

**COMPUTING MOVES TO THE CLOUD...TAKING REVENUE WITH IT** (Part II - Core vs. Edge)

**Summary.** CRM, IBM, HPQ, RHT have in recent weeks all launched “cloud computing” initiatives. GOOG and MSFT have just launched trial services. JAVA and AMZN already have offerings. What all have in common is that computing applications are increasingly being designed as services that reside on computers in the “cloud” at the Internet core or in a distant data center, rather than on the PC or local server in the building. Cloud computing is shaping up as the next great architecture shift in IT, building on earlier efforts of “utility computing” and “grids.” **Investors need to care about this shift because new applications and usage are moving to the cloud, taking revenue with them. Companies that enable this will win, and those that fight it will lose. This determines whether GOOG and CRM lead the next generation of computing, the presumed decline of MSFT, or whether the old guard (IBM, HPQ, JAVA) will get a second wave of growth. Use this analysis to anticipate how the leading companies are competitively positioning to make the change to cloud computing.**

**Cloud Computing Initiatives**

<p><b>Application as a service</b></p>	<p>Applications offered directly to the user as a “click to run” network service</p>	<p>CRM GOOG MSFT</p>	<p>All adding more software applications as cloud-based services. We believe GOOG and MSFT will soon offer “computing as a service” like CRM.</p>
<p><b>Computing as a service</b></p>	<p>Underlying IT resources (compute, storage, database) as a network service</p>	<p>GOOG — AMZN — CRM — JAVA — MSFT —</p>	<p><b>4/8 Google App Engine</b> <b>3/27 Elastic IP added to Elastic Compute</b> <b>1/17 Force.com</b> service with utility pricing <b>Network.com</b> \$1/CPU utility service <b>3/5 SQL Server Data Services</b></p>
<p><b>Tools to build own mini-cloud or outsource it</b></p>	<p>Sell customers the tools to build their own mini-cloud or manage it for them (host or on-premise)</p>	<p>IBM — HPQ — JAVA — ORCL —</p>	<p><b>3/26</b> Universities join “<b>Blue Cloud</b>” initiative <b>3/17 Adaptive Infrastructure</b> as a Service Offers a broad set of data center technology ORCL clustered grid with Linux, Apps, EM</p>

# “Computing As A Service” Initiatives

	Offering	Cost	Comment
<b>Amazon</b>	<b>Amazon Web Services</b> <ul style="list-style-type: none"> <li>Elastic Compute Cloud (EC2)</li> <li>Real simple storage</li> <li>Simple database</li> </ul>	<ul style="list-style-type: none"> <li>\$0.10/instance-hour (small)</li> <li>\$0.40/instance-hour (large)</li> <li>\$0.80/instance-hour (extra large)</li> </ul> Data Transfer: <ul style="list-style-type: none"> <li>\$0.10 per GB (in)</li> <li>\$0.13 – 0.18 per GB (out)</li> </ul>	<ul style="list-style-type: none"> <li>Leader in cloud computing since '04, probably most widely used.</li> <li>Widely used by start-ups/VC-backed</li> <li>Leverages AMZN's own IT infrastructure</li> <li>Over 200,000 developers using</li> <li>AWS solutions catalog</li> </ul>
<b>Red Hat</b>	Red Hat Enterprise <b>Linux on Amazon EC2</b>	<ul style="list-style-type: none"> <li>\$19/mo per account (fixed)</li> <li>\$0.21/instance/hour (small)</li> <li>\$0.53/instance/hour (large)</li> <li>\$0.94/instance/hour (extra large)</li> </ul> Data Transfer: <ul style="list-style-type: none"> <li>\$0.11/GB (in) / \$0.19/GB (out)</li> </ul>	RHT provides technical support. AMZN Web Services for billing, account activation.  This is RHT linux specific offering of AMZN EC2 for customers who know they want RHT Linux and want deeper RHT support.
<b>Sun</b>	<b>Network.com</b>	\$1/CPU hour <ul style="list-style-type: none"> <li>Only pay for time used</li> <li>Includes bandwidth + (on time) storage</li> <li>Can use PayPal or purchase order</li> </ul>	<ul style="list-style-type: none"> <li>Focused on compute-intensive, batch-oriented applications</li> <li>Network.com applications catalogue of Sun + 3<sup>rd</sup> party providers</li> <li>SunGrid developer community + tools</li> <li>Solaris-based, N-1 Grid engine</li> </ul>
<b>Salesforce .com</b>	<b>Force.com</b> Cloud Compute Architecture	\$0.99 per log-in introductory price	<ul style="list-style-type: none"> <li>Enables customers to build apps using Salesforce's technology (Apex, CodeShare, IDE) and then run it on CRM's infrastructure</li> <li>CRM customers have built 50,000 apps</li> </ul>

