



## Practical Guide to Cloud Management Platforms

July, 2017

**Contents**

Acknowledgements..... 3

Executive Overview..... 4

Defining Cloud Management Platforms and the Evolving CMP Market ..... 4

Challenges of Hybrid Cloud Services..... 5

Functions of a Cloud Management Platform..... 6

The Cloud Management Platform Landscape..... 10

Evaluation Criteria When Selecting a Cloud Management Platform..... 12

Deployment Considerations ..... 16

References ..... 17

© 2017 Cloud Standards Customer Council.

All rights reserved. You may download, store, display on your computer, view, print, and link to the *Practical Guide Cloud Management Platforms* at the Cloud Standards Customer Council Web site subject to the following: (a) the Guidance may be used solely for your personal, informational, non-commercial use; (b) the Guidance may not be modified or altered in any way; (c) the Guidance may not be redistributed; and (d) the trademark, copyright or other notices may not be removed. You may quote portions of the Guidance as permitted by the Fair Use provisions of the United States Copyright Act, provided that you attribute the portions to the Cloud Standards Customer Council *Practical Guide to Cloud Management Platforms* (2017).

## Acknowledgements

The major contributors to this whitepaper are: Mike Edwards (IBM), Preetam Gawade (nCryptedCloud), John Leung (Intel), Bill McDonald (WRM Consulting), Karolyn Schalk (IBM), Karl Scott (Satori Consulting), Bill Van Order (Lockheed Martin) and Steven Woodward (Cloud Perspectives).

## Executive Overview

The aim of this guide is to provide a practical reference to help enterprise Information Technology (IT) managers, business decision makers, system operations staffs, application architects and application developers understand the functions of Cloud Management Platforms (CMPs) and how they can be used to operate and manage applications and data across multiple cloud infrastructures including both on-premises and public cloud service providers. The paper also describes some of the commonly available CMPs in the market to help assist customers in making a selection of a CMP best suited to their needs. While cloud brokerage and cloud management can be considered separate activities, the rise of hybrid IT architectures increases the importance of process harmonization and tools interoperability to meet evolving requirements.

## Defining Cloud Management Platforms and the Evolving CMP Market

CMPs provide a means for a cloud service customer to manage the deployment and operation of applications and associated datasets across multiple cloud service infrastructures, including both on-premises cloud infrastructure and public cloud service provider infrastructure. In other words, CMPs provide management capabilities for hybrid cloud environments.

Gartner sets the minimum requirements for CMP offerings as: *“...products that incorporate self-service interfaces, provision system images, enable metering and billing, and provide for some degree of workload optimization through established policies.”* [1] Given the rapid increase in adoption of hybrid cloud environments these minimum requirements are a base level for CMP capabilities.

IT analysts claim that the average enterprise uses some combination of five or six different cloud environments, typically a mix of private on-premises and public environments. [2] Hybrid cloud environments are expected to grow at a CAGR of 34.3% during the period of 2016-2022 to reach an aggregate of \$241.13 billion by 2022. [3] Hybrid cloud adoption has expanded the role of IT operations and created a demand for adaptable management tools capable of supporting the complexity of hybrid cloud deployments. The market for CMPs can be expected to increase alongside the predicted growth in use of hybrid cloud environments. The capabilities of CMP offerings are also expected to evolve to meet the increased complexity of the target environments and more sophisticated requirements from enterprise customers.

To meet the most frequently mentioned drivers for adoption of hybrid cloud architectures – cost optimization, speed of innovation, and ‘future proofing’ – an enterprise CMP also needs to include specific functionality and the capability to integrate easily with a range of other enterprise management systems, both inside and outside IT operations. The CMP cannot create another, standalone system in an increasingly complex operational space. Rather, the CMP needs to serve as an integration point across existing and new systems.

The challenge of IT operations today is largely in the number of data points needed to gain visibility and the variety of systems used to collect the data. A CMP needs to provide a simplified management view

through its functionality and the aggregation and integration of data from the multiple cloud environments.

