New Approaches To Challenges Facing Enterprise ICT

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Corporate Profile

- Founded 1899 (115 Years)
- Annual Revenue: $30 billion*
- Employees: 101,000* Worldwide
- $1.4B/yr in Research and Development
- Five R&D Centers Worldwide
- Patents: >50,000 Worldwide

Global Presence

- Fortune Global 500 Corporation
- >55 Years in Servers & Storage (1958)
- Top 10 Branded and OEM Storage Sales
- Top 100 Manufacturer Globally

*As of March 31, 2014
NEC Worldwide: “One NEC”

Business activities in over 140 Countries and territories

<table>
<thead>
<tr>
<th>Region</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>7</td>
</tr>
<tr>
<td>Latin America</td>
<td>7</td>
</tr>
<tr>
<td>Europe, Middle East, and Africa</td>
<td>25</td>
</tr>
<tr>
<td>Greater China</td>
<td>21</td>
</tr>
<tr>
<td>Asia-Pacific</td>
<td>19</td>
</tr>
<tr>
<td>Japan</td>
<td>77</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>29.54 Billion dollars in 2013 sales</td>
</tr>
</tbody>
</table>

(As of June 6, 2014)

*U.S. dollar amounts are translated from yen, for convenience only, at the rate of ¥103 = U.S.$1. (As of March 31, 2014)
Challenges faced by enterprises today
Changes in ICT Investments

Past ICT
- Quality assurance
- Reduced maintenance cost
- Reduced operational cost

Future ICT
- New business creation
- Data application
- Faster launches

Maximizing ICT investments with a scheme directly connected to profits

Cloud

Big data

More efficiently maintaining and operating existing systems
Problems Surfacing through Rapidly Growing Cloud

**Volume**
Too many ICT devices to handle

**Distance**
Globalization

**Time**
Flexibility

- **M2M**
- **Private cloud**
- **Public cloud**
- **Marketing IT**
- **IoT**

- Partner's offices
- M&A offices
- Domestic offices
- Overseas offices
- Mobile workers
- SOHO workers
- Internet
- Versatile and diversified devices

**Globalization**
- Enterprise WAN

**Flexibility**
- Too many ICT devices to handle

- Distance
- Time

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Too many ICT devices to handle

Current problems

Future solutions

System A
System B
System C

System A
System B
System C
System D

Virtualized infrastructures
Virtual resources
Physical resources
Flexibility

Current problems

- System planning
- Negotiation with Sler
- System designing by SE of Sler
- Device preparation
- System construction
- AP development & service launches

A few months or more

Future solutions

- User
- Request for resources
- Resource provisioning
- Flexibility

Cloud

In a few minutes

Time
Globalization

Current problems
- Production site
- Remote DR Site
- VM move
- NW switch
- Synchronization
- AP stop
- Manual Operations

Future solutions
- Production DC
- Overseas DC
- Public cloud
- Remote DR Site
- Load balancing
- Automated Operations
- Click!
ICT and Software-Defined Infrastructure (SDI)

I. Too many ICT devices to handle
- Offloading administration burden on system operations

II. Flexibility
- Quick resource delivery

III. Globalization
- Load balancing between DCs
  - Simplified disaster recovery

Abstraction, Automation, and Scalability

Software-Defined Infrastructure (SDI)
What is Software-Defined Infrastructure (SDI)?

Main DC

Middleware

API

Automation

Abstraction

SDC

Virtual servers

Compute

SDS

Virtual storages

Storage

SDN

Virtual networks

Virtual resources

Physical resources

Public cloud

Scalability

SDN

Virtual networks

Sub DC (overseas)

Virtual resources

Physical resources

Main DC

Middleware

API

Automation

Abstraction

SDC

Virtual servers

Compute

SDS

Virtual storages

Storage

SDN

Virtual networks

Virtual resources

Physical resources

Public cloud

Scalability
Abstraction: Centralized management

In conventional systems

VM VM • • • VM
Block File Object

Dedicated GUI for block
Dedicated GUI for files
Dedicated GUI for objects

Individual management

SDS

VM VM • • • VM
Block File Object

Consolidated GUI

Administrator

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Abstraction: Policy-based management & QoS

**Gold**
- Guaranteed IOPS
- Automatic backup

**Silver**
- Guaranteed IOPS
- Automatic backup

**Bronze**
- Guaranteed IOPS
- Automatic backup

**Storage**
- Load control
- Guaranteed IOPS
- Highly loaded
- Normal
- Normal

**Guaranteed IOPS**
- Important
- Normal

**Stable performance**
- IOPS lower limit

**Automatic backup**
- Primary storages
- Backup
- NL-SAS
- SSD

**Abstraction**
- Block
- File
- Object
Automation: Automated operations by API

Middleware

RESTful API

OpenStack

OpenStack API

Automation

Virtual storage

Gold
Guaranteed IOPS

Silver
Automatic backup

Bronze

Virtual storage

Abstraction

Physical storage

Block
File
Object

Gold
Silver
Bronze

Guaranteed IOPS
Automatic backup
Automated Virtualized Management

Virtualized storage units

Technology Refresh  Data Tiering  Disaster Recovery

SAS  SSD
NEC’s approaches to SDS
NEC’s Software-Defined Storage (SDS)

