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Introduction to Cloud Computing

Agenda

- What is Cloud Computing?
- Amazon
- Google App Engine for Java
- Demo sample apps

What is Cloud Computing?

What is Cloud Computing?

- “A style of computing where scalable and elastic IT-enabled capabilites are provided as a service to external customers using Internet technologies” – Gartner

Cloud Computing

- Pay as you go
- Uses shared data centers
- Platform as a service
- Software as a service
- Minimize expenses
- Improve business agility

Evolution of Computing

- Mainframes
- Minicomputers
- PC’s
- Smart, portable devices

The Big Switch

- By Nicholas Carr

History of Electricity

- Companies used to have huge power plants
- Grid established
- Moved to centralized power generation.

Cloud Computing in the news

- *"The rise of the cloud is more than just another platform shift that gets geeks excited. It will undoubtedly transform the IT industry, but it will also profoundly change the way people work and companies operate."*

—The Economist, "Let it Rise," 10/23/08

- *I.B.M. to Help Clients Fight Cost and Complexity – NY Times, June 14, 2009*

Cloud Computing in the news

- **VMware buys SpringSource in cloud move – InfoWorld, Aug 10,2009**
- **“The two companies plan to build solutions for more efficiently running, building, and managing applications within internal and external cloud architectures.”**

Cloud Computing in the news

- Google and the wisdom of Clouds – Business Week, December 2007
- Micorsoft to launch cloud computing service – ComputerWeekly, March 2008
- The Internet Industry is on a Cloud – Whatever that may mean- Wall Street Journal , March 26, 2009

Cloud Computing in the news

- SAP Acquires Coghead's Technology As It Looks Towards The Cloud – Feb 19,2009

Most Popular Web based applications

What are they for corporations ?

