

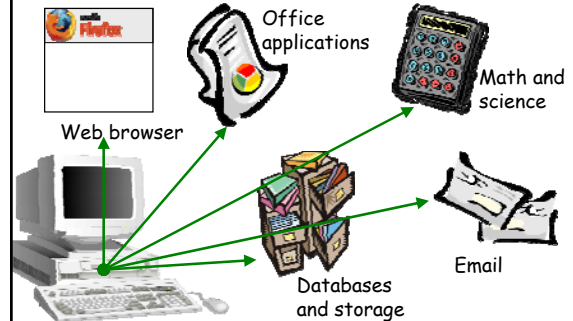
## Cloud Computing

Ed Lazowska

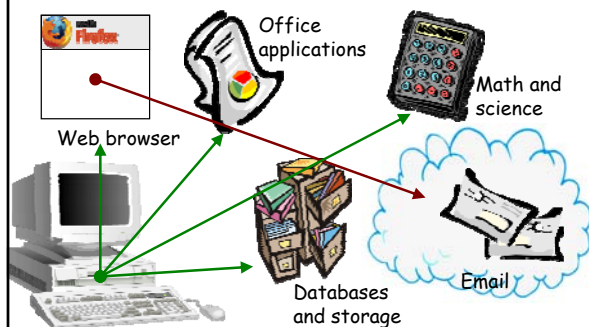
Bill & Melinda Gates Chair in  
Computer Science & Engineering  
University of Washington



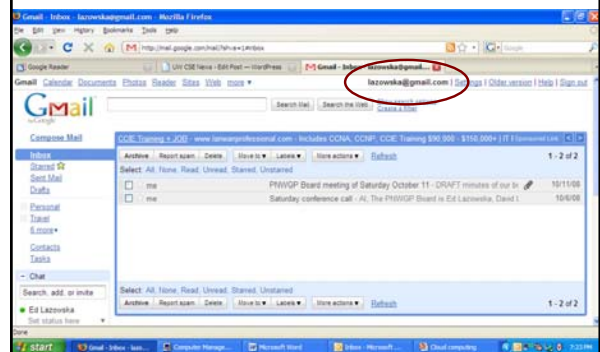
## Personal computing



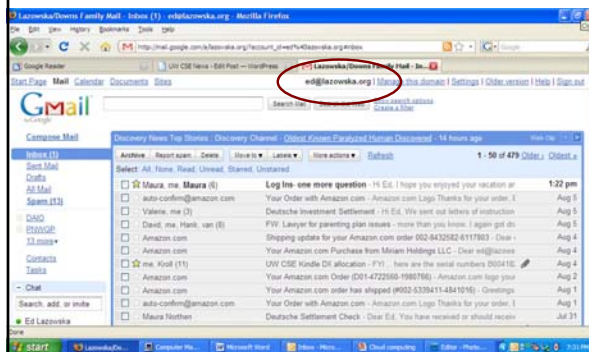
## Cloud email accessed through the browser



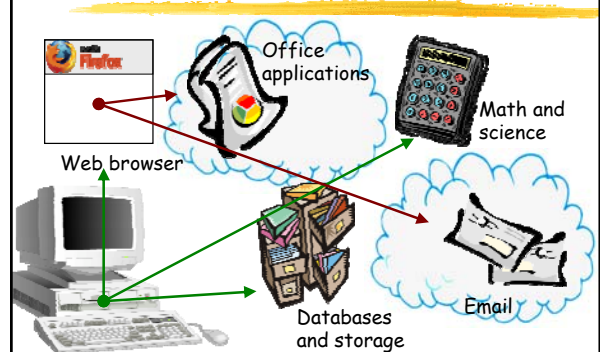
## ... with the cloud provider's domain name ...

