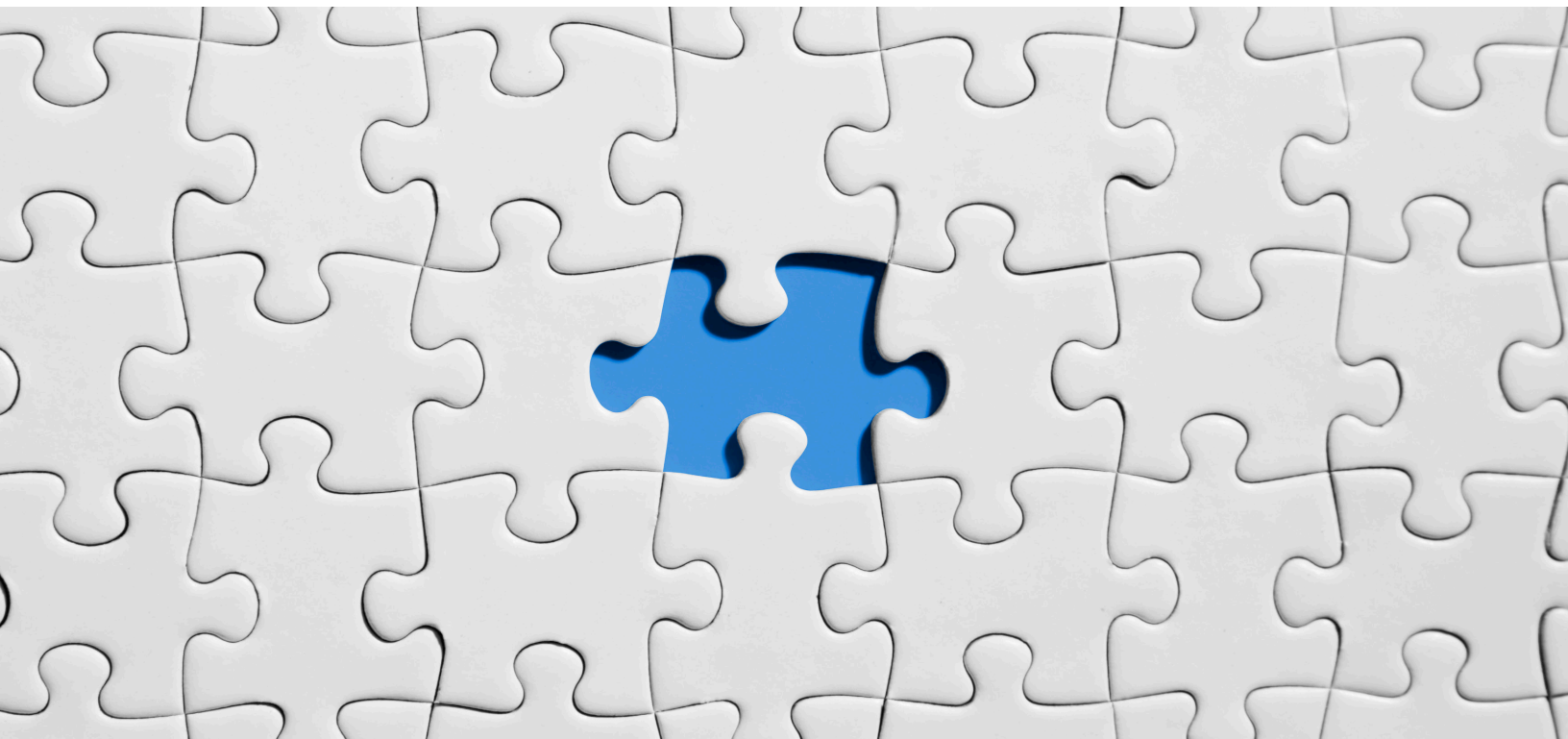


JOURNEY TO MULTI-CLOUD DEMYSTIFIED AND SIMPLIFIED



Anuj Sharma

Senior Principal Engineer

Dell EMC

Anuj.ajju@gmail.com

Benedikt Mayer

Senior Principal Engineer

Dell EMC

Benedikt.mayer@dell.com

Table of Contents

Introduction	3
Multi Cloud Background and Adoption	4
Multi Cloud Migration Framework for Success	6
Step 1: Business Goals	6
Step 2: Cloud Readiness Assessment.....	7
Step 3: Multi Cloud Requirements.....	8
Step 4: Architecture Design	8
Step 5: Organizational Framework	9
Step 6: Multi Cloud Roadmap	10
Dell Technologies Advantage for Multi-Cloud	11
Case Study.....	11
Service Offerings	12
References	14
Table of Figures.....	14
Table of Tables	14

Disclaimer: The views, processes or methodologies published in this article are those of the authors. They do not necessarily reflect Dell Technologies' views, processes or methodologies.

