

# Introduction to Cloud Computing

## Cloud Computing II (Qloud)

15-319, spring 2010

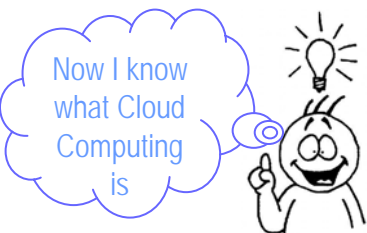
3<sup>rd</sup> Lecture, Jan 19<sup>th</sup>

**Majd F. Sakr**

# Lecture Motivation...

- Introduction to a Data center
- Understand the Cloud hardware in CMUQ (Qcloud)
- A quick look at the software components in the Qcloud
- System configuration and Demo (Suhail)
- If there is enough time we can take a look at our Data Center

# Do you ...?



End of week two

Time

# The Data Center

# What is a Data Center?

- As an organization's IT needs to grow, the total cost of ownership (TCO) of its IT resources grows
- Resource management, power, cooling scaling, fault-tolerance, space (real estate) becomes an issue
- Solution? Consolidate your IT resources into a **data center!**

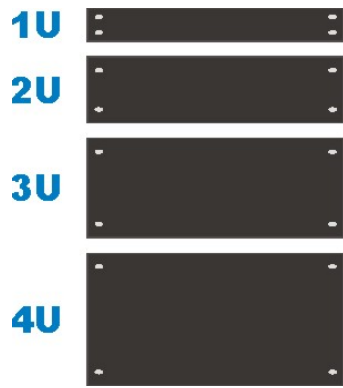


# Data Center Goals

- **Minimize floor space, maximize resource density**
- **Keep the equipment in a safe and controlled environment**
- **Resources must be easy to access physically and manage, components must be individually replaceable without disrupting normal operations**
- **Optimize operational costs**

# Physical Layout

- Equipment is placed in **racks**
- Equipment is designed in a modular fashion to fit into **rack units** (1U, 2U etc)
- Servers, blade enclosures, networking and power equipment etc can be loaded into these racks



1U Server



7U Blade center

# Data Center components

- **Air conditioning**
  - Keep all components in the manufacturer's recommended temperature range
- **Redundant Power**
  - UPS/Generators
  - Multiple power feeds
- **Fire protection**
- **Physical security**
  - CCTV/Access Control
- **Connectivity**
  - Multiple ISPs/Leased Lines
- **Monitoring Systems**



# A Quick Introduction to Servers and Blades

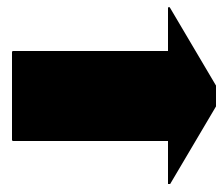
# Servers

- Computers that provide “services” to “clients”.
- Typically more powerful and have more resources than desktop computers.
- Organizations requiring more and more physical servers to provide various services (Web, Email, Database, etc.)
- Server hardware is becoming more compact.



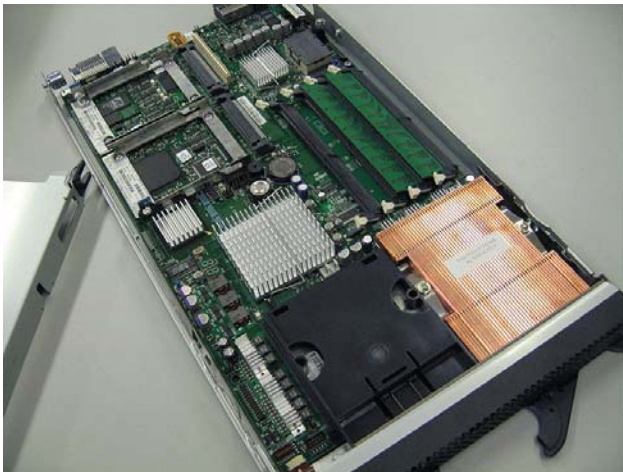
# Servers for Datacenters

- For large-scale installations, server hardware is getting more compact to help with manageability, scalability, and power and cooling
- Organizations would like to conserve the amount of floor space dedicated to their data centers.



