Executive Insight
Business Fit Assessment

FREEFORM DYNAMICS

in association

FUJITSU

Accelerate to hybrid cloud

FUJITSU Integrated System PRIMEFLEX for Microsoft Azure Stack Hub brings cloud into the data center

Freeform Dynamics, 2020

In a nutshell

The growth and success of your business demands enterprise-wide agility, flexibility and adaptability. This inevitably means doing things differently and constant change for your workforce and business processes. IT is likely to be an enabler and driver of this change, but business and operational requirements can sometimes inhibit its use and adoption. Public cloud services provide us with a good example of this. Yes, they can deliver real business benefits, but the cost might be a level of compromise that the organization is unwilling or unable to make. Hybrid cloud solutions seek to address these challenges while potentially unlocking additional levels of business value and IT capability.

The evolution of hybrid cloud

If you work for a large organization, chances are you're already using a mix of cloud service models (SaaS, PaaS, IaaS) and deployment models (private, public, hybrid) to support your business processes, applications and workloads. And the cloud model itself (on-demand, self- service, broad network access, rapid elasticity, and metered services) is also likely to be imbuing your overall IT strategy, steering it in the direction of 'hybrid IT'. This blending of models and architectures is driving the evolution of enterprise IT and cloud computing more generally, because what is one without the other.

If we look at public cloud services, such as AWS, Google Cloud Platform, and Microsoft Azure, we see that the market is developing at a rapid cadence. The services available include a growing range of innovative (and commodity) platform capabilities. These potentially enable organizations, with the help of their IT departments and service providers, to be more agile, more flexible, and more adaptable.

We all know the benefits of public cloud by now – easy access, scale as needed, and no up-front costs – but your organization's ability to adopt and employ public cloud services, especially platform services, is governed by its policies, strategies, processes, knowledge, skills and geography. And let's not forget those external factors relating to regulation, compliance and availability. So, if you want all the benefits of public cloud, it seems like compromises have to be made somewhere along the line.

Compromise has always been a part of business and the enterprise IT decision making process. But the wrong kind of compromise can be costly, resulting in a situation that could hinder the business and burden IT for some considerable period of time. Hybrid cloud, with its promise of data and application portability between cloud infrastructures, presents a technological way forward here. However, for this to be fully realized, those public cloud services mentioned earlier need full portability too.

AWS and Google have both announced initiatives in this area, but in this paper, sponsored by Fujitsu, we're going to look at Microsoft Azure Stack Hub, using Fujitsu PRIMEFLEX for Microsoft Azure Stack Hub as our practical example where necessary. We don't endorse or recommend specific solutions, but the combined Fujitsu and Microsoft offering serves to illustrate the nature and possibilities of hybrid cloud and how you might employ public cloud software and infrastructure on your own terms in your own data center.

Clouds have personas too

It's easy to get distracted by vendor strategies, especially when a market is evolving rapidly. But it's your strategy that matters here, so before dropping down to product specifics, it's worthwhile establishing a shared understanding of what hybrid cloud is and what it can do for your business. We've produced a couple of documents[1][2] to help with this, but your organization is unique, so you know best how to frame the 'business fit' discussion, particularly from the perspective of control, risk, security, etc.

If you're new to the topic, the term 'hybrid cloud' can seem rather vague, just like the term 'cloud' itself. Every vendor, it seems, has their own take on these terms to suit their business model and product portfolio, so a vendor-neutral definition might help. The National Institute of Standards and Technology (NIST) offers us a good start:

Hybrid cloud. *The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability.*

Before delving into hybrid cloud, let's address the question of AWS vs Azure vs Google Cloud. Which is best? Hopefully, you'll not be surprised when we say we can't answer this question for you, other than to say your best option might be to use all three. However, we can point to some differences in approach and 'persona' that might be useful to consider as you develop your multi-cloud, hybrid cloud strategy.

Looking first at AWS, it pretty much invented the idea of infrastructure as a service and has a wealth of experience handling huge amounts of data as a result. If we think about Google's strengths, these tend to be about broad market impact, clever algorithms and data analytics. As for Microsoft, it's all about enterprise IT 'roots and branches'. Those roots run deep inside the computer rooms and data centers of most organizations, and those branches spread far and wide, supporting a canopy of partners and alliances.