SDS

Virtualization of management

Abstraction    Automation

Virtualization of physical resources

iStorage

Scalability
Policy-based management

Abstraction

Central management of various resources

Tenant A

Tenant B

Resource pool

Servers

Storage

Gold

Silver

High performance

Low cost

App
OS

App
OS

App
OS

High performance

Low cost

Gold

Silver

Central management of various resources

SigmaSystemCenter

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Guaranteed Performance QoS

A: IOPS lower limit QoS
B: IOPS upper limit QoS

IO Load Manager

Important
Normal (Highly loaded)
Normal

Stable performance

Guaranteed performance

Load control

M series

Abstraction
Automatic backup

Abstraction

Gold
Silver
Bronze

Automatic backup

DirectDataShadow (automatic backup)

M series

HS series
Automated operations by API

- **Administrator**
  - Portal site
  - Standardized interface

**vDC Automation**
- API
- Guaranteed IOPS

**OpenStack**
- Automatic backup

**iStorage**
- M series: Primary storage
- HS series: Backup/Archive/Object storage
Resource Allocation Optimization

Scalability

Application server

Before reallocation

After reallocation

SSD pool

SAS pool

NL-SAS pool

M series

Access frequency

High

Middle

Low

(An example of effect)

Increased by about 60%

Before

After the 1st reallocation

After the 2nd reallocation

High

Middle

Low

Before reallocation

After reallocation
Disaster Recovery and Cloud

Customer site
HS3/HS8

NEC Cloud IaaS (public cloud)

Business operations resume in IaaS environment in case of a disaster.
Big data infrastructures for new forms of businesses
Increasing Unstructured Data

The market of disk storage systems in Japan
Structured and unstructured data volumes shipped and forecasted

Source: IDC Japan, July 2014
Japan Storage for Unstructured Data Demands Analysis 2014 (J14440108)
Value creation by big data analysis

Data in the real world

- Information directly available
  - e.g. Road traffic, logistics, videos, texts, and others

Visible data

Existing values

Invisible big data

- Information invisible below the surface
  - e.g. activity logs, failure causes, risks, supply and demand on commercial products, education, and others

New value creation

- with analysis technologies through ICT
Making Use of Invisible Unstructured Data

- Sensor data
- Medical data
- Production quality monitoring
- Satellite images
- Research data

- Documents
- Images and videos
- CAD data
- E-mail

Large-scale archive storage (object storage)

Analysis

New value creation

Data in the real world
SDS Architecture for Technology Refresh

- Abstraction
- Automation
- Scalability

Business application

Data migration

HS6
The Venus probe Akatsuki employed StarPixel.

- Low communication speed (2 to 32 kbps) in ultralong distance between Venus and Earth (longer than 0.1 billion km)
- Probe satellites have strict limitation in battery power and weight
- JPEG2000 imposes a heavy load on processing an image in 60 seconds

>> StarPixel compresses an image in about 1 second.
Managing Big Data in Layers of Storage and Tape

Automatic allocation by access frequency

High-speed access Economic efficiency

Tape device
Tape library

StorageForce

HS6

Compression
Layered
Common storage
NEC Storage HS6

Cost
Capacity
Example 1: Measures against information leakage

- Detecting unauthorized actions
- Providing evidence in the event of an accident
- Working as a restraint against data leakage

New value creation
- Detecting unauthorized actions
- Providing evidence in the event of an accident
- Working as a restraint against data leakage
Example 2: Video Analysis

Real-time sensing system

LAN

Object storage

Large volume of video data

New value creation
- Sales promotion through product and service matching
- Security and monitoring enforcement

Public space

Building/Tenant

Facility reception

Camera

Camera

Camera

Video searching system

Analysis

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NEC approach to Social Infrastructure
NEC’s Concept “Innovative Social Infrastructure”

For all people, an Abundant Society

Solutions for Society

Public
- Disaster prevention, security, electronic administration, finance

Enterprise
- Logistics, distribution, transport

Telecom Carrier (Information networks)

Smart Energy

Innovation of social infrastructure via ICT

Safety  Security  Efficiency  Equality

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Innovation of Social Infrastructure via ICT

Leveraging our proven results and strong position for global expansion

- From the seafloor to outer space, concentrating management resources in areas in which social infrastructure will be innovated by ICT

Responsible BU:

- Public
- Enterprise
- Smart Energy
- Telecom carriers

NEC ICT supporting social infrastructure and systems

Next-generation network technologies

High-performance, high-reliability core IT technologies

Diverse sensor and human interface technologies

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