CONTENTS

INTRODUCTION .................................................................................................................................3
   What is Cloud Computing? ..............................................................................................................3

ADOPTION OF CLOUD COMPUTING IN ASIA PACIFIC .....................................................................5

CLOUD IMPLEMENTATION ROADMAP ............................................................................................6
   Consolidate ........................................................................................................................................6
   Optimize ..........................................................................................................................................6
   Automate .........................................................................................................................................7
   Manage ..........................................................................................................................................7

CLOUD MONITORING AND SERVICE MANAGEMENT THROUGH IT MANAGEMENT-AS-A-SERVICE .............................................................................................................................7
   Multi-cloud Environments Becoming a Reality .............................................................................7
   The Changing Role of a CIO ...........................................................................................................8
   Benefits of Cloud Monitoring and Service Management .........................................................8

CONCLUSION .....................................................................................................................................9
**INTRODUCTION**

The information technology (IT) industry is undergoing a paradigm shift in the way computing resources are procured. Cloud computing is emerging as a key area of focus for CIOs and IT decision makers due to its ability to save costs, increase business agility and deliver IT in an on-demand manner. Indeed, the use of clouds has increased significantly over the last twelve months, driven by the benefits mentioned above and the growing need to reduce both the capital expenditure (CAPEX) and operational expenditure (OPEX) associated with IT.

**What is Cloud Computing?**

Cloud computing can be defined as a flexible and scalable IT environment in which service providers leverage virtualization technologies to create and distribute computing resources to customers on an as-needed basis, through private or public network and where the service is priced on a pay-as-you-use basis.

**Figure 1: Characteristics of Cloud Computing**

<table>
<thead>
<tr>
<th>Key Characteristics of Cloud Computing</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Demand, Self-Service</td>
</tr>
<tr>
<td>Pay As You Use, Metered Consumption</td>
</tr>
<tr>
<td>Rapid Elasticity, Scale Up/Down</td>
</tr>
<tr>
<td>Shared Pools, Illusion of Infinite Resources</td>
</tr>
<tr>
<td>Broad Network Access using Standard Internet Protocols</td>
</tr>
</tbody>
</table>

- **On-demand, Self-Service**: Services are available to end users on an “on-demand” and self-service basis.
- **Pay As You Use**: Consumers pay on a “utility” basis, exactly for what they use.
- **Rapid Elasticity/Scalability**: Capacity can be scaled up or down dynamically and immediately.
• **Shared Pools**: Seamless integration of computing, storage, and other infrastructure resources to create a “Virtual” resource pool, which creates the illusion of an infinite resource pool.

• **Broad Network Access**: Access to services is available through public and/or private networks and through any network enabled device – desktops, notebooks, tablets, and mobile phones.

In most enterprises, the existing IT infrastructure generally has many inefficiencies due to the low utilization rate of resources such as computing and storage. Customers have mostly invested in excess capacity based on the peak demand and thus have traditionally spent in excess of their normal usage levels. Cloud computing can eliminate these inefficiencies and allow enterprises to migrate to an on-demand utility-based consumption model. Moving to a cloud-based IT delivery model therefore delivers significant benefits:

**Figure 2: Value proposition of Cloud Computing**

- **Cost Savings**: The biggest catch-phrase associated with clouds is – “you pay for only what you use”. It allows customers to consume IT and allocate resources more efficiently, with a predictable monthly OPEX.

- **Enhanced Efficiency and Scalability**: Through virtualization and automation technologies, customers can eliminate the inefficiencies in infrastructure utilization and reap the “economies of scale” advantages of their infrastructure. It allows customers to gain access to “elastic” ICT resources without significant CAPEX.

- **Business Agility**: Through efficient usage of computing resources, the cloud provides an agile ICT ecosystem that is able to meet business needs effectively. Enterprises no longer need to wait for weeks to complete the provisioning cycle; resources can be provisioned at the click of a mouse.
• **Focus on Core Competency:** By allowing the IT team to focus on more important issues than patching software and upgrading hardware, cloud ensures the customers are focused on strategic tasks.

• **Automation of IT:** IT becomes a utility much akin to electricity – "pay as you use", "always available", and "highly automated".

• **Universal Resource Access:** As the ICT resources are entirely centralized, there is complete independence of location, device, and network. ICT resources can be accessed anytime, anywhere, and by any device using any kind of connectivity.

• **Standardization and Control:** Due to centralization, the hardware, software, and information can be controlled and updated more easily than before. The reliability of data also tends to be very high due to easier version control and centralized storage.

