# Data Centre and Cloud Infrastructures

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# 1. SUMMARY

Everywhere you turn these days, "the cloud" is being talked about. While "the cloud" is just a metaphor for the internet, "cloud computing" is what people are talking about these days. It provides better data storage, data security, flexibility, increased collaboration between employees, and changes the workflow of small businesses and large enterprises to help them make better decisions while decreasing costs. For this reason, more and more companies are shifting to the cloud to keep up with their competition and the changing tide of technology. One such company which is thriving to implement cloud technologies is Hackme.Com. Hackme.com is a fictitious company based in London which has 6000 employees and provides services to more than 20 million customers. The organization operates two data centers at two different geographic locations to deliver IT services. Nonetheless, the organization faces a challenge to cope with the fast-changing demands of customers about the services provided by the organization. These demands are forcing the organization to develop and deploy several new applications and make the services available to the customers rapidly. This report focuses on the requirements and methodologies that can be useful for implementing the cloud design for the organization. It provides an approach to optimize and innovate their business models through investment in cloud computing. The objective is to recommend which techniques can help Hackme.com meet the challenges and requirements of a move to a cloud-based infrastructure spanning across all areas of the business, from helping to reduce costs and to increase efficiency.

## 2. INTRODUCTION

Cloud computing is a massive headway in the delivery of data technology and services. It is a popular subject for consideration where both organizations and people show a distinct fascination for it. By delivering on-demand access to a shared pool of computing resources in a self-service, dynamically estimated, and metered practice, Cloud computing offers impressive advantages in cost, speed, proficiency, and efficiency. Organizations increasingly see the cloud as essential to their companies and operations, and for many, adoption of the cloud is quickly becoming a strategic business decision. When cloud computing grows and expands internationally, most companies are either embracing cloud computing, including corporations, government departments, research organizations, financial institutions, and universities, or are seriously planning their transition to cloud computing. Besides, the rise of technological developments such as automation, big data analytics, and social media forces companies to transform and evolve their business models by investing in cloud computing.

Traditional deployments typically allow applications to be connecting to a particular network, which leads to low consumption, decreased performance, and inflexibility. Cloud brings capabilities to enable dynamic deployment of applications at runtime on the appropriate infrastructure. Cloud computing's elastic nature enables systems to scale and expand upon request without regular updates or upgrades.

IT departments and infrastructure providers are under growing pressure to provide the lowest possible cost of computing resources. There is also an increasing number of public cloud providers seeking ways to build a flexible cloud infrastructure to support their customers. Businesses have entered a period of drastic cutbacks demanding creativity and flexibility at

lower survival costs. Business leaders are looking for ways to concentrate on their core strengths and assign them to external organizations.

This report uses several architectural views and models that include theoretical and practical perspectives to demonstrate a cloud computing architecture to the fictitious organization called Hackme.com. According to the proposed organization, an effort has been made to provide a clear separation of views that explain what architecture provides capabilities. The report also describes how the suggested architecture corresponds to well-established concepts of architecture and how different Cloud platform items can be useful.

# 3. APPROACHES

## 3.1 Background

Hackme.com is a financial organization that delivers business services electronically that is online services. Hackme.com has got a large legacy base, where they're trying to deploy things in an old fashioned way for a very conservative market. But in the financial sector as a lot of business sectors, things are fast-moving, and the organization needs to be able to confront challenges rapidly. To cope with the fast-changing demand, it needs to deliver new applications and be able to make changes to those applications or services rapidly with quick deployment.

To safeguard data during outages and other failures, the organization operates two data centres at two different geographic locations to provide IT services to its business units. These data centers run their applications on more than 300 servers, where the physical infrastructure components are interchangeable. Some of the applications are written in-house, and some are purchased as generic software from a software vendor.

## 3.2 Challenges

The problem is they've got more than 300 servers; Every time they develop a new application, they bought a new service. They're already delivering proprietary in house and customizable off the shelf applications and they're finding that extremely difficult to meet new challenges in making these new changes. Software installation, configuring network and security, testing,

etc has to be done which is the reason they're suffering to take so long to develop a new application.

The other thing is, as rolling stated, the compute systems in the data centers have an average utilization of 20%. So 80% of the time, the servers are doing nothing, thus the capacity is being wasted.

