NEC Flexible Business Infrastructure:
Keeping pace with business changes and expanding business opportunities

CONTENTS

Keeping pace with business changes and challenges of ICT infrastructure 2
ICT infrastructure evolution theory 5
Enhancing ICT infrastructures based on NEC Flexible Business Infrastructure 10
Conclusion 11
Keeping pace with business changes and challenges of ICT infrastructure

The 21st century has seen considerable changes in society and in the business environment. Economic globalization, diversification of consumer needs, shortened product and service lifecycles brought about by fierce competition, and many other factors have created a business environment that is subject to sudden change. To keep pace and continue to thrive, corporations need to move beyond existing frameworks and devise new strategies. Information and Communications Technology (ICT) works as a “motor nerve” that controls the execution speed of these strategies. Localized and rigid ICT infrastructures designed specifically for fixed organizations and processes slow down the execution of new strategies, making it imperative for corporations to create a flexible ICT infrastructure if they want to survive.

Meanwhile, ICT infrastructure has also become complex. Dispersed and siloed systems are being aggregated into single Data Centers (DCs). At the same time, it has become commonplace to use multiple DCs located in different areas as a Disaster Recovery (DR) measure. Mergers and Acquisitions (M&A) are also resulting in different systems distributed across multiple DCs. Added to this is the increasing trend of utilizing applications and resources on public clouds. These complex ICT infrastructures need a multi-site environment that coordinates multiple DCs and public clouds.

To enhance a corporation’s ability to handle business environment changes, three major management issues must be addressed: “growth strategy execution,” “cost reduction,” and “countermeasures against risks.” Corporate ICT infrastructure must support the resolution of these management issues rapidly and flexibly to improve the ability of a corporation to adapt to change. This section describes the ideal ICT infrastructures that will enable the above by providing support for multi-site environments.
“Growth strategy execution” is vital for corporations to expand sales and revenue. Corporations must be able to provide systems for launching and rolling out new businesses and services quickly. These systems must also be scalable to support fluctuations in loads and users. Barriers to growth strategy execution caused by conventional ICT infrastructure and the ideal ICT infrastructure to overcome these barriers are described below.

### Conventional ICT infrastructure
- It takes several weeks to deploy resources and create a suitable environment. (Everything needs to be approved by the IT department.)
- Configuration changes (network addresses, etc.) and retesting are required when migrating from development to production environments.
- Extra resources must be prepared to handle load fluctuations.

### New ICT infrastructure
- It takes only few minutes to deploy resources and create a suitable environment. (Departments using the infrastructure can procure everything themselves.)
- Seamless migration from development to production with no configuration changes.
- Extra resources must be prepared to handle load fluctuations.

“Cost reduction” mainly targets equipment costs and operating costs. Reducing equipment costs involves reducing hardware and power consumption costs. Reducing operational costs, on the other hand, involves integrating and centralizing distributed operations, standardizing and automating operations that currently require highly skilled engineers to carry out, and proactively addressing system failures. Barriers to achieving cost reductions caused by conventional ICT infrastructure and the ideal ICT infrastructure to overcome these barriers are described below.

### Conventional ICT infrastructure
- Hardware is installed independently in each system leading to redundant equipment investments.
- Hardware products are becoming more power efficient, but optimization of facility power consumption, which accounts for half of DC power consumption, is an issue that remains to be addressed.
- Systems are operated individually and operations must be carried out by highly skilled engineers.
- Virtualized and non-virtualized systems must be managed separately.
- Corporations are increasingly using multiple DCs and public clouds, but each is managed separately.
- Failure handling is reactive.

### New ICT infrastructure
- Equipment costs are reduced by virtualizing, aggregating, and sharing hardware.
- Power consumption costs are reduced by optimizing air conditioning, lighting, and equipment air flow systems.
- Systems in different environments are controlled centrally. The infrastructure complies with ITIL (Information Technology Infrastructure Library), a set of best practices for IT service management, eliminating dependency on expertise. Automation of regular work also reduces operating costs.
- Centralized control of virtualized and non-virtualized systems enables management of multiple sites as if they were one DC.
- Signs of failure are detected early, enabling proactive failure handling.

“Countermeasures against risk,” or contingency planning, primarily take the form of DR and security measures. DR measures involve migrating a system that consists of multiple machines with complex dependencies. The ability to smoothly migrate these systems to another DC is crucial. Security measures, on the other hand, must prevent Distributed Denial of Service (DDoS) attacks against the Application Programming Interface (API)
of Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) platforms. Barriers to implementing countermeasures against risk caused by conventional ICT infrastructure and the ideal ICT infrastructure to overcome these barriers are described below.

