

# Delivering Innovation and Business Value with Hybrid Cloud

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**Abstract** — This document presents a walkthrough of the general high-level steps of designing a hybrid cloud, highlighting typical options at each step and their applicability to sample scenarios, offer guidelines and points out relevant key areas.

**Keywords** — Hybrid Cloud, Digital Modernization, Cloud Migration.

## I. INTRODUCTION

Enterprise IT as a Services can help Technical Leaders infuse agility and flexibility into the Cloud and Traditional Infrastructure by partnering with strategic service providers. Hybrid is the new norm that leverages Brokerage Services and Enterprise IT as a Service. Gartner defines Hybrid Cloud Computing as – “Hybrid cloud computing refers to policy-based and coordinated service provisioning, use and management across a mixture of internal and external cloud services.”

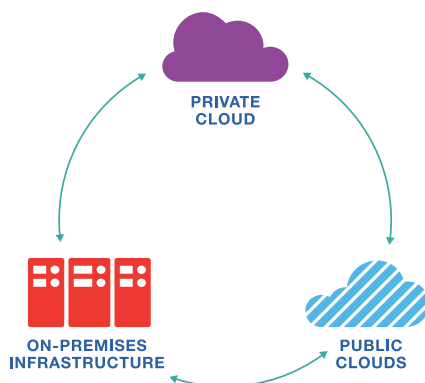


Fig. 1 Hybrid Cloud basic model.

## II. HYBRID CLOUDS

Hybrid Cloud combines a set of public clouds, private clouds, as well as traditional non-Cloud infrastructure. A carefully designed hybrid cloud solution can provide the benefit of on-demand compute like a public cloud; it can also provide better overall control over the data centre infrastructure and offer superior performance like a private cloud. Leveraging a Hybrid Cloud environment enables one to run every workload in its optimal place, at optimal cost. Following are the

common benefits envisaged through the use of Hybrid Clouds:

- Fast and flexible: Gives businesses access to the broadest choice of platforms on which to build and deploy their apps at the speed required for business needs.
- Value-driven: Better access to data and platforms across on premise and cloud for business apps.
- Secure and resilient: Apps can securely access the workloads and data that is needed to keep on premise to mitigate potential risks.
- Cost-effective: Optimize costs by migrating workloads that are best run in cloud while maximizing the value of investments in existing on premise IT.
- High quality: Improving the quality of service through advanced analytics and automation in an end-to-end service-management model.

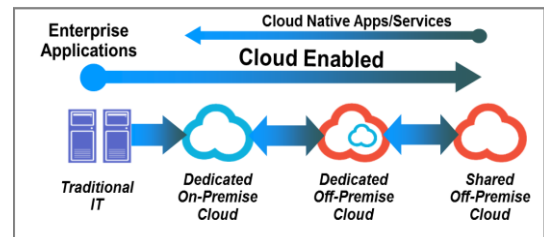


Fig. 2 Hybrid IT infrastructure enables businesses as applications.

Hybrid architecture brings together managed services, the products and infrastructure capabilities to support business and provide value. As applications are cloud enabled, they can leverage the benefits of cloud: Scale, elastic, agile etc.

Workload assessment can be used to determine which applications and workloads are suitable to move to cloud. Not all workloads are suitable for the cloud offerings currently available. There is a spectrum of workloads in any organisation that can be moved to cloud.

## III. ARCHITECTURAL VIEWPOINT

### A. Hybrid Cloud Reference Architecture

Hybrid architecture brings together managed services, the products and infrastructure capabilities to support business and provide values. Open standards based management services provide vendor agnostic application delivery. A blueprint supporting to achieve a hybrid cloud solution is depicted in figure 3.

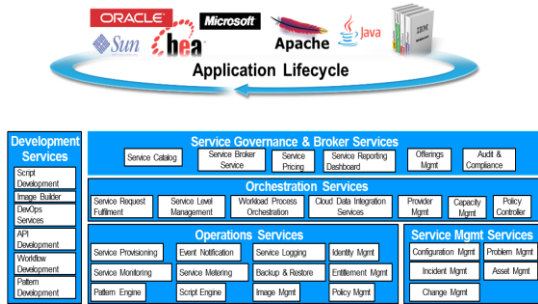


Fig. 3 Hybrid Cloud reference architecture

Hybrid infrastructure enables extending infrastructure into the cloud to gain operational efficiencies, lower costs and minimizing capital expenditures. Hybrid Applications extend application portfolio into the cloud to accelerate application deployment, minimize application deployment costs and control data.