### 3.3 Requirements

Hackme.com wants to transfer its existing data center to the cloud. They want to benefit from what the cloud has to offer. And they also do not want to use investment in the data center. They would like to build a cloud infrastructure using what they've already got and don't want to waste those 300 servers.

They're also aware that once they deliver new features to users, there will be an abrupt increase in cloud usage. If they have peaks of utilization or peaks of usage, they want to be able to use Cloud resources to top up their existing infrastructure. They don't want extra capital expenditure on buying new servers to meet the temporary increase in infrastructure.

As planned, they want to write new applications. But they want to do things like scalable, deployment, development testing in a rapid, agile manner. So they want to set up a development environment which allows them to continue developing their own software and not just want to buy off the shelf. They want to do both.

They want to automate the provisioning and configuration tasks along with defined policies. They want to be able to dynamically, uniformly, easily modify and manage their infrastructure.

They also want to be able to move resources around to grow it or to shrink and get all the things that the cloud could offer them. They also want to know how well they use in their resources and be able to know queries like: is there enough memory capacity? Is there enough storage capacity? enough processing capacity? What's the utilization? They need to be able to discover what's available and have to act accordingly.

### 3.3 Methodologies

To transform an existing data center into a cloud infrastructure, the organizations must identify which deployment option is appropriate for them. The brownfield deployment will be a better choice over the greenfield deployment for Hackme.com, as the latter describes the deployment of existing physical and virtual server workloads into a cloud environment. Greenfield also has its own advantages such as there is no lengthy process to locate IT resources and can start afresh with no restrictions. Although, for brownfield IT, the cloud represents both an important tool for facilitating the modernization of legacy applications, as well as a way to shift capital to operational expense while at the same time, reducing costs overall. Migrating existing physical and virtual workloads into clouds can be complex and time-consuming without the right solutions. And when it comes to Brownfield server workloads, the key is utilizing a C-Maas (Cloud-Migration-as-a-service) that is seamless and able to migrate physical, virtual and cloud-based servers into the cloud as-is.