Introduction

In IT, buzzwords evolve over time. Multi-cloud is a fairly new buzzword that we keep hearing. Today, there is no single cloud. Organizations on the path of digital transformation and increased cloud consumption, find themselves in a multi cloud world. As cloud service providers have reached a maturity level, they have gained confidence of enterprises to run their mission-critical applications on the cloud. Many now use multiple cloud deployment types and multiple cloud service providers to run their business applications. This results in a set of opportunities and challenges.

Enterprises wishing to extend the value of their classic applications have multiple options as they evaluate best fit as technical expertise with emerging cloud technologies improves. All enterprises have more opportunities and capabilities to migrate or extend applications by leveraging multiple clouds.

Different cloud service providers have their unique selling points. Some specialize in cloud deployment types, hosting offerings, specialize in a particular application, specialize in containers and so on. With so many options available, enterprises are using multiple cloud services providers as per the unique selling point of the Service Provider. For example, an organization may be using services from three different cloud service providers; one for hosting SAP, one for hosting containers and one for disaster recovery services. This way, enterprises can have the best of cloud by using multi cloud.

The opportunities of this multi cloud strategy includes better IT infrastructure efficiency, greater flexibility to meet changing requirements and improved time to market. However, this strategy includes challenges such as governance, compliance, data migration between clouds, managing usage/costs and skills required.

Seeing multi-cloud from a broader perspective, enterprises are again looking at cloud silos and silos were one of the reasons for organizations to move to the cloud. This means enterprises will have to monitor, manage and operate multiple-cloud environments, once again adding a lot of overhead in terms of management, monitoring.

Enterprise that overcome those challenges will realize the full potential out of a multi-cloud strategy and transform how they do business. Dell Technologies' extensive portfolio places it in a unique situation in the IT industry to consult and deliver-multi cloud solutions.

Multi-Cloud Background and Adoption

“Cloud” a simple IT buzzword with lot of complexities in it. Cloud computing has entirely changed the IT landscape. Cloud adoption has become one of the key focus areas for the success of business today. Adoption of cloud reduces time to market for business to a great extent along with other benefits, i.e. lower CapEx/OpEx. For instance, two business competitors – A and B – are planning to roll out a new product, each with a different IT operating model. A is building its own private cloud to support the new product business line while B is planning to host the supporting applications on a cloud vendor which gives them flexibility to move hosted workload to on-premises cloud and vice versa. Initial evaluation of the approach taken by A and B indicates that B will lead the race as time to market for B’s product will be reduced since B doesn’t need to wait for commissioning of on premises cloud to roll out the new product. This is a very simple example of how different strategies for cloud adoption directly affect business outcomes. As cloud computing has evolved, cloud service providers specialize to cater to a particular workload, application, platform, etc. Businesses now choose to host different applications or workloads on different cloud service providers by mapping applications to cloud service providers who have proven expertise as per applications or workload. This means that an organization can use services from various cloud service providers at the same time and is how the term “Multi Cloud” came in to existence.



Figure 1: Multi Cloud Adopters as percentage of Cloud Adopters IDC 2017 CloudView Survey

Figure 1 shows the outcome of the CloudView survey carried out by IDC [1]. The fact that will catch the eye is that 85% organizations of cloud adopters are already using services from multiple cloud providers. This raises the question: What compelled 85% of organization to choose multiple cloud providers? Let’s look at some of the drivers for an organization to choose multi-cloud.

- **Off-the-shelf applications**

Organizations are opting for a subscription-based model for applications like Office 365, VDI etc. instead of choosing a cloud service provider that provides infrastructure as a service. This saves organizations from spending on application design and implementation.

- **In-house applications**
For applications developed in-house, organizations opt for cloud service providers providing Platform as a Service (PaaS).
- **Emerging technologies**
A number of cloud service providers are leading the wave for Artificial Intelligence (AI), Machine Learning (ML), and Internet of Things (IoT). Enterprises turn to these providers for early adoption of new technologies that will enable them to remain competitive.
- **Compliance and Security Requirements**
Compliance and security requirements can lead an organization to choose a particular cloud service provider for specific applications or deploy a private cloud Infrastructure.
- **Agility**
C-Level executives are increasingly pushing a Cloud First Strategy to enable innovation, improve business agility, speed time to market and reduced costs.

