

CLoud COMPUTING: SERVICE MODELS

ISSUE 6, VOLUME 2

OFFICE OF TECHNOLOGY STRATEGIES (TS)

INTRODUCTION

In a previous Tech Insight (Volume 2, Issue 3, Tech Insight: Cloud Computing), we examined cloud computing, the main benefits that organizations like VA can gain from it, and a number of the current challenges that these organizations face when adopting a cloud-based system. Having previously introduced the basics, this Tech Insight will delve deeper into a subtopic of cloud computing, specifically covering the three cloud computing service models: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).

OVERVIEW

As discussed in Tech Insight: Cloud Computing, cloud computing is generally defined as a type of computing that relies on sharing computing resources rather than using local servers or personal devices to handle applications. By leveraging this technology, organizations can realize benefits like increased operational efficiency and improved service delivery. Cloud computing can be described as a stack, as a response to the range of services built on top of one another under the term “Cloud.”

The National Institute of Standards and Technology (NIST) identified several characteristics that are essential for a service to be considered “Cloud.” These include:

- On-demand self-service: The ability for an end user to sign up and receive services without the long delays that have characterized traditional IT
- Broad network access: Ability to access the service via standard platforms (desktop, laptop, mobile, etc.)
- Resource pooling: Resources are pooled across multiple customers
- Rapid elasticity: Capability can scale to cope with demand peaks
- Measured Service: Billing is metered and delivered as a utility service

In order to maximize the benefits that Cloud Computing brings, solutions should demonstrate these particular characteristics. Depending on the organization and project requirements, there are three different service models to choose from for optimal success.

SOFTWARE AS A SERVICE (SAAS)

In SaaS, the consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings. The Cloud model has no physical need for indirect distribution since it is not distributed physically and is deployed almost instantaneously.

While not all SaaS software share the same traits, there are several characteristics that are common among many SaaS applications. Most applications support application customization. A single customer can alter the set of configuration options that affect its functionality and look, and they can have their own settings for configuration options. For example, customers could provide a custom logo and colors. SaaS applications are also updated more frequently than traditional software (weekly and monthly). Because they are hosted centrally, updates are decided and executed by the provider. Many SaaS applications also offer features to allow users to collaborate and share information. For example, project management applications in SaaS models let users comment on tasks, plans, and share documents within and outside of an organization. Collaboration between users or customers is only possible within centrally hosted software.

While the benefits are there, limitations do exist within the SaaS model. Data security becomes an issue since data is being stored on a vendor's servers. Multi-tenant architectures limit customization of applications for large clients, inhibiting applications from being used in scenarios where customization is necessary. Certain business applications also require access to customer's current data, and when this data is large or sensitive, integrating them with remotely hosted software can be costly, at risk, or conflict with data governance regulations. Organizations that adopt SaaS may be forced into adopting new versions, which in turn can escalate training costs. In addition, switching SaaS vendors may involve transferring large data files, which is a slow and difficult process. Compatibility with other hardware, licensing and compliance, and patch revision processes can also cause limitations.

PLATFORM AS A SERVICE (PAAS)

The PaaS consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment. PaaS can be delivered in two ways: as a public cloud service from a provider, where the consumer controls software deployment and configuration settings, and the provider provides the networks, servers, storage and other services to host the consumer's application; or as software installed

in private data centers or public infrastructure as a service and managed by internal IT departments.

PaaS provides an environment for developers and companies to create, host, and deploy applications. Setting up, configuring, and managing elements of the infrastructure side is not necessary, so customers can focus on the application itself. They can also choose to maintain the software or have the vendor do it for them.

The primary advantage of PaaS is that it allows for higher-level programming with radically reduced difficulty. The development of the application is more effective because of the built-in infrastructure and easy maintenance. Multiple developers can work on a single project even if they are not close by. The primary disadvantage is the possibility of being locked in to a certain platform.

There are certain types of PaaS models that should be considered. These include:

- Public: Derived from SaaS, it is hosted in the public Cloud.
- Private: Can be downloaded and installed on a company's infrastructure or in a public Cloud. The private PaaS arranges for the application and components to be in a single hosting platform.
- Mobile: Provides development capabilities for mobile app designers and developers.
- Open: Does not include hosting, but provides open source software allowing PaaS providers to run apps in an open source environment

INFRASTRUCTURE AS A SERVICE (IAAS)

The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications, and possibly limited control of select networking components (e.g., host firewalls). A third party provider hosts hardware, software, servers, and other infrastructure components on behalf of the user. They handle tasks like maintenance, backup, and host users' applications.

IaaS models offer highly scalable resources that can be adjusted on-demand, making this model a good fit for projects that are temporary or experimental. Customers usually pay on a per-use basis by the hour, week, or month, which eliminates the expense of deploying in-house hardware and software. IaaS providers are useful for testing applications in a cost-effective environment. Once the software is ready for deployment, it can be transferred to a more traditional model.

IaaS does have its disadvantages. Because its providers own the infrastructure, management and monitoring is more difficult for users. This can also cause users' schedules to be affected if the provider experiences service interruption.

SERVICE MODELS AT VA

OI&T recently started offering IaaS at the Austin Information Technology Center (AITC) in accordance with the NIST definitions of cloud computing. This includes support for on-demand, self-service provisioning, broad network access, resource pooling, rapid elasticity, and measured services.

VA's future IT environment will rely more and more on the use of Cloud service models to build a robust networking infrastructure for VA users. The Enterprise Technology Strategic Plan (ETSP) describes the transition to the future IT Vision in which an IaaS model makes applications available on a Cloud Computing platform giving users access to enterprise applications on the IT infrastructure. This also includes applications hosted on multiple platforms such as SaaS clouds provided by third party independent software vendors. Some of the key transition activities related to delivering cloud capabilities include:

- Expansion of internal IaaS and PaaS offerings
- Implementation of Adaptive Cloud Environment (ACE) to provide IaaS capabilities and support services in a standardized orderable environment
- Implementing a cloud broker to aggregate, integrate and customize internal and external cloud services

If you have any questions about cloud computing service models, don't hesitate to ask TS (askTS@va.gov) for assistance or more information. Check out earlier Tech Insight editions [here](#).

TS TECH INSIGHT SERIES

The monthly Tech Insight series aims to help readers make better decisions and be more informed customers (of Office of Information & Technology's products and services) by providing them with high-level overviews of technology issues that impact or will impact VA's Information Technology (IT) environment. Tech Insights introduce topics in an easily digestible fashion by presenting background information on the topic, clearly explaining its importance within VA, and providing recommendations for success from TS. View all TS Tech Insights [here](#).

DISCLAIMER: This document includes links to websites outside VA control and jurisdiction. VA is not responsible for the privacy practices or the content of non-VA websites. We encourage you to review the privacy policy or terms and conditions of those sites to fully understand what information is collected and how it is used.