **Sep. 2002**: Foundation of the holding company, JFE Holdings
- **Apr. 2003**: Formation of JFE Steel - integrating steel dept. of NKK & Kawasaki

Present

- **JFE Holdings**
  - **NKK**
  - **Kawasaki Steel**
  - **JFE Steel**
    - **JFE Engineering**
    - **JFE Shoji Trade**
JFE Steel Corporation Overview

JFE Steel Corporation

- **J**: Japan
- **F**: Iron (Fe)
- **E**: Engineering

Also meaning:

Representing Japan,
We are the Future-oriented Enterprise

- **Name**: JFE Steel Corporation
- **Founded**: April 01, 2003
- **Capitalization**: 239.6 billion yen *approx. $2.18 billion
- **Net Sales**: 2,873.8 billion yen (FY2014)
- **Profit**: 188.6 billion yen (FY2014)
- **Crude steel production**: 31.6 Mt (million tonnes)
  - 9th in worldwide steel companies
Location of production

Optimized Production Efficiency
2 integrated steel mill at East and West + 1 steelworks at Mid-Japan

West Steelworks (Kurashiki & Fukuyama)
✓ Largest steelworks in the world
✓ [Product] Sheet, Plate, Electrical steel sheet, Bar, Rod

East Steelworks (Chiba & Keihin)
✓ Advantages in making high-grade products
✓ [Product] Sheet, Stainless, Plate, Iron powder

Chita Steelworks
✓ Specialized for manufacturing pipes
✓ Widest variety of pipes in the world
J-OSCloud - Solution Architecture
... Now how are we going to bridge the gap between Technology(=Cloud) and Processes & People?
IBM's Cloud Computing Reference Architecture supports the idea...
JFE's Requirements and the Solution

**JFE's Requirements**

**Cost Optimization**
- ✓ Operation cost minimization
- ✓ Cost competitive production
- ✓ Resource utilization effectiveness
- ✓ Infrastructure platform optimization

**Speed**
- ✓ Turnaround time reduction

**Scalability**
- ✓ Timely resource upgrade
- ✓ Adoption of latest technologies

**Business Continuity**
- ✓ Availability for Steelworks
- ✓ Disaster recovery

**Leading-edge Technology**
- ✓ "Competitive IT Strategy Company"

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**J-OSCloud Technology**

**Virtualization**
- Mobility and Cloud migration
- Exa & IBM

**Open**
- Adoption of latest technologies and elimination of "Vendor lock-in"

**Integrated DC**
- Location consolidation that improve cost effectiveness
- SoftLayer, an IBM Company

**Pay as you go**
- No additional cost for unused resources
- Pay as you go

**exa & IBM**
- Long history of system management at steelworks + Leadership in IT industry
Architecture Overview

JFE West Datacenter
- Local LAN
  - Bare Metal
  - Flex System

JFE East Datacenter
- Local LAN
  - Bare Metal
  - Flex System
- HQ LAN
  - Bare Metal
  - Flex System

J-OSCloud
- Layer 2 Overlay
  - Type A1
    - IA
    - XIV
  - Type A2
    - Power
    - XIV
  - Type B
    - Power
    - System z
    - DS8800
  - Type C
    - Public
    - Internet VPN
    - SoftLayer
    - Linux/Windows
    - Linux/AIX
    - Linux

Area colored in blue is the scope of J-OSCloud.
Area colored in gray is out of the scope of J-OSCloud.

SoftLayer (currently no requirement)
Requirements for Standardization and Automation

Assumed Changes in the next 5 years

- Rapid increase in # of distributed servers (Steelworks System Refresh, Re-hosting)
- Datacenter consolidation
- Spread of public cloud services

Requirements for J-OSCloud

- To retain high service levels currently provided
- Compelling cost effectiveness in both resources and operations
- Improvement in operating effectiveness
  - Improvement of current IT service management processes
  - Standardization of system management in multi-platform environment
  - Automation
Solution Overview

Automation - IBM Cloud Orchestrator

- IBM Delivery Team
- JFE Steel

OpenStack

Provisioning
- Pattern Mgmt.
- Resource Mgmt.

BPM

Process Workflows

Web based access

ssh

In-house Script

System commands

Server

Storage

Network

External System

Backup

Patch Application

User ID Mgmt.

Security Mgmt.

Monitoring

Standardization - IBM Control Desk

- IBM Application Development
- IBM/Exa

CMDB

Approval Workflows

Release Mgmt.

Capacity/ Perf. Mgmt.

Self Portal

Report Generation

Incident Mgmt.

Change Mgmt.

Problem Mgmt.

Knowledge Mgmt.

Cost/Bill Mgmt.

Incident Mgmt.

Service Request

Document Generation

Cost/Bill Mgmt.

Patch Application

User ID Mgmt.

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Approval Workflows

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Capacity/ Perf. Mgmt.

Self Portal

Report Generation

Change Mgmt.

Problem Mgmt.

Knowledge Mgmt.

Cost/Bill Mgmt.

Incident Mgmt.