Results of the IDC 2017 Cloud View Survey [2] offer a broader perspective of how the dynamics of the IT industry are shaping up.

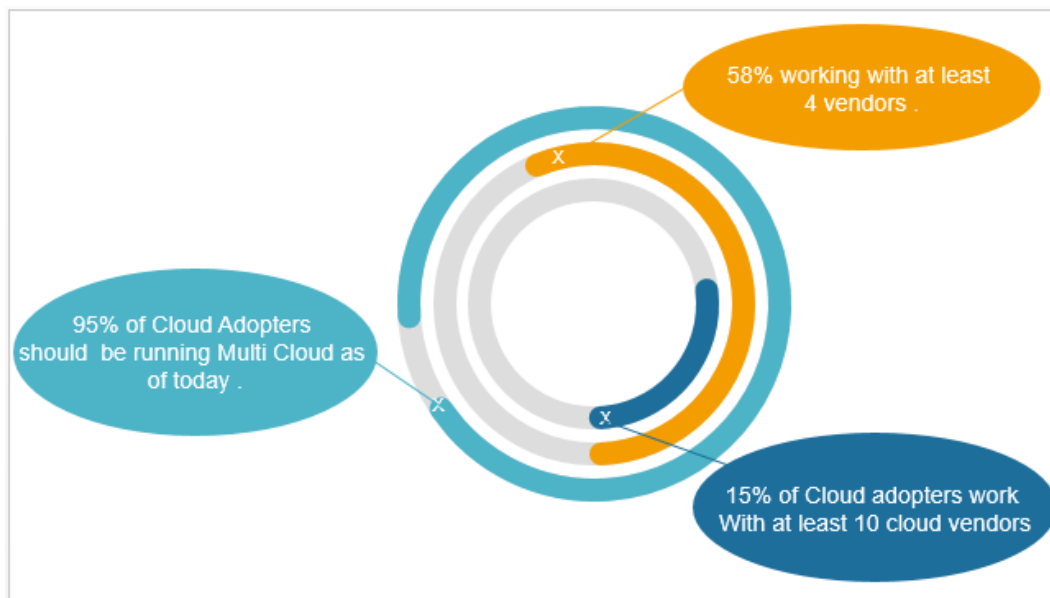


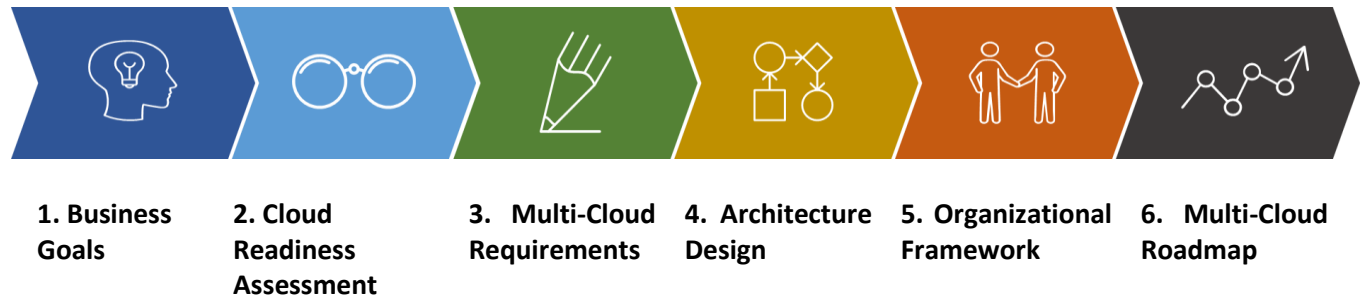
Figure 2: Multi-Cloud Adopters; IDC Cloud View Survey

We now have a better understanding of “What is Multi-Cloud and Why Multi-Cloud“. As mentioned earlier, the benefits of multi-cloud also introduce challenges, i.e. management, monitoring, lack of skills and multiple service contracts. Hence, it’s important for organizations to develop a multi-cloud adoption roadmap so that a mitigation plan is in place to overcome challenges.

Multi-Cloud Migration Framework for Success

Implementing and moving to a multi-cloud framework is integral to digital transformation. Success starts not with technology, but with organizational collaboration across a broad spectrum of stakeholders to gain insight and drive consensus about priorities and next steps including business, technical, operational, and financial.

