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Research Article

Strategic Design of Platform Technology on the Cloud Service

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Abstract: Cloud is defined as an information processing system that enables flexible utilization of information and communications resources such as information and communications devices, devices and software integrated and shared through information and communications networks in response to changes in User Speed data. Especially in today's data-intensive environments, enterprises need to efficiently deploy, store, and process Bigdata. The purpose of this study is to analyze and gain insights from cloud service platform technologies. First, we define a technical analysis of cloud service platforms and analyze their characteristics. Then look at the analytics framework, reference models, and market trends for cloud services. To develop a detailed strategy, we will also look at technology trends in IaaS, PaaS, and SaaS, which are key cloud technologies. Finally, these technologies will be integrated to utilize platform technologies and explore the service market. Each IaaS, PaaS and SaaS strategy is designed from the perspective of public and private organizations.

Keywords: Bigdata, Cloud, Cloud Service, Platform Design, Platform Development

1. Introduction

Through cloud services, companies and institutions can conveniently receive applications and services anywhere, and can quickly provide and distribute services if they interact with providers without much effort. In the era of the Fourth Industrial Revolution with Bigdata (Park, S. et al., 2015) (Park, S.B. et al., 2015) (Park, S. & Lee, S., 2015) (Lee, J.M. et al., 2015) (Kim, J.K. et al., 2016) (Lee, S.W. & Kim, S.H., 2016) (Lee, S. & Shin, S.Y., 2016) (Nam, M. & S. Lee., 2016) (Kim, S.H. et al., 2017) (Kang, Y.; Kim, S.; Kim, J. and Lee, S. (2017), Artificial Intelligence (AI) (Kim, S. et al., 2018) (Kang J. & Lee, S., 2019) (Kang J. & Lee, S., 2019), and the Internet of Things (IoT) (Huh, S. et al., 2017) (Lee, I. & Lee, K., 2015) (Gubbi, J. et al., 2013), the Cloud is emerging as an essential element such as electricity and water supply. The Cloud is one of the top 10 trends in IT outlook reports such as Gartner and IDC, which have already recognized the importance of cloud and published 10 years ago as a major issue in IT strategy technology and trends. Cloud has been an important technology since early on, and it is a technology that many businesses have introduced. It is widely used in all areas of corporate activity as a means of streamlining IT systems to support work within the enterprise. Not only private companies but also public and government agencies are introducing the cloud. According to data from the Ministry of Science and ICT and the Ministry of the Interior and Safety on demand for cloud computing in the public sector, the demand forecast for private clouds has more than doubled in 2019 compared to 2018.

2. Related Works of Cloud Service Platform Technical Analytics

2.1. Cloud Service Platform Technology for Analysis

Cloud service platform technology have independent and objective analytical results by the stage you want to. Cloud services platform technology analysis approach are illustrated in Figure 1. The course consists of a total of five steps. (1) Step 1 identifies reference models and market trends. Reference models needed for cloud service offerings will be reviewed, and cloud strategies to identify cloud market trends will also be reviewed. Public or private cloud environments are reviewed to learn about cloud market trends. (2) Step 2 analyzes the dynamics of IaaS technology. Analysis of IaaS technology trends (virtualization technologies) is conducted, and analysis of infrastructure and equipment technology trends (SDx, HCI, OpenStack, DevOps) is made. (3) Step 3 analyzes the dynamics of PaaS technology. Analyses of PaaS-related technologies (Controller & Docker, PaaS technology and market trends) are made, and analysis of open-source technology trends (Cloud Foundry, Kubernetes) is also made. Meanwhile, analysis of trends (Pivotal Cloud, Foundry, Ibm Cloud Private, Openshift) for commercial solution technologies is also made. (4) Step 4 analyzes the dynamic performance of SaaS technology. SaaS technology trend analysis is done first, and service marketplace is reviewed. Parts on the mashup platform (Mashup concept and

configuration, portal and mashup comparison, deployment cases) are also discussed comprehensively. (5) Step 5 draws implications. At this stage, the results of the technical survey are aggregated, and implications are derived. In particular, the process of identifying reference models and market trends is divided into individual-oriented services and enterprise-oriented services, which are analyzed to derive information service requirements and implications.

