

Amazon AWS Overview

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Public, Private, and Hybrid Clouds

- **Public Cloud:**
 - Built over the Internet and can be accessed by any user who has paid for the service
 - Owned by service providers and are accessible through a subscription, typically offered on a flexible price-per-use basis
 - Examples: Google App Engine (GAE), Amazon Web Services (AWS), Microsoft Azure, IBM Blue Cloud, and Salesforce.com's Force.com
 - Promote standardization, preserve capital investment, and offer application flexibility
- **Private Cloud:**
- **Hybrid Cloud:**

Amazon EC2

- Amazon was the first company to introduce VMs in application hosting
- Customers can rent VMs instead of physical machines to run their own applications
- By using VMs, customers can load any software of their choice
- The elastic feature of such a service is that a customer can create, launch, and terminate server instances as needed, paying by the hour for active servers
- Amazon provides several types of preinstalled VMs
- Instances are often called *Amazon Machine Images (AMIs)* which are preconfigured with operating systems based on Linux or Windows, and additional software

Infrastructure-as-a-Service (IaaS)

- IaaS public cloud providers

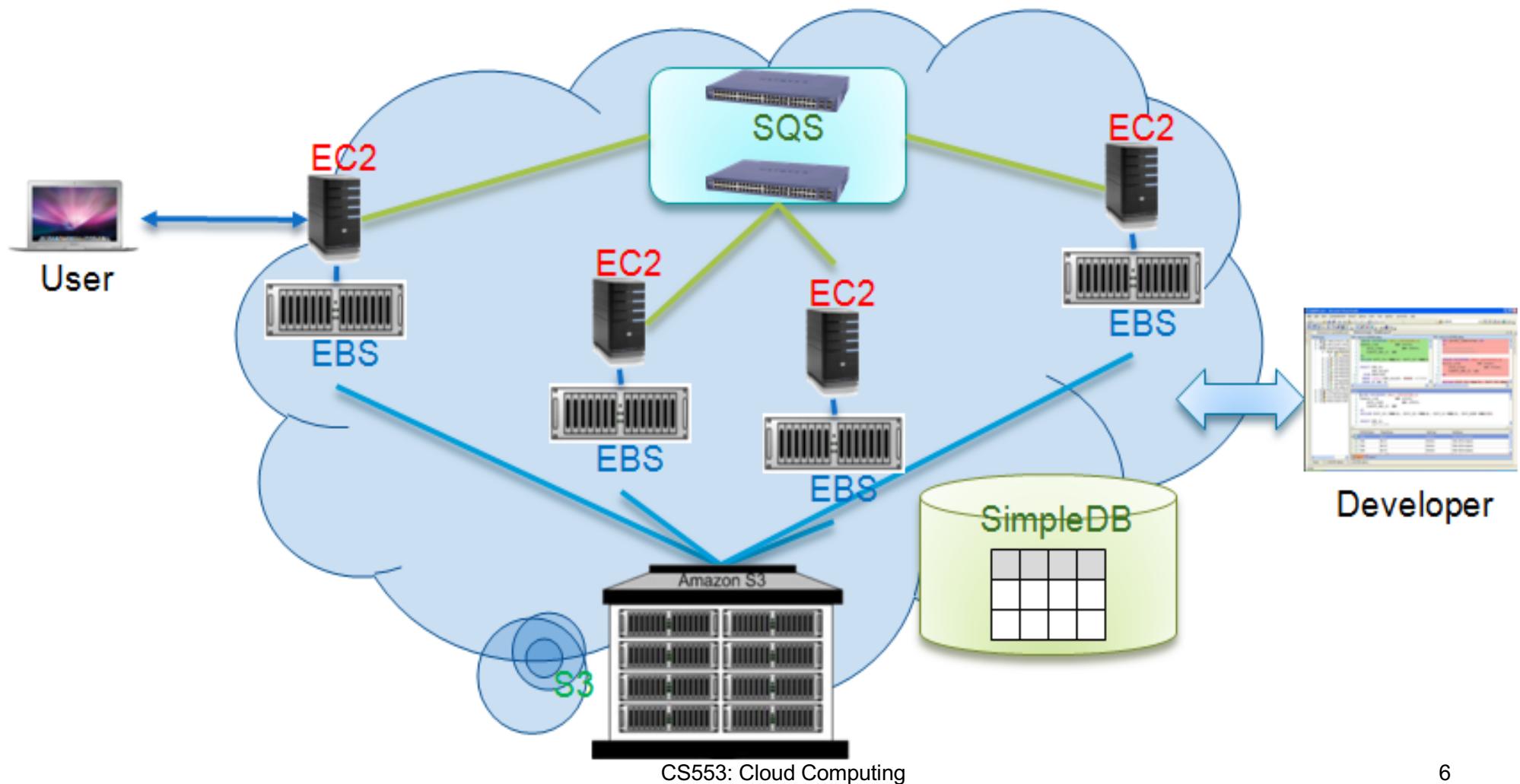
Cloud Name	VM Instance Capacity	API and Access Tools	Hypervisor, Guest OS
Amazon EC2	Each instance has 1–20 EC2 processors, 1.7–15 GB of memory, and 160–1.69 TB of storage.	CLI or Web Service (WS) portal	Xen, Linux, Windows
GoGrid	Each instance has 1–6 CPUs, 0.5–8 GB of memory, and 30–480 GB of storage.	REST, Java, PHP, Python, Ruby	Xen, Linux, Windows
Rackspace Cloud	Each instance has a four-core CPU, 0.25–16 GB of memory, and 10–620 GB of storage.	REST, Python, PHP, Java, C#, .NET	Xen, Linux
FlexiScale in the UK	Each instance has 1–4 CPUs, 0.5–16 GB of memory, and 20–270 GB of storage.	Web console	Xen, Linux, Windows
Joyent Cloud	Each instance has up to eight CPUs, 0.25–32 GB of memory, and 30–480 GB of storage.	No specific API, SSH, Virtual/Min	OS-level virtualization, OpenSolaris