This section outlines a multi cloud adoption strategy that achieves success in six steps.



These six steps are further broken down in the following sub sections.

Step 1: Business Goals

Just as business goals are the key driver for any initiative, the same applies to a multi-cloud strategy. The business goals should be discovered, understood and clearly defined for the project to be a success. Workshops need to be performed with all stakeholders to define precise goals and priorities.

Table 1 outlines examples of some business goals.

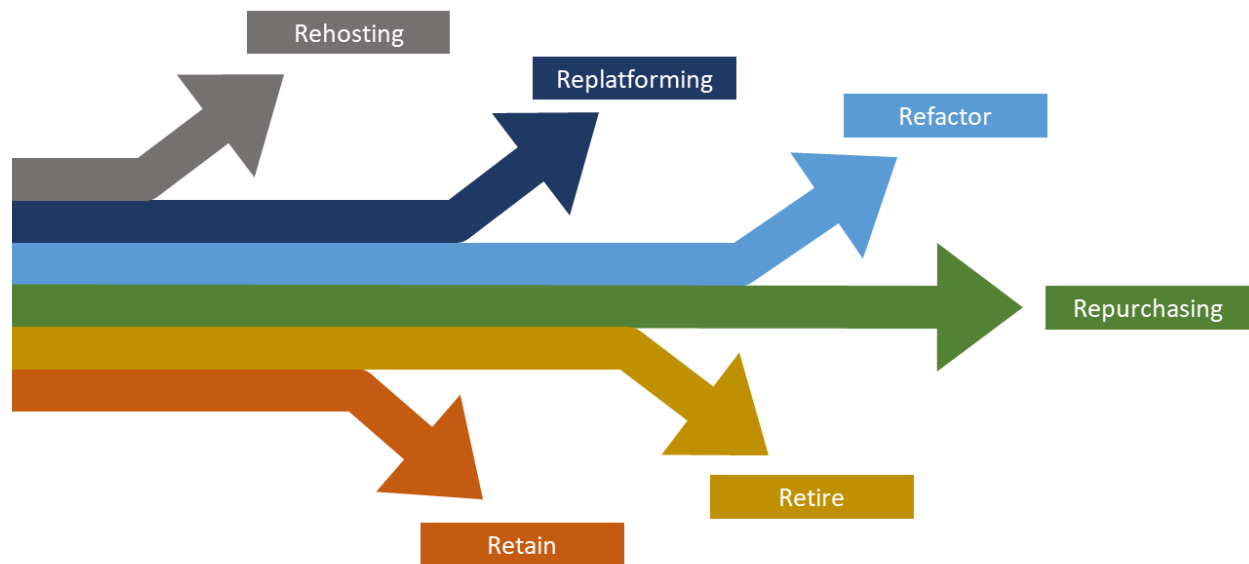
Goal #	Goal Description	Priority
G01	Increase competitiveness against competitor in the same sector	High
G02	Reduce IT cost	Medium
G03	Move from a CAPEX to OPEX mode	Medium
G04	Enhance availability	High
G05	Improve Compliance	Medium

Table 1: Business Goals

Step 2: Cloud Readiness Assessment

The next step is to take a look at the current application landscape and perform an assessment. The outcome of the assessment helps to plan how to migrate to the cloud.

The industry uses the 6 “R’s” to help navigate through these decisions [3]:



1. Rehosting

Many early cloud projects gravitate toward net new development using cloud-native capabilities. However, in a large legacy migration scenario where the organization is looking to scale its migration quickly to meet a business case, a majority of applications are rehosted. Most rehosting can be automated with tools.

2. Replatforming

A few cloud optimizations are used in order to achieve some tangible benefit, but otherwise the core architecture of the application is not changed. For example, reducing the amount of time spent managing database instances by migrating to a database-as-a-service platform such as Amazon Relational Database Service.

3. Refactoring

This is typically driven by a strong business need to add features, scale, or performance that would otherwise be difficult to achieve in the application's existing environment. While this pattern tends to be the most expensive, it can also be the most beneficial if you have a good product-market fit.

4. Repurchasing

This most commonly occurs when moving to a SaaS platform, i.e. Salesforce.com, an HR system to Workday, a CMS to Drupal, and so on.

5. Retire

During the application discovery it might be revealed that an application is no longer required or is redundant to other applications. The organization's lifecycle process can be used to retire these applications.