## CLOUD COMPUTING: DIFFERENT NAMES – VARIATION OF MEANINGS

The big shift in information technology is increasingly being called “cloud computing”. This builds on and extends earlier technologies and efforts (utility computing, grids, service oriented architecture, virtualization) as is often the case in computing. The core elements are:

1. **Services.** Software applications are used or consumed as reusable (“loosely coupled”) services rather than a one-time license to and installation of the code.
2. **Scale.** These applications are designed to be delivered in scale to thousands or millions of users, rather than as more customized solutions designed for individual or groups of customers.
3. **Internet-based.** These applications are designed to live on the network (cloud) and interact with and be accessed by other programs and computers/devices on the network. This is typically in a standards-based fashion, independent of the specific hardware/software implementation that exists on any one computer in the network.

**What this means to the customers** is that they can simply request an application from the network, and the underlying computing, storage, database and other IT resources are seamlessly and dynamically allocated to provide the necessary service. On a simple level this is what happens when a user clicks on an Internet webpage (URL), just for a vastly more complicated set of applications and transactions. It requires lots of very difficult technology to make it simple.

**This has big implications for the business models** of the computing companies and the economics of IT. We have written at length on how MSFT, ORCL, RHT, CRM, GOOG, and other leaders are individually trying to adapt their products, pricing, technologies, and go-to-market channels to succeed in this new environment.

**What is new about the latest initiatives** is that they span all 3 dimensions of the challenge.

1. **Application as a service.** This is like **GOOG** (search) and **CRM** (sales & marketing), where the user simply “clicks to run” an application that is invoked across the network as a service. This is no longer a niche but millions of consumers, and 100k businesses.
2. **Computing as a service.** This is like **AMZN**’s Elastic Compute Cloud, **JAVA**’s Network.com or **CRM**’s Force.com, where users can buy underlying “building block” computing resources of processing, storage, etc. by the hour. This is the approach of buying your IT infrastructure like the electric utility model.
3. **Technology to build your own mini-cloud or outsource to a computer vendor’s cloud.** This is a more sophisticated version of earlier approaches where the computing vendors (IBM, HPQ, JAVA, ORCL) sell the technology & tools for the customer to build their own more efficient “mini-cloud” or simply manage (host or outsource) the computing infrastructure and applications for the customer directly.



See P.2

# 4

## THE BIG ADVANTAGES OF MOVING TO THE CLOUD

Those customers and applications that can move to the cloud enjoy:

1. Lower total costs and lower fixed costs; Usage based pricing and variable costs
2. Flexibility to scale up and down IT capacity over time, 24x7, to business needs
3. More agile, responsive IT capabilities to changing business needs
4. Substantially lower administrative & maintenance costs
5. In some cases, freedom from specific operating systems, chip CPU technologies

### THIS DOES NOT MEAN ALL APPLICATIONS MOVE TO THE NETWORK

In fact, we've argued that varying by: (see 6/25, 7/12 ADBE, 7/23 MSFT, 6/21 CRM)

- Class of applications: graphics intensive, latency, data input-output, asynchronous
- Types of users: enterprise vs. small business vs. consumer vs. mobile/off-line
- Operational requirements: regulation, integration, performance, etc.
- The relative change in the costs of processing, bandwidth, and storage...

...many applications will NOT live in the cloud, but will remain on PCs and local, private network servers. The network is not becoming thin client. It is becoming "fatter" everywhere, with more intelligence at the edges and more of a mesh architecture. Even in the cloud, different data centers (e.g. IBM vs. GOOG) will use different technology depending on the applications and users they are serving.

However, the big important point is that the change on the margin is more customers, applications, and usage will increasingly shift to the cloud. Dollars will follow that shift.

- Companies that move with this change will gain customers, applications, usage and revenue over time.
- Companies that do not move with this change will lose customers, applications, usage and revenue over time.

Said differently, a change in where and how computing applications occur, changes which companies capture the associated revenue flows. This shift will take place at varying speeds in different places. That's why we are focusing on these antecedents of cloud computing that signal how well, quickly, and where different tech companies are making the change.