



Architectural Design Challenges

COURSE: 23CAE717 - Cloud Computing

UNIT III : Cloud Infrastructure

CLASS : II Semester / I MCA



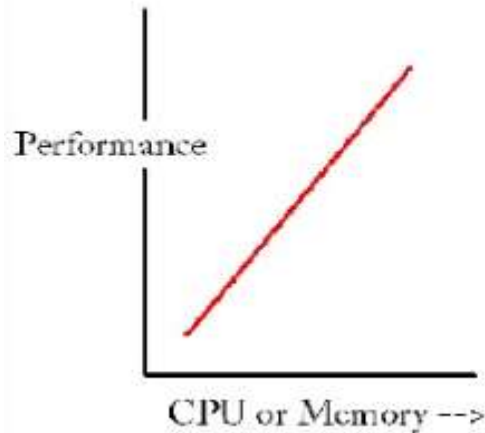
- ❑ Common challenges
 - ❑ Massive auto scaling
 - ❑ High performance, because of Heavy load variations
 - ❑ Fault recovery
 - ❑ Data portability
 - ❑ Pay as you go





❑ Common challenges

Massive auto scaling



- Elastic design
- Parallelization of tasks
- In-memory execution
- Caching



□ Common challenges

Data portability





Service Availability and Data Lock-in Problem Cost

Data Privacy and Security Concerns



Unpredictable Performance and Bottlenecks



Distributed Storage and Wide- spread Software Bugs

Cloud Scalability, Interoperability, and Standardization



Software Licensing and Reputation Sharing



- ❑ Service Availability and Data Lock-in Problem Cost
 - using multiple cloud providers may provide more protection from failures
 - availability obstacle is distributed denial of service (DDoS) attacks.
 - standardize the APIs so that a SaaS developer can deploy services and data across multiple cloud providers



❑ Data Privacy and Security Concerns

- Cyber laws for SaaS providers to keep customer data and copyrighted material within national boundaries
- Traditional attacks: buffer overflows, DoS attacks, spyware, malware, rootkits, Trojan horses and worms.
- hypervisor malware, guest hopping and hijacking, or VM rootkits



❑ Data Privacy and Security Concerns

- man-in-the-middle attack for VM migrations
- Passive attacks steal sensitive data or passwords.
- Active attacks may manipulate kernel data structures which will cause major damage to cloud servers



- ❑ Unpredictable Performance and Bottlenecks
 - Improve I/O architecture and OS to efficiently virtualize interrupts and I/O channels.
 - data transfer bottlenecks must be removed, bottleneck links must be widened, and weak servers should be removed

- ❑ Distributed Storage and Widespread Software Bugs
 - efficient distributed SAN
 - Data center to meet scalability, data durability, and HA





- ❑ Cloud Scalability, Interoperability, and Standardization
 - Automatic scaling to load increases and decreases
 - Open Virtualization Format (OVF) describes an open, secure, portable, efficient, and extensible format for packaging and distributing of VMs & format for software to be deployed in VM

- ❑ Software Licensing and Reputation Sharing
 - Open source
 - create reputation-guarding services
 - Legal liability





Cloud application (SaaS)	Concur, RightNOW, Teleo, Kenexa, Webex, Blackbaud, salesforce.com, Netsuite, Kenexa, etc.		
Cloud software environment (PaaS)	Force.com, App Engine, Facebook, MS Azure, NetSuite, IBM BlueCloud, SGI Cyclone, eBay		
Cloud software infrastructure	Amazon AWS, OpSource Cloud, IBM Ensembles, Rackspace cloud, Windows Azure, HP, Banknorth		
Computational resources (IaaS)	Storage (DaaS)	Communications (CaaS)	
Collocation cloud services (LaaS)	Savvis, Internap, NTTCommunications, Digital Realty Trust, 365 Main		
Network cloud services (NaaS)	Owest, AT&T, AboveNet		
Hardware/Virtualization cloud services (HaaS)	VMware, Intel, IBM, XenEnterprise		

In addition to IaaS, PaaS, SaaS,

- Hardware as a Service (HaaS)
- Network as a Service (NaaS) - Virtual LAN
- Location as a Service (LaaS)





Cloud Service Tasks and Trends

- SaaS applications - CRM,
- PaaS is provided by Google, Salesforce.com, Facebook etc.
- IaaS is provided by Amazon, Windows Azure, RackRack etc.
- NaaS is provided by AT&T, Qwest, AboveNet., etc.

Software Stack for Cloud Computing

Table 4.7 Cloud Differences in Perspectives of Providers, Vendors, and Users

Cloud Players	IaaS	PaaS	SaaS
IT administrators/cloud providers	Monitor SLAs	Monitor SLAs and enable service platforms	Monitor SLAs and deploy software
Software developers (vendors)	To deploy and store data	Enabling platforms via configurators and APIs	Develop and deploy software
End users or business users	To deploy and store data	To develop and test web software	Use business software



Runtime Support Services

- ❑ **Cluster monitoring** is used to collect the runtime status of the entire cluster
- ❑ **The scheduler** queues the tasks submitted to the whole cluster and assigns the tasks to the processing nodes according to node availability
- ❑ **Distributed scheduler** for the cloud application has special characteristics that can support cloud applications, such as scheduling the programs written in MapReduce style
- ❑ **Runtime support system** keeps the cloud cluster working properly with high efficiency.



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- ❑ Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, TMH, 2009.
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