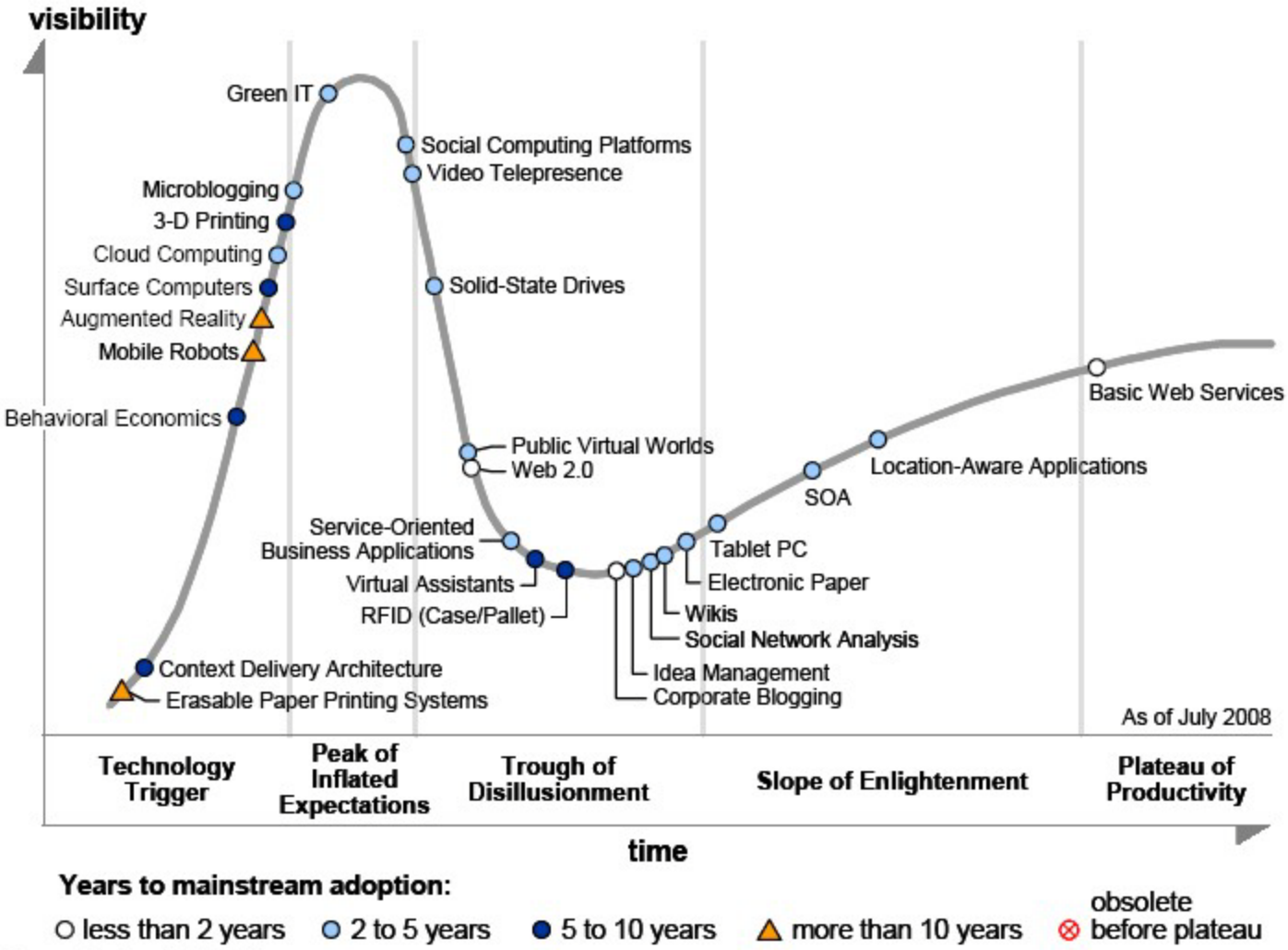
Most Popular Web based applications

- Managing Payroll
- Managing Customer Accounts

Projections for Cloud Computing

- Estimates vary widely
- Research Firm IDC - $42 B in 2012
- Gartner Inc – World Wide Cloud services revenue will rise 21% to $56.3 B in 2009

Figure 1. Hype Cycle for Emerging Technologies, 2008



Source: Gartner (July 2008)

Leaders

- Amazon – Elastic Compute Cloud service
- Google – App Engine
- Salesforce
- Microsoft – Azure services
- IBM

Companies to watch

- Appirio - Appirio, a cloud solution provider, offers both products and professional services that help enterprises accelerate their adoption of the cloud.
- RightScale – Enable computers to stay in control on the cloud
- Skytap – IT lab in the cloud