Necessary functionality includes:

- Access and authorization management
- Resource management across environments
- Financial management relating to subscribed cloud services
- Integration with the relevant target cloud environments and enterprise internal systems
- Service catalogs to support self-service provisioning or resource approvals
- Cloud brokerage – rules-based guidance for asset placement decisions

Integration points can include:

- Service delivery systems – part of self-service, approval and ongoing management of deployment and cloud service consumption.
- Identity and access management – leverage enterprise SSO and role-based permissions where possible.
- ERP and financial systems – collect metering information from the CMP for billing and invoicing, internal chargeback.
- Automation tools – automate deployment according to rule sets and manage resource configuration.
- Infrastructure monitoring – visibility of operational data to support SLA management, security alerts, threat monitoring.
- Business process rules systems or other business systems that include rules used for such things as governance of cloud consumption or self-service, approval flows, and billing.

For mature enterprises the CMP could use, wherever possible, data, policies, and governance already defined within systems or processes. For less mature or smaller organizations, configuration of the CMP can guide them through the establishment of these policies and processes. For all organizations the CMP needs to provide specific functions, such as usage metering, that are not part of ordinary enterprise financial or accounting packages.

## Challenges of Hybrid Cloud Services

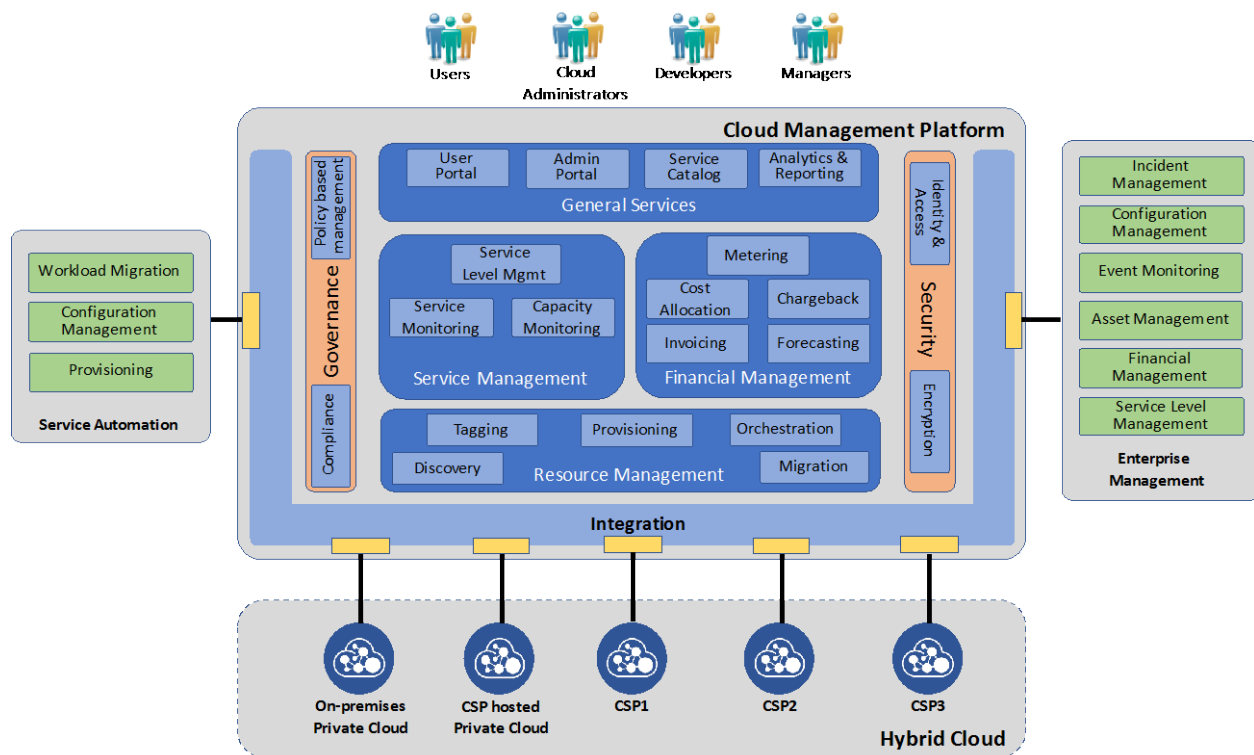
Adoption of hybrid cloud services is driven by the need to reduce cloud infrastructure spend, increase speed of delivery, improve IT resiliency, more effectively service a variety of workloads (e.g., high performance computing), use best-of-breed cloud services, and avoid vendor lock-in. There are many potential benefits associated with the use of hybrid cloud services. However, hybrid cloud can introduce new challenges that IT should be prepared to address:

- *Governance* – The use of hybrid cloud increases the challenge to effectively maintain visibility of cloud resources, to manage spend (including chargebacks), and to ensure quality of service. The level of complexity introduced by hybrid cloud adoption requires strong governance.
- *Security and protection of PII and other sensitive information* – Security and protection of personally identifiable information (PII) and other company confidential information are challenging when applications and data are spread across multiple cloud services. Application and data must be placed in a cloud environment that implements appropriate security and data residency controls.
- *Compliance* – Maintaining compliance with internal security policies, industry mandates, standards and regulations becomes more challenging with hybrid cloud environments.
- *Performance* – Hybrid cloud environments can introduce latency and impact the performance of applications and services. Organizations must leverage the proper tools to detect increased latency and identify the source of degradation.

## Functions of a Cloud Management Platform

According to the National Institute of Standards for Technology (NIST) a cloud broker is defined as: *an entity that manages the use, performance and delivery of cloud services, and negotiates relationships between cloud providers and cloud consumers.* [4] Cloud brokers can be classified as business brokers or technical brokers. CMPs are technical brokers that possess the ability to analyze and assess various cloud service options available to consumers.

The CMP plays an essential role to enable visibility, simplify management, and optimize the utilization of resources in a multi-cloud environment. The intent of this section is to highlight the core functional capabilities needed to achieve this goal. These core capabilities are represented by four categories: General; Service Management; Financial Management; and Resource Management. Effective and efficient management of hybrid cloud environments require rich CMP capability in each area. A reference architecture for hybrid cloud management is illustrated in Figure 1 below.



**Figure 1: Hybrid Cloud Management Reference Architecture**

**Integration** - CMPs must integrate with internal and external systems to manage multi-cloud services. The ability to support both published APIs and provide for customization, if needed, is a critical capability. A lack of flexible integration may limit the organization’s ability to leverage existing systems. The key areas of integration include:

- On-premises private cloud – where the cloud environment exists within the customer organization. Platforms such as VMWare, OpenStack, and Apache CloudStack should be integrated to manage private cloud resources. Capabilities should also include integration with container orchestrators such as Kubernetes.
- CSP hosted private cloud – Sometimes called *dedicated cloud*. Private hosted cloud resources are managed via APIs made available by the private cloud provider, in much the same way as public cloud resources.
- Public cloud service – The CMP must integrate with required public cloud services such as Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform (GCP), and IBM Bluemix to enable management of resources residing in public cloud services. Integration can be achieved by use of the public APIs of the target cloud service, or by an agent running within the public cloud service environment.
- Enterprise Management – It is typical for CMPs to rely on existing enterprise systems to provide capabilities such as incident management, configuration management, asset management, and financial management.

- **Service Automation** – Organizations may consider CMP integration with existing automation tools to simplify resource management. Integration with configuration management tools such as Chef and Puppet, and deployment tools such as Terraform are key considerations.

**General Services** - A flexible foundation is needed to enable integration, provide for self-service and give feedback to users. The capabilities needed to establish the foundation include:

- **Portal** – A portal is needed to establish a central point of access for CMP functions and enable self-service, where appropriate. The portal should be configurable and accessible via web browser and mobile devices (native or web responsive app).
- **Service Catalog** – The CMP should present a catalog of the available cloud services for the organization, spanning all the target cloud environments.
- **Analytics and Reporting** – The CMP must provide analytics and reporting to enable insight into the use of cloud services. Understanding consumption of cloud services, rationalization of consumption, and recommendations to optimize utilization of services to decrease cost, reduce risk, or increase service levels is key to effective multi-cloud management.