Amazon Web Services (AWS)

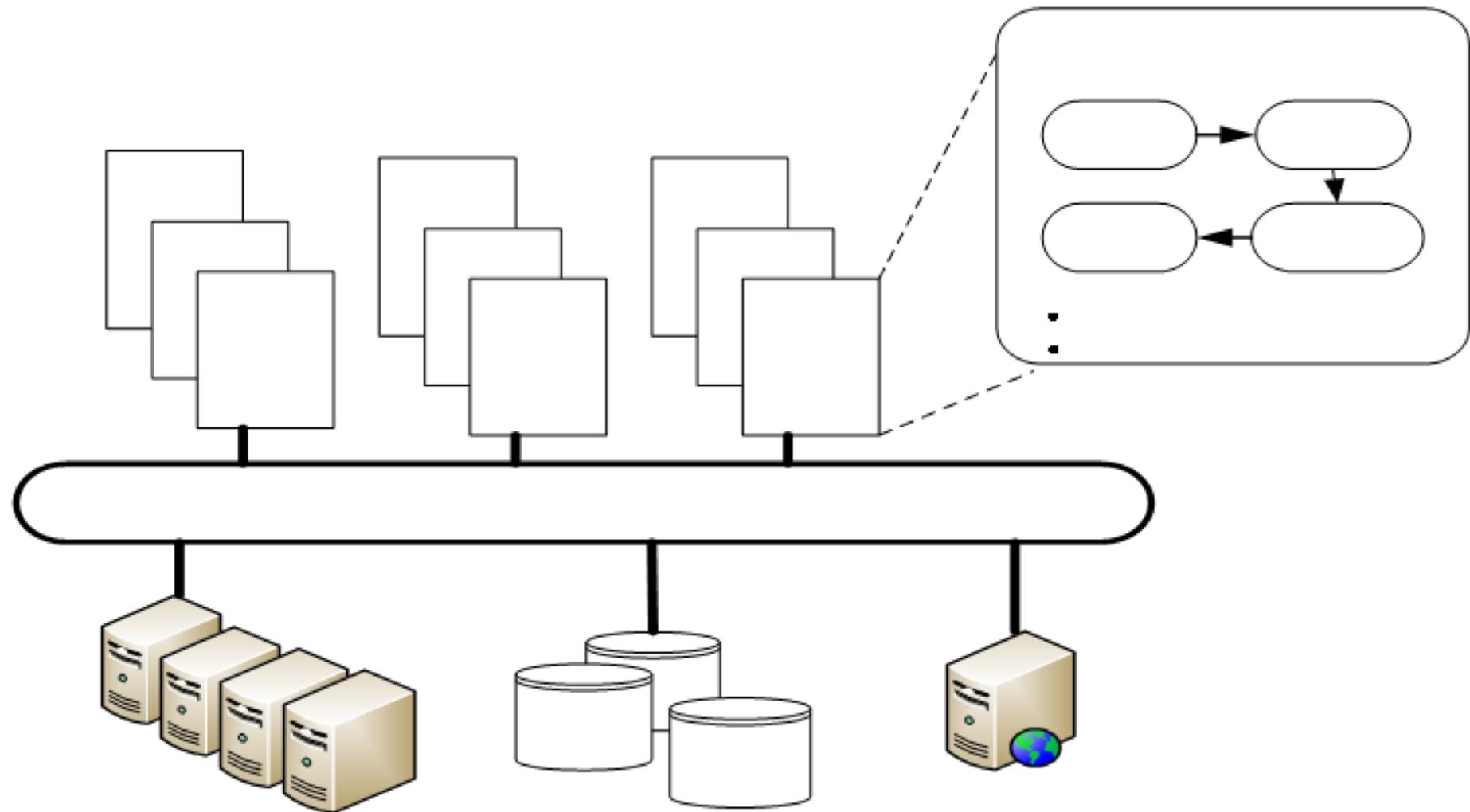
- Amazon has been a leader in providing public cloud services
- Amazon applies the IaaS model in providing its services
- Different from Google, Amazon provides a more flexible cloud computing platform for developers to build cloud applications.
- Elastic Computing Cloud (EC2) provides the virtualized platforms to the host VMs where the cloud application can run
- S3 (Simple Storage Service) provides the object-oriented storage service for users
- EBS (Elastic Block Service) provides the block storage interface which can be used to support traditional applications
- SQS stands for Simple Queue Service, and its job is to ensure a reliable message service between two processes
 - The message can be kept reliably even when the receiver processes are not running
 - Users can access their objects through SOAP with either browsers or other client programs which support the SOAP standard.

Amazon Web Services (AWS)

- Amazon cloud computing infrastructure



Amazon EC2 Execution Environment



Amazon EC2 Execution Environment

- Three types of AMI

Image Type	AMI Definition
Private AMI	Images created by you, which are private by default. You can grant access to other users to launch your private images.
Public AMI	Images created by users and released to the AWS community, so anyone can launch instances based on them and use them any way they like. AWS lists all public images at http://developer.amazonwebservices.com/connect/kbcategory.jspa?categoryID=171 .
Paid QAMI	You can create images providing specific functions that can be launched by anyone willing to pay you per each hour of usage on top of Amazon's charges.

Amazon EC2 Execution Environment

- Types of instances
 - **Standard instances** are well suited for most applications.
 - **Micro instances** provide a small number of consistent CPU resources and allow you to burst CPU capacity when additional cycles are available. They are well suited for lower throughput applications and Web sites that consume significant compute cycles periodically.
 - **High-memory instances** offer large memory sizes for high-throughput applications, including database and memory caching applications.
 - **High-CPU instances** have proportionally more CPU resources than memory (RAM) and are well suited for compute-intensive applications.
 - **Cluster compute instances** provide proportionally high CPU resources with increased network performance and are well suited for high-performance computing (HPC) applications and other demanding network-bound applications. They use 10 Gigabit Ethernet interconnections.

