

CSE 451: Operating Systems  
Spring 2013

Module 26  
Cloud Computing

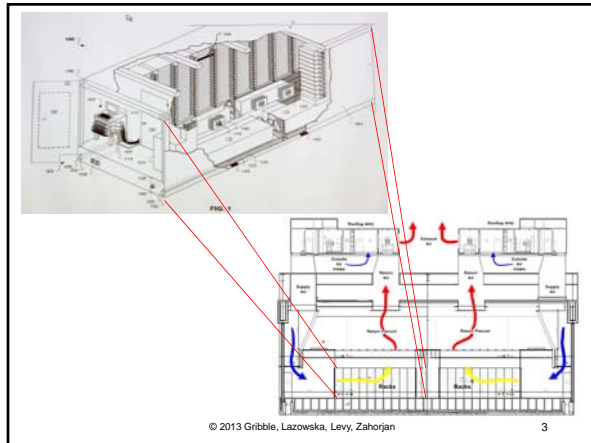
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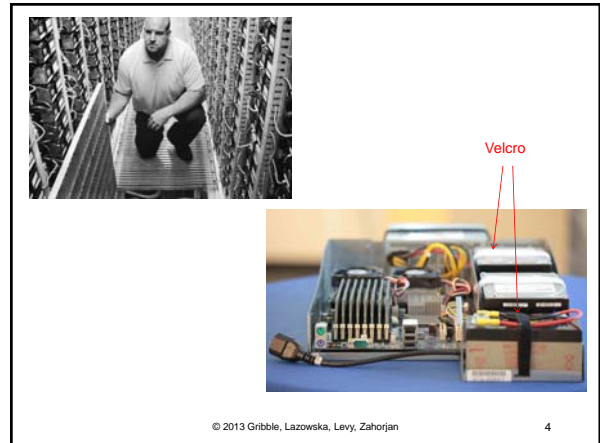
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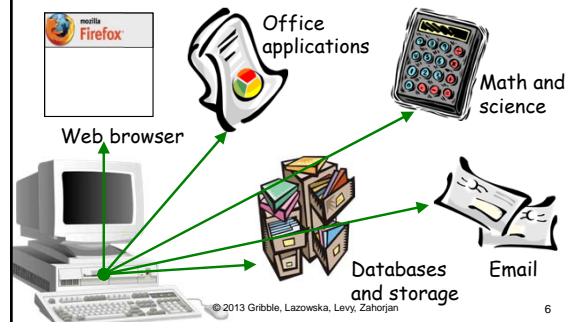
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- A datacenter has 50 - 250 containers
- A container has 1,000 - 2,000 servers
- A server has two processors, 2 disks, tons of memory, battery backup
- Processors are chosen for power efficiency, not performance

