CLOUD COMPUTING-CSC3210

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About the Course unit

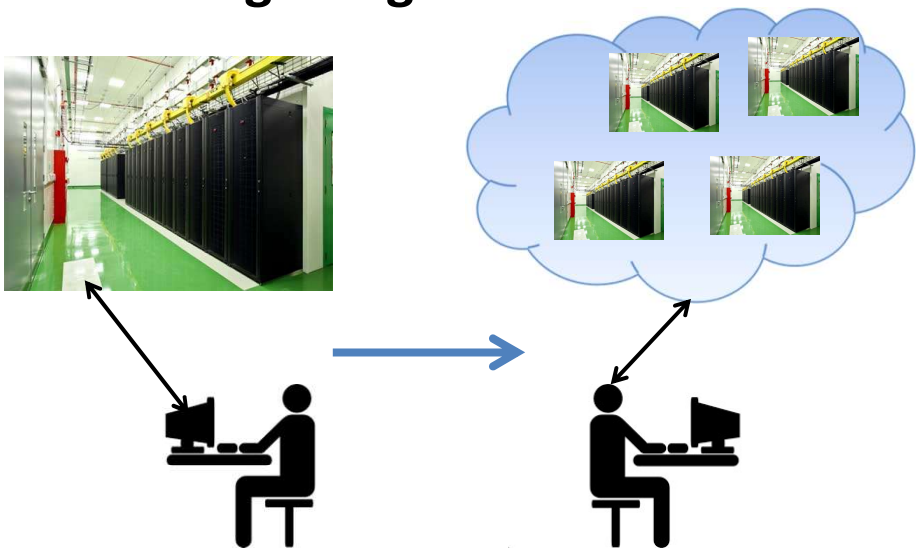
Contact Hours / Assessment

- Contact Hours= 60 Hours
- Course work / Continuous Assessment=30%
- Final Examination=70%

Primary Texts/ Resources

1) Cloud computing : principles and paradigms (2011), Rajkumar Buyya, James Broberg, Andrzej Goscinski (Eds).
2) Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online (2009) Book by Michael Miller
3) Cloud Computing Concepts, Technology and Architecture (2013) Book by Ricardo Puttini, Thomas Erl, and Zaigham Mahmood

Migrating to the Cloud



Migrating to the Cloud

✓ **Migrating to the Cloud (i.e cloud-based data centers)**

- ❑Cloud Computing worst practices
- ❑Choosing the right cloud service model
- ❑The process of migration (i.e steps)
- ❑Why companies are still hanging onto their data centers

Migrating to the Cloud

❑Cloud Computing worst practices

When it comes to implementing new and transformational technologies, there are many causes of failure:-

- ***Failing to fully understand*** or embrace new technologies.
- ***Rushing into development*** mode and forgo the necessary architecture and design steps.
- Having ***unrealistic expectations***
  - ✓too-aggressive due dates
  - ✓too large of a scope
  - ✓not the right people.

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❑ Cloud Computing worst practices

- ***Why companies moving to the cloud might fail***

i. Migrating Applications to the Cloud
ii. Misguided Expectations
iii. Misinformed about Cloud Security
iv. Selecting a Favorite Vendor, Not an Appropriate Vendor
v. Outages and Out-of-Business Scenarios
vi. Underestimating the Impacts of Organizational Change
vii. Skills Shortage
viii. Misunderstanding Customer Requirements
ix. Unexpected Costs

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❑ **Cloud Computing worst practices**

- ***Why companies moving to the cloud might fail***

➢ **Migrating Applications to the Cloud**

- Migrating tightly coupled legacy applications into a loosely coupled cloud computing environment not a simple task
  - ➢ ***Understand if an application is a good candidate for migrating to the cloud or if hosting or a rewrite is a better option***

➢ **Misguided Expectations**

- Taking on cloud computing initiatives with inflated expectations because of success stories
- ***Set realistic expectations, and Understand the pros and cons of each cloud service model first***

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❑ **Cloud Computing worst practices**

- ***Why companies moving to the cloud might fail***

➢ **Misinformed about Cloud Security**

- Cloud computing is not catastrophically insecure. Neither is security fully taken care of for them by the cloud vendors
- ***Start by making sure the architects, the product team, and the security professionals have a broad understanding of cloud security, regulatory controls, and auditing requirements***