6. Retain

Some applications might be retained "as-is", because legacy OS and applications are not supported in the cloud or the business justification for migrating is insufficient.

Table 2 provides sample information to outline this process. The main idea is that each action must satisfy the business goal.

Application #	Action	Aligned Business Goals
Application 1	Repurchase	G01, G02, G03, G04, G05
Application 2	Refactor	G01, G02, G03, G04, G05
Application 3	Replatform	G01, G03, G04, G05
Application 4	Rehost	G03, G04, G05

Table 2: Application List

Step 3: Multi-Cloud Requirements

After understanding the business goals for the multi-cloud strategy and the application landscape, the next step involves defining technical requirements that the cloud provider needs to fulfil.

Though this can heavily depend on the cloud deployment type, Table 3 provides an example of IaaS requirements. Again, the key is to map these technical requirements back to the business goals.

Requirement #	Requirement	Aligned Business Goal
R01	Self-Service Portal	Increase competitiveness against competitor in the same sector
R02	Automation and API access	Increase competitiveness against competitor in the same sector
R03	Life Cycle and Cost Management	Reduce IT cost, move from a CapEx to OpEx mode
R04	Security Policy Enforcement	Improve Compliance
R05	Cross-Cloud Networking	Improve Compliance

Table 3: Multi-Cloud Requirements

Step 4: Architecture Design

An architecture design document is created to formalize and document the design. There are many enterprise architecture frameworks available that provide a good structure to follow. For example, the Zachman framework moves from Conceptual Design to Logical Design to the Physical Design. This framework has proven valuable as requirements can be easily mapped throughout the different phases of the design.

Table 4 provides an example on how to document design decisions as part of the architecture document.

Design Decision ID	DD01
Design Decision	
Design Justification	
Design Implication	
Design Quality	
Requirements Reference	

Table 4: Design Decision

Step 5: Organizational Framework

The cloud adoption journey of each organization is unique. To execute the defined cloud strategy, it is key to understand the organization’s current state, the target state, and the transition required to achieve the target state. To get the full benefit of a multi-cloud environment, IT organizations need to adopt a service-oriented framework.

Figure 3 highlights examples of the difference between a legacy- and service-oriented organization.

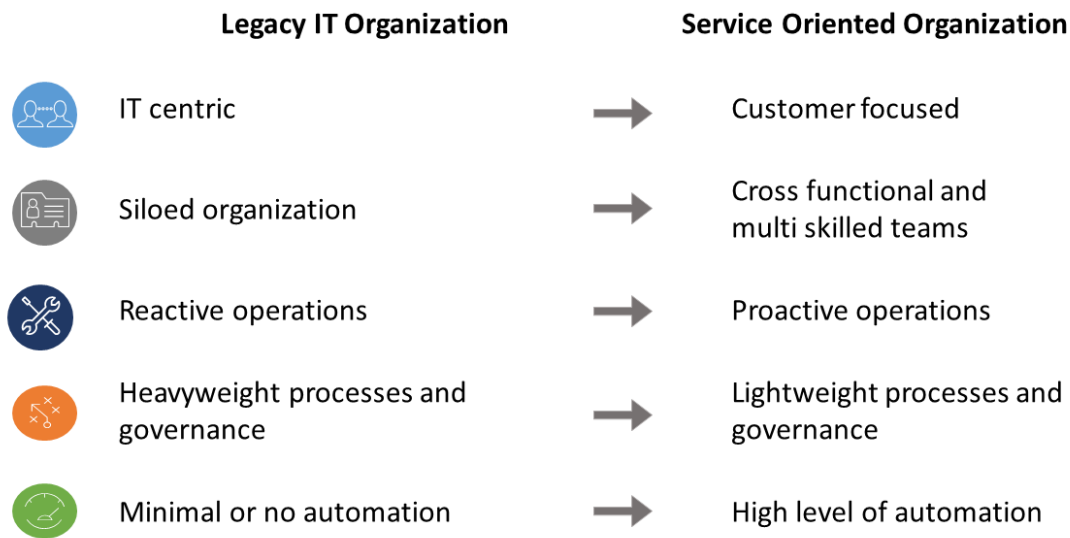


Figure 3: Organizational Framework

This change might appear disruptive, but it provides an opportunity to create an agile IT organization. The journey towards a multi-cloud environment requires new skills and creates new roles inside the organization. It provides an opportunity for existing employees to upskill and move into new roles, i.e. Cloud Architect, Cloud Administrator, Cloud Developer and Cloud Security Architect.

