Introduction

In this day and age, many IT departments are pressured by leadership groups to move away from the static nature of traditional in-house data centers to more dynamic, cloud-centric architectures—increasing agility, flexibility, and scalability while reducing operational cost. And because public and private clouds each have their pros and cons, around 71%\(^1\) of businesses implement hybrid models to benefit from more of the pros, while nullifying many of the cons. However, almost all of these organizations do so by employing nonhomogeneous cloud infrastructure and application services, which drastically increases complexity for the cross-functional teams tasked with architecting and maintaining these deployments.

Prominent Hybrid-Cloud Use Cases

Linking two (or more) distinct cloud environments to fabricate a hybrid-cloud is not only beneficial from an agility, flexibility, and scaling standpoint, it also enables a whole host of specialized use cases that would be much more difficult—or impossible—to implement. Arguably, the most common of these are:

High Availability (HA) and Disaster Recovery (DR)

Establishing and maintaining a highly available, geographically redundant backup of a private cloud to prevent downtime of essential applications is very expensive and would likely double the investment required to run a single private cloud. Not only would you need twice as much physical hardware, you’d need a separate data center, with its own power, cooling, and staffing in a geographically separate location.

Alternatively, HA and DR environments can be housed in the public cloud for a fraction of the cost. The application data is stored each time it’s backed up from the private cloud while the actual application and networking resources lie dormant until required, i.e., in the case of a disaster or private cloud failure. If needed, these applications and resources are spun up and operationalized using the stored data, ensuring application availability and business continuity.

Application Development and Testing

Developing a new application in a private cloud can be substantially more expensive than in the public cloud. It requires up-front capital investment to run the workload, with no guarantee it will work or be adopted in the current market. For these reasons, companies are following the ‘fail fast, fail cheap’ mantra by using the on-demand capacity of the public cloud to develop, test, and run new apps in production mode. Once deemed operationally sound or seen to be widely adopted by users, apps can be migrated to the private cloud, which may be more secure and operationally cheaper in the long-run. Alternatively, they could stay in the public cloud, deployed in a longer-term, more cost-effective environment, using cheaper reserved instances and the like.

Cloud Bursting
Often considered the most desirable hybrid-cloud capability, cloud bursting is probably the hardest to actually implement, frequently becoming the white whale of many hybrid-cloud strategies. With cloud bursting, an application runs predominantly in the private cloud. When demand exceeds capacity, additional requests are redirected to an exact replica running in the public cloud on rented infrastructure. However, this is a temporary state, designed to handle unexpected traffic spikes which last for short periods of time. Once higher traffic periods become sustained, companies can scale up the capacity of their private cloud.

Configuring a hybrid-cloud environment for cloud bursting is inherently difficult and complex. It requires a synergistic relationship between the two environments, as well as failsafe orchestration to ensure redirection happens autonomously and seamlessly, with little or no impact on the end users experience. The difficulty is further amplified for the teams tasked with configuration and management when the infrastructure, services, and tools used to run and support the applications are different for each environment.

Homogeneity: the Key to Hybrid-Cloud Success

It shouldn’t surprise you to know that not all clouds are alike. Each has its own unique infrastructure, networking and application services, developer tools, user interface, and differentiation over other cloud competitors. For example, it’s much easier for users of Sharepoint, Exchange, SQL Server, or other Microsoft technologies to migrate to Microsoft Azure than it would be for them to relocate to AWS or Google Cloud. These platform and service dissimilarities lead to incompatibilities between clouds and make the task of developing hybrid-cloud environments incredibly challenging.

However, Microsoft has made considerable progress toward supporting hybrid-cloud creation by offering synonymous resources and services across both public and private cloud environments through Azure and Azure Stack, respectively. Azure Stack, which was only recently unveiled, gives users many of the features and benefits of public cloud with the control and security of an in-house data center.

We’ll compare three common, high-level hybrid-cloud models to demonstrate how this new approach, when combined with F5 advanced application services, drastically simplifies hybrid-cloud development and operation.

Model 1 – Nonhomogeneous Cloud Platforms and Application Services

Our first example is a hybrid-cloud environment using Azure with Azure-native application services for the public cloud aspect, while leveraging VMware with F5 application services for the private cloud component, as shown in figure 1.
Introduction

In this day and age, many IT departments are pressured by leadership groups to move away from the static, monolithic data center infrastructure in favor of more agile and dynamic environments that can respond to changing business requirements at any time, to adapt to changing business requirements. This shift towards both public and private cloud environments is driven by the need for greater cost efficiency, increased flexibility, and enhanced scalability.

Reference:
- Rightscale State of the Cloud Report 2018

Many businesses have started to realize the benefits of implementing hybrid models. By combining the pros of both worlds while nullifying many of the cons, businesses can create a more dynamic and flexible environment that can better respond to business needs. A hybrid model may be defined as the combination of a public cloud, private cloud, or both. The challenge is to find the right balance between the two to suit your business requirements.

One of the most important parts of any hybrid-cloud strategy is the migration of application services between cloud environments. This decision is often fraught with difficulty as businesses must navigate the complex plumbing required to operationalize the app in each cloud—which effectively doubles the work required to achieve similar results. Furthermore, each platform also has its own unique portal interface and developer/administrator tools, this model quickly becomes prohibitively complicated.