**B. Hybrid Integration Structure**

Enterprise customer will have specific requirements on using hybrid cloud:

- Private leased line or link from customer datacentre to cloud datacentre.
- Single Sign-on with enterprise directory (using Employee Intranet ID to logon to Cloud)

The following table of contents summarize the different levels of access requirements and the technology supported to establish a connection to a hybrid cloud.

	Customer Environment	Connection to Cloud
<b>User Identity Level</b>	<ul style="list-style-type: none"> <li>• Enterprise Directory</li> <li>• Identity &amp; Access Mgr</li> <li>• Identity Provider</li> </ul>	<ul style="list-style-type: none"> <li>• OAuth</li> <li>• SAML</li> <li>• Directory replication</li> </ul>
<b>Application Level</b>	<ul style="list-style-type: none"> <li>• Enterprise Application</li> <li>• App Security Gateway</li> </ul>	<ul style="list-style-type: none"> <li>• Encryption in App</li> <li>• API call WebService, RESTAPI</li> </ul>
<b>Middleware / DB / Platform Level</b>	<ul style="list-style-type: none"> <li>• noSQL / RDBMS</li> <li>• Application Server</li> </ul>	<ul style="list-style-type: none"> <li>• Encryption in Middleware</li> </ul>
<b>Infrastructure Level</b>	<ul style="list-style-type: none"> <li>• Firewall</li> <li>• Router</li> </ul>	<ul style="list-style-type: none"> <li>• SSL/VPN</li> </ul>

Fig. 4 Components in hybrid cloud environment.

**C. Example – IBM Hybrid Cloud Integration Structure**

The figure shows how IBM Cloud manages the infrastructure level of a Hybrid scenario:

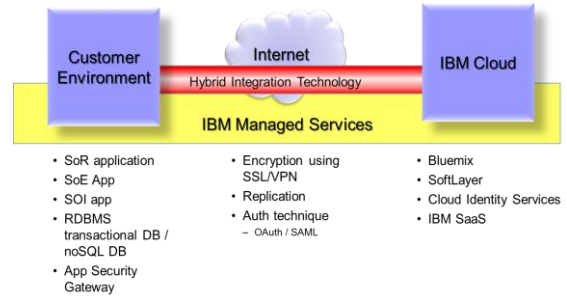


Fig. 5 Generic Hybrid cloud integration technology.

Let us now take a closer look at how this scenario functions for two specific IBM Cloud viz. Softlayer and Bluemix.

**D. Integration with IBM Softlayer**

IBM Cloud SoftLayer has two technologies to integrate with enterprise environment:

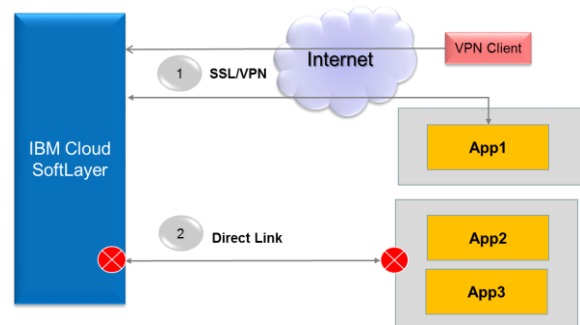


Fig. 6 Hybrid cloud: Integration with IBM Softlayer Cloud.

**E. Integration with IBM Bluemix**

IBM Cloud Bluemix has three technologies to integrate with enterprise environment internationally accepted rules and conventions:

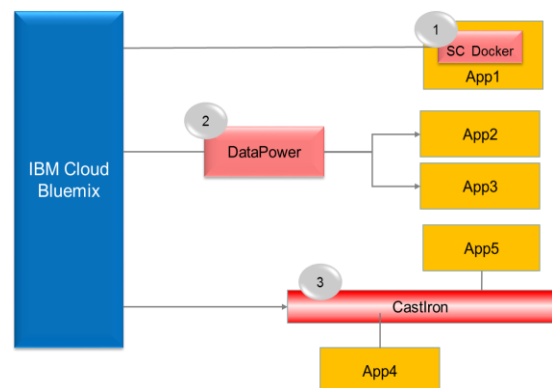


Fig. 7 Hybrid cloud: Integration with IBM Bluemix Cloud.

#### **IV. PHASES IN HYBRID CLOUD JOURNEY**

Designing a solution around hybrid cloud usually means going through a series of phases that culminate in providing a best fit solution for the organization.

##### **A. Define End Goal**

This implies defining the success criteria i.e. the end state which defines the success of the organization's transformation. More specifically it means what business drivers would be deemed accomplished by adopting the hybrid cloud.