**Service Management** - The intent of service management is to simplify service requests and manage resources to ensure business service levels are achieved.

- **Service Level Management** – The CMP should enable cloud service level management. This includes meeting agreed availability and performance service levels.
- **Service Monitoring** – The CMP needs to provide monitoring and reporting for all the managed cloud services.
- **Capacity Monitoring** – On-premises cloud systems have finite memory, storage, and CPU resource capacity. CMPs must provide a view into the capacity of these resources to ensure appropriate decisions are made when evaluating private and public cloud workload placement. Lack of capacity information can lead to poor placement decisions resulting in resource-starved workloads and suboptimal application response times. Public cloud systems may also have capacity concerns, where pricing may change based on utilization.

**Financial Management** - Automating cloud resource consumption tracking and spend is a critical CMP capability. Accurate, real-time analysis and reporting along with predictive analytics is required to contain cost. Financial capability includes:

- **Metering** – The CMP collects cloud resource and service usage statistics. This information is used to analyze utilization patterns and provide consumption-based invoicing.
- **Cost allocation** – Allocation of cost to specific departments or organizations is a key requirement. Cost allocation definition should be configurable to meet an organization's cost center structure.
- **Chargeback/Showback** – CMPs must present chargeback reports to internal stakeholders. These reports should provide aggregate spend along with detailed drill-down of consumption and rates by resource group and elements. The chargeback process includes receiving and reviewing the cloud provider invoice. The CMP should compare metered data and projected resource



spend with the provider invoice. Exceptions must be identified and addressed prior to submitting the invoice for payment.

- *Invoicing* – Invoicing extends chargeback functionality to create customer invoices. This capability is needed for service providers but also applies to IT organizations that must invoice internal customers. Multi-currency support and integration with billing system is a consideration for invoicing.
- *Forecasting* – The CMP should enable forecasting spend associated with currently deployed cloud resources and services. This includes performing “what-if” analysis to determine financial impact of scaling up/down as demand changes.

**Resource Management** - A CMP must provide visibility to cloud resource management of virtual resources (application, server, storage, and network) and deliver services on-demand when needed. The capabilities needed to effectively and efficiently manage resources include:

- *Discovery* – The first step in resource management is discovery of cloud resources. The CMP must possess the capability to discover applications, servers, storage, and services residing within both public and private cloud environments and maintain an accurate inventory on an ongoing basis.
- *Tagging* – Assigning attributes to resources is a critical function of the CMP. The CMP must be able to apply tags to cloud resources to facilitate effective management. For example, assigning cost center attributes simplifies the cost allocation process. Both CMP and cloud provider tags/attributes must be synchronized for consistency.
- *Provisioning/De-provisioning* – The CMP should simplify provisioning and de-provisioning of cloud resources via appropriate automation tools.
- *Orchestration* – The ability to automate processes needed to manage cloud resources is key to efficient service delivery and service level compliance. CMPs must integrate with service automation deployment and configuration management tools to facilitate provisioning, maintaining and decommissioning resources.
- *Cloud-to-Cloud Migration* – CMPs must support cloud-to-cloud migration capability. This includes shifting a workload from a private cloud service to a public cloud service. The process includes provisioning equivalent resources (servers, storage, network, databases, etc.) in the public cloud and migrating applications and datasets. The CMP can't be responsible for all aspects of the migration (e.g., data migration, redirection, etc.) but should act as a broker to orchestrate migration and ensure the integrity of service and financial management.
- *Additional Considerations* – CMP solutions should also include asset and license management capability.