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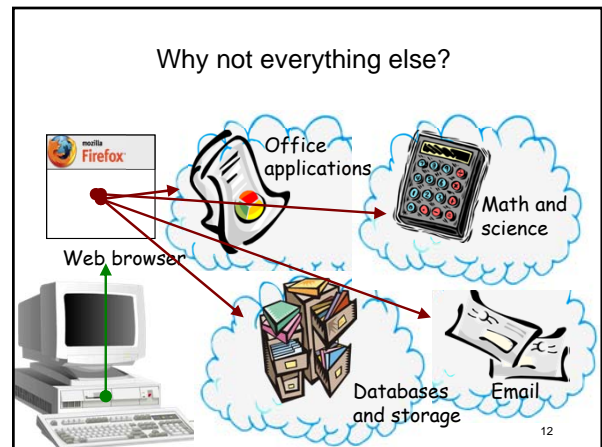
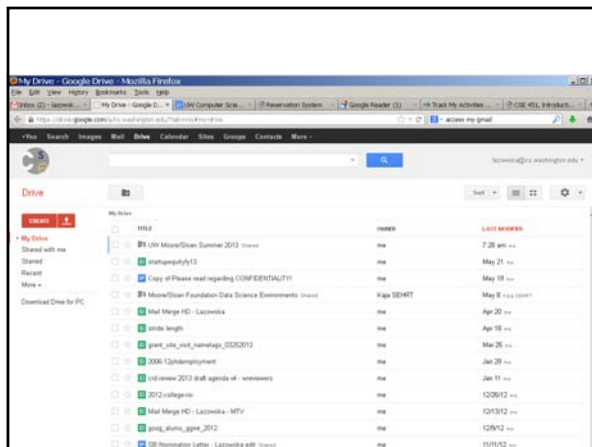
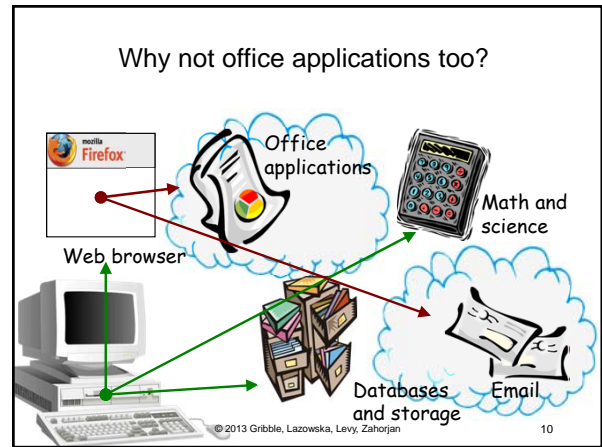
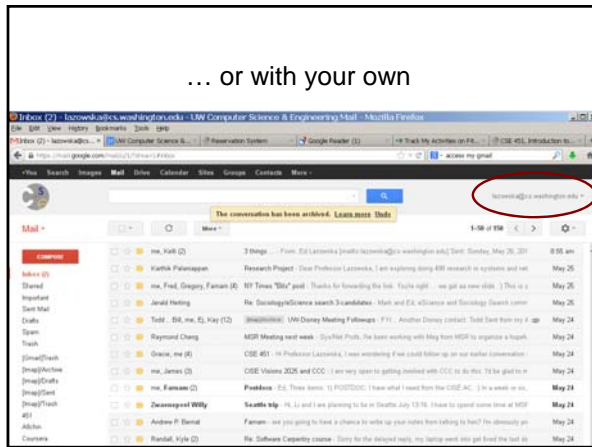
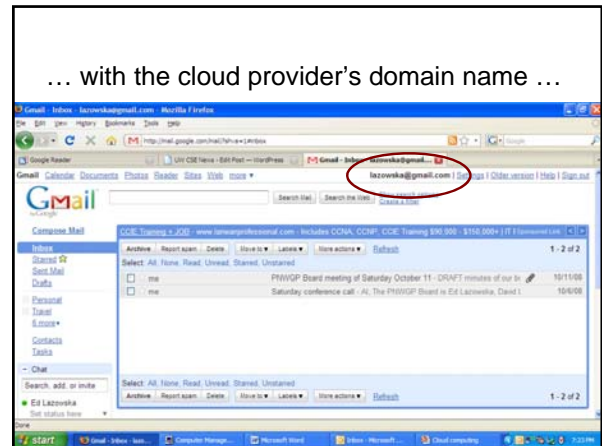
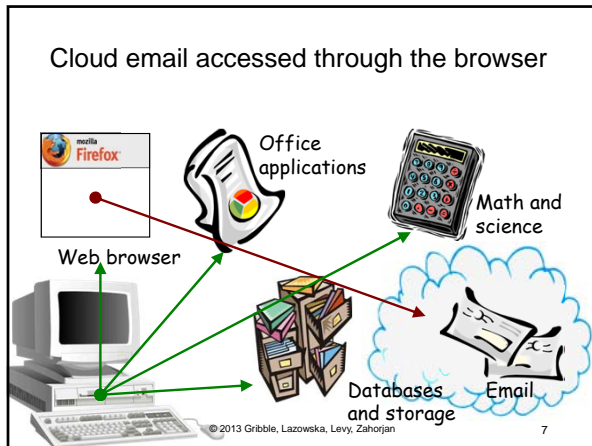
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Personal computing



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## Consider ...