Amazon EC2 Execution Environment

- Instance Types Available on Amazon EC2
(October 6, 2010)

Compute Instance	Memory GB	ECU or EC2 Units	Virtual Cores	Storage GB	32/64 Bit
Standard: small	1.7	1	1	160	32
Standard: large	7.5	4	2	850	64
Standard: extra large	15	8	4	1690	64
Micro	0.613	Up to 2		Only EBS	32 or 64
High-memory	17.1	6.5	2	420	64
High-memory: double	34.2	13	4	850	64
High-memory: quadruple	68.4	26	8	1690	64
High-CPU: medium	1.7	5	2	350	32
High-CPU: extra large	7	20	8	1690	64
Cluster compute	23	33.5	8	1690	64

Amazon EC2 Execution Environment

- **Cost of Amazon On-Demand VM Instant Types (October 6, 2010)**

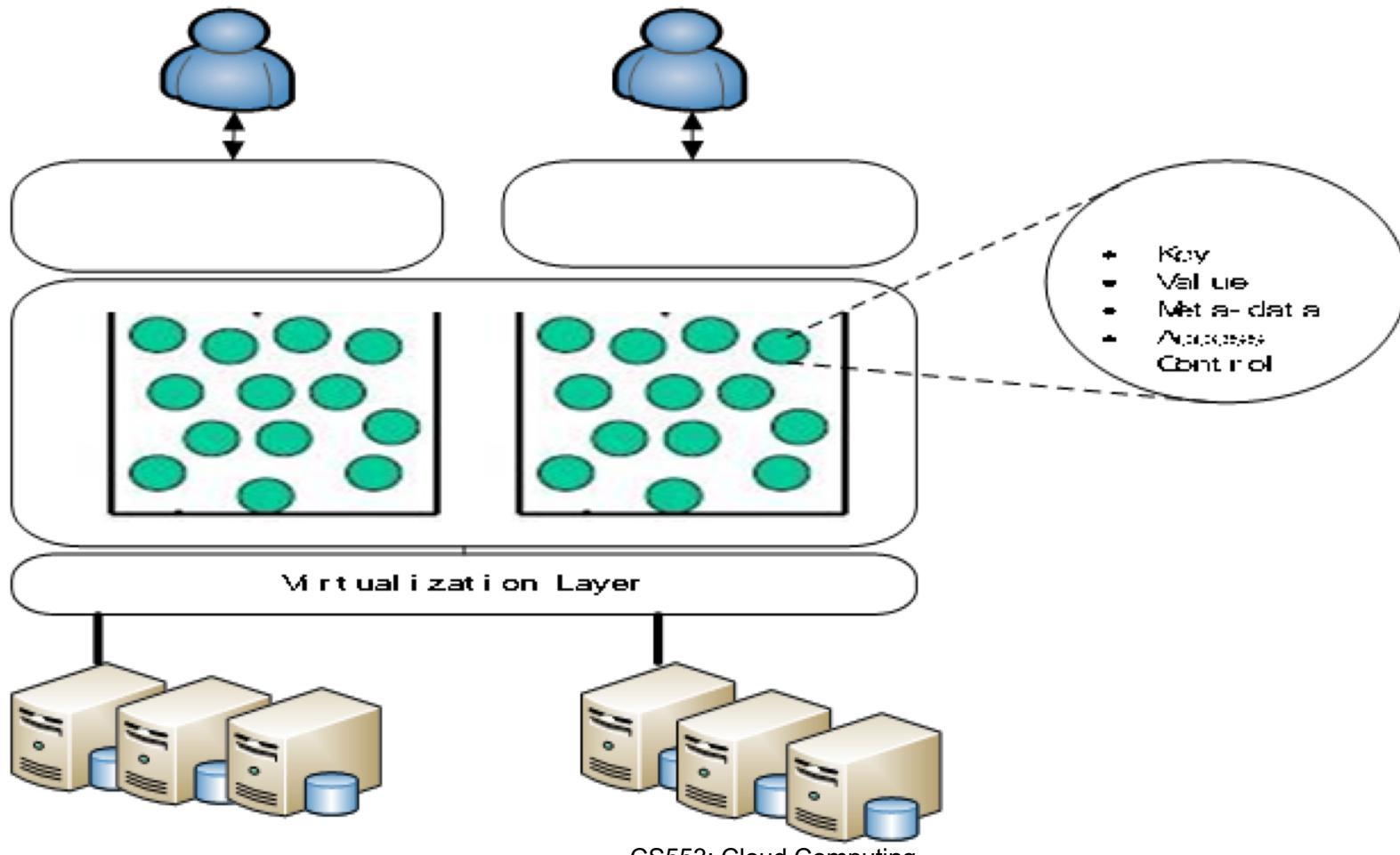
VM Instance Type	Size	Linux/UNIX Usage	Windows Usage
Standard instances	Small (default)	\$0.085 per hour	\$0.12 per hour
	Large	\$0.34 per hour	\$0.48 per hour
	Extra large	\$0.68 per hour	\$0.96 per hour
Micro instances	Micro	\$0.02 per hour	\$0.03 per hour
High-memory instances	Extra large	\$0.50 per hour	\$0.62 per hour
	Double extra large	\$1.00 per hour	\$1.24 per hour
	Quadruple extra large	\$2.00 per hour	\$2.48 per hour
Cluster compute instances	Quadruple extra large	\$1.60 per hour	Not available

