

Cloud Software to Drive Digital Transformation in Composite Businesses

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Digital transformation is now a major strategic focus for organizations of all sizes. But, “transformation” is not an end state—it is literally the process of becoming something else. So what exactly are organizations transforming into as a result of widespread digitalization? The answer in our view is composite businesses. Composite businesses will create and monetize adaptable, intelligent, and highly automated business models built on the orchestration of millions of real time connections spanning people, systems, and things. However, controlling the huge complexity of this web of connections is beyond the capabilities of today’s business and ICT practices, requiring more powerful tools, higher levels of automation, and the pervasive use of machine intelligence. To succeed, we must therefore build platforms that enable people to explicitly model, visualize, and control the highly complex distributed ecosystems underpinning the next generation of connected business models. This paper describes the four defining characteristics of future composite businesses resulting from digital transformation, the software being developed to support their implementation, and the way in which these software components combine to create a platform for composite businesses.

1. Introduction

While digital transformation is a major strategic focus for enterprises, very few understand the forces driving it. For decades, organizations’ growth has been constrained by their need to own assets—manufacturers need more machinery while service providers need a bigger workforce—but growing an asset base is a time-consuming and difficult process, highly affected by the economic environment. Such problems, therefore, limit organizations to linear growth.

In “The Nature of the Firm”, Ronald Coase proposed that falls in the cost of procuring goods and services via markets would result in greater outsourcing.¹⁾ Today, ubiquitous connectivity together with accelerating digitalization are making it easy to find and integrate a huge variety of human, business, and technological resources at low cost, and this variety is growing exponentially as billions of everyday objects join the network. Most importantly software is making these resources open and easy to integrate—creating a rich environment for the creation of digital business.

This ability to easily utilize external resources has

resulted in new, exponential organizations²⁾ with incredible growth rates. Rather than acquiring resources, such businesses leverage cloud and mobile technology to build networks of external relationships—creating significant revenue streams while owning just a fraction of the assets. For example, Uber has no cars or drivers but is worth more than General Motors,³⁾ while Airbnb has no property or hospitality staff but is bigger than both Hilton and Hyatt combined.⁴⁾ Both of these organizations have used external resources to operate with a workforce of less than 1% than that of GM, Hilton, and Hyatt.

While these organizations are outliers, they demonstrate the profound changes of the digital age. No longer will the accumulation of assets be the primary route to business success—rather the goal will be to utilize external resources as much as possible to support fast improvisation, instant scale, and clear business focus. We believe this will create a world of composite businesses⁵⁾ that create new digital business models by composing people, systems, and things using software.

To unlock such digital innovation for our

customers, Fujitsu develops and offers various cloud service technologies. By empowering people with these new technologies, we aim to enable our customers to achieve meaningful digital transformation by evolving towards new composite business models.

In this paper, we explain the four defining characteristics of future composite businesses that will result from digital transformation. We then introduce the cloud software we are developing to support the implementation of these four characteristics. Finally, we explain how these software products combine to create a platform for composite businesses.

2. The characteristics of composite businesses

In this section, we describe the four significant characteristics of composite businesses.

2.1 Business Everywhere through immersive experiences

Composite businesses deliver value through as many human-centric touchpoints as possible, using multiple channels to integrate seamlessly into experiences, e.g. web, mobile, voice, chat, and mixed reality, such as augmented reality (AR) and virtual reality (VR). This will ensure they can serve customers at any time and place of their choosing, helping to generate greater revenue through better relationships. Smartphones and other connected devices have already enabled people to access the Web from anywhere while providing new rich sources of information using cameras and sensors, enabling businesses such as Google and Uber to transform entire industries. The next wave of immersive technologies will offer new opportunities to do the same.

2.2 Hyper-connectivity through cloud and IoT

Composite businesses will create value through integration, using the whole digital fabric of clouds, gateways and devices to push intelligence—in the form of information, algorithms, and software—to the right place. This will enable composite businesses to be more efficient by removing waste, connecting silos, and integrating processes from end-to-end.