**ADOPTION OF CLOUD COMPUTING IN ASIA PACIFIC**

Frost & Sullivan conducted an end-user survey with 600 data center customers in the Asia Pacific region in June 2011. The survey indicates that cloud computing is witnessing increasing traction in the Asia Pacific market and has emerged as the #1 priority for a significant number (38%) of businesses in the Asia Pacific region. Moreover, a third of IT managers are experiencing increasing pressure from top management to procure cloud services. The adoption of cloud computing in Asia Pacific stands at 29% of businesses, with rapid adoption being witnessed over the last few years.

**Figure 3: Adoption of Cloud Computing in Asia Pacific**

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Adopters</td>
<td>65%</td>
</tr>
<tr>
<td>Public</td>
<td>14%</td>
</tr>
<tr>
<td>Private</td>
<td>12%</td>
</tr>
<tr>
<td>Hybrid</td>
<td>9%</td>
</tr>
</tbody>
</table>

N=600

*Source: Frost & Sullivan*
Hybrid Clouds are the preferred choice for more than half of cloud users as it offers them the best of both worlds - the security, availability and SLAs of private clouds; and the convenience of the pay-per-use model and scalability of public clouds.

However, cloud computing is yet to become the core strategy of many IT teams with 64% of businesses in the region spending only 1-10% of their annual IT budgets on cloud computing. A cloud roll-out is often a complex process that can involve significant investment in technology, processes and people.

**CLOUD IMPLEMENTATION ROADMAP**

A cloud implementation consists of four important phases as outlined below:

**Figure 4: Cloud Implementation Phases**

---

**Consolidate**

Organizations can generate substantial efficiencies by consolidating their infrastructure, primarily through various virtualization techniques. Virtualization is the first step towards cloud adoption as it creates seamless logical pools of resources and increases asset utilization. It makes applications independent of the underlying hardware infrastructure, thereby allowing flexible service creation. When implemented properly, virtualization can lead to more efficient provisioning of resources, increased flexibility and lower operational costs.
Optimize

Consolidation of IT infrastructure delivers efficiencies through increased asset utilization. However, consolidation needs to be followed by optimization of the underlying storage, network and service management layers so that they are aligned to supporting the needs of a virtual infrastructure. Frost & Sullivan recommends three key changes that will help data centers to cope better with virtualization and cloud computing. Firstly, organizations need to look at replacing Spanning Tree Protocol (STP) with new protocols such as Transparent Interconnection of Lots of Links (TRILL), Serial Bus Protocol (SBP) or others to increase efficiency of links. Secondly, organizations need to redesign the three-tier datacenter architecture which is not optimized for VM-VM or VM-Storage traffic. Finally, with the rising heterogeneity in data center networks, it is critical that customers choose solutions which adhere to open industry standards. This future proofs their investments.

Automate

The true promise of cloud – business agility and on-demand provisioning of resources – can only be delivered if workflows are automated. Automation can convert many of the laborious and time-consuming manual processes into seamless workflows, thereby reducing repetitive processes. Datacenter automation today incorporates – Provisioning, Orchestration, Lifecycle Management and Metering & Billing.

Manage

Maintaining high availability and service levels of private clouds is an important imperative for both service providers and in-house IT teams. Private clouds are complex to monitor due to the virtualized nature of core infrastructure resources (compute, storage, and networking) which are always in a state of flux.

Many of the concerns with cloud computing can be addressed by monitoring and analysing end-user response, service level metrics and business service environments. Data obtained can then be used to ensure that service levels and security issues are addressed, performance and response times are met and that sufficient flexibility is built into IT infrastructures.

CLOUD MONITORING AND SERVICE MANAGEMENT THROUGH IT MANAGEMENT-AS-A-SERVICE

Multi-cloud Environments Becoming a Reality

Cloud computing is becoming mainstream and, as discussed earlier, the adoption levels are rising rapidly with an ever increasing number of businesses coming on board the cloud bandwagon. It has also been established that one cloud does not fit all requirements, especially in the case of large enterprises where multi-cloud environments are a reality today.
Enterprises have complex IT requirements and different applications/workloads require different levels of service and performance. This mandates the need to run different workloads from different environments. While an enterprise may choose to run CRM applications from a public cloud, it may not be confident of data security in running its ERP application from the cloud. Furthermore, the same organization may implement desktop virtualization through its own data center in order to ensure high performance levels and keep control of information. In an environment where enterprises run public, private and hybrid clouds, along with their in-house datacenters, the role of monitoring and managing efficiency and performance has become imperative.

**The Changing Role of a CIO**

The role of a CIO too is witnessing a transition to address the above changes to their IT environments. With administrative tasks being reduced with the adoption of cloud, the focus of the CIO has shifted from hiring and managing the right talent in his team to that of identifying the right environments to meet his users' needs. The CIO and his team today have evolved into an internal IT service provider to the business. The CIO is focused on ensuring consistently high levels of performance and availability; eliminate CapEx to the extent possible and lower OpEx; and provide great customer experience.