2.2. Cloud Market Trends

The leading companies' cloud strategy is pursuing a hybrid cloud strategy that combines public and private based on a multi-cloud strategy. The cloud service market is expanding into the public cloud market, avoiding existing commercial solution-based private clouds, and corporate users are rapidly moving to public clouds. VMware's solutions, which were leading the private cloud, are rapidly eroding the solutions of the powerhouses of public clouds, reflecting the trend toward open-source-based technology becoming the norm.

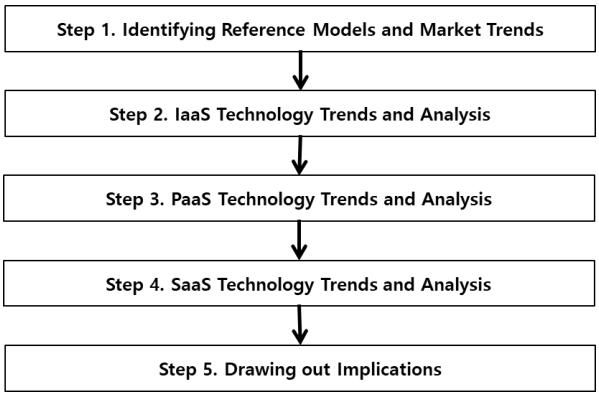

Figure.1 Cloud Services Platform Technology Analysis Approach

3. IaaS Technology Trends and Analytics

We now investigate the technology trends of IaaS in the cloud computing platform and analyze the configuration and trends of key technologies to derive implications to suggest the direction for improvement of many companies' cloud infrastructure platform. In relation to the technology trends of IaaS in cloud computing platforms, the latest technology trends in infrastructure, such as virtualization technology and software-defined virtualization, are analyzed and reflected in the direction of enterprise cloud policies. IT infrastructure software virtualizes large systems and networks with a variety of hardware and software requirements and enables efficient allocation and management of resources. Businesses use IT infrastructure software to consolidate hardware for different purposes on a software-based basis into a single system, simplifying management, and consolidating data across multiple platforms while maintaining data integrity. The technologies under analysis include server virtualization, network virtualization, software defined data center (DDC) and SDx. Server virtualization refers to the process of dividing physical servers into distinct virtual servers separated by multiple separate virtual servers through a software application. Network virtualization can combine or divide multiple networks independently by abstracting the network resources that were previously provided by hardware into software. SDDC and SDx are data centers that virtualize infrastructure through abstraction, resource pooling, and IaaS delivery automation. Other equipment includes Hyper Converged Infrastructure (HCI), which integrates storage, computing, and networking into a single system.

3.1. Virtualization Technology - VMWare

Through an understanding of the technical concepts and principles of virtualization that forms the foundation for cloud services, we can infer the scope of technology's application to the task of driving the efficiency of sharing and allocation of IT resources. Hypervisor engine software is installed on physical hardware in a virtualized data center and serves as a platform for virtual machines. Hypervisors dynamically provide virtual machines with physical hardware resources to support their operation. The hypervisor allows virtual machines to operate somewhat independently of the underlying physical hardware. Virtualization lets you consolidate physical computing resources such as CPU, memory, storage, and networking into resource pools, providing them dynamically and flexibly to virtual machines. Virtualization includes server virtualization, desktop virtualization, and storage

virtualization. Server virtualization abstracts physical servers through Hypervisor into virtual machines (VMs) to mount virtualization engines for servers and virtualizes resources such as CPU, memory, disk, and NIC of servers to form VMs. Desktop virtualization features a virtualization engine for desktops on top of Hypervisor's virtual machine and abstracts CPU, memory, disk, and NIC to provide its own VM. Network virtualization can reproduce all the features of Layer 2 to Layer 7 networking services (e.g., switching, routing, access control, firewall features, QoS, and load balancing), and it builds a virtualized network environment regardless of the underlying IP network area. Storage virtualization provides host-specific virtualization by logically abstracting storage resources and capacity. In addition, the Thin Client is an equipment with minimal resources to install the OS, and the Zero Client is an equipment with Terminal functionality to connect to a virtual desktop. Anyone should compare the capabilities and configuration requirements of VMware's product options to select the appropriate options for virtualization deployment and reflect them in your design. Features and components for VMWare NSX should be analyzed to optimize network definitions for virtualization deployment and reflect them in the design.

