

Emerging Technologies

[Exam importance- 12 marks; Loveliest topic of ISCA; LBH]

➤ Grid Computing

➤ Cloud Computing:

○ Benefits of Cloud Computing:

1. Anytime, anywhere access
2. Easily expand their capacities without investing in new infrastructure
3. Need not worry about maintenance of resources
4. Highly dynamic & scalable
5. Companies can outsource their data-center infrastructure

○ Cloud vs. Grid Computing:

❖ Similarities:

1. Scalability
2. Multi-tenancy & multi-tasking

❖ Differences:

1. Grid- well suited for data intensive storage; Cloud- can store items from 1 byte to several TB.
2. Grid- focuses on intensive operations; Cloud- offers standard and high CPU operations.

○ Objectives of Cloud Computing: (Core goal- pool available resources together into a highly efficient infrastructure whose costs are aligned with what resources are actually used but to the services accessible & available from anywhere at anytime):

1. To create a highly efficient IT ecosystem
2. Anywhere, anytime access
3. Scalable IT ecosystem
4. Consolidated IT infrastructure
5. Reduce costs related to IT energy consumption
6. Enable rapid provisioning of resources as needed

○ Characteristics of Cloud Computing:

1. High Scalability
2. Agility
3. High Availability & Reliability
4. Multi-sharing
5. Services in Pay-per-use mode
6. Easier Maintenance
7. Virtualization
8. Performance

○ Advantages of Cloud Computing:

1. Cost Efficiency
2. Almost unlimited storage
3. Back up & Recovery
4. Automatic software integration
5. Easy access to information
6. Quick deployment

- Issues relating to Cloud Computing:

- A. Security Issues:

1. Confidentiality
2. Integrity
3. Availability
4. Governance
5. Trust
6. Legal issues & compliance
7. Privacy
8. Audit
9. Data Stealing
10. Architecture
11. Identity Management and Access Control
12. Incident Response
13. Software Isolation
14. Application Security

- B. Implementation/ Adaptation Issues:

1. Threshold policy
2. Interoperability
3. Hidden Costs
4. Unexpected Behavior
5. Software development in cloud
6. Environment friendly cloud computing

- Cloud Computing Architecture:

1. Front End Architecture
2. Back End Architecture

+ Central server for administering the whole system; monitoring client's demand and traffic to ensure system runs without any problem.

+ Middleware (s/w) allows computers that are connected on the network to communicate with each other.

- Cloud Computing Environment: (Types of Clouds based on their deployment & use):

1. Private Cloud:

- Types: (differences on pg-8.5 JC Book)

- a) On-premise private cloud
- b) Outsourced private cloud

- Characteristics:

- a) Secure
- b) Central Control
- c) Weak SLAs

- Advantages:

- a) Improves average server utilization; thus reducing cost
- b) High level of security
- c) Small in size; controlled & maintained by the organization

- Limitations:

- a) Budget constraints
- b) Loose SLAs

c) Investment in buying/building & maintaining the cloud independently

2. Public Cloud:

- Characteristics:

- a) Highly scalable
- b) Affordable
- c) Less Secure
- d) Highly available
- e) Stringent SLAs

- Advantages:

- a) Widely used in development, deployment and management of enterprise applications, at affordable costs
- b) Delivers highly scalable and reliable applications at more affordable costs
- c) No need for establishing infrastructure for setting up and maintaining the cloud
- d) Strict SLAs
- e) No limit for the number of users

- Limitations:

- a) Security issues
- b) Privacy
- c) Organizational autonomy not possible

3. Hybrid Cloud: (generally pvt cloud is expanded by adding public cloud for meeting addnl reqs.)

- Characteristics:

- a) Scalable
- b) Partially Secure
- c) Stringent SLAs
- d) Complex cloud management

- Advantages:

- a) Highly scalable
- b) Better security than public cloud

- Limitations:

- a) Security issues
- b) Complex to manage

4. Community Cloud: (is a cloud infra. that is provisioned for exclusive use by a specified community of consumers from organizations that have shared concerns; suitable for orgs. that cannot afford pvt. cloud and cannot rely on public cloud either)

- Characteristics:

- a) Collaborative and Distributed maintenance
- b) Partially secure
- c) Cost effective

- Advantages:

- a) Allows establishing low-cost private cloud
- b) Allows collaborative work on the cloud
- c) Allows sharing of responsibilities among the orgs.
- d) Better security than public cloud

- Limitations:

- a) Autonomy of the org. is lost
- b) Security not as good as that of private cloud
- c) Not suitable in there is no collaboration

○ Cloud Computing Service Models: (3 basic service models)