**Conventional ICT infrastructure**
- Migration is carried out one virtual machine at a time. DR of a whole dependent system is difficult.
- Security measures only cover servers, networks, and data.

**New ICT infrastructure**
- Whole systems can be migrated for DR.
- Security measures also cover the platform’s API.

<table>
<thead>
<tr>
<th>Management policies</th>
<th>Challenges</th>
<th>Key factors</th>
<th>Conventional ICT infrastructure</th>
<th>New ICT infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth strategy execution</td>
<td>Rapid provision of systems</td>
<td>Lead time for resource deployment</td>
<td>Several weeks</td>
<td>Few minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Migration from development to</td>
<td>Requires configuration</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>production</td>
<td>changes/re-testing</td>
<td></td>
</tr>
<tr>
<td>Improvement of system</td>
<td>Sizing in accordance with user</td>
<td>Always possess excess resources</td>
<td>Use public cloud</td>
<td></td>
</tr>
<tr>
<td>flexibility</td>
<td>fluctuation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost reduction</td>
<td>Equipment cost reduction</td>
<td>Hardware</td>
<td>Installed per system</td>
<td>Aggregated and shared</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power consumption</td>
<td>Use low power ICT equipment</td>
<td>Optimize total facility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operating cost reduction</td>
<td>Separated/engine-dependent</td>
<td>Standardized and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operating model for each system</td>
<td>operation</td>
<td>automated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Virtualized and non-virtualized</td>
<td>Separated</td>
<td>Integrated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>environments</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operation of multi-site</td>
<td>Separated</td>
<td>Integrated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>environments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Countermeasures against</td>
<td>DR</td>
<td>Failure handling</td>
<td>Reactive</td>
<td>Proactive (failure</td>
</tr>
<tr>
<td>risk</td>
<td></td>
<td></td>
<td></td>
<td>sign detection)</td>
</tr>
<tr>
<td></td>
<td>Security measures</td>
<td>Protection targets</td>
<td>Servers, networks, data, etc.</td>
<td>Platform API added</td>
</tr>
</tbody>
</table>

DR: Disaster Recovery
Corporations who want to enhance their ability to handle changes in business environment must build an ideal ICT infrastructure. However, the ICT systems in many corporations have become siloed, and corporations face many circumstantial and organizational barriers to changing them. Attempting to update to an ideal infrastructure in one go might prove costly, as well as risky.

NEC focuses on an approach that allows corporations to maintain current business processes while gradually increasing their efficiency and solving problems step by step. NEC proposes this ICT infrastructure evolution theory as a set of steps to establishing an ideal ICT infrastructure. The ICT infrastructure evolution theory covers two areas: single DCs and multi-site environments.

There are five evolutionary steps: 1) partial virtualization of systems, 2) standardization of operations, 3) automation of operations, 4) introduction of self-service capability, and 5) optimization of resources. These steps are the same for both single DCs and multi-site environments. It is not necessary to complete all the steps in a single DC before migrating to a multi-site environment. Smooth migration to a multi-site environment is possible from any step being implemented in a single DC. For example, a corporation that has completed step 3 “automation of operations” in a single DC can expand the scope of step 3 to a multi-site environment. The corporation can then proceed with step 4 “introduction of self service capability,” and step 5 “optimization of resources.”
ICT infrastructure evolution theory for a single DC

1  Partial virtualization of systems (single DC)

In a single DC, step 1 involves migrating systems to a virtualized platform when a maintenance contract expires or the systems are upgraded. By using a virtualized platform, hardware equipment such as servers, networks, and storage devices are shared, thereby reducing equipment costs. Virtualization also enables total optimization of energy consumption, including that of the facility, which reduces power consumption costs.

2  Standardization of operations (single DC)

In this step, virtual resource management is implemented to manage virtual resources as resource pools, and bare-metal management is implemented to manage existing non-virtualized systems. Operations management, configuration management, trace management, log management, incident management, and other features needed to comply with ITIL best practices are also implemented by the DC internal management feature. This step also involves implementing security measures against DDoS attacks and so on. A development environment that integrates a database and other features can also be used as middleware as required. These features combine to enable total management of the bare-metal and virtualized environments and ensure ITIL-compliant operations, which leads to reductions in cost. The availability of cloud-based security features also gives rise to improved risk management.