3.2. SDx Technology - SDC(Software Defined Compute)

Through an understanding of the technical concepts and principles of virtualization that forms the foundation for cloud services, we can infer the scope of technology's application to the task of driving the efficiency of sharing and allocation of IT resources. The Software-Defined Compute (SDC) consists of a pool of virtual resources, such as the physical server's CPU, memory, disk, and network interface card (NIC). As part of SDx, it provides the ability to support all physical and virtual resources to operate in an integrated manner.

3.3. SDx Technology - SDS(Software Defined Storage)

SDS is a storage architecture that separates storage software from hardware, and SDS is typically designed to work on industry-standard or x86 systems by eliminating software dependencies on proprietary hardware, such as traditional NAS or SAN. Software-Defined Storage (SDS) can be composed of a single Storage Pool through virtualization by consolidating physical storage resources, ensuring scalability, availability, data protection, and more through software. Unlike NAS and SAS, SDS can use storage virtualization to control storage through abstracted software layers from physical storage. It provides various storage device interfaces for objects, files, and blocks, enabling fast provisioning, enabling rapid and flexible performance and capacity scaling.

3.4. SDx Technology - SDN(Software Defined Networking)

SDN is an architecture that aims to make the network agile and flexible, and its goal is to improve network control by enabling companies and service providers to respond quickly to changing business requirements. Before virtualization technology, applications ran on one server and exchanged traffic with clients, but today applications are distributed across multiple virtual machines, and VMs are rapidly moving locations to optimize server loads, requiring network design changes. Software-defined networking (SDN) is a software-based open network control technology that separates the Control Plane from individual network equipment such as routers and switches and focuses on the central controller, each of which performs only the Data Plane function. SDN makes it easy to define service-specific virtual networks, such as Overlay, using APIs provided by a central controller.

3.5. SDx Technology - SDDC(Software Defined Data Center)

SDDC refers to data centers that virtualize infrastructure through abstraction, resource pooling, and infrastructure as a service delivery automation, and SDDC is considered the next step in the evolution of virtualization, containers, and cloud services. The Software Defined Data Center (SDDC) is a data center that virtualizes all components of the data center, including servers, storage, networking, security systems, and management solutions, and automatically controls and manages the infrastructure of the virtualized environment. As a data center where all infrastructure resources are virtualized under the concept of SDX, existing enterprise applications are delivered in a more flexible and economical manner via SDDC. SDDC refers to a data center that virtualizes infrastructure through abstraction, resource pooling, and automated delivery of infrastructure as a service (IAAS), which is considered the next step in the evolution of virtualization, containers, and cloud services.

3.6. HCI Technology

CI technology allows storage, computing, and networking to be integrated into a single system, enabling HCI to reduce data center complexity and improve system scalability. Hyper Converged Integration (HCI) enables storage, server, virtualization SW, and management SW as a single appliance. Known as hyperconverged infrastructure, architectures are one of the most commonly used architectures for building private enterprise clouds. Based on the scale-out architecture of x86 servers and HCI, which are utilized as core building blocks, we can reduce costs. Early on (computing and storage) as the price of x86 servers lowers hardware costs, and scale-out architectures scale out by simply adding nodes to the cluster. The installation is relatively small. Eliminating the need for dedicated storage systems and SAN switches further reduces costs. The scale-out architecture of HCI solutions also contributes to

improved agility. IT can quickly expand compute and storage resources by adding nodes to existing clusters without taking applications offline. Installation is simple and the level of automation is high, which generally reduces the management burden. Most solutions are targeted at IT generalists or virtual machine (VM) managers and are designed to be installed and executed at the minimum possible level. In a customer survey of cloud platforms for enterprise data centers, evaluators Gartner and Forrester rated Nutanix as the technology and market leader.