Other public clouds exist of course, and together they continue to open-up new use cases for external customer-facing applications and internal line-of-business systems. Used appropriately, and in conjunction with traditional IT systems, cloud services can provide new IT capabilities, and these in turn can unlock new business opportunities.

Employ public cloud on your own terms

If we examine the hybrid cloud strategies of major cloud players, we see that each is implementing a range of standardized and proprietary techniques to enable data and application portability between delivery models, especially public and private clouds.

In July 2018, AWS announced EC2 for its AWS Snowball Edge device, which means that customers can now run virtualized applications in local EC2 instances. Around the same time, Google announced GKE On-Prem, which brings the Google Kubernetes Engine into the data center. Microsoft's hybrid cloud approach is to bring Azure to the data center in the form of Azure Stack Hub integrated systems from partners such as Dell EMC, HPE,

Fujitsu, etc. Azure Stack Hub is also available from a growing range of managed service providers.

Microsoft developed Azure Stack Hub in response to Azure customer feedback, focusing on issues and obstacles related to latency, intermittent connectivity, and regulation. Azure Stack Hub's reason for being is to provide a way to run Azure within your own computing environment or that of a hosting partner/provider, and to do so in a way that is consistent with Microsoft's public cloud platform. Ideally, organizations can then make their technology decisions based on business requirements, rather than business decisions based on technology complications.

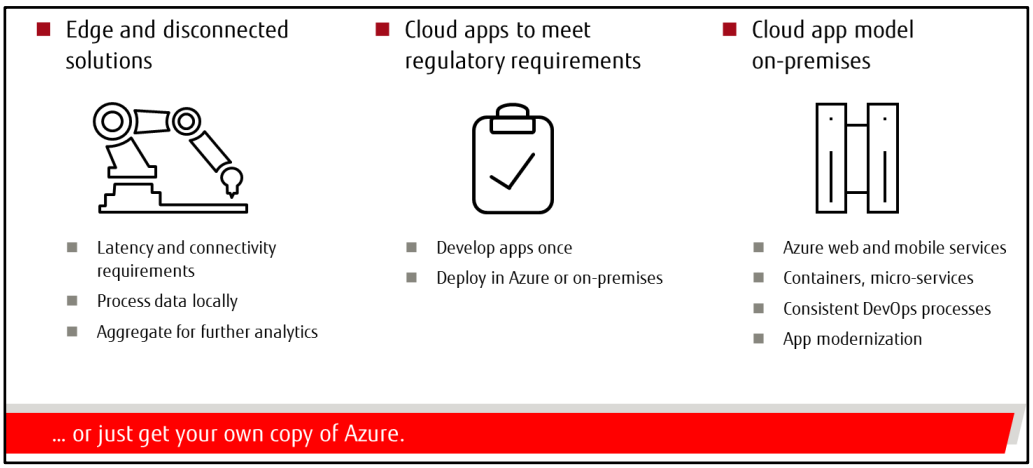

Figure 1: Azure and Azure Stack Hub - Hybrid use cases (Source: Fujitsu)

Use cases for Azure and Azure Stack Hub (Figure 1) tend to fall within three main categories: disconnected or latency sensitive solutions, meeting regulatory requirements, and modern application development and delivery models. Let's take a closer look.

Disconnected or latency sensitive solutions

Internet connectivity is neither consistent nor abundant in many parts of the world, and even when it is, practical circumstances can often require local processing and storage. Using Azure Stack Hub, you can better address latency and connectivity requirements by processing data locally and then aggregating it in Azure for further analysis.

Meeting regulatory requirements

An application developed initially for Azure can be deployed on Azure Stack Hub – or vice versa – to meet changes in regulatory requirements with little or no code changes required. This approach can help your organization meet its own governance requirements and/or those imposed by external bodies and authorities. Using a hybrid environment, you can also deploy different instances of the same application to Azure or Azure Stack Hub, based on business and/or technical requirements.