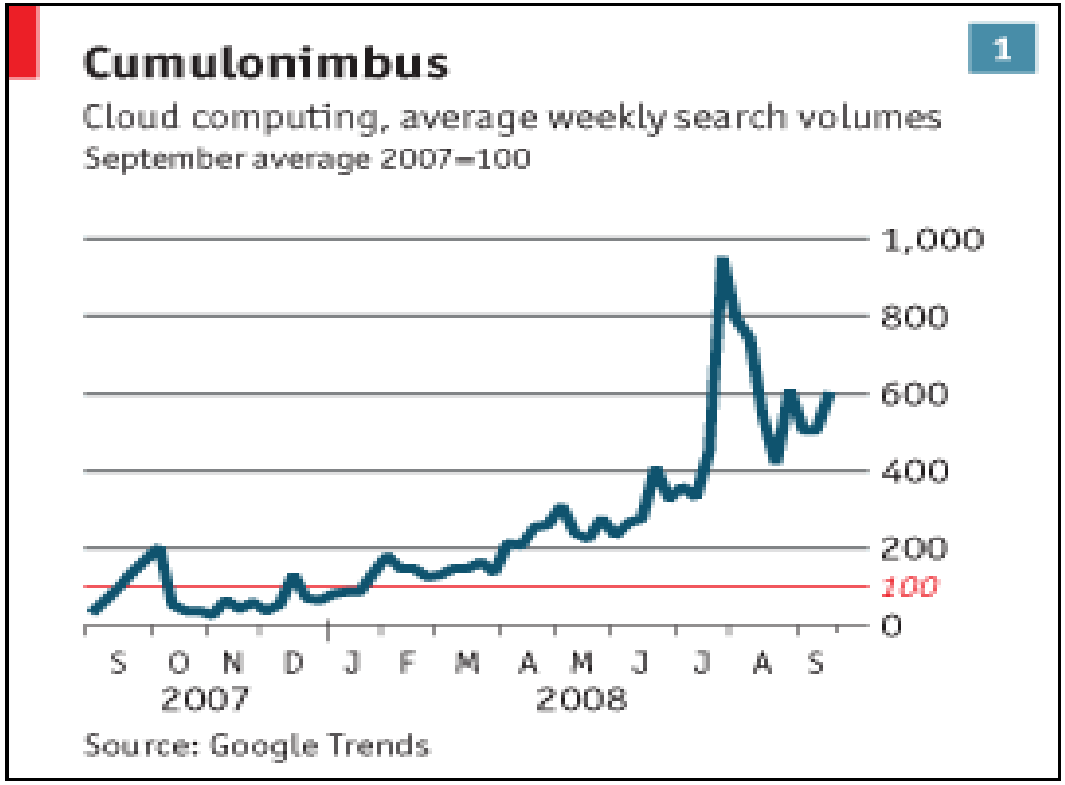
Risk Mitigation - Gartner

- Privileged user access—Who has specialized access to data and about the hiring and management of such administrators?
- Regulatory compliance—Is the vendor willing to undergo external audits and/or security certifications?
- Data location—Does the provider allow for any control over the location of data?
- Data segregation—Is encryption available at all stages, and were these encryption schemes designed and tested by experienced professionals?

Risk Mitigation

- Recovery—What happens to data in the case of a disaster, and does the vendor offer complete restoration, and, if so, how long does that process take?
- Investigative Support—Does the vendor have the ability to investigate any inappropriate or illegal activity?
- Long-term viability—What happens to data if the company goes out of business, and is data returned and in what format?
- Data availability—Can the vendor move your data onto a different environment should the existing environment become compromised or unavailable?

Cloud Computing – Search volumes



GSA in the Cloud

- General Services Administration (GSA) is participating in the Federal Cloud Computing Initiative
- https://www.apps.gov/cloud/advantage/main/start_page.do

Amazon Services

- Amazon Elastic Compute Cloud
- Amazon Simple Storage Service – Optimized for large objects, dense storage drives, stores raw data
- Amazon Simple DB – Optimized for data access speed, less dense storage drives.
- Amazon Simple Queue Service

Amazon EC2

- Web service
- Provides resizable computing capacity
- Cloudwatch – Monitoring web services
- Available in two regions:
  - US and Europe

Amazon EC2 – Supported OS

- Red Hat Enterprise Linux
- Windows Server 2003
- Oracle Enterprise Linux
- OpenSolaris

Amazon EC2 – Supported Databases

- IBM DB2
- Oracle 11g
- Microsoft SQL server
- MySQL Enterprise

Amazon SQS

- Simple Queue Service
- Exposes Amazon’s messaging infrastructure as a web service

Google App Engine - Supported

- Java Data Objects (JDO)
- Java Persistence API (JPA)
- Java Server Faces (JSF) 1.1
- Java Server Pages (JSP) + JSTL
- Java Servlet API 2.4
- JavaBeans™ Activation Framework (JAF)
- JavaMail
- XML processing APIs including DOM, SAX, and XSLT

Google App Engine – Not Supported

- Enterprise Java Beans (EJB)
- JAX-RPC
- JAX-WS
- JAXB
- Java Database Connectivity (JDBC)
- Java EE™ Connector Architecture (JCA)
- Java Management Extensions (JMX)
- Java Message Service (JMS)
- Java Naming and Directory Interface (JNDI)
- Remote Method Invocation (RMI)

Storing the data

- App Engine's underlying datastore is based on BigTable, not a traditional SQL-based RDBMS like MySQL or PostgreSQL.
- You may either use the low-level datastore API or the JDO or JPA object-relational mapping interfaces provided.
- Various JDBC wrappers are available for the datastore, and you may still be able to connect to in-memory databases such as the H2 database engine or HSQLDB.