3.7. Infrastructure Operations Technology - OpenStack

OpenStack is an open-source project involving most of the global IT companies, with software that enables Rackspace and NASA to build IaaS. OpenStack is an open-source project that began in 2012 with the creation of the OpenStack Foundation, a software that enables the deployment of Infrastructure as a Service, launched by Rackspace in 2010 and NASA. OpenStack is a cloud operating system that controls large pools of compute, storage, and networking resources across managed and provisioned data centers through APIs with common authentication mechanisms. As the word IaaS implies, it has implemented a comprehensive set of server virtualization, storage virtualization, and network virtualization technologies needed for cloud infrastructure. The latest version of OpenStack has enhanced bare metal and network management capabilities, and container management capabilities have been enhanced with Kubernets integrated support.

3.8. Infrastructure Operations Technology - DevOps

DevOps is a combination of cultural philosophy, methods, and tools that enhance the organization's ability to deliver applications and services at a faster pace, enabling product innovation and improvement faster than organizations that use traditional software development and infrastructure management processes. DevOps refers to a culture in which Development and Operation work together to create high-quality software more quickly. It is a development environment or culture that emphasizes communication, collaboration, and integration between software developers and information technology experts. That is to say that DevOps is an interdependent response between software development organizations and operational organizations and aims to quickly develop and distribute software products and services.

4. PaaS Technology Trends and Analytics

Firstly, I define application criteria for public cloud deployment targets (Figure 1). A corporate closed network We would like to present the direction of improvement of a company's cloud development platform by investigating technology trends in PaaS in cloud computing platforms and analyzing the configuration and trends of key technologies.

4.1. Container Technology Trends

Container management platforms are also called operating system-level virtualization because they facilitate the configuration and virtualization of software containers, and developers use containers to start, test, and protect applications in an independent resource environment. Containers provide logical packaging mechanisms to abstract applications from the actual driving environment. This isolation makes it easy to deploy container-based applications in any environment, from private data centers to public clouds to even developer's personal laptop computers. Containerization allows business areas to be neatly separated. In other words, developers can focus on the logic and dependencies of the application, and IT operations can focus on deployment and management without wasting time on the detailed tasks associated with specific software versions and individual app configurations. Container management platforms help users allocate resources to optimize efficiency and balance system workloads, while vendors in the market provide a flexible platform for configuring, automating, and deploying applications. Container management platforms perform operating system-level virtualization functions and facilitate configuration and virtualization of software containers. Developers use containers to start, test, and secure applications in resource-independent environments.

4.2. Docker Platform Technology Trends

Container management platforms help users allocate resources to optimize efficiency and balance system workloads, while vendors in the market provide a flexible platform for configuring, automating, and deploying applications. Docker is a package tool that automates much of the creation and distribution of Linux-based containers. And also, Docker is a software platform that enables rapid deployment, testing, and deployment of applications, enabling rapid deployment and expansion of applications across any environment, and ensuring code execution without problems. Docker is an operating system for containers that provides a standard way of executing code that can be installed on each server and used to build, start, or stop containers. Using Docker can reduce costs

by delivering code faster, standardizing application operations, moving code smoothly, and increasing resource utilization.

4.3. PaaS Technology Trends

PaaS is a cloud computing model that provides users with hosted development kits, database tools, and application management capabilities. Platform as a Service (PaaS) is a classification of cloud computing services that provides a platform that enables customers to develop, run, and manage applications without the complexity of creating and maintaining infrastructure typically associated with app development and startup. It is a model that extends the concept of SaaS to the development platform, making it easy to utilize the necessary development elements on the web without having to build a platform for development. We can reduce back-end software development time by providing users with virtual resources to build, deploy, and run software applications through PaaS platform deployment or use.