Equally important, the diffusion of low cost sensors pioneered by smartphones means that almost

everything—from sports shoes to self-driving cars—will soon be a distributed compute node, creating a new IoT⁶⁾ where multiple clouds and billions of devices will offer processing spaces in which we can deploy business functionality. This shift from centralization to distribution is critical; real world data is too massive, complex, and time sensitive to routinely send to the cloud for processing, and so we must instead move processing nearer to the data.

However, this distribution will bring trust challenges, with digital business models spanning organizations as well as technologies. Blockchain is emerging as a potential infrastructure for such distributed trust, however, creating a distributed “database” of immutable assertions about the state of transactions shared between multiple parties across clouds and IoT.⁷⁾

2.3 Fast evolution with software-defined business

Composite businesses will move fast by defining themselves in software, using digital models of people, systems, and things to quickly create and monetize offerings built on the composition of digital services. This will enable digital businesses to evolve at a fundamentally faster pace, using business-focused tooling to quickly generate and adapt digital offerings on a global scale.

Many of today’s digital natives—such as Airbnb, Amazon, Facebook, Google, etc.—have created their businesses almost entirely in software, enabling them to use the malleability of software to launch and adapt at a fundamentally different speed. But, the growing penetration of software into every aspect of life is opening up the opportunity to model the behavior of almost everything—e.g. devices, processes, applications, data, and computing—directly in software, making it increasingly easy to digitally source, configure, and integrate the resources necessary to construct a functioning business. In this way, composite businesses will be able to use software as a concrete expression of their organization’s business model and goals—including the ability to instantiate, manage, and monetize software-defined business models across the distributed processing spaces of the global network.

2.4 Intelligent management using smart algorithms

Composite businesses will become increasingly complex as they begin to leverage and compose billions of people, systems, and things across the global digital environment. But, constantly managing and adapting businesses at this scale will require millions of real time decisions every second spanning operations, finances, and business models. Making each of these decisions manually will quickly hit scale and complexity barriers without automated support.

Fortunately, the emerging field of machine learning can help. By combining large datasets and complex statistical models machine learning can be used to automate a broad range of routine tasks.⁸⁾ But machine learning is not a new form of “general” intelligence; rather it is a special kind of algorithm that delivers outstanding results within the highly specialized domain for

which it has been designed, meaning that it will need to work in combination with people. By automating millions of routine decisions, however, machine learning can take care of simple tasks, optimize specific processes, and incrementally evolve business operations, which frees people to focus on bigger issues of strategy and experimentation. This combination of people and AI will enable composite businesses to make faster, more accurate decisions, creating a rapid feedback loop that exponentially improves their business model.

3. Environment for digital business creation

Fujitsu believes that future composite businesses will need technology support to achieve all four characteristics discussed (Figure 1).

To support new immersive experiences, composite business platforms will need to support emerging