New ways of doing business will require new processes and policies. Those include blueprint and automation policies, chargeback policies, capacity management and security policies.

Step 6: Multi-Cloud Roadmap

In the final step, a roadmap is created that can be executed against. It will drill down over time into detailed project plans, but the idea is to provide the business an overview of the journey.s

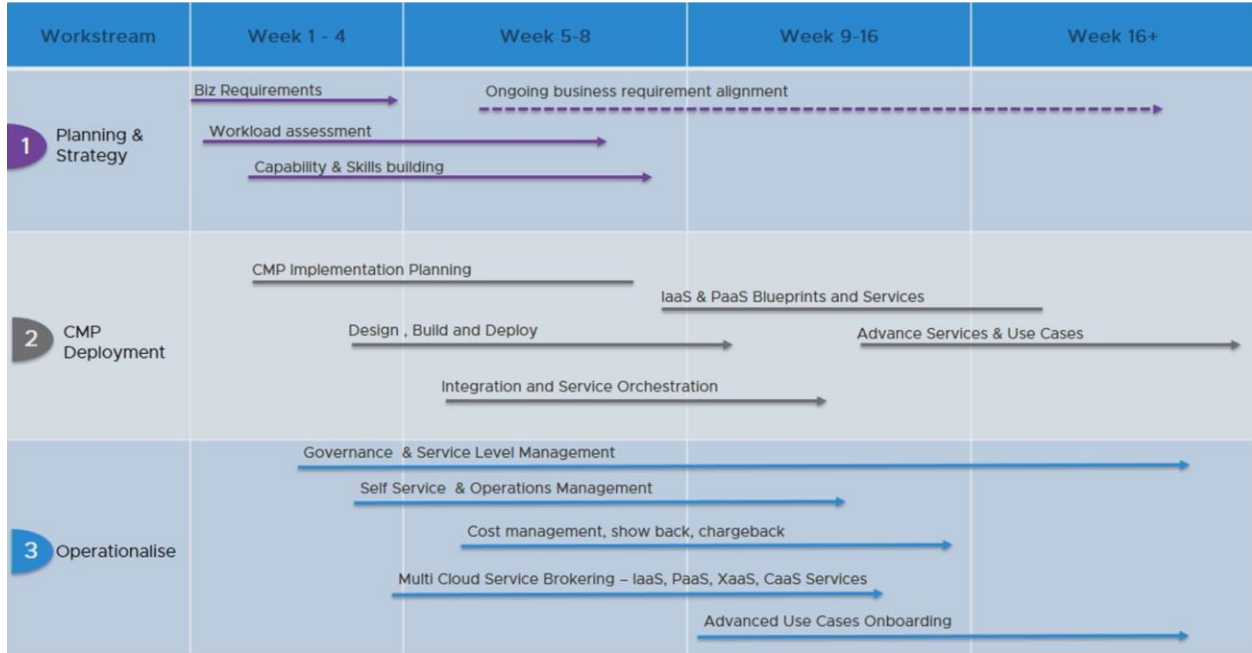


Figure 4: Cloud Roadmap [4]

Dell Technologies Advantage for Multi-Cloud

Multi-cloud is the de facto operating model for digital transformation. To optimize data and collaborate in a digital ecosystem, IT needs a multi-cloud operating model for standardizing and automating common provisioning, deployment, monitoring, data protection, and security services across multiple clouds. Dell Technologies offers a broad range of solutions and services to simplify, accelerate, and leverage multi-cloud.

Dell Technologies is a combination of seven technology leaders with one common goal: to ensure customers keep pace with digital innovation to accelerate their own success. As a hybrid of digital experts, Dell Technologies delivers real results for customers across a spectrum of industries. [5]