**Governance** - Hybrid cloud services must be managed in accordance with organization policies.

Governance capabilities include:

- *Policy-based Management* – The CMP must include a policy engine to ensure cloud resources and services are managed in accordance with organization policies. These policies can range from preventing the porting of confidential data to a public cloud to limiting the purchase

options (on-demand, reserved, spot) for test servers to applying quotas for project spend and geographic placement of infrastructure and information. Policies are critical to enabling governance over the use of cloud services.

- *Compliance* – The CMP should include logic to track and manage compliance with regulatory and industry mandates. This includes preventing subscription to non-compliant cloud services.

**Security** - Security of hybrid cloud services must be managed in accordance with company policies. Security capabilities include:

- *Encryption Management* – The CMP must include capabilities to manage the use of encryption in the target cloud services. This includes data at rest and data in motion. The capabilities must also extend to Key Management and certificates associated with encryption capabilities.
- *Identity and Access Management* – Role based access control is essential for CMP platforms. The tools must be capable of defining entitlements for all roles including end users, cloud administrators, developers and managers.

## The Cloud Management Platform Landscape

Since cloud computing is now a large and very active area of the IT world, it is not surprising to find that there is a well-developed market in products and services that provide cloud management platform capabilities. Gartner finds the CMP market "fragmented and rapidly changing, with no vendor having dominant market share." [5]

Probably the most important question to ask is "What is the CMP aiming to manage?" This varies significantly between the different offerings.

The first area of concern is what cloud environments are managed by the CMP. Does it handle private / on-premises cloud environments – and if so, what technologies are supported for these systems? Does it handle public cloud environments and if so, which of the various public cloud offerings are supported? Does the CMP handle hybrid environments which combine private and public cloud environments?

The second area of concern is what capabilities are managed by the CMP. It is typical for IaaS capabilities to be managed – compute, storage and networking. For compute, the question extends to whether VMs are managed or whether containers (Docker, etc.) are also managed. Some CMPs support PaaS and SaaS services as well – in which case it is necessary to understand which PaaS environment(s) and which SaaS services are supported.

CMPs can have a variety of management capabilities:

- support the configuration and deployment of applications to the target cloud environment(s)
- manage the estate of deployed VMs and containers
- manage sets of services (e.g., databases)
- manage security capabilities including encryption and identity & access management
- enforce policies across the environments

The following table contains a list of some of the principal CMP offerings in the marketplace, by vendor.<sup>1</sup> It is not intended to be a complete and exhaustive vendor list. Some vendors have single offerings covering all capabilities, while others have divided up the capabilities between multiple separate offerings. Some offerings are based on open source – most cases involve a "freemium" model where the open source code is available freely, but where the vendor concerned offers support and premium services at a charge.

Cloud Management Platform
BMC Control-M Cloud Lifecycle Management Cloud Operations Management <a href="http://www.bmc.com/it-solutions/cloud-computing-software.html">http://www.bmc.com/it-solutions/cloud-computing-software.html</a>
Cisco CloudCenter (formerly CliQr) <a href="http://www.cisco.com/c/en/us/products/cloud-systems-management/cloudcenter/index.html">http://www.cisco.com/c/en/us/products/cloud-systems-management/cloudcenter/index.html</a>
CloudBolt Software <a href="https://www.cloudbolt.io/">https://www.cloudbolt.io/</a>
Cloudify <a href="http://getcloudify.org/">http://getcloudify.org/</a>
DivvyCloud <a href="https://divvycloud.com/">https://divvycloud.com/</a>
Embotics vCommander <a href="http://www.embotics.com/">http://www.embotics.com/</a>
HPE Cloud Service Automation <a href="http://www8.hp.com/us/en/software-solutions/cloud-service-automation/index.html">http://www8.hp.com/us/en/software-solutions/cloud-service-automation/index.html</a>
IBM Cloud Orchestrator Cloud Automation Manager Cloud Brokerage <a href="http://www-03.ibm.com/software/products/en/ibm-cloud-orchestrator">http://www-03.ibm.com/software/products/en/ibm-cloud-orchestrator</a> <a href="https://www.ibm.com/us-en/marketplace/cognitive-automation">https://www.ibm.com/us-en/marketplace/cognitive-automation</a> <a href="http://www-03.ibm.com/software/products/en/cloudbrokerage">http://www-03.ibm.com/software/products/en/cloudbrokerage</a>

<sup>1</sup> All product/service names and brands are property of their respective owners. All company, product and service names used in this Guide are for identification purposes only. Use of these names and brands does not imply endorsement.