It is needed to agree on concrete acceptance criteria associated with functional and non-functional requirements. For example, customer demands pertaining to "environment and product stability" should be attached to clearly defined service levels.

##### **B. Cloud Selection**

The organization needs to make a selection on the cloud type and vendor depending upon the initial analysis, fitment and economics. As part of this exercise, the organization also aims to decide which portion of its business it wants to deploy on to cloud and which portion to keep as traditional. The choice of on-premise or off-premise is also finalized in this phase. As part of the cloud model, it is also advisable to choose the cloud broker design that the organization may be interested in. e.g. Graviant.

##### **C. Cloud Management Platform**

This is largely applicable for private clouds (on-premise or hosted), and includes the following:

- a. The core cloud stack
- b. Orchestration and Automation
- c. Patterns Enablement
- d. Integration with Service Management

The options include the likes of IBM Cloud Orchestrator or VMware vRealize, but also touches on SoftLayer and Amazon Web Services. The service management platforms may include IBM Control Desk (ICD), Service Now, and Remedy

##### **D. Workload Assessment**

The workload assessment, which is also known as fit-for-cloud exercise, is an important element of the organization's modernization drive. There are usually two ways of proceeding with this – either do a high level screening of the workload inventory to determine an estimate of how many are probable cloud candidates; or do a systematic deep dive of individual workloads to shortlist the high probable candidates. In either case the reference happens to be the target cloud selection, the to-be architecture and cloud landing criteria, standards that the organization intends to adopt etc.

##### **E. Cloud Reference Architecture**

This is a vital piece as it includes not only the target reference architecture, but also the middleware allowed, the standards that the organization wants etc. The various elements included in this phase are as follows:

a. Catalogue Design – it deals with designing the service catalogue of consumable offerings and how that catalogue will be exposed to the customer.

b. Network Design - This step explores network design and issues that may surface.

c. Storage Design - explores storage centric issues including the kind of storage which is required, like high performance, base storage, optimized etc.

d. Resilience - Backup, Disaster Recovery & High Availability discusses how resiliency requirements can affect choice of the target cloud, what the standard approaches are to design against recovery/uptime SLAs, high availability.

e. Security & Compliance: This section explores security-centric aspects of a hybrid cloud solution and includes organization specific rules and policies that the cloud would need to adhere to.

f. Performance Considerations: Performance is an important non-functional requirement and it is important to gather the performance baseline data, test cases etc. on the source so that a meaningful comparison can be done post migration to the cloud.

g. Deployment & Steady State Delivery - it lays out how the cloud vendor can help with steady state management of hybrid cloud managing environments.

##### **F. Discovery of Source Inventory**

Various tools and technology exists to scan the inventory of servers in the source environment and determine the technology landscape. The output of these scans include list of servers, their infrastructure details like OS, CPU, RAM, Disk etc., the middleware list including the versions, network, filesystems and the like. All these information help access the source environment, helps determine the migration scope, forms the input to lot of analysis like fit-for-cloud.

##### **G. Workload Migration**

To achieve the workload migration, we expect to discover one of the following possible situations:

- Situation A: Server images are already virtualized and operated to business satisfaction in a Regional Datacenter or cloud hosting environment.
- Situation B: Server images are already virtualized and can benefit from a direct move into a cloud hosting environment.
- Situation C: Server images are running local, but are not capable for a direct move into a consolidated- or cloud hosting- environment. However, the application-installable can be re-

platformed with an optional upgrade of software versions.

- Situation D: Server images are running on physical hardware without virtualization manager, but the workload is suitable for consolidation in a Regional Datacenter (RDC) or even a cloud hosting environment.
- Situation E: Server images not capable to operate in a consolidated or cloud-hosting environment yet, and/or are not operated to business satisfaction. However, the application environment can be “re-factored” by repackaging and re-deployment on a new greenfield infrastructure. If the application package cannot be re-factored, a major overhaul of the business solution (“re-architect”) might be required.
- Situation F: The server-application combination is better off staying at their current location, either due to business- or technical reasons, or if application decommissioning is envisioned on short term.

## V. CONCLUSIONS

A Hybrid Cloud environment allows deployment of new apps on the cloud while maximizing the value of on-premise investments. In a Hybrid Cloud environment, it is easier to provide the standardization, advanced analytics and automation that enable the enterprise to create value for customers efficiently. The number of integration points in the end-to-end hybrid solution will be proportional to the delivery complexity and hence to the risk; so this should be designed in as standard a way as possible. This document attempted to cover these steps in a high level so that to give the readers a holistic view of what is expected in a Hybrid cloud environment.

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