1. Infrastructure as a Service (IaaS)
 2. Platform as a Service (PaaS)
 3. Software as a Service (SaaS)
- Infrastructure as a Service (IaaS):
 - Service provided by IaaS:
 1. Compute
 2. Storage
 3. Network
 4. Load Balancers
 - Characteristics of IaaS:
 1. Web access to the resources
 2. Centralized management
 3. Elasticity and Dynamic scaling
 4. Shared infrastructure
 5. Metered Services (charged as per use)
 - Difference Instances of IaaS:
 1. Network as a Service (NaaS)
 2. Storage as a Service (SaaS)
 3. Database as a Service (DBaaS)
 4. Back-end as a Service (BaaS)
 5. Desktop as a Service (DaaS)
 - Platform as a Service (PaaS):
 - Service provided by PaaS:
 1. Programming Languages
 2. Application Frameworks
 3. Database
 4. Other tools (that are required to develop, test and deploy an application)
 - Characteristics of PaaS:
 1. All in one
 2. Web access to the development platform
 3. Offline Access
 4. Built-in Scalability
 5. Collaborative platform
 6. Diverse Client tools
 - Software as a Service (SaaS):
 - Services provided by SaaS:
 1. Business Services
 2. Social Networks
 3. Document Management
 4. Mail Services
 - Characteristics of SaaS:
 1. One to Many
 2. Web Access

3. Centralized Management
4. Multi-device support
5. Better scalability
6. High availability
7. API Integration

- Difference Instances of SaaS:
 1. Testing as a Service (TaaS)
 2. API as a Service (APIaaS)
 3. Email as a Service (EaaS)

- Other Cloud Service Models:
 - ❖ Communication as a Service (CaaS)
 - ❖ Data as a Service (DaaS)
 - ❖ Security as a Service (SaaS)
 - ❖ Identity as a Service (IaaS)

➤ Mobile Computing:

- Components of Mobile Computing:
 1. Mobile Communication (e.g. mobile network tower)
 2. Mobile Hardware (e.g. smartphone)
 3. Mobile Software (e.g. iOS)
- How mobile computing works? (pg- 8.15 JC Book)
- Mobile Computing Benefits:
 1. Enables mobile sales personnel to update work order status in real-time, facilitating excellent communication
 2. Provides mobile workforce with remote access to work order details
 3. Facilitates access to corporate services and info. at anytime, anywhere
 4. Provides remote access to corporate knowledgebase at job location
 5. Enables to improve management effectiveness of mobile workforce with better control and quality
- Limitations of Mobile Computing:
 1. Insufficient Bandwidth
 2. Security standards
 3. Power consumption (relies only on batteries; no power source)
 4. Transmission interferences
 5. Potential health hazards (radiations)
 6. Human interface with device
- Issues with Mobile Computing:
 1. Security Issues
 2. Bandwidth
 3. Location Intelligence
 4. Power consumption
 5. Revising the technical architecture
 6. Reliability, coverage, capacity and cost
 7. Integration with legacy mainframe and emerging client/server applications

8. End-to-end design and performance
9. Business challenges

➤ Green Computing:

- Green Computing BEST PRACTICES: (read in detail pg-8.17 JC Book)
 1. Develop a sustainable Green Consumption Plan
 2. Recycle
 3. Make environmental sound purchase decisions
 4. Reduce Paper Consumption
 5. Conserve Energy

➤ Bring Your Own Device (BYOD):

- Advantages of BYOD:
 1. Happy Employees
 2. Lower IT Budgets
 3. Reduced support requirements
 4. Early Adoption of New Technologies
 5. Increased employee efficiency
- Emerging BYOD Threats:
 1. Network Risks
 2. Device Risks
 3. Application Risks
 4. Implementation Risks
- Mobile computing and BYOD (Read from PM)

➤ Social Media, Web 2.0 and Web 3.0:

- Components of Web 2.0 for Social Networks:
 1. Communities
 2. RSS-generated Syndication
 3. Usage of Ajax and other new technologies
 4. Blogging
 5. Wikis
 6. Folksonomy
 7. File sharing/ Podcasting
 8. Mashups
- Types and Behavior of Social Networks:
 1. Social Contact Networks
 2. Study Circles
 3. Social Networks for Specialized groups
 4. Networks for Fine Arts
 5. Police & Military Networks
 6. Sporting Networks
 7. Mixed Networks
 8. Social Networks for the “inventors”
 9. Shopping and Utility Service Networks
 10. Others

- Life Cycle of Social Networks: (Steps)
 1. Need for social network
 2. Initial set of members identified
 3. Create space for social networking site
 4. Conduct regular meetings (online meeting tools); Have discussions on imp. topics; Interact with other networks
 5. Achieve final goal or terminate the network
 6. Share group data with all members (through file sharing/ podcasting)
- Applications of Web 2.0 in different fields:
 1. Social media
 2. Marketing
 3. Education
- Benefits and Challenges of Social Networks using Web 2.0:
 - Benefits:
 1. Provides a platform where users need not worry about implementation or updation of underlying technology; same can be done at very affordable cost and minimum time
 2. Web 2.0 techniques are very user oriented, thus adaption is very fast
 - Challenges:
 1. Data security and privacy (chances of data leakage & loss of confidentiality)
 2. Majority of social network users are offline; people involved are not computer literate
- Web 3.0: (aka Semantic Web): (describes sites wherein the computers will be generating raw data on their own without direct user interaction):
 - ✓ 2 major components of Web 3.0:
 - Semantic Web
 - Web Service
 - ✓ Web 3.0 helps to achieve a more connected open and intelligent web applications using the concepts of natural language processing machine learning, machine reasoning, and autonomous agents.