InfoSys Cloud Infrastructure Services <a href="https://www.infosys.com/infrastructure-services/">https://www.infosys.com/infrastructure-services/</a>
Morpheus <a href="https://www.morpheusdata.com">https://www.morpheusdata.com</a>
Red Hat CloudForms <a href="https://www.redhat.com/en/technologies/management/cloudforms">https://www.redhat.com/en/technologies/management/cloudforms</a>
RightScale Cloud Management Platform Optima <a href="http://www.rightscale.com/">http://www.rightscale.com/</a>
Scalr <a href="https://www.scalr.com/">https://www.scalr.com/</a>
Servicenow <a href="https://www.servicenow.com/products-by-category.html">https://www.servicenow.com/products-by-category.html</a>
T Systems Cloud Integration Center <a href="http://cloud.t-systems.com/solutions/enterprise-cloud-broker">http://cloud.t-systems.com/solutions/enterprise-cloud-broker</a>
VMWare vRealize Suite <a href="http://www.vmware.com/products/vrealize-suite.html">http://www.vmware.com/products/vrealize-suite.html</a>

## Evaluation Criteria When Selecting a Cloud Management Platform

While many CMPs perform the same set of core functions, they often started from different design philosophies and formed their roots with specific private or public cloud environments in mind. Over time they evolved to their current state as the market grew and their customers emphasized the development of specific features of importance to them.

Evaluating a CMP offering should be performed within the context of the current and target operating environment along with a clear view of business objectives and technical requirements. Since cloud management platforms and cloud services are still evolving, it may be optimistic to assume that a *perfect* solution exists for all enterprises, but selecting a vendor that is pursuing a strategy consistent with enterprise directions and goals should allow forward progress as the product matures. Engagement with enterprise major stakeholders and cloud tenants should also help refine and prioritize the criteria listed in this section.

For simplicity, the evaluation criteria have been grouped into the following broad categories:

- Technology and architecture criteria
- Operational criteria
- Business and acquisition criteria

The following table helps define some of the key criteria and differentiating areas that may assist in selecting the right CMP for the enterprise environment and needs. This information along with the capabilities described in the *Functions of a Cloud Management Platform* section of this document, provides a full view of CMP selection considerations.

Criteria	Description
<b>Technology &amp; Architecture Criteria</b>	
Cloud Service Provider and Cloud Infrastructure Integrations	One of the most significant criteria to consider in your evaluation should be the ability of the CMP to provide a single pane of glass view of all your subscribed cloud services and deployed cloud workloads within your current and target public, community, and private clouds. A major strength of the CMP is to provide integration and abstraction for each of the public, private, or hybrid cloud services which the organization is using. While most CMPs provide integration with many of the same cloud service providers and private cloud infrastructures, some notable vendor differences exist that can influence a procurement decision. A CMP which conforms to industry standards such as the Cloud Infrastructure Management Interface published by the Distributed Management Task Force (DMTF) helps ensure continued interoperability with cloud service providers. [6]
Agent vs. Agentless Architecture	An architecture decision that the CMP vendor made when designing their software is whether to require a small software agent to be installed on the managed cloud services to collect information and provide control or to provide direct (cloud native) connection to the cloud service instances. Some CMP solutions support both an agent and an agentless architecture, with additional management features supported on agent based instances. While both approaches can accomplish the task, it is useful to know these deployment requirements and the functional implications it may have in relation to new and existing cloud services.