Google AppEngine restrictions

- Cannot write to the filesystem. Can read files
- Cannot Spawn a new thread.
- Cannot open a socket to another host
- The app must respond within 30 seconds, or you will see DeadlineExceededException.
- System methods like exit(), gc() do nothing.

Additional Limits

request size=10 megabytes

response size=10 megabytes

request duration=30 second

maximum number of application files =1,000

maximum number of static files=1,000

maximum size of an application file=10 megabytes

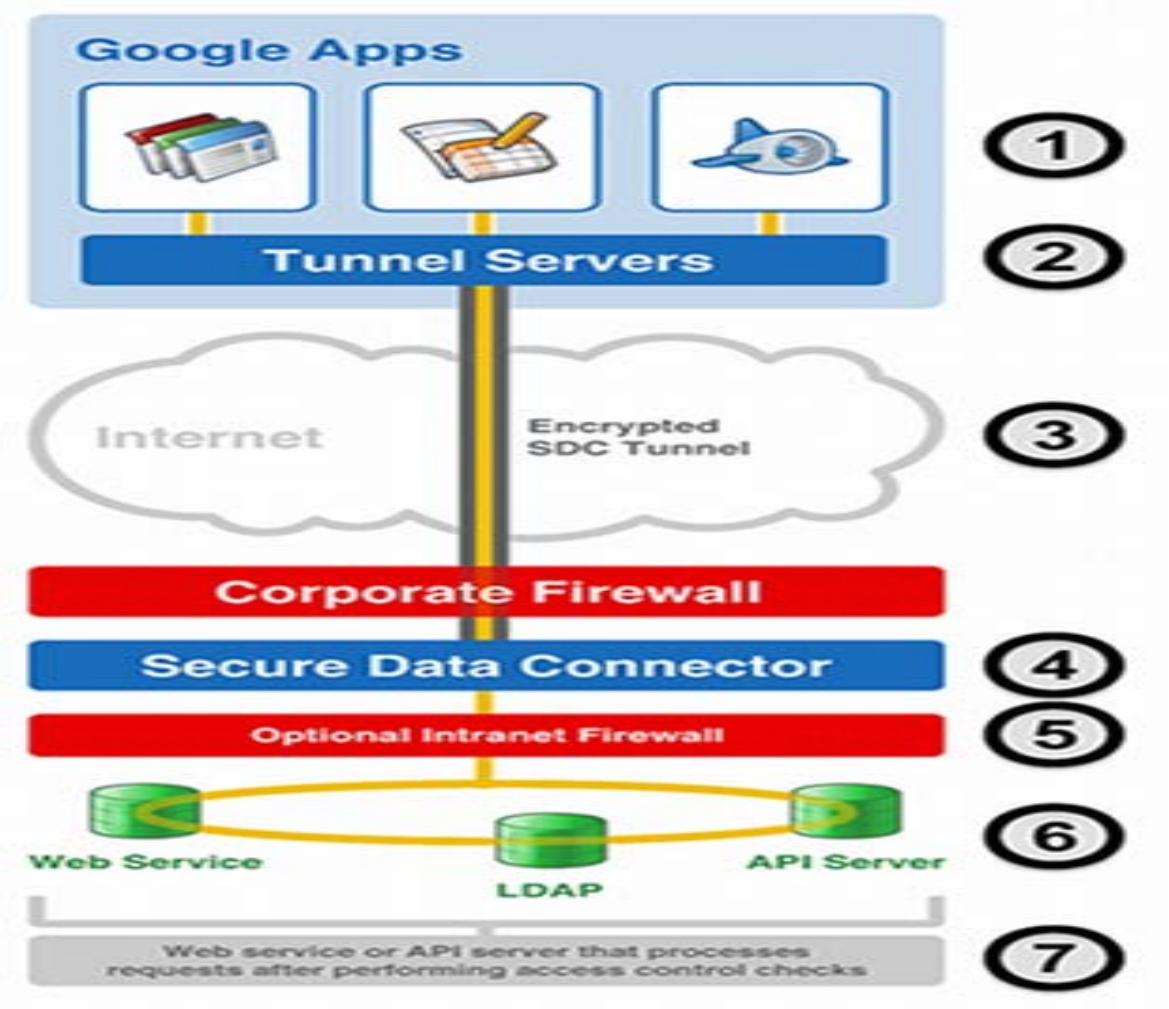
maximum size of a static file=10 megabytes