Modern application development and delivery models

Azure Stack Hub provides developers and IT teams with a consistent set of Azure services, containers, serverless and microservices architectures. These can be used to update and extend existing applications or build new ones. And if DevOps is important

to you, Microsoft's hybrid cloud offering enables you to implement consistent DevOps processes across on-premises environments (Azure Stack Hub, Azure Stack HCI and Azure Stack Edge) and public cloud (Azure).

Consistency is valuable in enterprise IT

Figure 2 provides a simplified view of Azure Stack Hub and its relationship with Microsoft Azure. The two platforms are not identical, but they do provide developers and IT teams with a consistent hybrid cloud experience.

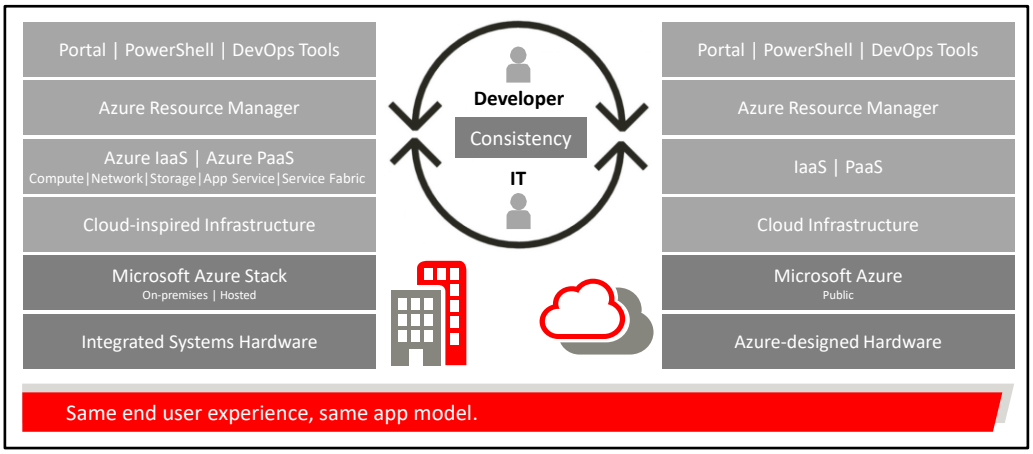

Figure 2: Azure and Azure Stack - Full consistency (Source: Fujitsu)

Looking at the top layer, we can see that the primary Azure user interface, Azure Portal, is consistent across both environments. So too is PowerShell, Microsoft's task automation and configuration management framework. And the DevOps tools that support Continuous Integration, Continuous Delivery, and Continuous Deployment activities are also consistent across the two manifestations.

A key element of Microsoft's cloud model is the Azure Resource Manager. In both Azure and Azure Stack Hub, Azure Resource Manager provides the entry point for defining sets of resources running in the cloud. It also enables 'cloud operators' (which could be members of your IT team) to manage the offers, plans, services, and quotas being offered to the tenant. Using the word 'tenant' might seem a little strange, but remember, this is the world of cloud services. Discord can arise when service models change, so discuss this with your business peers as well as potential 'customers' within IT itself, such as development and application teams.

The third layer in our conceptual model presents Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS). We'll go into more detail about these in the next section.

The fourth layer is where we find our 'cloud-inspired' hardware, the physical foundation of Azure Stack Hub integrated systems. Azure Stack Hub is delivered as an integrated system with software installed by Microsoft's hardware partners on pre-qualified hardware. These systems are a combination of optimized hardware, software, and services. It's this combination that brings Azure to your data center or that of a partner/service provider. Microsoft is partnering with several companies here, each of which brings something different to the proposition based on their mix of products,

services, expertise, geographical location and pricing. We'll look at how one vendor, Fujitsu, is taking its offering to market later in this paper.

Standardizing your approach to hybrid cloud

As we start to look more closely at Azure Stack Hub, there are some topics that require us to step back a little and look at the bigger picture, especially from an IT perspective. The first of these hooks into the discussion about flexibility and the ability to run your applications and systems wherever it's deemed most suitable or appropriate at the time. Virtualization and containerization are important technologies here, so it's worth considering how Azure Stack Hub supports these important features.