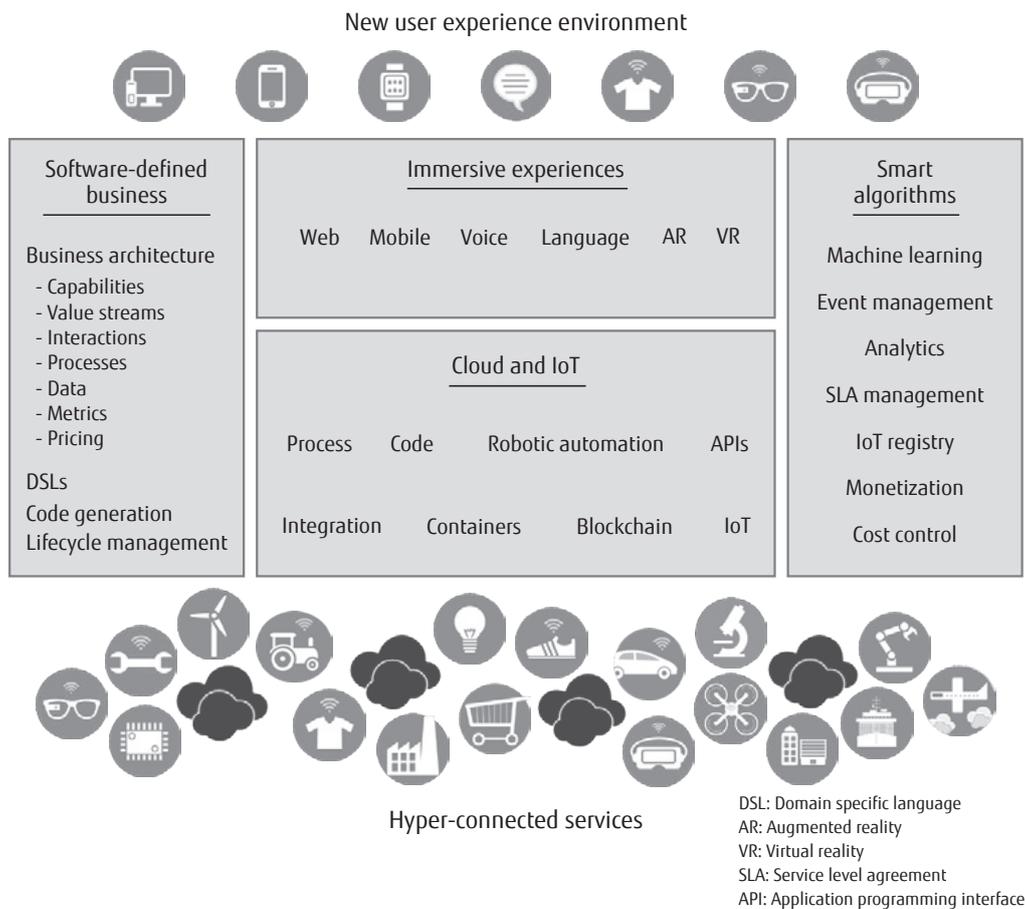


Figure 1
Core technologies for composite business.

devices and platforms such as voice interactions and mixed reality. These services in turn must be connected to a range of services built and distributed across the hyper-connected infrastructure of cloud and IoT resources. Together, these elements will create a runtime platform for composite business operations. To enable the fast, manageable creation of such business models, however, we will also require a highly advanced business modelling and development environment, enabling the rapid creation, deployment, and adaptation of composite business models implemented within software. Finally, a range of smart algorithms will be required to assist people with the ongoing optimization of composite business models, automating decisions across complex combinations of resources, and enabling users to focus on goals and business model strategy.

4. Fujitsu technologies to support digital innovation

Fujitsu’s mission is to provide a platform that empowers our customers’ digital innovation and helps them evolve towards the benefits of composite business. To achieve this mission, we are researching and developing software across the dimensions of Business Everywhere, Hyper-connectivity, Fast Evolution, and Intelligent Management.

4.1 FUJITSU Cloud Service RunMyProcess

FUJITSU Cloud Service RunMyProcess (RMP)^{9),10)} is

a cloud platform that empowers customers to quickly build digital applications that connect a broad range of resources via a fast, process-oriented approach. Using RMP, users can quickly deliver new digital user experiences for web and mobile users by modelling business processes that easily connect resources from across the hyper-connected infrastructure of cloud and IoT resources. In this way, RMP helps businesses to immediately create and operate software-defined business models using process definition (Figure 2).

Utilizing technologies like Docker, NoSQL, asynchronous cloud messaging, and distributed cache, RMP provides a large scale, high performance platform for delivering smart, process-oriented business applications within the public cloud. Today, RMP runs millions of processes and integrations every month for more than 350,000 users around the world—all with 99.99% availability.

Unlike traditional application development approaches requiring highly skilled engineers, RMP provides a high-productivity environment for building applications through modelling—helping a range of expert and non-expert users quickly create the UIs, business processes, data models, and integrations necessary to solve business problems and digitize operations.

Connecting all of the necessary systems and data is made simple using a large library of pre-configured connectors to popular on-premises and cloud systems