maximum total size of all application and static files=150megabytes

Chat & Task Queues

- Can send and receive messages – XMPP API
- Task Queues – Applications can schedule jobs.

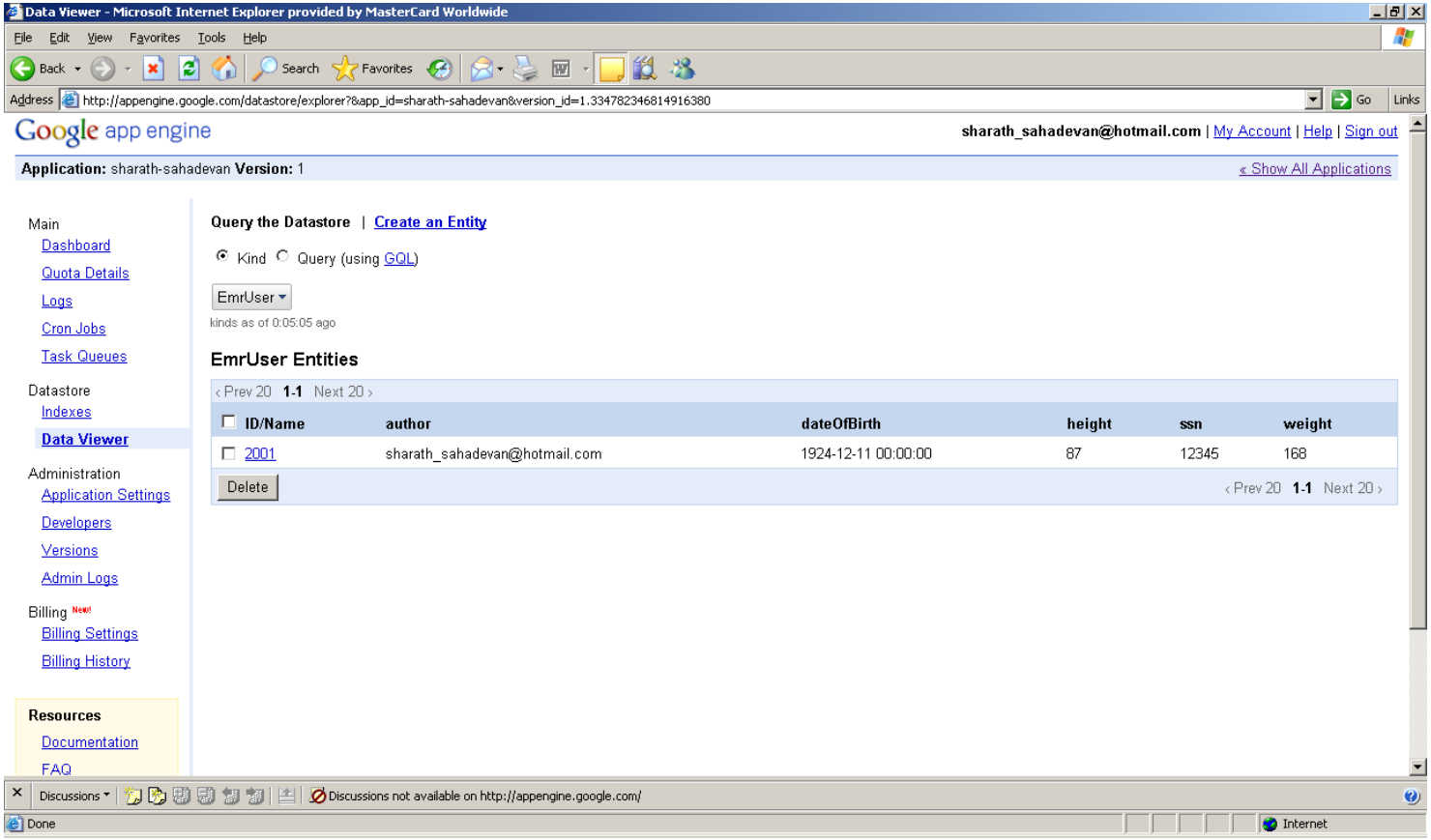
Google – Secure Data Connector



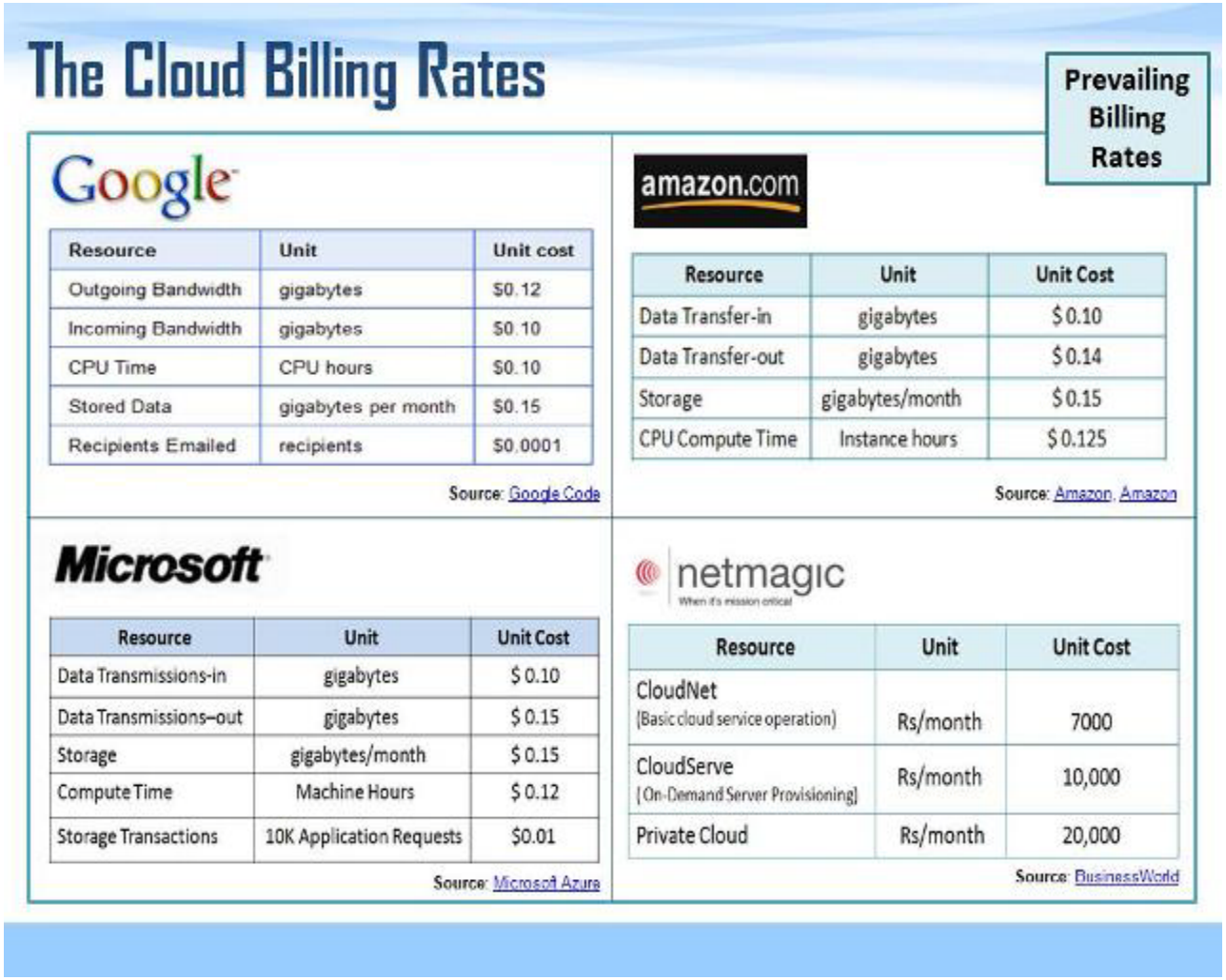
Integration

- Salesforce and Google App Engine
- Feed data into force.com
- Pull data from force.com

Viewing the data



Comparing the services



The Cloud Billing Rates

Prevailing Billing Rates

Google

Resource	Unit	Unit cost
Outgoing Bandwidth	gigabytes	$0.12
Incoming Bandwidth	gigabytes	$0.10
CPU Time	CPU hours	$0.10
Stored Data	gigabytes per month	$0.15
Recipients Emailed	recipients	$0.0001

Source: Google Code

amazon.com

Resource	Unit	Unit Cost
Data Transfer-in	gigabytes	$0.10
Data Transfer-out	gigabytes	$0.14
Storage	gigabytes/month	$0.15
CPU Compute Time	Instance hours	$0.125

Source: Amazon, Amazon

Microsoft

Resource	Unit	Unit Cost