Azure Stack Hub virtual machines present on-demand, scalable computing resources. However, there are differences between the virtual machine features available in Azure Stack Hub and Microsoft Azure. The Azure Marketplace contains images that you can use to create virtual machines, whereas it's the role of the Azure Stack Hub cloud administrator to produce these. Currently, Azure Stack Hub supports a subset of Azure Virtual Machine sizes, and likewise virtual machine extensions.

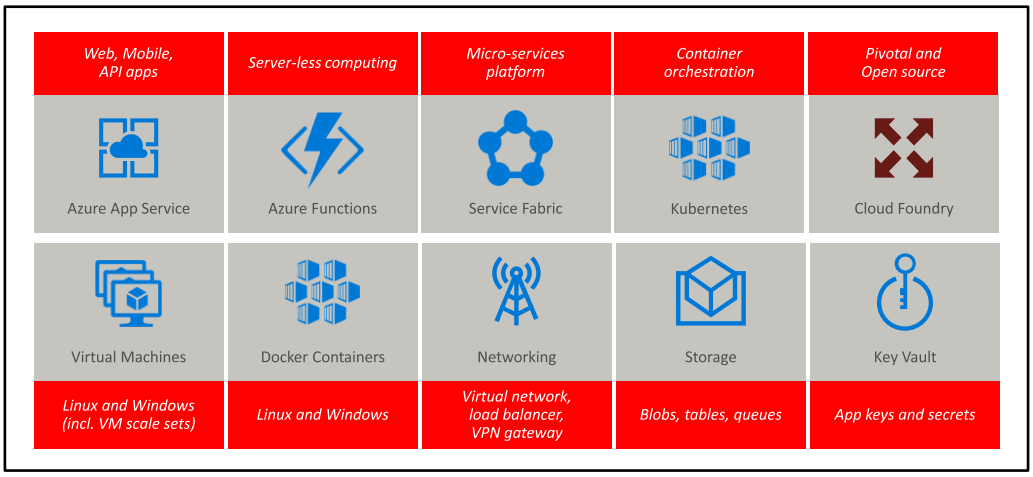

Figure 3: Azure Services on Azure Stack Hub - PaaS and IaaS (Source: Fujitsu)

Like virtual machines, containers have become an import facet of enterprise IT. If you're not familiar with containers, you can think of them as you might do virtual machines, albeit one where the container image only includes the resources it needs to run the application, such as the code, execution runtime, specific libraries, and settings.

Kubernetes is an open-source system for automating deployment, scaling, and managing of applications in containers. Azure Stack Kubernetes (AKS) is still in preview at the time of writing, but it points to the standardization of technologies that can be used to deploy applications and workloads in different locations based on business, regulatory or practical requirements. Using AKS, applications can be deployed in your data center or in other clouds; the interface, the applications, the technology, and the requisite skills remain the same.

The primary appeal of Microsoft's hybrid cloud approach is that you can build an application on Azure Stack Hub and then deploy it to Azure Stack Hub, to Azure, or to a combination of the two. Azure and Azure Stack Hub are different, but ultimately, in

addition to agility, the unique selling point of Microsoft's hybrid cloud strategy comes down to the consistency of these two environments.

Azure Stack Hub developer considerations

Azure Stack Hub lets you use Azure services located in your data center or a service provider's data center. If you're an 'Azure shop' already, Azure Stack Hub will feel like a natural extension to what you're doing. However, if you're new to Azure, or just starting out on your cloud journey, it's worth considering how Azure Stack Hub might fit with your business application development strategy.

The ability to build and deploy applications on any combination of Azure Stack Hub and Azure sounds very appealing, as indeed it should do. But it's important that developers understand some of the high-level differences that exist between Azure Stack Hub and Azure before committing to the platform. The differences can be summarized by answering the three key questions that developers ask:

Q: Who operates it?
A: Microsoft operates Azure. Your IT team or a service provider operates Azure Stack Hub.
Q: Who do I contact for support?
A: Microsoft supports Azure. An operator, at your organization or a service provider, supports Azure Stack Hub.
Q: What services are available?
A: Azure services vary by region. Azure Stack Hub supports a subset of Azure services. Actual services will vary based on what your company or service provider chooses to offer.