Service Request

Document Generation
Three-Layer Architecture

JFE Steel (Users)

Service Mgmt.
- Service Desk
- Computing Resources
- Storage Resources
- Configuration Services
- Management Services

J-OSCloud Service Portal

CMDB

Web API Channel

IBM Control Desk

Layer 1

Layer 2

IBM Cloud Orchestrator
- OpenStack
- IBM Cloud Orchestrator
- OpenStack

West Datacenter
- IA
- Power
- XIV

East Datacenter
- XIV
- Power
- IA

SoftLayer

Layer 3

Service Providing Plat.

Finance Mgmt.

Incident Mgmt.

Problem Mgmt.

Change Mgmt.

Release Mgmt.
3

Technology & Implementation
OpenStack as an Enterprise Cloud Driver

<table>
<thead>
<tr>
<th>Pattern</th>
<th>• Wrapping with OpenStack API Independent from hypervisors interfaces</th>
<th>• Bypassing OpenStack API Independent from additional SW stack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>• Full OpenStack component and BPM</td>
<td>• Only BPM</td>
</tr>
<tr>
<td>Development Workload</td>
<td>• Simplify the development of workflow/scripts</td>
<td>• Complicated development of workflow/scripts</td>
</tr>
<tr>
<td>Ease of Ops Stability of VMs</td>
<td>• Additional Operations of OpenStack • Less Experience in IBM/exa • Spoil VMware tools &amp; assets</td>
<td>• Experienced stable operation</td>
</tr>
<tr>
<td>Disaster Recovery</td>
<td>• Need to mediate UUID (Complicated Process)</td>
<td>• No need to mediate UUID</td>
</tr>
<tr>
<td>HA Cluster</td>
<td>• VM HA/Power HA</td>
<td>• VM HA/Power HA</td>
</tr>
<tr>
<td>Open Standard</td>
<td>• Standardized on the OpenStack Layer avoiding locked into proprietary technology</td>
<td>• Standardized on the Hypervisor Layer, locked-in by VMware</td>
</tr>
<tr>
<td>Future</td>
<td>• Risk for market penetration • Quick catch-up of new open source technology</td>
<td>• Stable future of VMware • Depends on VMware and EMC</td>
</tr>
<tr>
<td>Value Proposition</td>
<td>• Open Technology • Agile adaptation to the market leading technology</td>
<td>• ITIL workflow scripts asset based on particular environment of JFE • No more advanced innovation</td>
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</tbody>
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Open Stack API

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VM Hypervisor API
<table>
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<tr>
<th>#</th>
<th>Issues</th>
<th>Implications</th>
<th>Alternatives</th>
<th>Decision</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Scope of OpenStack</strong>&lt;br&gt; - Which components to be applied</td>
<td>- Operational efficiency&lt;br&gt;- Development Cost&lt;br&gt;- Future</td>
<td>1) Compute&lt;br&gt;2) Compute, Storage&lt;br&gt;3) Compute, Storage, Network</td>
<td>1) Compute</td>
<td>• Storage(XIV) and Network(Cisco Nexus) already been standardized and applying Storage(cinder/swift) and Network(neutron) will cause negative impact on both infrastructure and operation.&lt;br&gt;• keystone, glance, neutron and cinder will be implemented as required by nova.&lt;br&gt;• BPM replaces heat and ICD replaces horizon.</td>
</tr>
<tr>
<td>2</td>
<td><strong>Datacenter Configuration</strong>&lt;br&gt; - Where to run ICD, ICO, vCenter and PowerVC</td>
<td>- Operational efficiency&lt;br&gt;- Reliability</td>
<td>1) Span over both DCs&lt;br&gt;2) Everything at East DC&lt;br&gt;3) ICD&amp;BPM at East DC, OpenStack &amp; Hypervisor controllers at both DCs</td>
<td>3) OpenStack &amp; Hypervisor controllers at both DCs</td>
<td>• To keep consistency in Portal, MDB and Automation Repository, ICD and BPM should run in one location. According to the existing DR, define East as the primary site.&lt;br&gt;• OpenStack and vCenter/PowerVC would be deployed at both site as this is recommended OpenStack configuration and contribute to shorten RTO of DR.</td>
</tr>
<tr>
<td>3</td>
<td><strong>ICD/ICO role under disaster condition</strong>&lt;br&gt; - Should ICD and ICO provide services at DR site</td>
<td>- Business Continuity&lt;br&gt;- RPO/RTO</td>
<td>1) ICD/ICO will provide services&lt;br&gt;2) without ICO/ICO&lt;br&gt;3) without ICO/ICO for a while</td>
<td>3) without ICO/ICO for a while</td>
<td>• Put higher priority on reducing RTO of the managed to systems, putting aside the recovery of ICD/ICO.&lt;br&gt;• If operation at the disaster site persists, recovered systems will be migrated under control of ICD/ICO.</td>
</tr>
<tr>
<td>4</td>
<td><strong>Data Backup Solution</strong>&lt;br&gt; - Availability&lt;br&gt;- Storage</td>
<td></td>
<td>1) Cinder Snapshot&lt;br&gt;2) XIV Remote Mirror&lt;br&gt;3) Other Backup Software</td>
<td>2) XIV Remote Mirror</td>
<td>• Because a volume backup requires suspension of application services, we chose XIV Remote Mirror that can instantly make a copy of a volume and resume services with minimum disruption.</td>
</tr>
</tbody>
</table>
Should keystone be shared or separated?