3  Automation of operations (single DC)

This step involves implementing an orchestrator that can automatically assign resources, configure initial settings, apply patches according to a schedule, and perform other regular tasks. This enables rapid provisioning of cloned systems based on templates and autoscaling in accordance with CPU loads, which reduces operating costs and errors.
In this final step, data utilization and information analysis are implemented by the DC internal management feature. This enables monitoring and management of the correlation between resource (server, storage, network) usage and business Key Performance Indicators (KPIs) such as sales, production data and so on. The acquired information can be used to forecast business impact in the event that any of the processes and systems that configure the business stop. KPI-focused management also allows corporations to optimize their resource investments.

In step 4, a portal is deployed that allows user departments to build systems themselves by selecting configurations from a service catalog. Resource usage can also be measured, allowing users to pay as they go.
ICT infrastructure evolution theory for a multi-site environment

1. Partial virtualization of systems (multi-site environment)

Following the partial virtualization of systems implemented in single DCs, the main DC and sub DCs can now be connected to the same network so that their systems are linked. Systems built on public clouds can also be connected via a Virtual Private Network (VPN).

2. Standardization of operations (multi-site environment)

Once operations are standardized in each DC, management of multiple sites is centralized to enable wide-area DR and backup for each system.

3. Automation of operations (multi-site environment)

A multi-site orchestrator is deployed to automate operations over multiple sites. This enables provisioning across multiple DCs, automation of regular tasks, and automation of operations via the public cloud API.
Step 4 involves deploying a multi-site portal that integrates the portals of the single DCs. This enables single sign-on on one portal screen and allows the multi-site environment to be operated as if it were a single DC. The service menu also offers features such as automated selection of clouds for resource provisioning and smooth migration from development to production environment with no configuration changes, which can be selected according to price and service level.

In addition to the data utilization and information analysis features implemented in single DCs, here a large, real-time data analysis platform is deployed. This platform is used to analyze the huge amount of logs generated in a multi-site environment and detect potential failures, thus enabling proactive failure handling.
NEC Flexible Business Infrastructure is an ICT infrastructure architecture that adopts NEC’s ICT infrastructure evolution theory to help customers keep pace with business changes and expand business opportunities. NEC Flexible Business Infrastructure provides the following three benefits:

(1) Openness

NEC Flexible Business Infrastructure allows customers to select and integrate systems from NEC’s products and open source software in accordance with their needs, and choose their hypervisor (server virtualization platform) from a wide range of vendors. The ICT infrastructure can also be deployed differently according to the required level of reliability. For example, bare metal can be used for mission-critical systems, NEC products for core systems that need high availability, and open source ICT infrastructure for web services and other systems that must deliver flexibility and cost effectiveness. By adopting NEC Flexible Business Infrastructure, customers have access to unprecedented openness, configuration flexibility and innovative features.

(2) Adaptivity to multi-site environments

Seamless linkage between multiple DCs and public clouds requires the connection of multiple sites via a flat network and automation of network operations spanning different environments. NEC Flexible Business Infrastructure deploys NEC’s advanced Software-Defined Networking (SDN) technology to achieve flexible multi-site network control and supports both the software network overlay and the hardware network underlay—a particular strength of NEC. NEC Flexible Business Infrastructure also enables on-premise infrastructure to be linked with public clouds through NEC Cloud IaaS, a solution that only NEC can offer due to its capability as both a system integrator and cloud service provider.
(3) Operation stability

NEC Flexible Business Infrastructure has a DC internal management feature that complies with ITIL best practices for IT service management. It also provides patch management, ID management, trace management and other features to enhance corporate compliance, as well as an essential set of operations and management features that improve security. NEC Flexible Business Infrastructure leverages NEC’s expertise honed over many years of monitoring mission-critical systems and developing the NEC Cloud IaaS cloud service platform to deliver stable and secure operation of private clouds.

To keep pace with business changes and expand business opportunities, corporations need to build new ICT infrastructures that support multi-site environments. NEC Flexible Business Infrastructure provides a step-by-step solution comprising five steps: 1) partial virtualization of systems, 2) standardization of operations, 3) automation of operations, 4) introduction of self-service capability, and 5) optimization of resources. The architecture of NEC Flexible Business Infrastructure is uniquely suited to customers wanting to migrate to a new ICT infrastructure due to its openness, adaptivity to multi-site environments, and operation stability.

Please contact NEC for inquiries concerning the contents of this White Paper and NEC Flexible Business Infrastructure.