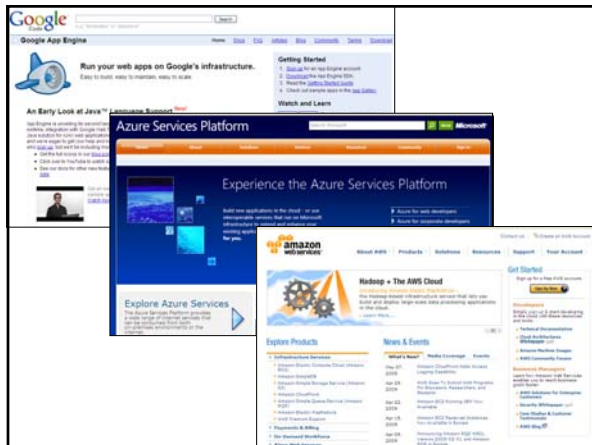
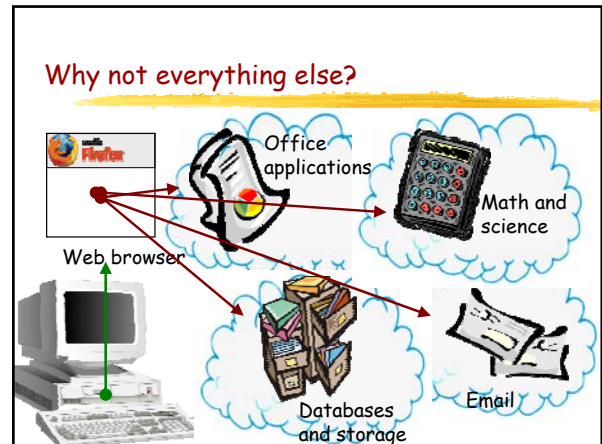
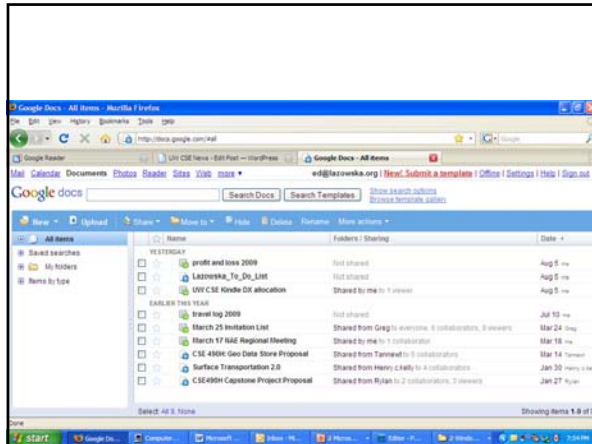


## ... or with your own



## Why not office applications too?





### 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

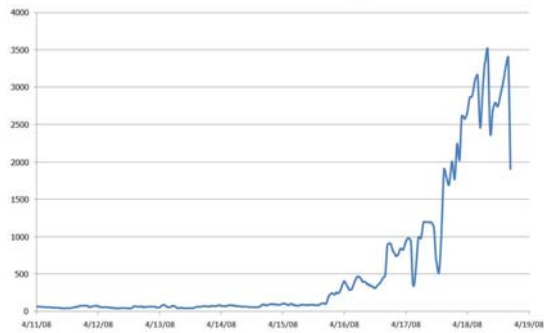
### Amazon Elastic Compute Cloud (EC2)

- \$0.80 per hour for
  - 8 cores of 3 GHz 64-bit Intel or AMD
  - 7 GB memory
  - 1.69 TB scratch storage
- Need it 24x7 for a year?
  - \$4800
- \$0.10 per hour for
  - 1 core of 1.2 GHz 32-bit Intel or AMD (1/20<sup>th</sup> the above)
  - 1.7 GB memory
  - 160 GB scratch storage
- Need it 24x7 for a year?
  - \$590

### This includes

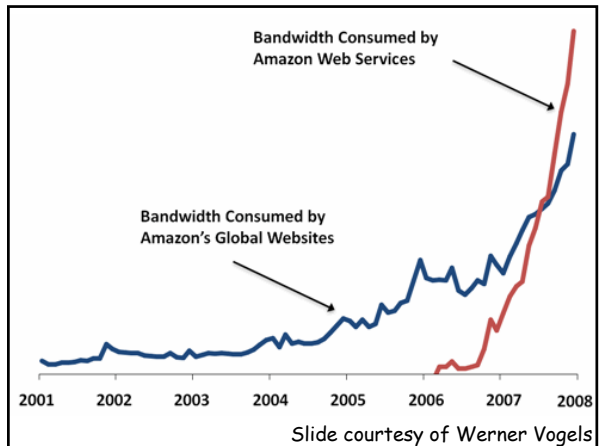
- Purchase + replacement
- Housing
- Power
- Operation
- Reliability
- Security
- Instantaneous expansion and contraction

### Animoto: EC2 Instance Usage



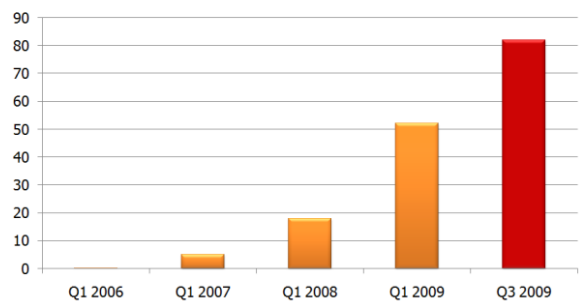
Slide courtesy of Werner Vogels

### Bandwidth Consumed by Amazon Web Services



Slide courtesy of Werner Vogels

### 82 Billion Objects in Amazon S3



Slide courtesy of Werner Vogels