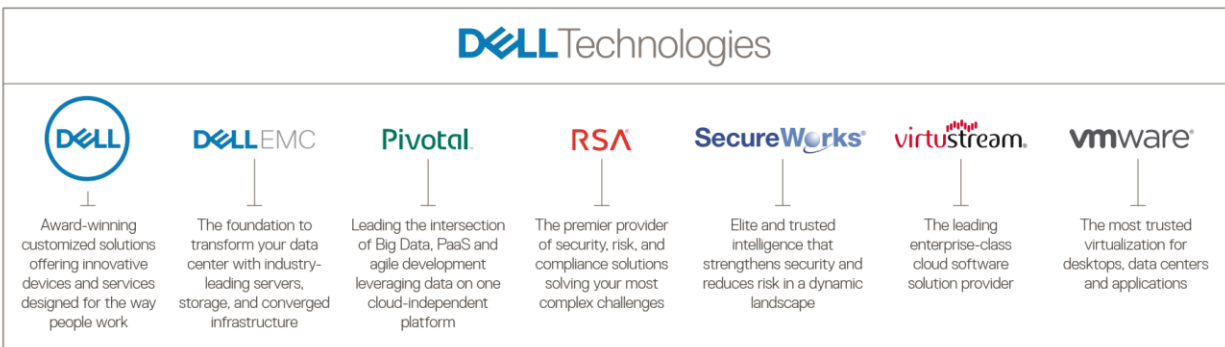


Figure 5: Dell Technologies Companies

Their wide portfolio of products and services enables Dell Technologies to deliver the right multi-cloud solution for customers.

Case Study

A financial services organization based in London was looking to adopt a PaaS and IaaS architecture to replace the existing landscape. The goal was to provide developers with a platform that allowed them to spend more time building software to support customers and less time provisioning hardware and dealing with other infrastructure concerns. In addition, the deployment and management of traditional virtual machine workload should be optimized.

As the organization was evaluating multiple mergers and acquisitions, the requirement was to design a platform that can extend into the public cloud if needed to provide on demand resources. Dell Technologies designed and implemented an end-to-end solution for the customer. A robust on-premises private cloud based on VMware Validated Design (VVD) was implemented on Dell EMC VxRail Hyperconverged appliances across multiple sites. Pivotal Cloud Foundry provided the PaaS environment for the financial services organization. To extend to the public cloud, VMware Cloud on AWS was adopted while leveraging VMware NSX to provide cross-cloud networking.

The end-to-end solution enabled the customer to:

- automate many of the operational tasks that required manual intervention
- focus on higher value tasks as opposed to performing repetitive tasks
- implement an agile self-service environment where developers can bind services to their applications and push code to production without needing to involve the operations team

Figure 6 provides a high-level overview to the architecture.

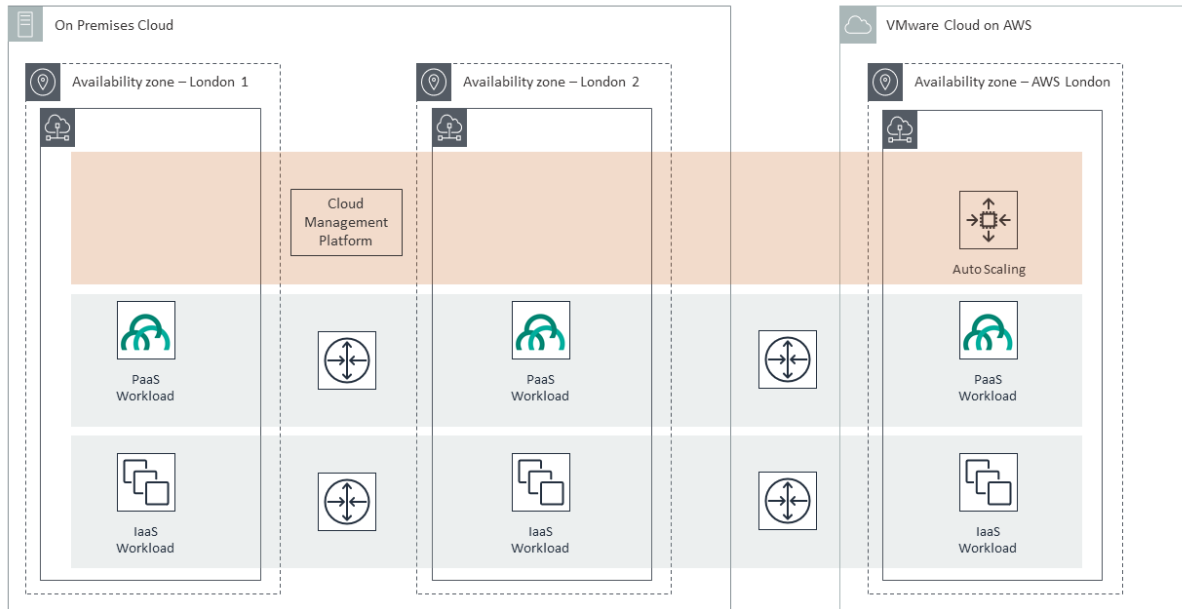


Figure 6: Cloud Architecture

Service Offerings

Dell Technologies provides numerous services around multi-cloud. The “Multi Cloud Roadmap and Business Case” service can jump-start your IT transformation so that you can realize the business value of cloud sooner. This service can help you understand where you are, create a future-state vision, define the journey, and project the savings. [6]

