



CLOUD COMPUTING CONCEPTS

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INTRODUCTION TO CLOUDS

Lecture D

WHAT'S NEW IN
TODAY'S CLOUDS

FOUR FEATURES NEW IN TODAY'S CLOUDS

I. Massive scale.

I. On-demand access: Pay-as-you-go, no upfront commitment.

- Anyone can access it

II. Data-intensive Nature: What was MBs has now become TBs, PBs and XBs.

- Daily logs, forensics, Web data, etc.
- Humans have data numbness: Wikipedia (large) compress is only about 10 GB!

III. New Cloud Programming Paradigms: MapReduce/Hadoop, NoSQL/Cassandra/MongoDB and many others.

- High in accessibility and ease of programmability
- Lots of open-source

Combination of one or more of these gives rise to novel and unsolved distributed computing problems in cloud computing.



I. MASSIVE SCALE

- Facebook [GigaOm, 2012]
 - 30K in 2009 -> 60K in 2010 -> 180K in 2012
- Microsoft [NYTimes, 2008]
 - 150K machines
 - Growth rate of 10K per month
 - 80K total running Bing
- Yahoo! [2009]:
 - 100K
 - Split into clusters of 4000
- AWS EC2 [Randy Bias, 2009]
 - 40,000 machines
 - 8 cores/machine
- eBay [2012]: 50K machines
- HP [2012]: 380K in 180 DCs
- Google: A lot

WHAT DOES A DATACENTER LOOK LIKE FROM INSIDE?

- A virtual walk through a datacenter
- Additional reference:
<http://gigaom.com/cleantech/a-rare-look-inside-facebooks-oregon-data-center-photos-video/>



SERVERS



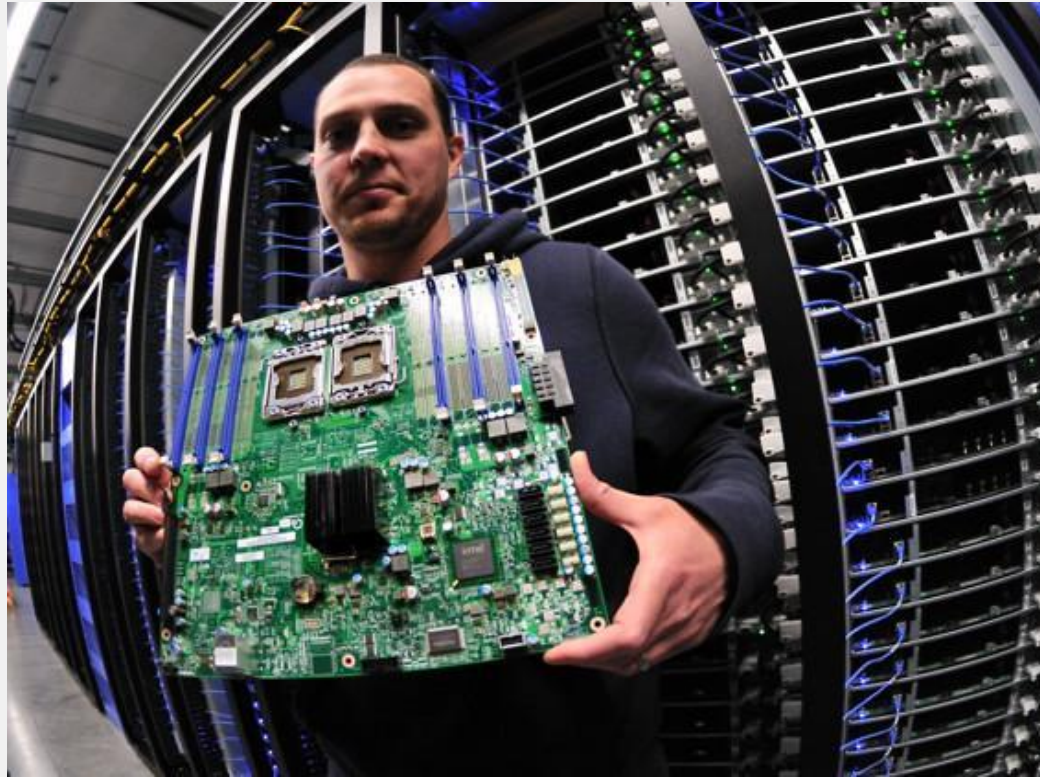
Front

SERVERS



Back

SERVERS



Inside

SERVERS



Some highly secure
(e.g., financial info)

POWER



- $WUE = \text{Annual Water Usage} / \text{IT Equipment Energy (L/kWh)}$
(low is good)
- $PUE = \text{Total Facility Power} / \text{IT Equipment Power}$
(low is good - e.g., Google = 1.11)

Off-site

On-site

COOLING

- Air sucked in
- Combined with purified water
- Moves cool air through system



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EXTRA - FUN VIDEOS TO WATCH

- Microsoft GFS Datacenter Tour (Youtube)
 - <http://www.youtube.com/watch?v=hOxAll1pQIw>
- Timelapse of a Datacenter Construction on the Inside (Fortune 500 company)
 - <http://www.youtube.com/watch?v=ujO-xNvXj3g>