- Sharing is easy
- Someone else does backup
- Someone else handles software updates
- There's 7x24x365 operations support, auxiliary power, redundant network connections, geographical diversity
- Scalability – both up and down – is instantaneous
- Many fewer demands on the local operating system and machine

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## Amazon Elastic Compute Cloud (EC2)

- \$0.24 per hour for
  - 2 cores of 2.4 GHz 64-bit 2007 Opteron
  - 15 GB memory
  - 1.7 TB scratch storage
- Need it 24x7 for a year?
  - \$1167
- \$0.06 per hour for
  - 1 core of 1.2 GHz 32-bit or 64-bit Intel or AMD
  - 1.7 GB memory
  - 160 GB scratch storage
- Need it 24x7 for a year?
  - \$292

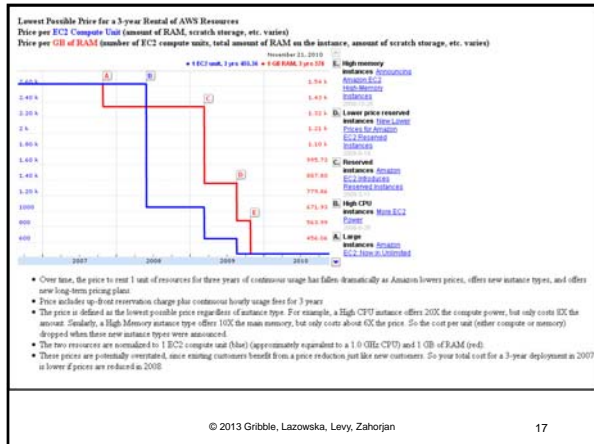
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- This includes
  - Purchase + replacement
  - Housing
  - Power
  - Operation
  - Reliability
  - Security
  - Instantaneous expansion and contraction
- 1000 processors for 1 day costs the same as 1 processor for 1000 days!

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## AWS Free Usage Tier (Per Month):

- Elastic Compute Cloud (EC2)**
  - 750 hours of Amazon EC2 Linux+ Micro Instance usage (613 MB of memory and 32-bit and 64-bit platform support) – enough hours to run continuously each month\*
  - 750 hours of Amazon EC2 Microsoft Windows Server+ Micro Instance usage (613 MB of memory and 32-bit and 64-bit platform support) – enough hours to run continuously each month\*
- Simple Workflow Service (SWF)**
  - 1,000 Amazon SWF workflow executions can be initiated for free. A total of 10,000 activity tasks, signals, timers and markers, and 30,000 workflow-days can also be used for free.\*\*
- Simple Queue Service (SQS) and Simple Notification Service (SNS)**
  - 1,000,000 Requests of Amazon Simple Queue Service\*\*
  - 1,000,000 Requests, 100,000 HTTP notifications and 1,000 email notifications for Amazon Simple Notification Service\*\*
- Amazon Elastic Transcoder**
  - 30 minutes of EC transcoding at 10 minutes of HD transcoding\*\*
- Simple Storage Service (S3)**
  - 5 GB of Amazon S3 standard storage, 20,000 Get Requests, and 2,000 Put Requests\*\*
- DynamoDB**
  - 100 MB of storage, 5 units of write capacity, and 10 units of read capacity for Amazon DynamoDB.\*\*
- Relational Database Service (RDS)**
  - 750 hours of Amazon RDS Single-AZ Micro DB Instances, for running MySQL, Oracle RDBMS, or SQL Server (running SQL Server Express Edition) – enough hours to run a DB instance continuously each month\*\*
  - 20 GB of database storage
  - 10 million I/Os
  - 20 GB of backup storage for your automated database backups and any user-initiated DB Snapshots
- CloudWatch**
  - 10 Amazon CloudWatch metrics, 10 alarms, and 1,000,000 API requests\*\*
- Data Transfer**
  - 15 GB of bandwidth out aggregated across all AWS services\*\*
- Data Pipeline**
  - 3 low frequency precondition running on AWS per month\*
  - 5 low frequency activities running on AWS per month\*
- ElastiCache**
  - 750 hours of Amazon ElastiCache - enough hours to run a Cache Node continuously each month\*\*

### Animoto: EC2 Instance Usage