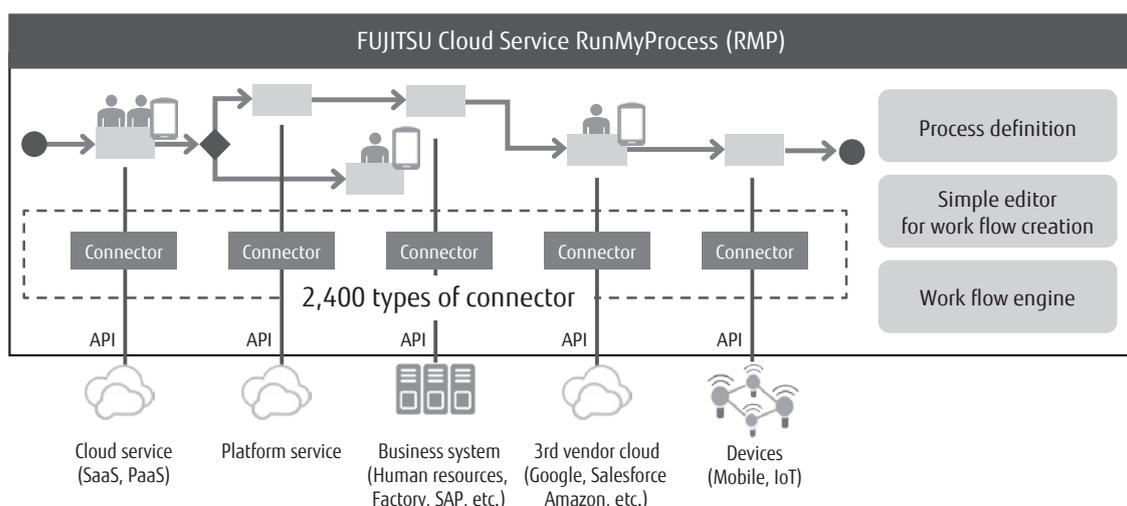


Figure 2 Usage image of RMP.

such as Google Apps, SAP, Microsoft 365, Salesforce, and ServiceNow. In addition, RMP supports important industry protocols for IoT, helping customers extend their business processes more deeply into the real world. For services not supported out of the box, users can easily create and use their own connectors.

Once connected to all necessary resources, RMP applications can be accessed by users in many different ways—for example not only via browser-based interfaces but also via cross-platform mobile apps with sensor, camera, GPS, and offline interaction support (Figure 3).

By adopting the fast, experimental methodology enabled by RMP’s model-driven approach to digitalization, customers can attain great agility—starting with small implementations before rapidly expanding step-by-step towards larger and more complex use cases. In this way, customers can realize a faster and more agile way to evolve their business.

4.2 FUJITSU Software Enterprise Service Catalog Manager

FUJITSU Software Enterprise Service Catalog Manager (ESCM)¹¹⁾ provides a central portal through which an organization can provide and manage access to a broad range of cloud services spanning infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS). In addition, ESCM adds a range of key capabilities that are necessary for ICT organizations to deliver such hybrid business systems as

a service, providing important enabling capabilities for security, pricing, subscription management, and billing. By providing a broad range of service-enablement features out of the box, ESCM enables a faster, safer, and more consistent way for enterprises to expand the range of digital services available within their business. ESCM provides features for both accelerating the introduction of new services and streamlining their provisioning and management once active.

1) Accelerating service introduction

When ICT organizations begin to broker and provide business and technology capabilities as a service, they need to care of both the business logic of the services and their delivery model, covering issues such as service portal, user management, subscription, cost allocation, billing, etc. ESCM takes care of all such service-related functions, enabling organizations to significantly shorten the time needed to develop and introduce new cloud services. It achieves this by providing a simple API-driven wrapper for all service-related capabilities (Figure 4). Furthermore, by creating an internal “marketplace” of approved internal and external service offerings, ESCM creates a central point through which ICT organizations can manage their hybrid ICT service portfolio shown in Figure 5, while providing an easier and more consistent way for users to consume services.

2) Streamlining provisioning and management

ESCM provides standard adapters for easily provisioning and managing a range of different types of