As you consider the relevance and business value afforded by Azure and Azure Stack Hub, you might want to consider some of the less easy to quantify aspects of Microsoft's hybrid cloud offering. These are probably best explored by way of the "Azure Stack Promise" that Microsoft laid-out to early adopters.

Consistent application development

"Maximize developer productivity by empowering them to build and deploy applications the same way whether they run on Azure or Azure Stack Hub. Implement a common DevOps approach across hybrid cloud environments."

The most notable aid here is Azure Resource Manager, which presents developers with the same application model, self-service portal, and APIs. Also, Microsoft has been eager to promote existing skills transfer through a consistent development and deployment experience with Visual Studio. And if DevOps is important to you and your team, Azure Stack Hub offers support for cross-platform tools and technologies, such as Docker, Jenkins, Chef, Puppet, and Ansible.

Azure services available on-premises

"Adopt hybrid cloud computing on your terms. Meet business and technical requirements, with the flexibility to choose the right combination of cloud and on-premises deployment models."

Azure Stack Hub provides out-of-the-box IaaS features, including support for Kubernetes, Windows and Linux containers, advanced networking and load balancing, and storage (Blob, Table and Queue). However, PaaS is where things start to get interesting, with Azure App Service for web and mobile applications services; Azure Functions for serverless computing; Azure Service Fabric for building scalable distributed apps; Azure Container Service; and Cloud Foundry, the open source multi-cloud application platform. You probably won't be using all these capabilities initially, but it's worth knowing what's there so that you can focus your efforts and priorities.

Integrated delivery experience

"Focus on optimizing business applications and services, with integrated systems that are designed to deliver consistent Azure innovation in a predictable manner."

Flexibility and choice of hardware have always been part of the Microsoft ecosystem, and Azure Stack Hub is no different. As we mentioned earlier, Microsoft is partnering with several enterprise-class hardware partners, each of which offers purpose-built Azure Stack Hub integrated systems.

If you examine the Azure Stack Hub partner list, there's a good chance you already have a relationship with one (or more) of these vendors. And if you prefer to consume Azure Stack Hub through your managed service provider, it's highly likely this will be an option too. We're already starting to see some of the big system integrators and managed services providers "pairing-up" with hardware vendors, but as with Azure, AWS, and GCP, the end user or customer doesn't think about what hardware's powering their cloud experience.

Azure Stack Hub infrastructure considerations

Most organizations are not running data centers at hyper-scale, as Microsoft does with Azure, so the company designed Azure Stack Hub to run at enterprise scale. This means that IT professionals familiar with managing enterprise-class integrated platforms should have few issues getting to grips with an Azure Stack Hub integrated system.

Producing the specification for your Azure Stack Hub integrated system will be a familiar process for many IT infrastructure specialists, albeit with a few new aspects to consider. A minimal deployment of an Azure Stack Hub integrated system contains four servers plus a set of network switches. The servers are aggregated together in a hyper-converged failover cluster, with every component deployed in a resilient manner.

Microsoft provides a set of pre-purchase planning/configuration worksheets to help with system sizing. However, Azure Stack Hub integrated systems are only available from certified hardware partners, and can have different hardware configurations, so it makes sense to discuss the specifics with your preferred original equipment maker, such as Fujitsu, early in the process. These partners will, of course, need to understand the nature of your projects, especially the data and operational management elements.

Coming back to our practical solution example, let's look at how Fujitsu is pulling everything together for its customers with PRIMEFLEX for Microsoft Azure Stack Hub.

An Azure Stack Hub integrated system is going to sit alongside existing systems inside your data center. This means management through an established IT management and operations framework will be essential.

From a Fujitsu infrastructure management perspective, Figure 4 shows where FUJITSU Software Infrastructure Manager (ISM) software fits in the system. ISM enables you to have centralized control of your Fujitsu data center including integrated systems with all their components using a single user interface.