The distinct lack of consistency across environments makes this the most difficult model to implement and operate. With the HA/DR use case discussed earlier, an application would have to be individually configured to run identically in each cloud. Given the differences in virtual machines, APIs, and underpinning networking resources, this is unlikely to be a straightforward task. These differences contribute to reducing the overall portability of the application due to the complex plumbing required to operationalize the app in each cloud—which effectively doubles the work required to achieve similar results. Furthermore, each platform also has its own unique portal interface and developer/administrator tools, this model quickly becomes prohibitively complicated.

And that’s just considering the differences in platforms. When you add the effect of dissimilar application services, with disparate interfaces, administration tools, and configuration requirements, the complexity grows exponentially. And management dysfunction isn’t the only problem; feature inconsistencies prevent applications from being configured with the same services in each cloud, exposing you to additional risk. For example, dissimilar security services lead to separate firewall rulesets and policies. These can create security loopholes resulting in application downtime or loss of customer data as a result of any ensuing cyberattacks.

Model 2 – Nonhomogeneous Cloud Platforms with Homogenous Application Services

This set-up is similar to the one in Model 1, but with each cloud environment supported by F5 application services, as depicted in figure 2.
**Model 3 – Homogenous Cloud Platforms and Application Services**

This final model sees further incremental improvement; taking the configuration described in Model 2, and replacing the VMware private cloud with Microsoft Azure Stack, as illustrated in figure 3.
**Introduction**

In this day and age, many IT departments are pressured by leadership groups to move away from the static nature of on-premises IT and infrastructure. The technological advancements, as well as the economic viability of cloud-centric models, have pressured organizations to consider cloud deployment and/or hybrid-cloud models, where resources are housed in public, private, and/or cloud environments. This move is sometimes out of necessity, but often driven by the desire for increased agility, flexibility, and scalability. The key is to select the right mix of resources and deliver the best experience to end users.

Similarly, the workloads and applications developed across IT departments are more complex and varied than ever before. As a result of increased adoption of cloud services and platforms, it is often the case that an app can be developed, tested, and run in one environment, while IT teams seek to move it to another. Configuring a hybrid-cloud environment for cloud bursting is inherently difficult and complex. It requires a synergistic relationship between the two environments, as well as failsafe orchestration to ensure redirection happens autonomously and seamlessly, with little or no impact on the end users experience. The difficulty is further amplified for organizations with a need to provide high availability (HA) and disaster recovery (DR). Without proper orchestration, it is not only challenging to support an app in different environments, it can be nearly impossible to maintain HA and DR. This is especially true if they are housed in two different clouds, where there are many incompatibilities and requirements to meet/module when moving the app between environments. As a result, these organizations are faced with the challenge of maintaining HA/DR while safeguarding applications and their data with consistent security features and policies.

Many reasons may lead an organization to consider a hybrid-cloud strategy. However, many of the decisions concerning the use of hybrid-cloud models are subjective and depend on the needs of each organization. There are three primary hybrid-cloud models to consider:

1. **Model 1**
   - This hybrid-cloud model combines the benefits of consistent application services and cloud infrastructure while reducing the number of system variables from four to two, greatly enhancing application portability and reducing IT management strain. Unifying both the platforms and application services allows network operators and IT management to view their hybrid-cloud architecture as a single, homogenous entity, rather than two individual monoliths.

2. **Model 2**
   - This hybrid-cloud model combines the benefits of consistent application services and cloud infrastructure while halving the number of system variables from four to two, greatly enhancing application portability and reducing IT management strain. Unifying both the platforms and application services allows network operators and IT management to view their hybrid-cloud architecture as a single, homogenous entity, rather than two individual monoliths.

3. **Model 3**
   - This hybrid-cloud model combines the benefits of consistent application services and cloud infrastructure while halving the number of system variables from four to two, greatly enhancing application portability and reducing IT management strain. Unifying both the platforms and application services allows network operators and IT management to view their hybrid-cloud architecture as a single, homogenous entity, rather than two individual monoliths.

**Conclusion**

Using Microsoft Azure and Azure Stack as platforms for those organizations considering a hybrid-cloud strategy, this white paper provides insights into reducing integration hurdles and operational complexity—thereby allowing organizations to more easily migrate workloads and applications between environments and to provide a better, consistent user experience.

**The Truly Hybrid Cloud: F5 for Azure and Azure Stack**

Running identically on both platforms, F5’s BIG-IP virtual edition (VE) enhances the parity of Azure/Azure Stack architectures through replication of the supporting application services. Developers can not only develop an app in one environment and re-locate it to another, they can mirror entire production-ready stacks, inclusive of all the same BIG-IP configurations, policies, and application services. This eliminates the need for countless hours of application refactoring and testing, and allows developers to get on with what they do best: writing code.
Securing applications and their data is often a concern for developers moving apps to the public cloud—but that need not be the case. A developer can build an app in their Azure Stack environment, while a security architect configures the necessary settings on F5’s web application firewall (WAF). The entire stack can be replicated in Azure with the knowledge that the application will be protected by the same industry-leading WAF. With identical policies and rulesets, there won’t be any security loopholes or vulnerabilities that might otherwise be generated by employing disparate WAFs.