This is where the role of IT Management-as-a-Service becomes critical as in empowering the CIO with the visibility into his IT environment to ensure business demands are met. Being available over the cloud IT Management-as-a-Service's availability is not dependent on the enterprises underlying infrastructure. This gives the CIO real-time monitoring and service management capabilities. The pay-as-you-go model allows the CIO to further manage costs efficiently.

**Benefits of Cloud Monitoring and Service Management**

Figure 5: Benefits of Cloud Monitoring and Service Management

---

**Source:** Frost & Sullivan
- **Single Platform for Multi-cloud Environments**: A cloud monitoring and service management tool allows users to manage multiple cloud environments through a single platform providing visibility and control over the entire IT environment of the enterprise. This enables greater control, flexibility and agility across the environment.

- **Real-time Service Level Monitoring**: The tools provide real-time visibility into the performance, availability and costs of the entire environment allowing CIOs to monitor these parameters against service level agreements (SLAs).

- **Pro-active Service Management**: The tools can alert the CIO in case one of the SLAs drops below a certain pre-defined level to take preventive measures that ensure business continuity. Furthermore, analysis of usage trends empower the CIO to make informed decision making to pro-actively prepare for future business demands, i.e., enables business agility.

- **Low Cost of Ownership**: In addition to a lower total cost of ownership generated by cloud computing, cloud monitoring and service management tools have a lower cost of ownership than legacy systems management tools. Furthermore, these tools may offer the option to be procured in a utility-based pay-as-you-go model, further lowering the cost of ownership.

**CONCLUSION**

While adoption of cloud computing is rising, challenges continue to hamper its take-up. Concerns around security and privacy remain at the top of the pyramid. However, enterprises are now cognizant of the benefits of a multi-pronged cloud strategy where they use different workloads in different cloud environments. This is leading to increasing adoption of hybrid cloud environments as well as multi vendor environments. Furthermore, these changes in the IT environments are changing the role of the CIO. The CIO is now becoming an internal services provider for the company with focus on performance, availability, costs and user experience. In such environments, effective management, visibility and analytics become essential to ensure business needs are constantly met in the most efficient manner as well as plan for future requirements. Proactive monitoring and service management is the key to future CIO success.
ABOUT FROST & SULLIVAN

Frost & Sullivan, the Growth Partnership Company, enables clients to accelerate growth and achieve best-in-class positions in growth, innovation and leadership. The company’s Growth Partnership Service provides the CEO and the CEO’s Growth Team with disciplined research and best-practice models to drive the generation, evaluation, and implementation of powerful growth strategies. Frost & Sullivan leverages more than 50 years of experience in partnering with Global 1000 companies, emerging businesses and the investment community from more than 40 offices on six continents. To join our Growth Partnership, please visit http://www.frost.com.

ABOUT CA TECHNOLOGIES

CA Technologies (NASDAQ: CA) provides IT management solutions that help customers manage and secure complex IT environments to support agile business services. Organizations leverage CA Technologies software and SaaS solutions to accelerate innovation, transform infrastructure and secure data and identities, from the data center to the cloud. CA Technologies is committed to ensuring our customers achieve their desired outcomes and expected business value through the use of our technology. To learn more about our customer success programs, visit ca.com/customer-success. For more information about CA Technologies go to ca.com.

DISCLAIMER

These pages contain general information only and do not address any particular circumstances or requirements. Frost & Sullivan does not give any warranties, representations or undertakings (expressed or implied) about the content of this document; including, without limitation any as to quality or fitness for a particular purpose or any that the information provided is accurate, complete or correct. In these respects, you must not place any reliance on any information provided by this document for research, analysis, marketing or any other purposes.

This document may contain certain links that lead to websites operated by third parties over which Frost & Sullivan has no control. Such links are provided for your convenience only and do not imply any endorsement of the material on such websites or any association with their operators. Frost & Sullivan is not responsible or liable for their contents.

INDEPENDENCE

Although Frost & Sullivan was commissioned by CA Technologies to write the whitepaper, the analysis contained in this report reflects the views of Frost & Sullivan analysts without any bias or influence from any third party.

COPYRIGHT NOTICE

The contents of these pages are copyright © Frost & Sullivan Limited. All rights reserved. Except with the prior written permission of Frost & Sullivan, you may not (whether directly or indirectly) create a database in an electronic or other form by downloading and storing all or any part of the content of this document. No part of this document may be copied or otherwise incorporated into, transmitted to, or stored in any other website, electronic retrieval system, publication or other work in any form (whether hard copy, electronic or otherwise) without the prior written permission of Frost & Sullivan.