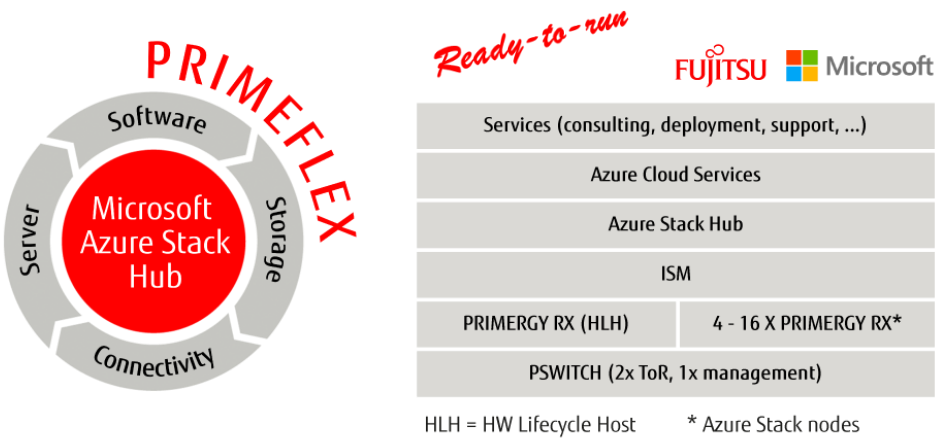

Figure 4: PRIMEFLEX for Microsoft Azure Stack Hub (Source: Fujitsu)

Once plumbed-in to your data center, a PRIMEFLEX for Microsoft Azure Stack Hub integrated system is largely a hands-off affair that your ops team monitors and manages. Two support contracts underpin the solution, one with Microsoft (or your cloud solution provider) for Azure services support, and one with your hardware provider for system support. It's important to note, however, that an integrated support experience provides coordinated escalation and resolution no matter which party you decide to call first.

Microsoft release Azure Stack Hub updates on a monthly cycle. Hardware vendors also release driver and firmware updates. Although delivered as separate packages, both sets of updates are imported, installed and managed in the same way.

Microsoft's partners have considerable knowledge, experience and expertise when it comes to keeping mission-critical systems up-and-running in the field, and this is reflected in the kind of support services offered. Fujitsu, for example, provides a solution pack designed to deliver end-to-end support for its integrated systems. This includes:

- Incident management and single point of contact for support for the entire Fujitsu integrated system.
- Technical solution support providing fast access to experts who analyze and identify issues and coordinate failure elimination.
- Hardware and software support for all released products certified for the integrated system.
- Optional proactive services, such as technical account management, system health check, and patch information management.

Licensing Microsoft hybrid cloud

Azure Stack Hub increases flexibility, including financial flexibility, which means there are license options and choices to consider. For on-premises deployments, the basic model is relatively straightforward: You purchase Azure Stack Hub hardware and hardware support directly from your integrated system supplier, such as Fujitsu, and you purchase Azure services and support from Microsoft. You're already covered if you have an Azure or Premier support contract with Microsoft (either directly or via a partner). As with existing infrastructure purchase arrangements, various financing options are available, including CAPEX, leasing, and flexible capacity models.

Private clouds may be owned, managed and operated by your organization or by a third party (or a combination thereof), and may exist on- or off-premises. To accommodate these scenarios, and/or to enhance or operationally harden the environment, your systems supplier can offer other products and value-added services alongside Azure Stack Hub, e.g. in areas such as DR and data protection. And if you have an existing relationship with a CSP (Cloud Service Provider) through which you are already billed for Azure services, you may want to extend that to cover Azure Stack Hub rather than starting a new billing relationship with Microsoft directly.

There are two consumption models for Azure Stack Hub. The first of these is the pay-as-you-use model, where metered usage data is collected and forwarded to the Microsoft commerce system which then bills you for usage in the same way as Azure. The capacity model offers an alternative approach where you license all the physical cores in the system and then pay a fixed fee per core. This might be appropriate for disconnected systems or where more predictable billing is required.

The nature of enterprise IT requires vendors and service providers to offer licensing and deployment options that suit their customer's business requirements. Microsoft Licensing Solution Partners, such as Fujitsu, understand the often-complex aspects of enterprise software licensing, such as Enterprise Agreements, and how it needs to be reflected in the customer's IT environment.