➢ **Selecting a Favorite Vendor, Not an Appropriate Vendor**

- Not thoroughly evaluating the cloud vendors and simply selecting vendors that one is familiar with
- ***Understand the differences between the three cloud service models and Know what business cases are best suited for each***

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❑ **Cloud Computing worst practices**

- ***Why companies moving to the cloud might fail***

➢ **Outages and Out-of-Business Scenarios**

- There should be an expectation that everything can and will fail
- ***When choosing a cloud service model and cloud service providers, understand the risks and points of failure and design for failure***

➢ **Underestimating the Impacts of Organizational Change**

- The impacts of organizational change should not be underestimated (*i.e Business processes, accounting principles, human resource incentive programs, and legal processes*).
- ***Start with smaller, lower-risk initiatives. If the projects are risky and large in size, do not underestimate the impacts of organizational change.***

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❑ **Cloud Computing worst practices**

- ***Why companies moving to the cloud might fail***

➢ **Skills Shortage**

- Enterprises often don't have the required expertise to build cloud-based solutions
- ***Evaluate the current staff and identify skill gaps based on the project requirements***

➢ **Misunderstanding Customer Requirements**

- Neglecting the business side of the equation and building the cloud solution that is best for IT
- ***Understand the business requirements and customer expectations of cloud computing before selecting cloud service models and cloud types***

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❑ **Cloud Computing worst practices**

- ***Why companies moving to the cloud might fail***

➢ **Unexpected Costs**

- Unconditional belief in the promise of cloud computing to greatly reduce the cost of IT infrastructure.
- Each cloud service model brings a unique set of challenges for controlling costs.
- ***Understand the costs of each cloud service model and establish the appropriate levels of governance and software controls to optimize and monitor costs.***

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❑**Choosing the right cloud service model**

- One misperception about cloud computing is that one cloud service model fits all.
- Endeavor to understand the pros and cons of each cloud service model before implementing solutions on either of them.

"It takes less time to do things right than to explain why you did it wrong".—Henry Wadsworth Longfellow, poet

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❑Choosing the right cloud service model

❖ **Consider the feasibility of each service model based on following five categories:**

1.*Technical* (i.e performance, scalability, security, regulation, business continuity, disaster recovery)

2. ***Financial*** (i.e focus on total cost of ownership)

3. *Strategic* (i.e i.e based on how important is speed-to-market?)

4. *Organization* (have the skills to build solutions in the cloud?)

5. ***Risk*** (i.e How much risk is a company willing to assume? How long can the solution be down? How damaging is a security breach? Can the government seize the data in the cloud with a warrant?)

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❑ Choosing the right cloud service model

- **When to Use SaaS?**

✓ Software as a Service is the most mature of the three cloud

✓ SaaS providers have total control over the infrastructure, performance, security, scalability, privacy, and much more.

✓ ***A company should use SaaS to outsource all applications, features, and services that are not a core competency, assuming it meets its needs and is affordable.*** *(Example: writing HR, payroll, customer relationship management (CRM), accounting software)*

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- **Choosing the right cloud service model**
  - **When to Use SaaS?**
  - **SaaS solution Categories**

i. Enterprise business applications like CRM, enterprise resource planning (ERP), accounting, human resources, and payroll.
ii. Those that deal with security, monitoring, logging, testing, and so on.
iii. The data category that includes business intelligence, database as a service, data visualization, dashboards, data mining, and more. The
iv. The productivity category that includes collaboration tools, development tools, surveys, e-mail campaign tools, and much more.

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- **Choosing the right cloud service model**
  - **When to Use PaaS?**

✓ PaaS is the least mature of the three cloud service models.
✓ Public PaaS service providers manage the underlying infrastructure, networks, storage devices, and operating systems.
✓ Private PaaS service providers do not provide the abstraction of the infrastructure services like the public PaaS providers do.

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❑ **Choosing the right cloud service model**

- **When to Use PaaS?**
  - **Components that are candidates for PaaS**

✓ **Seller services**. Lower volume, moderate number of customers.

✓ **Mobile touch-point.** The team has very little mobile experience and is required to develop for many different types of phones and tablets.