4.4. Kubernetes

Kubernets is an open-source platform designed by Google for container management and is currently managed by the Linux Foundation, combining Google's experience in running production workloads on a large scale with community ideas and applications. The name ‘Kubernets’ derives from the Greek word for ‘helmsman’ or ‘pilot’ and was open-source by Google in 2014. Kubernnets is designed to provide a platform for automating the deployment, scaling, and operation of application containers between hosts in multiple clusters, and works with a set of container tools, including dockers. KuKubernets is a portable, scalable, open-source platform for managing containerized workloads and services. It facilitates both declarative configuration and automation, and services, technical support and tools are readily available anywhere. And it has a workflow of managing multiple worker nodes through one master node, which is a node administrator upon service request, and is increasing service competitiveness through application-driven service management at the core of existing infrastructure services. Furthermore, Kubernnets is an open-source platform that consists primarily of one master node and several walker nodes, and is intended to manage containers. It provides automated installation, management, and updates from the Kubernets API to the OS to simplify the development and deployment of applications by companies. The service configuration as a Kubernets solution consists of six categories and is supported in a single way from development environment to deployment and operation.

4.5. Cloud Foundry

Cloud Foundry Platform is open-source software available to anyone, through the Cloud Foundry Foundation, an open-source software, or through several commercial providers, products or services. Cloud Foundry is an open-source, multi-cloud application PaaS managed by the Cloud Foundry Foundation, one of the 501(c)(6) organizations. VMware's Open PaaS strategy began in April 2011 with SpringSource’s Java platform ‘SpringSource Cloud Foundry’, which was acquired by VMware in open source PaaS software (implemented as Ruby), and has since been developed with the addition of development languages, services, and frameworks. Cloud Foundry components facilitate the deployment process through integration with self-service application execution engines, automated engines for application deployment and lifecycle management, scriptable command-line interfaces (CLI) and development processes. Cloud Foundry has an open architecture that includes build pack mechanisms for adding frameworks, application service interfaces, and cloud provider interfaces. The Cloud Foundry interacts with the underlying infrastructure using the cloud foundry BOSH deployment script language, another open source tool from Pivotal. Its container-based architecture runs apps in any language on top of a variety of cloud services, including AWS, MS Azure, GCP, OpenStack, VMWare vSphere, VMware Photo, and IBM SoftLayer. Kubernets is an open source system that automates the deployment, expansion, and management of containerized applications and is effectively becoming a container-tuning standard, and, in conjunction with the Cloud Foundry platform, can be used to manage the entire cloud environment much more easily. Cloud Foundry is a leading multi-cloud application platform for organizations around the world and is ideal for ongoing deployment because it supports a complete application lifecycle from initial development to all test phases and deployments.

4.6. Openshift

Red Hat OpenShift is a leading hybrid cloud enterprise Kubernets application platform trusted by more than 1,700 organizations. Of the four versions, Origin and Container Platform are installed versions, while Online and Dedicated are cloud versions. OpenShift can use any cloud and all application types in a variety of clouds that customers want, including virtualization, bare metal, and public cloud. OpenShift is a full container application platform that essentially integrates technologies such as Docker and Kubernets, a powerful container cluster management and orchestration system, and combines them on Red Hat Enterprise Linux to enterprise-based. OpenShift manages hybrid cloud and multi-cloud deployments by extending Enterprise Kubernets with automated full-stack operations. OpenShift is an open-source platform that creates a development environment that allows

users to develop, deploy, operate, and manage applications in a cloud PaaS environment. OpenShift is accelerating integration to automatically manage the architecture, processes, platforms and services needed to enhance the capabilities of its development and operations teams in terms of management. The service configuration as an OpenShift solution consists of six categories and is supported in a single way from development environment to deployment and operation.