Data Transmissions-in	gigabytes	$ 0.10
Data Transmissions–out	gigabytes	$ 0.15
Storage	gigabytes/month	$ 0.15
Compute Time	Machine Hours	$ 0.12
Storage Transactions	10K Application Requests	$0.01

Source: Microsoft Azure

netmagic

When it's mission critical

Resource	Unit	Unit Cost
CloudNet (Basic cloud service operation)	Rs/month	7000
CloudServe (On-Demand Server Provisioning)	Rs/month	10,000
Private Cloud	Rs/month	20,000

Source: BusinessWorld

Issues

- Data Privacy
- Not Open

Where is it used?

The New York Times needed to convert 11 million articles and images in its archive (from 1851 to 1980) to PDF. Their Internal IT said it would take them seven weeks. In the meantime, one developer using 100 Amazon EC2 simple Web service interface instances running Hadoop (an open-source implementation similar toMapReduce) completed the job in 24 hours for less than $300. — open.blogs.nytimes.com, “Self-service, Prorated Super Computing Fun!”11/1/07, open.blogs.nytimes.com/2007/11/01/self-service-prorated-super-computing-fun/

Demos

- Demo of Amazon SQS Client
- Application on Google App Engine – Use Google account(gmail id) to login to app.

Questions ?

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Acronyms

- Iaas – Infrastructure as a service
- Paas – Platform as a service
- Saas – Software as a service

Useful links

- http://ss-demo-emr.appspot.com/emr/Main.jsp - Link to application on Google app engine
- Java Library for simple DB
- http://developer.amazonwebservices.com/connect/entry.jspa?externalID=1132
- http://www.pcmag.com/article2/0,2817,2340325,00.asp

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- Cloud Computing Primer – Sun Microsystems
- http://kenai.com/projects/suncloudapis - Sun Cloud API

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- http://www.salesforce.com/cloudcomputing/

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