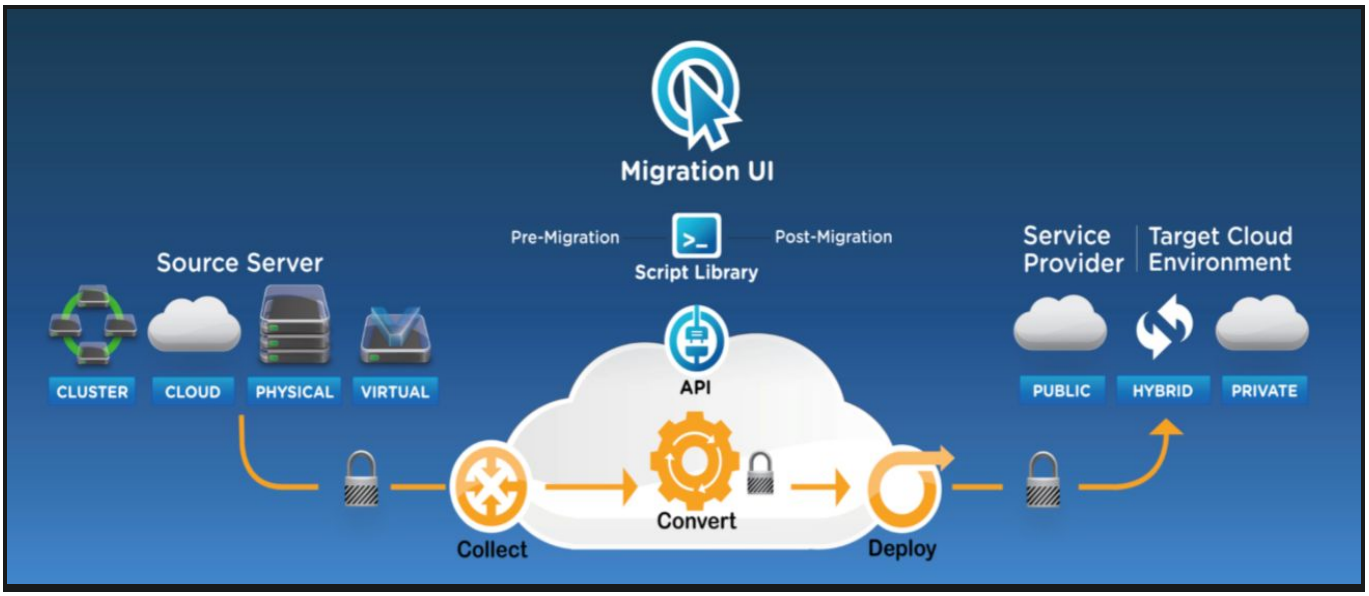


*fig 1. Brownfield using C-Maas*

One of the major problems that Hackme.com is facing is that it's computing units not being fully utilized where eighty percent of the time they're idle and their capacity is being wasted. The solution to overcome this issue is by integrating Best-of-breed Cloud Infrastructure Components. This helps the organization have the flexibility to use and incorporate the infrastructure components from different vendors. This approach enables Hackme.com to build their cloud infrastructure by repurposing their existing infrastructure components in a brownfield deployment option. Taking part in the 'API Economy', this approach also gives access to the latest technologies, including Industry 4.0 apps that can really bring the company into the 21st century. Best-of-breed cloud services can also minimize the need for expensive consultants and pricey service agreements, which allows you to pay for the services you need when you need them. This benefits from incorporating services across geographical locations and can move a large portion of IT expenses from CAPEX to OPEX.

We know that Hackme.com is planning to develop new applications along with their proprietary applications and desires to set up an environment for it on their infrastructure. The best solution for this is to adopt a Platform as a Service (PaaS) cloud service model where a PaaS vendor provides hardware and software tools over the internet, and the organization can use these tools to develop applications. This provides the organization with everything (OS, a database, a programming framework, middleware, and tools to develop, test, deploy, etc) they needed to develop and deploy an application without having to do any provisioning of the underlying infrastructure themselves. PaaS also helps application testers to test the applications and deployers to publish or update the applications in various cloud-based environments. Further to help Hackme.com to build its own environment to develop it's in-house and off the shelf applications, the PaaS can use the externally-hosted private cloud model which is hosted by an external cloud provider that provides an exclusive cloud environment with full privacy guarantees. The externally-hosted private cloud PaaS not only saves the cost incurred to purchase hardware resources, labour costs, and other maintenance costs but also to invest in security and control practices.

Hackme.com would like to set up a centralized management of heterogeneous resources to ensure service levels and monitor resource utilization. For this purpose, the Software-Defined Approach helps the organization to allocate resources for cloud services based on policies and applications as needed by the business. A software-defined approach improves flexibility by extracting the fundamental IT resources to allow service providers to use low-cost, non-proprietary standardized hardware and utilize existing infrastructure investment to dramatically reduce CAPEX. The software used for this approach runs on a centralized

compute system called the Software-Defined Controller. A software-defined controller has built-in expertise that automates provisioning and configuration based on the policies driven.

It allows Hackme.com to modify and manage its infrastructure dynamically, uniformly and easily. The controller also discovers the underlying available resources and generates an overview of resources. The controller allows the Hackme.com's cloud administrator to implement policies uniformly across components of the network, manage resources networking, traffic flow, monitor actions of underlying components, and enforce protection. All these can be done from a software interface that makes it simple to operate for the organization.

## 4. CONCLUSION:

Cloud is increasingly becoming a critical company and IT integration strategy and is beginning to dominate discussions on the roadmap of architecture. Many businesses have either embraced Cloud as a strategic choice to support their business and technology goals or have plans to embrace it. Some cloud deployments may involve some hybrid approach where private cloud enterprise combined with either other private clouds or public clouds. To successfully implement complex and highly scalable cloud infrastructures that meet internal and external needs, it is necessary to understand both provider and user perspectives of the cloud.

Cloud infrastructures are distinguishable by the size, speed, and level of automation expected from conventional IT infrastructure. Building a successful cloud infrastructure requires extensive preparation and reliable execution to ensure that a large margin does not underestimate or overestimate resource capacity. To support availability, elasticity, and management, automation, and self-service should be incorporated automatically into the network.

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