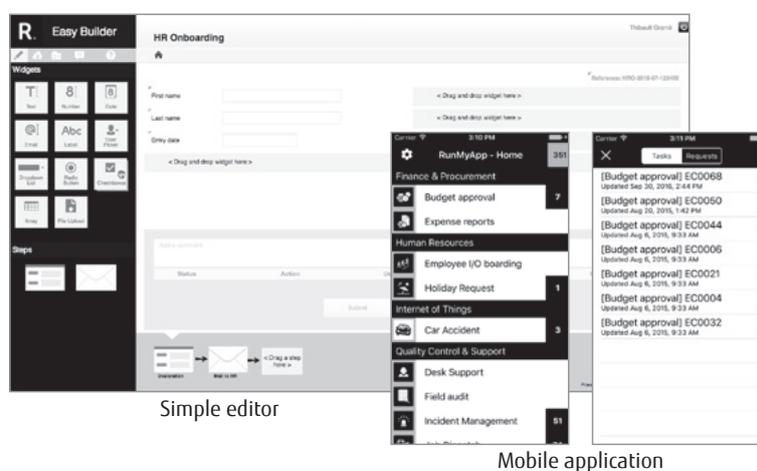


Figure 3 Simple editor and mobile application.

services such as IaaS, PaaS, and SaaS. For example, by defining virtual machine templates for environments such as Amazon Web Service (AWS) and OpenStack, ESCM adapters can provision computing and software resources on the basis of parameters set in the service portal, automating the creation of virtual machines and systems (Figure 6). This ability to bundle software and virtual machine definitions for easy provisioning can be used to easily deploy traditional applications and

middleware on new cloud infrastructures like AWS, etc. Moreover, it is simple to create adapters with APIs for provisioning accounts or users in more complex SaaS services such as Office 365.

The services registered in ESCM are managed in a consolidated enterprise-wide catalog, enabling a single portal for subscription and management of cloud services from many vendors. Through the ESCM service portal, users are empowered to easily subscribe to many kinds of services while their department is still presented with a single bill for their total combined usage.

In the future, ESCM will be further extended into the hyper-connected infrastructure, adding support for containers and IoT resources. By using the easy subscription and billing capabilities of ESCM, customers will be empowered to continuously adapt the services they use to compose their digital business model, creating an important enabler for software-defined business.

4.3 FUJITSU Cloud Service PICCO

FUJITSU Cloud Service PICCO^(12),note) is a cost management service that automatically collects and analyzes an organization’s cloud usage data, helping

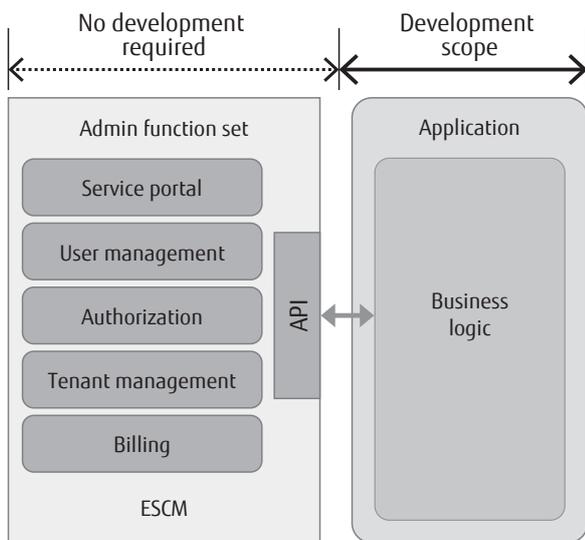
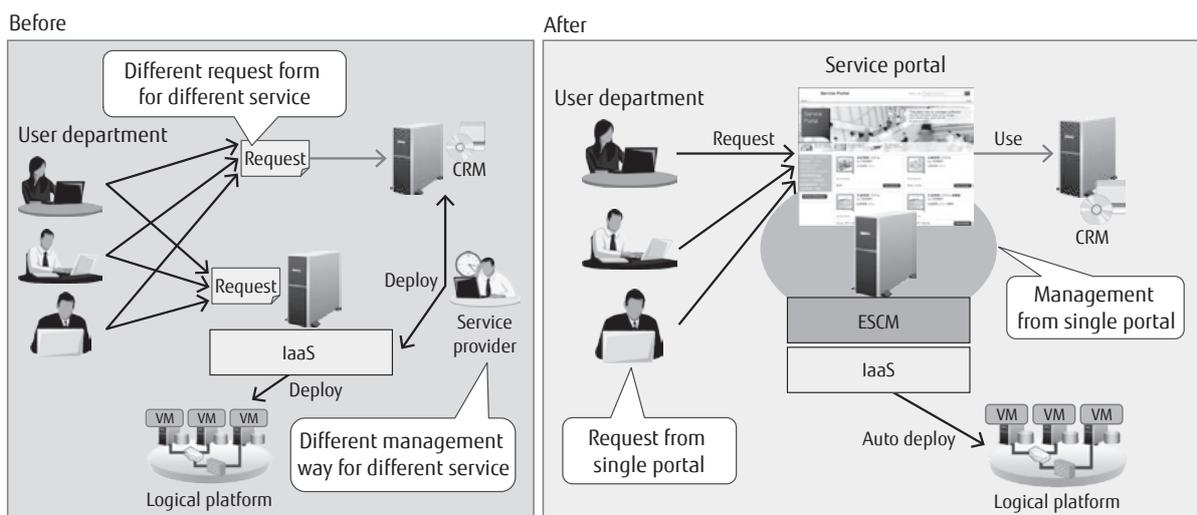