Amazon S3

- Amazon S3 provides a simple Web services interface that can be used to store and retrieve any amount of data, at any time, from anywhere on the Web
- S3 provides the object-oriented storage service for users
- Users can access their objects through *Simple Object Access Protocol (SOAP)*
 - Supports both browsers and client programs which support SOAP
- SQS is responsible for ensuring a reliable message service between various processes, even if the receiver processes are not running

Amazon S3

- Amazon S3 execution environment



Amazon S3

- Fundamental operation unit of S3 → *object*
- Each object is stored in a *bucket* and retrieved via a unique, developer-assigned key
 - A bucket is the container of the object
 - Objects have other attributes such as values, metadata, and access control information
- S3 is essentially a key-value pair
 - Users can write, read, and delete objects containing from 1 byte to 5 gigabytes of data each
- Two types of Web service interfaces to access data stored in Amazon clouds
 - REST (Web 2.0)
 - SOAP

Amazon S3

- Key Features of S3:
 - Redundant through geographic dispersion
 - Designed to provide 99.999999999 percent durability and 99.99 percent availability of objects over a given year with cheaper reduced redundancy storage (RRS)
 - Authentication mechanisms to ensure that data is kept secure from unauthorized access
 - Objects can be made private or public, and rights can be granted to specific users
 - Per-object URLs and ACLs (access control lists)
 - Default download protocol of HTTP. A BitTorrent protocol interface is provided to lower costs for high-scale distribution
 - \$0.055 (more than 5,000 TB) to 0.15 per GB per month storage (depending on total amount)
 - First 1 GB per month input or output free and then \$.08 to \$.15 per GB for transfers outside an S3 region
 - There is no data transfer charge for data transferred between Amazon EC2 and Amazon S3

Amazon Elastic Block Store (EBS)

- Traditional EC2 instances will be destroyed after use
- Note that S3 is “Storage as a Service” with a messaging interface
- The *Elastic Block Store (EBS)* provides the volume block interface for saving and restoring the virtual images of EC2 instances onto S3
 - The status of EC2 can now be saved in the EBS system after the machine is shut down
 - Users can use EBS to save persistent data and mount to the running instances of EC2
 - EBS is analogous to a distributed file system accessed by traditional OS disk access mechanisms
 - EBS allows you to create storage volumes from 1 GB to 1 TB that can be mounted as EC2 instances

Amazon Elastic Block Store (EBS)

- Multiple volumes can be mounted to the same instance
- These storage volumes behave like raw, unformatted block devices, with user-supplied device names and a block device interface
- You can create a file system on top of Amazon EBS volumes, or use them in any other way you would use a block device (like a hard drive)
- Snapshots are provided so that the data can be saved incrementally
 - This can improve performance when saving and restoring data
- Pricing → similar pay-per-use schema as EC2 and S3
 - Volume storage charges are based on the amount of storage users allocate until it is released, and is priced at \$0.10 per GB/month
 - EBS also charges \$0.10 per 1 million I/O requests made to the storage (as of October 6, 2010)
- The equivalent of EBS has been offered in open source clouds such Nimbus

Questions

