Summer 2012 - Cloud Computing Course Topics

1. Cloud Computing Overview

- Cloud Computing definition and characteristics (elasticity, multi-tenant, on-demand, ubiquitous access, usage metering, self-service, sla-monitoring, etc.)
- Cloud Computing and SOA
- Enterprise Cloud drivers and adoption trends
- Typical Cloud Enterprise workloads
- Cloud service models/types (public, private, hybrid, and community clouds)
- Cloud deployment models (IaaS, PaaS, SaaS, BPaas)
- Cloud ROI models
- Cloud reference architectures
- Cloud standards (OSDIAPIs, etc.)
- Technology providers vs. Cloud providers vs. Cloud vendors
- Planning Cloud transformations (suitability assessment, future state definition, financial assessment and platform selection, roadmap definition)

2. Infrastructure as a Service (IaaS)

- Evolution of infrastructure migration approaches (virtualization-VMWare/Xen/KVM virtualization, adaptive virtualization, Cloud Computing and on-demand resource provisioning)
- Cloud Infrastructure services (storage, compute, services management, cloud brokers, etc.)
- IaaS vendor solutions: Amazon EC2, HP, Microsoft, Savvis, Terremark, Right Scale, Rackspace cloud, IBM, Oracle, Verizon
- IaaS mainstream offerings (assessment offerings, design offerings, build offerings, integrated operations and management offerings, governance offerings)
- IaaS project: Ongoing programming project (Part I) – Configuration and programming on a combination of public/private provider platforms (e.g., Amazon EC2/Amazon AWS, IBM SmartCloud Enterprise, Windows Azure, Oracle Public Cloud, etc.) to support the overall course project application.

3. Platform as a Service (PaaS)

- Evolution of computing paradigms and related components (distributed computing, utility computing, Cloud computing, grid computing, etc.)
  e.g., Spring vs. VMWare vFabric, gemstone vs. VMWare Gemfire, WMWare Hyperic/TC Server/RabbitMQ
- Cloud platform services (monitoring and management, application servers, messaging, data management, development and testing, integration, business intelligence, etc.)
- PaaS vendor solutions: EMC, Google App Engine, HP, IBM, Microsoft Azure, Rackspace, Savvis, Verizon, force.com, VMware vFabric, OpenStack, Eucalyptus, Storage-as-a-Service platforms (Google Storage, ObjectStore S3, Amazon Dynamo, etc.)

- PaaS mainstream offerings: build/extend/migrate/manage Enterprise applications on top of Microsoft Azure, plan/develop/manage Enterprise applications using AWS transformation services
- PaaS project: Ongoing programming project (Part II – Builds on Part I) – Leverage various PaaS vendor platform capabilities to configure and extent pre-packaged software platforms for the course project application.

4. Software as a Service (SaaS)

- Overview of the Cloud application development lifecycle
- SaaS platform services (application development, application migration, SaaS implementation, business intelligence - Cloud-based/big data/real time analytics)
- SaaS vendor horizontal solutions: ADP, Cisco, SalesForce.com, Microsoft Online Services, SAP, Oracle OnDemand, Tibco, Cordys, Google, Zoho, Taleo, NetSuite, SuccessFactors, Eloqua, Workday
- SaaS vendor vertical solutions: SmartStream, Callidus Software, TriZetto, Fineos, Misys, Merced System, Inc.
- SaaS mainstream offerings: SaaS Enablement (ISV & product-based), vendor-based SaaS offerings (SFDC, Cordys, Oracle), SaaS solution development, SaaS migration, Cloud application usage optimization
- SaaS project: Ongoing programming project (Part III – Builds on Part II) – Leverage various SaaS frameworks to configure / create / extend SaaS components for the course project application).

5. Business Process as a Service (BPaaS)

- Overview of BPM on the Cloud (i.e., BPaaS vs. managed business services and BPO) and BpaaS sample solutions (e.g., accounts payable, media planning, order management, clinical data management, MRO process, sentiment analysis, production management)
- BPaaS platform services (process modeler, rules engine, process portal, BAM reporting, process administration, process integration, process collaboration, PaaS management, Cloud manager, process workbench, collaboration tools, application builder, etc.)
- BPaaS vendor solutions: IBM, Dell
- BPaaS mainstream offerings: business and technical services design and development
- BPaaS project: Ongoing programming project (Part IV – Builds on Part III) - Leverage BPaaS frameworks to configure / create / extend BPaaS components for the course project application.

6. Cloud Security

- Cloud security challenges
- Cloud security approaches: encryption, tokenization/obfuscation, cloud security alliance standards, cloud security models and related patterns
- Cloud security in mainstream vendor solutions
- Mainstream Cloud security offerings: security assessment, secure Cloud architecture design

- Cloud security project: Ongoing programming project (Part V – Builds on Part IV) - Design a secure Cloud architecture to support the deployment of a secure version of the course project application.

7&8. Enterprise Cloud-Based High Performance Computing (HPC) Applications

- Overview of High Performance Computing (HPC) on Cloud
- Enterprises HPC applications (high-performance grid computing, high-performance big data computing/analytics, high performance reasoning)
- HPC Cloud vendor solutions: compute grids (Windows HPC, Hadoop, Platform Symphony, Gridgain), data grids (Oracle coherence, IBM Object grid, Cassendra, Hbase, Memcached, HPC hardware (GPGPU, SSD, Infiniband, Non blocking switches)
- HPC on Cloud mainstream offerings: reengineering of HPC applications to leverage HPC on Cloud, Hadoop performance tuning, etc.
- HPC projects 6 & 7: Ongoing programming projects (Part VI and VII – Build on Part V) – Design and develop high-performance application components for the course project application.

References:

Cloud industry publications, online textbooks, and research papers on various topics connected to the various sessions.