# Blades and Blade Enclosures

- A blade server is a stripped down server computer with a modular design
- A blade enclosure holds multiple blade servers and provides power, interfaces and cooling for the individual blade servers.
- A single rack can hold up to 42 1U servers



# The Qloud

# Our Qloud Hardware

- **IBM Bladecenter H**

- Advanced Management Module
- Two Nortel Gigabit Switches
- 112 cores
- 7TB of storage

- **14 Blades, each having:**

- Two quad-core Intel Xeon(R) CPU (8 Cores)
- 8GB RAM
- Two 300GB SAS disks



# Hardware Overview

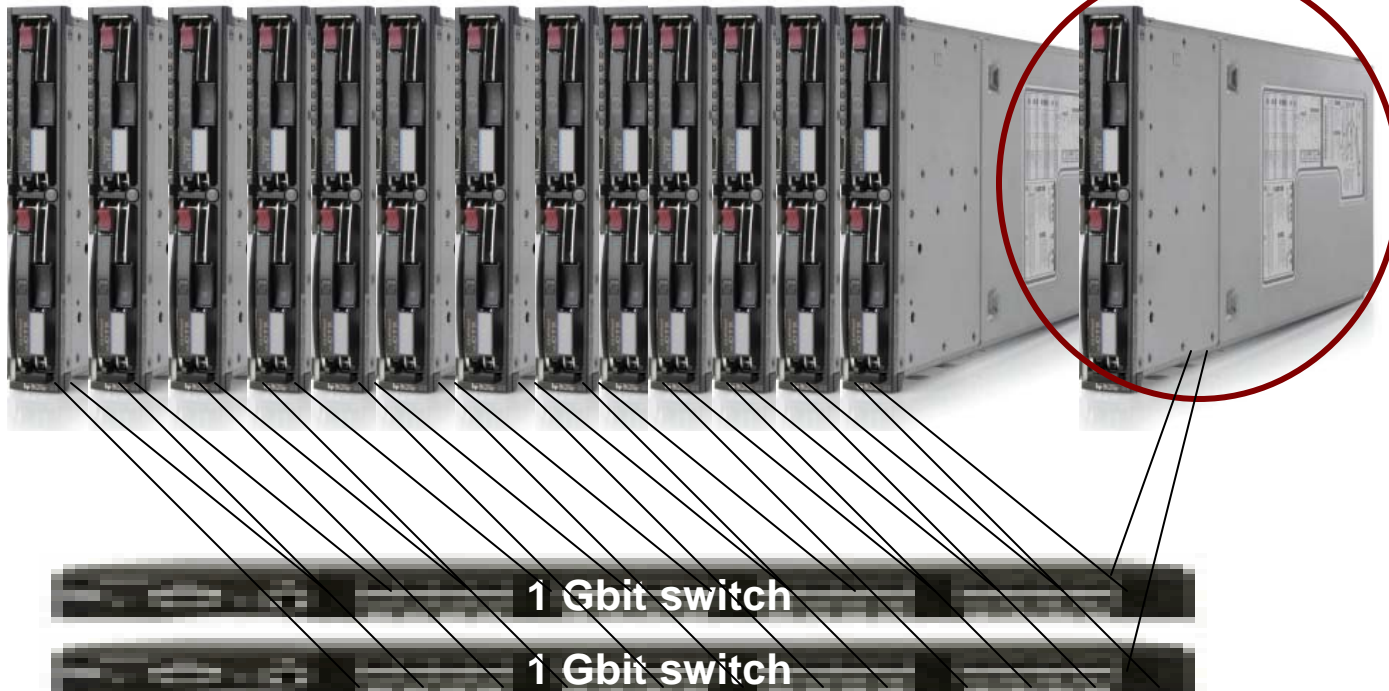
## ■ Qloud Blades

- Network: 2 (1Gbit switches)
- Each blade is connected to each of the switches



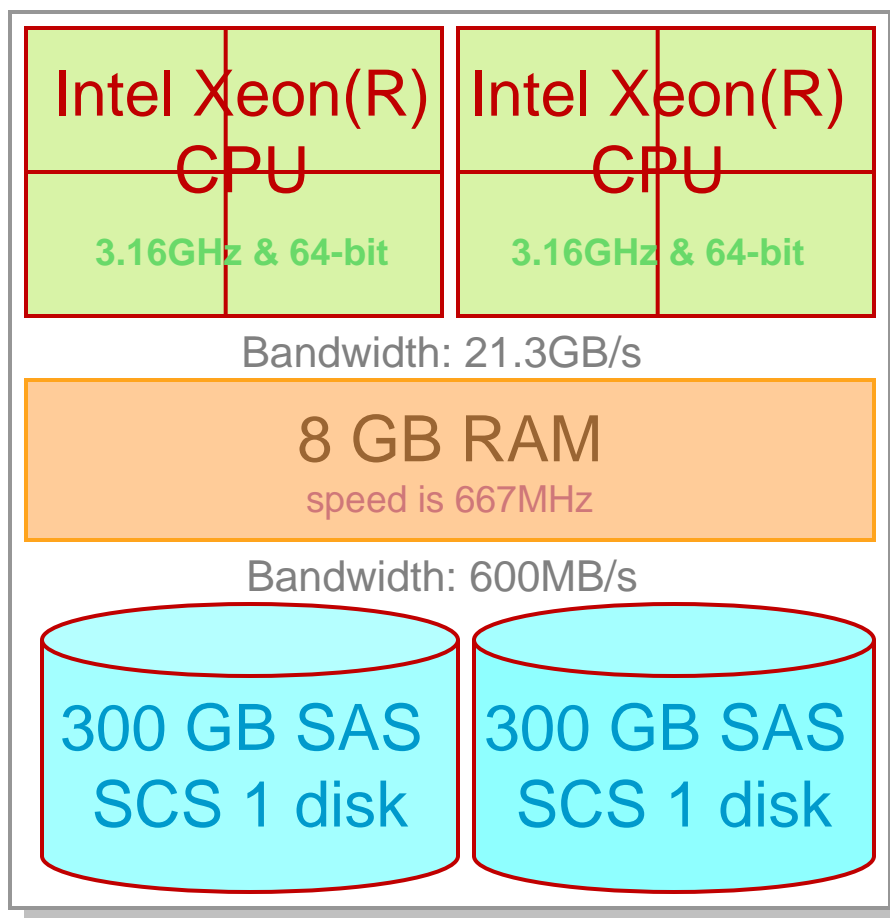
13 VM hosts

Blade #14 (Control)