Existing licensing arrangements should be taken into consideration as you explore Microsoft's hybrid cloud environment, because Azure Stack Hub lets you use your existing licenses for things like Windows Server, SQL Server, etc. This gives you the option to choose between, for example, a native Azure Stack Hub Windows Server virtual machine or a base virtual machine used in conjunction with your existing Windows Server license.

Multiple hybrid clouds

Vendors may well dream of a future where they dominate the cloud universe, but the practical realities of supporting a diverse and everchanging set of business requirements means that the future is almost certainly going to be one of multiple clouds and hybrid clouds. So, if you're going to embrace Microsoft's hybrid cloud strategy, you'll need to consider how it will sit within your multi-vendor, multi-cloud environment.

Azure Stack Hub clearly offers good consistency across Microsoft's hybrid cloud environment, providing a single cloud endpoint for Azure services, but enterprise IT is a heterogeneous mix of platforms, architectures and clouds. So, if you're beginning to worry about 'service sprawl' you might want to take a look at a paper we've produced that looks at this topic in a bit more detail[3], including a glance at Fujitsu's Enterprise Service Catalog Manager. In addition, the Fujitsu Cloud Service PICCO can be used to visualize, analyze, and manage cloud usage and costs across the enterprise.

Operationalizing hybrid cloud

Building data center infrastructures is not for the faint hearted, as it's a complex and time-consuming process. It's for this reason that Azure Stack Hub integrated systems are offered through companies that have significant experience in the design, development, implementation, management and optimization of business IT infrastructure solutions.

Fujitsu has developed a strong reputation for delivering resilient, secure and performant systems through its PRIMEFLEX portfolio, and its hybrid cloud capabilities are further extended by a range of hardware and software offerings. For example, the company's ETERNUS data protection appliances simplify and consolidate backup and archive infrastructures, an important challenge not to be overlooked when thinking "cloud".

But there are other considerations to bear in mind, not least how do you build applications for the cloud and deploy them there? This is an area where some vendors have developed tools to help. For example, Fujitsu Software UForge AppCenter enables you to model, build and deploy applications for any cloud, including Azure. And if you have existing applications you are considering moving to a cloud platform, Fujitsu has garnered considerable experience helping organizations get existing applications ready to run on Azure.

Final thoughts

All-in-all, Azure Stack Hub will feel familiar to most enterprise IT departments, and if you're already using Azure, Azure Stack Hub is likely to be a natural progression. Does Azure Stack Hub fit your business requirements? Well, only you can say, but the signs look promising, especially if your forward-looking application development requirements coincide with Microsoft's Azure strategy. And if your strategy includes multiple platforms and architectures, which undoubtedly it will, you'll find that Azure Stack Hub integrated systems offer that important element of choice and selection as reverse public cloud develops.

In the short term, the arrival of public cloud in the data center is likely to increase complexity and management overhead. This can be managed of course, but only with the right kind of approach, some sort of 'masterplan' and by using the skills of partners, especially those with expertise across multiple clouds and traditional enterprise IT.

So, if you're a private sector company wanting to run Azure Stack Hub in your data center, or a public sector organization looking for a managed service provider to run Azure Stack Hub on your behalf, Fujitsu can help you configure Azure Stack Hub to meet your

business needs. And with its multi-cloud service support packages, and multi-cloud cost management expertise, they can help you successfully blend your private, public and managed clouds.

Azure Stack Hub represents a specific kind of approach to hybrid cloud, one that's worth evaluating if you're already on the Microsoft Azure path. If you're not an Azure customer, but find the notion of operational and developer consistency compelling, then it's certainly worth taking a closer look, assisted perhaps by a partner that understands the enterprise landscape of multi-cloud, hybrid cloud and, ultimately, hybrid IT.

Further reading

1. **Consistency is key with hybrid cloud:** Can Microsoft Azure Stack Hub negate your public cloud barriers?
2. **Get going with Azure Stack Hub:** Accelerating adoption of hybrid cloud.
3. **Simplifying Multi-Cloud Service Delivery:** The emerging role of the Cloud Services Marketplace

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