Figure 4 Management function set of ESCM.

note) PICCO stands for “profile, insight, cost & capacity optimization.”



CRM: Customer relationship management

Figure 5 Comparison of usage situation of user.

them optimize the cost of their business operations. In a composite business, the ability to track and optimize the costs of the resources used to compose business models will be a critical differentiator. In this case, organizations will need to be able to monitor the cost of their operations by visualizing, analyzing, and optimizing their mix of owned and external services.

For example, **Figure 7** shows how a service, A, uses a combination of AWS and Google Compute Engine (GCE), while another service, B, uses a combination of FUJITSU Cloud Service K5 and AWS. In a typical scenario, organizations must manually consolidate invoices from multiple providers to calculate the total cost of their infrastructure services—but even then, it may be difficult to allocate the AWS costs to specific services.

PICCO provides functions that make it easy to visualize the relationship between an organization’s services and the underlying cloud infrastructure that supports them, providing deep analytics on the costs attributable to each service. In this scenario, it is easy to visualize, forecast, and compare the costs of different

services using a range of smart algorithms, and to further allocate these costs to different departments within the enterprise. Such automated support for financial control and optimization helps provide intelligent management for business operations.

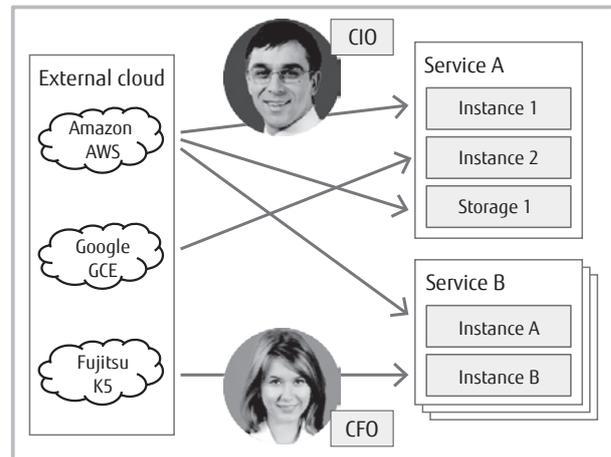


Figure 7
Understanding cost in the case of using various clouds.