1) OK
→ Supported

2) NG
→ Not supported

3) NG
→ DR of BPM not supported

4) OK

- ICD
- BPM
- keystone
- OpenStack
- vCenter
- PowerVC

West
East

- ICD
- BPM
- keystone
- OpenStack
- vCenter
- PowerVC

West
East

- ICD
- BPM
- keystone
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- vCenter
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West
East

- BPM
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- BPM
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West
East

- BPM
- keystone
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- PowerVC

West
East

- BPM
- keystone
- OpenStack
- vCenter
- PowerVC

West
East
OpenStack APIs manage resources under the ITSM governance

**West Datacenter (DR Site)**

ICM (IBM Cloud Manager with OpenStack)

- nova
- glance
- cinder

**East Datacenter (Primary Site)**

ICD (IBM Control Desk) : ITIL Process

ICO (IBM Cloud Orchestrator) : BPM

ICM (IBM Cloud Manager with OpenStack)

- keystone
- nova
- glance
- cinder

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**Heterogeneous Multi-Region**

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* We chose XIV Remote Mirror (xiv cli) instead of Cinder Snapshot because JFE could not accept the service downtime caused by waiting for VMware snapshot (triggered by Cinder Snapshot API) completion, which is required to close the snapshot volume.
OpenStack Configuration

- **Domain**
  - Domain contains multiple projects to make security group
  - Unique user ID in a domain

- **Project (Tenant)**
  - Set of VMs sharing the resources
  - Project contains multiple Availability Zones

- **Region**
  - Set of computing resources in a domain
  - Each region contains only one hypervisor type

- **Availability Zone**
  - Grouped in each Region
  - AZs being mapped to the VM HA Clusters
Thoughts on Disaster Recovery

West

Steady State

 ICO 2.5
BPM (Stand-by)
OpenStack(ICM)

1. N/W
2. vCenter
   - PowerVC
   - HMC
   - VIOS
   - ESXi
   - OS

Disaster

6. ICD

7. ICD

8. ICD

9. ICD

East

 ICO 2.5
BPM
OpenStack(ICM)

10. N/W
11. vCenter
   - PowerVC
   - HMC
   - VIOS
   - ESXi
   - OS

...Technical Directions
DR Configuration with OpenStack + XIV

ICM#1 (OpenStack)

West Power Region

VM instance

Nova (system)

Cinder (data)

Power VC

XIV driver

LUN = rootvg

LUN = datavg

LUN = datavg

LUN = rootvg

XIV

LUN = rootvg

LUN = datavg

LUN = datavg

LUN = rootvg

ESXi

Nova (system)

Cinder (data)

VM instance

ICM#2 (OpenStack)

East Power Region

XIV

ESXi

Nova (system)

Cinder (data)

VM instance

ICM#3 (OpenStack)

West VMware Region

VM instance

Nova (system)

Cinder (data)

ESXi

LUN = VMFS

vm

dk

LUN = VMFS

vm

dk

LUN = VMFS

vm

dk

LUN = VMFS

vm

dk

XIV

mirror

mirror

ICM#4 (OpenStack)

East VMware Region

XIV

ESXi

Nova (system)

Cinder (data)

VM instance

mirror

mirror

XIV

mirror

mirror

mirror

mirror

Cinder (data)

VM instance

Nova (system)

Cinder (data)

VM instance

LUN = datavg

LUN = datavg

LUN = datavg

LUN = datavg

LUN = datavg

LUN = datavg

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Future of JFE Steel and J-OSCloud
JFE's Requirements and the Solution

**JFE's Requirements**

**Cost Optimization**
- Operation cost minimization
- Cost competitive production
- Resource utilization effectiveness
- Infrastructure platform optimization

**Speed**
- Turnaround time reduction

**Scalability**
- Timely resource upgrade
- Adoption of latest technologies

**Business Continuity**
- Availability for Steelworks
- Disaster recovery

**Leading-edge Technology**
- "Competitive IT Strategy Company"

**Virtualization**
- Mobility and Cloud migration

**Automation**
- Cost reduction and Quality stability

**Standardization**
- Efficiency and service level maximization
- Abstraction of implementation with OpenStack

**Open**
- Location consolidation that improve cost effectiveness

**Integrated DC**
- No additional cost for unused resources

**Pay as you go**
- Cloud experience & capabilities

**exa & IBM**
- Leading-edge Technology Company
Summary: JFE and IBM Collaborate to Achieve the Vision

JFE Steel's Vision

Continually reinvent ourselves as a global steel supplier that creates new value as we grow with our customers.

IBM's Mission

- Speed
- Cost
- Quality
- Open & Technology

Implementation

Standardization based on IT Service Management

Automation of Service Provisioning

- IT Resource Pooling & Virtualization
- Service Design based on System Management
- Business Continuity (DR, Availability, Virtual Network)
- Pay as you go
- OpenStack (Standardizing Multi-Platform)
Thank You!
Questions ?