✓ **Social touch-point.** Measuring the impact of the various social touch-points could be a major project.

✓ **Utility services.** The PaaS likely provides services for security, event triggering, notifications, and APIs to connect to the popular social sites

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❑ **Choosing the right cloud service model**

- **When to Use IaaS?**
  - **You should leverage IaaS if an application or service has performance or scalability requirements that require the developers to:-**
- Manage memory,
- Configure database servers and application servers to maximize throughput,
- Specify how data is distributed across disk spindles,
- Manipulate the operating system, and so on,
  - **If you don't need to worry about the above things, then you should consider PaaS instead.**

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❑ **Choosing the right cloud service model**

❖ **Common Cloud Use Cases**

1) Cloud Bursting
2) Archiving/Storage
3) Data Mining and Analytics
4) Test Environments

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❑ **Choosing the right cloud service model**

▪ **Summary**

a. *As we move up the stack toward SaaS we increase speed to market, reduce the number of human resources required, and reduce operational costs.*
b. *As we move down the stack toward IaaS, we get more control of the infrastructure and have a better chance of avoiding or recovering from a vendor outage.*

The decisions should be based on business drivers, constraints, and customer impacts.

Migrating to the Cloud

❑ **The Seven Step Model of Migrating into the Cloud**

1. Conduct Cloud Migration Assessments
2. Isolate the Dependencies
3. Map the Messaging & Environment
4. Re-architect & Implement the lost Functionalities
5. Leverage Cloud Functionalities & Features
6. Test the Migration
7. Iterate and Optimize

Migrating to the Cloud

❑ **The Seven Step Model of Migrating into the Cloud**

1. Conduct Cloud Migration Assessments

- ✓ Migration Costs
- ✓ Recurring Costs
- ✓ Database data segmentation
- ✓ Database Migration
- ✓ Functionality migration

Migrating to the Cloud

❑ **The Seven Step Model of Migrating into the Cloud**

2. Isolate the Dependencies

✓ Runtime Environment
✓ Licensing
✓ Libraries Dependency
✓ Applications Dependency
✓ Latencies Bottlenecks
✓ Performance bottlenecks
✓ Architectural Dependencies

Migrating to the Cloud

❑ **The Seven Step Model of Migrating into the Cloud**

3. Map the Messaging & Environment

✓ Messages mapping: marshalling & de-marshalling

✓ Mapping Environments

✓ Mapping libraries & runtime approximations

Migrating to the Cloud

❑ **The Seven Step Model of Migrating into the Cloud**

4. Re-architect & Implement the lost Functionalities

✓ Approximate lost functionality using cloud runtime support API

✓ New Use-cases

✓ Analysis

✓ Design

Migrating to the Cloud

❑ **The Seven Step Model of Migrating into the Cloud**

5. Leverage Cloud Functionalities & Features

✓ Exploit additional cloud features

✓ Seek Low-cost augmentations

✓ Autoscaling

✓ Storage

✓ Bandwidth

✓ Security

Migrating to the Cloud

❑ **The Seven Step Model of Migrating into the Cloud**

6. Test the Migration

✓ Augment Test Cases and Test Automation

✓ Run Proof-of- Concepts

✓ Test Migration strategy

✓ Test new test-cases due to cloud augmentation

✓ Test for Production Loads

Migrating to the Cloud

❑ **The Seven Step Model of Migrating into the Cloud**

7. Iterate and Optimize

✓ Optimize–rework and iterate

✓ Significantly satisfy cloudonomics of migration

✓ Optimize compliance with standards and governance

✓ Deliver best migration ROI

✓ Develop roadmap for leveraging new cloud features

Migrating to the Cloud

❑ **Why companies are still hanging onto their data centers**

1. Control

✓ "The biggest risk is giving up control of your data to someone else using different data centers in remote places. What happens in the event of a disaster? You're also putting your data next to someone else's."

- *Gavan Egan, managing director of cloud and IT solutions for Verizon.*

Migrating to the Cloud

❑ **Why companies are still hanging onto their data centers**

2. Security and governance
3. Lack of direct relationships with vendors
4. Safekeeping of intellectual property
5. Uptime and disaster recovery
6. Internal skillsets and support

Cloud Resource Management and Scheduling

END