# Hardware Overview

- Each Blade



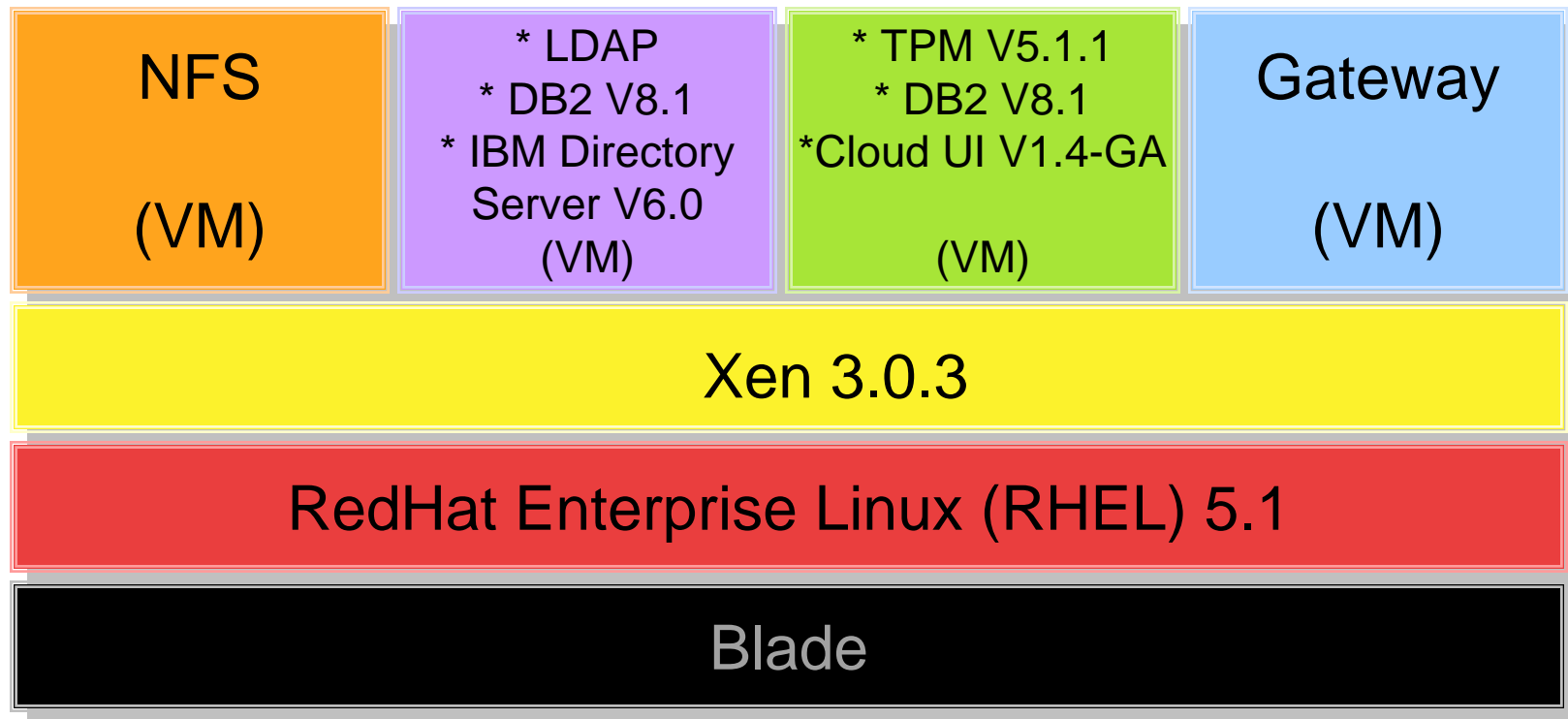


# Cloud Software Stack

- **IBM Cloud Software V1.4**
  - **Tivoli Provisioning Manager (TPM) V5.1.1**
    - Manages software installation of VMs
    - System provisioning
  - **Cloud UI V1.4-GA**
    - Web interface to TPM
  - **IBM Directory Server V6.0**
    - User management and LDAP
  - **DB2 V8.1**
    - Storage for TPM, Cloud UI and Directory Services
  - **RedHat Enterprise Linux (RHEL) 5.1**
    - Primary OS
  - **Xen 3.0.3**
    - VM Hypervisor