Available Cloud Ecosystem Tool Integrations	The CMP is typically only one piece of a complete enterprise cloud solution. Built-in integrations with existing IT service management tools, software configuration management and DevOps tools, finance/billing and data analytics tools used in the organization can be important criteria to support a complete end-to-end interoperable solution. Lack of built-in tool integrations may require development of these interfaces using the CMP API to accomplish specific tasks of interest, with added cost and risk.
API Robustness	It is possible that the organization will need to extend the capabilities of a CMP by leveraging its Application Programming Interfaces (APIs). APIs allow support of a wide range of tasks ranging from cloud instance management, security and user administration, logging and reporting, workflow automation and integration with other tools. Most CMP offerings have APIs with vendor examples available to explain their use.
Security Design	Given the importance of security, it is necessary to engage with the information security or risk assessment team during the CMP evaluation phase. This helps guaranty that all new interfaces and capabilities are evaluated and vetted to ensure they meet policy and regulatory requirements. Additionally, during a source selection process it is valuable to understand how candidate CMP vendors approach security in the development of their offerings.
<b>Operational Criteria</b>	
CMP Hosting Environment Requirements	Some CMPs are offered for on-premises installation or for deployment by the customer within a cloud service. Others may be offered as a Software as a Service (SaaS) run by the vendor. The choice will impact your total cost of ownership, skill requirements, network connectivity profile, and ability to directly control portions of your cloud infrastructure including service level agreements.
Operations & Service Management Capabilities	The capabilities provided to cloud tenants typically include the ability to allow self-service provisioning and delegated operational and cost control for tenant resources. The ability to delegate specific operations and service management functions should be reflective of the enterprise’s governance policies.

CMP Administrative Capabilities	These are the capabilities provided to CMP administrators including security management, operational visibility of all cloud resources, automation control, operational metrics and reporting, tenant resource quota assignments, and governance control.
Automation, Workflow and Provisioning orchestration	One of the strengths of many CMPs is their ability to facilitate automation, orchestration of application provisioning and execution of scripts, or notifications when pre-configured events are triggered, thereby simplifying overall cloud resource provisioning and management.
Cloud Resource Consumption and Chargeback Support	Many CMPs provide a Cost Management dashboard that can monitor real-time resource consumption and provide cost modeling and metrics needed to support direct billing or data feeds to external billing applications. This capability may help support remediation and negotiations when SLAs are not met. Data from supported public cloud services are often automatically acquired while private cloud costs are typically subscriber-configured when establishing particular cloud services.
Infrastructure Optimization and Cross-Cloud Migration Support	Two distinct but complementary emerging features offered by some CMPs are 1) the ability to look at deployed cloud resources and optimize the resource or cost footprint and 2) the ability to support cross-cloud migrations when pursuing this optimization strategy. This is considered a growth area for further vendor enhancements as enterprises continue to push vendors to identify further operational cost savings.
Product Support & Patch/Release Cycles	For both fixes and functional enhancements, it is important to understand the vendor patch release cycles and the frequency of releases in their development cycle. The direct impacts of software releases and versions are minimized to subscribers of SaaS CMP offerings compared with on-premises CMP deployments.
<b>Business &amp; Acquisition Criteria</b>	

Total Cost of Ownership (Acquisition and Recurring Operations)	One of the critical criteria for justifying the investment and comparing the costs of various CMPs is in calculating the initial acquisition and recurring operations costs for the platform or service. Since there may be additional required integrations to the CMP, it is advisable to include these anticipated costs into the TCO estimate. Potential exit strategies from the CMP solution should also be considered as part of the analysis and evaluation.
Product Licensing or Service Subscription Model	Depending on whether the CMP is open source, a licensed product for on-premises installation, or a vendor SaaS offering, you will have different acquisition and recurring costs that will be reflected in your Total Cost of Ownership. Besides cost, the terms and conditions of the product support and licensing agreements or SaaS Service Level Agreements (SLAs) should be carefully scrutinized to ensure your business and operations objectives are achieved within defined CAPEX or OPEX budgets.
Vendor Financial Stability	Because of the dynamic and evolving nature of the CMP market, some vendor consolidation, acquisitions, and marketplace instability are still likely to be experienced. Switching CMP platforms as a result of these instabilities is likely to be costly, so there is a need to obtain assurance of vendor stability and market commitment in the procurement decision.
Availability & Comprehensiveness of Product Training and Professional Services Offerings	Availability of staff training and professional services is important in the product selection phase. A wise investment in each category can often save considerable configuration and deployment time getting you “up and running” quickly.