And because Azure Stack supports Azure Resource Manager (ARM), F5’s extensive selection of ARM templates can be used to automate the deployment and configuration of BIG-IP VE instances across both environments, significantly reducing spin up times and enhancing hybrid-cloud efficiency. Ultimately, all of the work F5 has done to achieve such a tight integration with Azure now benefits both Azure, and Azure Stack customers.

Conclusion

There are many reasons an organization may choose to invest in a hybrid-cloud strategy, with just as many ways in which they can implement that strategy. By diversifying and using multiple dissimilar cloud platforms and application service providers, companies make the task of implementing and operating a hybrid-cloud architecture exponentially more challenging.

By Standardizing on F5 advanced application services across cloud environments while leveraging the homogenous nature of Microsoft’s Azure and Azure Stack cloud platforms, IT organizations can create a truly hybrid architecture with complete portability of applications between ecosystems. Supporting applications with the same BIG-IP traffic management and security services allows network and security operators to optimize application availability for end users while safeguarding applications and their data with consistent security features and policies.

And in this relatively early chapter in the tale of cloud computing, many IT organizations are under pressure to make difficult decisions on their long-term cloud strategy—whether it should be entirely in the public cloud, entirely in the private cloud, or a mixture of both. F5 application services for Azure and Azure Stack alleviates the impacts of this decision by creating a holistic solution where an entire application portfolio can be migrated between cloud environments at any time, to adapt to changing business requirements.

Reference:

1 - Rightscale State of the Cloud Report 2018
of businesses implement hybrid models to benefit from more of the pros, while nullifying many of the cons.

By Standardizing on F5 advanced application services across cloud environments while leveraging the homogenous nature of Microsoft's Azure and Azure Stack cloud platforms, IT organizations can create a truly hybrid architecture with complete portability of applications between ecosystems. Supporting applications with the same BIG-IP traffic configurations, policies, and application services. This eliminates the need for countless hours of application refactoring and testing, and allows developers to get on with what they do best: writing code.

The Truly Hybrid Cloud: F5 for Azure and Azure Stack

Infrastructure while halving the number of system variables from four to two, greatly enhancing application portability and reducing spin up times and enhancing hybrid-cloud efficiency. Ultimately, all of the work F5 has done to achieve such a result is made possible through the capability of running identically on both platforms, F5's BIG-IP virtual edition (VE) enhances the parity of Azure/Azure Stack environments and relocates it to another, they can mirror entire production-ready stacks, inclusive of all the same BIG-IP knowledge that the application will be protected by the same industry-leading WAF. With identical policies and rulesets, there won't be any security loopholes or vulnerabilities that might otherwise be generated by employing disparate WAFs.

High Availability (HA) and Disaster Recovery (DR)

Often considered the most desirable hybrid-cloud capability, cloud bursting is probably the hardest to actually implement, results. Furthermore, each platform also has its own unique portal interface and developer/administrator tools, this model plumbing required to operationalize the app in each cloud—which effectively doubles the work required to achieve similar straightforward task. These differences contribute to reducing the overall portability of the application due to the complex aspect, while leveraging VMware with F5 application services for the private cloud component, as shown in figure 1.

Our first example is a hybrid-cloud environment using Azure with Azure-native application services for the public cloud. The value is in the ability to easily transfer in Azure, then quickly and seamlessly transition it to Azure Stack for production deployment (or vice versa) while in the private cloud, with identical services, tools, and virtual infrastructure. The integration addresses cloud bursting in Azure Stack customers who do not want to purchase an additional cloud environment, but with each cloud environment supported by F5 application services, as shown in model 1.

And that's just considering the differences in platforms. When you add the effect of dissimilar application services, with cloud bursting, this model becomes even more difficult to operationalize. The complexity comes from the combination of different application services from each cloud—which can lead to a complex hybrid infrastructure. There isn't a straightforward route to link the two environments; F5's solution is to use the homogenous nature of Azure and Azure Stack to create a truly hybrid architecture.

Linking two (or more) distinct cloud environments to fabricate a hybrid-cloud is not only beneficial from an agility, scalability while reducing operational cost. And because public and private clouds each have their pros and cons, around traditional in-house data centers to more dynamic, cloud-centric architectures—increasing agility, flexibility, and long-run. Alternatively, they could stay in the public cloud, deployed in a longer-term, more cost-effective environment, cloud to develop, test, and run new apps in production mode. Once deemed operationally sound or seen to be widely up-front capital investment to run the workload, or impossible—to implement. Arguably, the most common of these are:

- **Model 1 – Nonhomogeneous Cloud Platforms and Application Services**
  - F5 customers are spun up and operationalized using the stored data, ensuring application availability and business continuity. Alternatively, HA and DR environments can be housed in the public cloud for a fraction of the cost. The application data is dormant until required, i.e., in the case of a disaster or private cloud failure. If needed, these applications and resources of essential applications is very expensive and would likely double the investment required to run a single private cloud.