5. SaaS Technology Trends and Analytics

We would like to present the direction of improvement of a company's cloud development platform by investigating technology trends in PaaS in cloud computing platforms and analyzing the configuration and trends of key technologies. Software as a Service (SaaS) is a software delivery model in which software and associated data are centrally hosted and users connect through clients such as web browsers, and is also known as on-demand software. SaaS providers manage all potential technical issues, such as data, middleware, servers, and storage, so customers can focus on their business while simplifying maintenance and support. SaaS is a service that charges users according to the usage of S/W over the Internet, including ERP, CRM, SCM, document editing, groupware, document management, and cloud management. It is also a software delivery model in which software and associated data are centrally hosted and users connect through clients such as web browsers. It is an on-demand software (on-demand software) method. After all, SaaS refers to commercially available software that is accessed and managed on a network basis. Through this, SaaS manages activities from a central location rather than from each customer site, allowing customers to access applications via the Web. Application delivery is typically more like a one-to-many model than a one-to-one model, which includes architecture, pricing, partnering, and management characteristics. And SaaS is eliminating the need to download patches and upgrades with centralized feature updates. While smartphone app stores and cloud SaaS market places are structured to provide services in a similar way, SaaS cloud services are available, scalable, and multi-tenancy. In SaaS cloud marketplace, service providers develop services and register them with SaaS marketplace. The Cloud platform providers build PaaS platforms to provide service development and operational environments. Mashup provides new services using APIs that are released to create new software, services, databases, etc. by combining information and services provided by the existing web. Mashup in web development is the concept of creating new Web applications by sharing data using a common interface between two or more sources to create new services. Meshup refers to easy and fast integration using open application programming interfaces (open APIs). Furthermore, it can be combined with raw source data using data sources to generate rich results. The main characteristics of mashups are combinations, visualizations, and aggregation, and it is important to make existing data more useful for personal and professional purposes. Mashups are typically client applications or hosted online so that data from other services can be permanently accessed. The Mashup service has the advantage that it costs little to develop, and new services are provided by converging its own user interface or content on the basis of Open APIs that disclose product information and technology provided by service providers as Web services. In the future, a large number of good commercial mash-up services will be created if APIs for websites with large amounts of data such as transportation, weather, large bookstores and discount stores are released.

6. Conclusions

Through this work, we advance the analysis of cloud service platforms IaaS, PaaS, and SaaS technologies. These results derive implications from public and private perspectives. The cloud market is expanding into the public cloud market, avoiding private clouds based on existing commercial solutions, and corporate users are rapidly moving to public clouds. VMware's application of virtualization solutions to private clouds is decreasing and being replaced by public deployment and operational platforms. Firstly, in terms of IaaS, software-defined-based virtualization technologies along with server virtualization technologies represented by VMware have evolved to automate operations. HCI architectures are evolving into the most commonly used architectures for building private enterprise clouds. OpenStack continues to grow its market share as an open-source project and is evolving into a core part of the SDDC. DevOps refers to a culture in which development and operation work together to quickly create high-quality software, based on mutual trust. Secondly, in terms of PaaS, the development of PaaS platform technology is increasing service competitiveness by reducing software development time, and PaaS usage continues to increase. Container technology is an operating system-level virtualization feature that can run programs independently of resources, making it a platform-centric. Kubernets is an open-source platform for managing containerized workloads and services, becoming the center of the PaaS management engine. Cloud Foundry is an open-source, multi-cloud application platform that supports a complete application lifecycle from initial development to all testing stages and deployment, and is becoming a development standard around the Kubernets

engine. Pivotal Cloud Foundry is a commercial version of an open-source Cloud Foundry solution that includes additional commercial functionality and continues to grow. IBM Cloud Private is a container orchestration platform based on Kubernets to develop and manage on-premise applications. OpenShift is an open-source container application platform that provides Docker and Kubernets, which manages the OpenShift Cluster. Third, on the SaaS side, SaaS-based service marketplace is expanding into the corporate public cloud market because it can save users time and money. The Mashup service has the advantage of having little development cost, and a large number of good commercial mesh-up services will be created if APIs for websites with large amounts of data as well as maps are released in addition to maps.

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