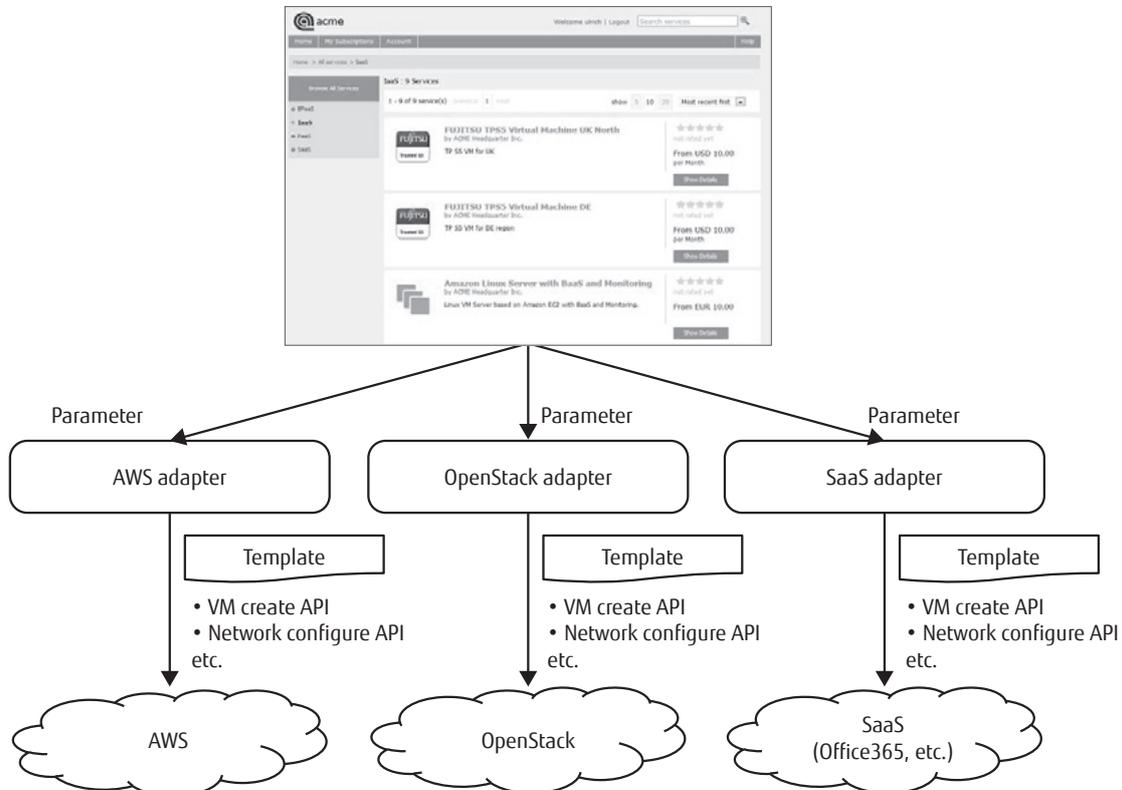


Figure 6
Adaptor for each cloud.

1) Visualize cost

PICCO collects cost information from each cloud automatically, aggregating, filtering, and harmonizing different data formats to consistently identify different kinds of cost. Users can set budget thresholds for entities such as services, projects, and departments, alerting the responsible person if thresholds are approached or breached. Equally important, by making cost data available more visible, PICCO enables people to take a greater personal responsibility for managing and optimizing their costs. Today, PICCO supports a range of services—e.g. AWS, GCE, Microsoft Azure, OpenStack, and K5—as standard and can be easily extended with additional adaptors for services such as PaaS and SaaS.

2) Cost forecast analysis and cost comparison

PICCO can also forecast future costs on the basis of an analysis of service usage patterns over time, using smart algorithms to estimate the future costs of a service together with any likely minimum and maximum variance. Equally important, it can use this information to compare the likely costs of using one external infrastructure against another, helping organizations to continually optimize the cost of their operations in an intelligent manner.

Over time, PICCO will grow its support beyond simple metrics such as CPU usage of a virtual machine (VM) and begin to optimize an organization's overall process costs, using data regarding the whole cost of executing a business activity to realize intelligent management of an organization.

4.4 Delivering a composite business platform through technology synergies

From a strategic point of view, each of the technologies we have presented in this paper have a role to play in building our future composite business platform.

To support the rapid composition of new business models, users will be able to select a range of services from the ESCM marketplace, connect them together with RMP to create new business value, and then forecast and manage the costs of the resulting business using PICCO. Fujitsu's software technologies are converging towards a platform to accelerate composite businesses, helping people focus on goals and strategy over technology to create faster, more efficient, and

more profitable future business models.

5. Conclusion

Fujitsu believes the technology changes for the next 10 years will fundamentally change the nature of the enterprise, favoring those that are fast, focused, and connected over those with large asset bases that are difficult to scale and slow to evolve. By mastering the capabilities we have outlined in this paper, organizations will be able to build new composite business models that leverage the digital environment for sustained, exponential growth. Today, Fujitsu technologies enable customers to find new services, connect them together with wider ecosystems of people, systems, and things and to track and optimize their cost of execution.

Moving forward, Fujitsu will continue to innovate its software technologies, building a new platform for the fast, productive deployment of hyperscale, composite business models on the basis of the blueprint outlined in this paper.

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