# Software Stack Overview

## ■ The Control Blade



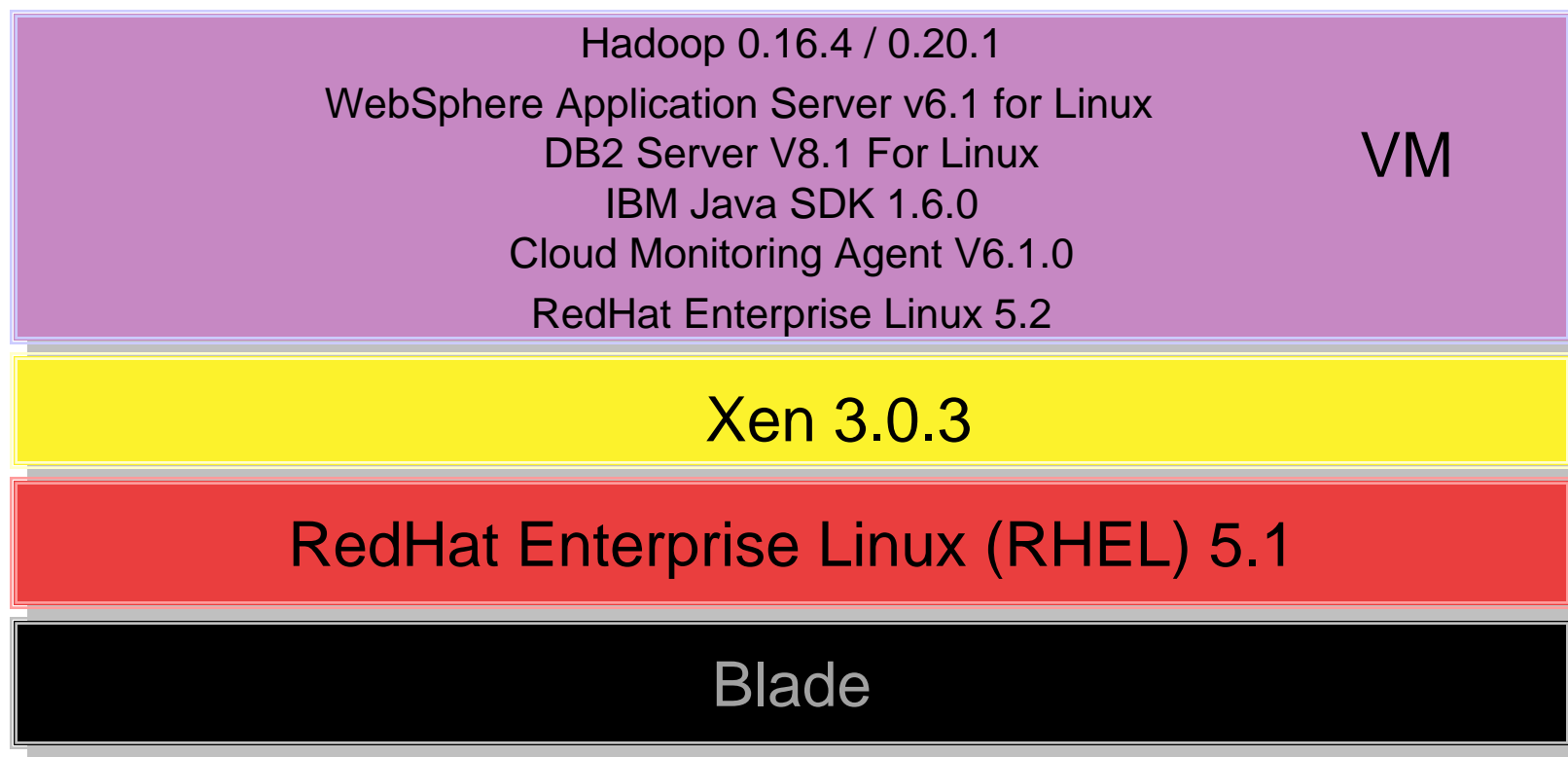
# Endpoint Software Stack

- **RedHat Enterprise Linux 5.2**
  - OS
- **Hadoop 0.16.4 / 0.20.1**
  - Distributed Environment
- **IBM Java SDK 1.6.0**
  - Programming API
- **Cloud Monitoring Agent V6.1.0**
  - To report status of VMs to TPM
- **WebSphere Application Server v6.1, Linux**
  - For developing SaaS applications
- **DB2 Server V8.1 For Linux**
  - Database server for SaaS applications

} Not necessary in this Course

# Software Stack Overview

- The 13 VM hosts



# Time for a Demo