## Deployment Considerations

Mapping out a draft deployment plan is highly recommended prior to making a Cloud Management Platform product selection as it provides a roadmap for subsequent activities and defines the resources that are required in each phase. Whether embarking on a proof-of-concept/pilot or a full enterprise level deployment of the CMP, the following considerations should enable establishment of realistic and achievable goals. Many of the guidelines for adoption of hybrid cloud computing also apply to the planning for CMP deployment. A key deployment consideration is whether to host CMP services on-premises or leverage a SaaS offering.

- **Establish partnerships** – recognize that project success is based on a team effort including the vendor that will support the deployment with training and professional services staff as well as the tenant and user community. Form the team and establish a common vision and goals. The partnerships for deployment must extend into the enterprise itself. The CMP likely introduces



new self-service delivery options. Internal budget and charge back schemes need to be adapted or created. The same applies to the enterprise security and risk organizations – they need to be closely involved.

- **Set reasonable expectations** – recognize that CMP deployment progresses in phases. Define a set of use cases focused on the main business priorities for the use of cloud services, whether it be agility, reduced cycle times, cloud cost optimization, full life-cycle visibility, enhanced capabilities, or reduced operational staffing. Work on incrementally accomplishing these tasks with the partners. Plans should also include how to onboard users of the platform for self-service and establishing change management for phased additions to the CMP solution.
- **Understand the role and impact of the CMP within the cloud ecosystem** – the CMP helps consolidate the management of the various cloud platforms and cloud services. To achieve the full value of this investment also requires integration with other tools in the infrastructure that support functions such as service management, DevOps, configuration management and financial management. Also depending on whether a SaaS or on-premises deployment solution is selected there may be impacts to your existing connectivity and service level commitments.
- **Identify risks & opportunities early** – whether you have made a commitment to a given CMP product or are just evaluating a potential offering, it is important to capture and monitor deployment and operations risks and improvement opportunities early so you can leverage lessons learned, contain cost overruns and modify plans when needed. Whenever you leverage a new technology it is good to know your back-out plans or alternatives when assumptions and outcomes change.

## References

- [1] Gartner IT Glossary – Cloud Management Platforms  
<http://www.gartner.com/it-glossary/cloud-management-platforms>
- [2] RightScale 2017 State of the Cloud Report  
<http://assets.rightscale.com/uploads/pdfs/RightScale-2017-State-of-the-Cloud-Report.pdf>
- [3] Infoholic Research LLP. *Worldwide Hybrid Cloud Computing Market: Drivers, Opportunities, Trends, and Forecasts, 2016–2022*  
<https://www.infoholicresearch.com/worldwide-hybrid-cloud-computing-market-to-grow-at-a-cagr-of-34-3-during-the-period-2016-2022-to-aggregate-241-13-billion-by-2022/>
- [4] NIST SP 292 Cloud Computing Reference Architecture  
[http://ws680.nist.gov/publication/get\\_pdf.cfm?pub\\_id=909505](http://ws680.nist.gov/publication/get_pdf.cfm?pub_id=909505)
- [5] Gartner: Market Guide for Cloud Management Platforms  
<https://www.gartner.com/doc/3688830/market-guide-cloud-management-platforms>
- [6] Cloud Infrastructure Management Interface (CIMI) Model and RESTful http-based Protocol, An Interface for Managing Cloud Infrastructure, DMTF Standard, DSP0263  
[http://www.dmtf.org/sites/default/files/standards/documents/DSP0263\\_1.0.0.pdf](http://www.dmtf.org/sites/default/files/standards/documents/DSP0263_1.0.0.pdf)