- **Current State Analysis:** Dell Technologies assesses the infrastructure environment with a maturity assessment across fourteen dimensions including governance, funding, data center components, service delivery, inventory and asset management, monitoring and performance, capacity planning, and more. Through collateral reviews and interviews with key stakeholders, information is gathered and evaluated to understand the state of the current environment. Based on the customer’s operating model, maturity levels for your service delivery strategy, organization, processes, service offerings, and IT service management technology are determined.

- **Target State Definition:** For infrastructure, a custom reference architecture that defines the recommended hardware and software components is defined for the target state. For operating model, Dell Technologies identifies the IT processes needed to address the service management lifecycle, and the roles needed to manage both service delivery and the infrastructure.
- **Transformation Roadmap:** Dell Technologies uses the current state and target state information to develop a transformation strategy and roadmap that is actionable and relevant to your business. The roadmap shows the activities and timelines across four transformation work streams: governance and strategy, infrastructure, operating model, and applications.
- **Transformation Business Case:** Dell Technologies has developed a methodology based on best practices to determine the key metrics to help build the business case for the transformation. It evaluates hard costs for components of both the current and target IT environment, including hardware, software, networking, application maintenance costs, facilities, staff, fees for external services, and overhead costs. Transition costs are evaluated including hardware, software, supplemental connectivity, staff and training costs. All of these costs are input to a cost-benefit analysis to calculate IT run rates, develop an investment profile, and determine the projected ROI, net savings, NPV, and payback period of the transformation.

References

[1] [2] Cisco.com (2018). Adopting Multicloud — A Fact-Based Blueprint for Reducing Enterprise Business Risks. Available at: <https://www.cisco.com/c/dam/en/us/solutions/collateral/trends/cloud/adopting-multicloud-idc-white-paper.pdf> [Accessed 14 Jan.2019].

[3] Orban, S. (2019). 6 Strategies for Migrating Applications to the Cloud. [online] Amazon Web Services. Available at: <https://aws.amazon.com/blogs/enterprise-strategy/6-strategies-for-migrating-applications-to-the-cloud/> [Accessed 14 Jan. 2019].

[4] VMware (2018). Multi-cloud strategy to accelerate digital transformation. [Online]. Available from: <https://s3-us-west-1.amazonaws.com/vmworld-usa-2018/MGT1763BU.mp4> [Accessed 14 Jan. 2019].

[5] delltechnologies.com (2019). 7 technology leaders combined in to one. [online] Available at: <https://corporate.delltechnologies.com/en-us/about-us/our-brands.htm> [Accessed 13 Jan. 2019].

[6] emc.com. (2019). DELL EMC MULTI-CLOUD ROADMAP AND BUSINESS CASE. [online] Available at: <https://www.emc.com/collateral/service-overview/h16751-dell-emc-multi-cloud-roadmap-business-case.pdf> [Accessed 13 Jan. 2019].

Table of Figures

Figure 1: Multi-Cloud Adopters as percentage of Cloud Adopters IDC 2017 CloudView Survey 4

Figure 2: Multi-Cloud Adopters IDC Cloud View Survey 5

Figure 3: Organizational Framework..... 9

Figure 4: Cloud Roadmap [4] 10

Figure 5: Dell Technologies Companies 11

Figure 6: Cloud Architecture 12

Table of Tables

Table 1: Business Goals 6

Table 2: Application List 8

Table 3: Multi-Cloud Requirements 8

Table 4: Design Decision 9

Dell Technologies believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

THE INFORMATION IN THIS PUBLICATION IS PROVIDED "AS IS." DELL TECHNOLOGIES MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WITH RESPECT TO THE INFORMATION IN THIS PUBLICATION, AND SPECIFICALLY DISCLAIMS IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Use, copying and distribution of any Dell Technologies software described in this publication requires an applicable software license.

Copyright © 2019 Dell Inc. or its subsidiaries. All Rights Reserved. Dell Technologies, Dell, EMC, Dell EMC and other trademarks are trademarks of Dell Inc. or its subsidiaries. Other trademarks may be trademarks of their respective owners.