

CAP470: Cloud Computing

Unit-6: Cloud Application Design and Collaboration

Cloud Application Design

- In the traditional systems applications were designed with consideration of limited resources.
- But in the cloud applications architect can take the advantage of almost unlimited resources and consider this change while architecting applications on cloud.
- Application design for cloud infrastructure needs some key considerations to leverage the advantages provided by cloud.

Application Design Considerations

1. Handle failure as an event and not as exception

- In the traditional systems failure was handled as an exception and on the occurrence of failure system was designed to gracefully exit. This was primarily due to the lack of resources.
- On the cloud infrastructure, design the application to handle failure as an event. Design application not to exit on failure but take advantage of cloud infrastructure to provision new resources and switch over in the event of failure.

2. Log everything

- Logs are very useful to collect data from every event on the system. In the traditional systems we used to restrict logs due to lack of resources.
- On the cloud log all the system / user events, this will translate into a large amount of data which will be helpful for business insights and application maintenance.

3. Identify and remove single point of failures

- The single point of failure means the system components in the architecture which has no automated fallback in place i.e. if that component fails, system will break.
- The architects need to identify if any single point of failures is in the system and remove single point of failures by creating automated fallback for those components in the system. This will result in a high available and resilient system.

4. User data should be stored in distributed environment

- The user data should be stored in the distributed environment with redundancy in different seismic zones.
- This can be achieved either by designing redundant file systems through software RAID /LVM / NFS on cloud or by using data storage services provided by the cloud service providers such as Simple Storage Service (S3) by Amazon Web Services.

5. **Deployment should be a continuous process**

- Business needs a very agile system with quick incremental deployments to handle continuous changing requirements.
- The system should be architected in such a way that continuous deployment is possible from testing to staging and then staging to production.
- The applications should be designed in a modular way so that continuous deployment is possible.

6. **Use smaller units to scale up**

- Application should be designed such that smaller units of compute can be used for scaling up and down.
- The performance of application and compute unit requirements should be monitored and optimized.
- The sessions should be stored in the database to take advantage auto scaling without loss of sessions and will give you more control on the granularity of scaling up and down.

7. Design database in modular distributed fashion

- The database should be designed in modular distributed fashion.
- The data base performance can be bottle neck beyond the application scale up and out.
- To improve the read performance use read only replica with load balancing and or cache in memory.
- To improve the write performance use database horizontal partitioning and distributed write process.

Question

Who is responsible to provide application-level services in the cloud?

- Cloud Service Provider
- Server
- Client
- All of the above

Cloud App Development Methodology

- Designing or developing any cloud-based application is not a simple straightforward process and always involve a number of intricate steps right from managing codebases, injecting library dependencies, configuring system properties and leading into a proper production deployment at scale.
- This is considered to be as one of the most difficult stages to manage while building any cloud-based app. In order to properly build and manage these cloud-native apps, a number of identified patterns have been introduced with a design methodology.

- In the modern era, software is commonly delivered as a service: called *web apps*, or *software-as-a-service*. The twelve-factor app is a methodology for building software-as-a-service apps that:
 - Use **declarative** formats for setup automation, to minimize time and cost for new developers joining the project;
 - Have a **clean contract** with the underlying operating system, offering **maximum portability** between execution environments;
 - Are suitable for **deployment** on modern **cloud platforms**, obviating the need for servers and systems administration;
 - **Minimize divergence** between development and production, enabling **continuous deployment** for maximum agility;
 - And can **scale up** without significant changes to tooling, architecture, or development practices.
- The twelve-factor methodology can be applied to apps written in any programming language, and which use any combination of backing services (database, queue, memory cache, etc).

1. **Codebase:** One codebase tracked in revision control, many deploys
2. **Dependencies:** Explicitly declare and isolate dependencies
3. **Config:** Store config in the environment
4. **Backing services:** Treat backing services as attached resources
5. **Build, release, run:** Strictly separate build and run stages
6. **Stateless processes:** Execute the app as one or more stateless processes
7. **Port binding:** Export services via port binding
8. **Concurrency:** Scale out via the process model
9. **Disposability:** Maximize robustness with fast startup and graceful shutdown
10. **Dev/prod parity:** Keep development, staging, and production as similar as possible
11. **Logs:** Treat logs as event streams
12. **Admin processes:** Run admin/management tasks as one-off processes

Question

Which phase is not included in application deployment model in cloud:

- Business Architecture Development
- IT Architecture Development
- Selecting Cloud Computing Provider
- None of the above

Cloud Computing Architecture

- *Cloud Computing architecture* basically comprises of the two parts. They are the front-end and the back-end.
- The front end is the end which uses by the user and the back-end manages by the host. Both the end connects to each other with the means of internet.
 - **Front End:** The front end is the client part of Cloud Computing which uses as per the requirement of the user. Front-end comprises of the applications and the interfaces which help to access the cloud computing. Example- Browser or an app created by the company itself.
 - **Back End:** The back end is a part which manages by the allotted authorities of the company and their back end has large data storage facilities, Virtual machines, security system, and servers. They are also engaged in traffic management along with security management.

Components of Cloud Computing Architecture



Question

The non-functional requirement in cloud are:

- Disaster Recovery
- Security
- Reliability
- All of the above

- **Hypervisor:** The hypervisor is also known as *Virtual Machine Monitor*. This consists of the software, hardware, and firmware which makes and runs the virtual machines. The Hypervisor provides a user with a platform which is known as *Virtual Operating Platform*.
 - This allows us to manage the guest's operating system to use the cloud. This can be also known as the traditional term of the kernel in an operating system.
- **Management Software:** Management software consists of various plans and the strategies which help to increase the performance of the cloud. This management software provides many features such as on-time delivery of storage, proper security, all-time access, and many other facilities.
 - This is one of the important parts of Cloud Computing architecture. One of the important features of this is the compliance auditing, management of overseeing disaster, and contingency plans.

- **Deployment Software:** Cloud deployment simply means *to initiate the working of the SaaS, PaaS, and IaaS*. This initiates the solutions that can access by the users or the customers.
 - This deployment consists of all the mandatory installations and configurations of the cloud. This emerges from the back end and implements before the provisioning occurs.
- **Route of Connectivity:** It is an important part of the Cloud Computing architecture, through which the whole cloud gets connected. The speed of transfer depends on the network which is the internet connection.
 - There are many cloud servers present which connects with the help of this virtual route. This also provides a facility to the user by allowing them to customize the route and protocol.

- **A server of the Cloud:** A cloud server is a virtual server running in cloud computing premises. It's engineered, hosted and delivered via a cloud computing platform via the web. It can be accessed from anywhere.
 - Cloud servers are stable, quick and secured. They avoid the hardware problems seen with physical servers, and that they are seemingly to be the foremost stable choice for businesses. Also, call as virtual servers.
 - Cloud servers have all the software they need to run and can operate as non-dependent units. It also has the profit because it is incredibly simple and fast to upgrade by adding memory and disk space, further as being more cost-effective.

- **Storage of the Cloud:** Cloud storage service, construct to produce applications, services and organizations with access to offsite storage capability that may provision instantly are versatile in scaling automatically at runtime and is globally accessible.
 - An Infrastructure as a Service (IaaS) service model delivers scalable, flexible and redundant storage capability through net services API, online interfaces and thin client applications.
 - Cloud Storage also benefits the user by providing remote access with the help of internet. The storage services are very quick to access. Cloud information is often held on, altered and retrieved from a remote cloud storage server over the web below a utility computing model.

Question

Which property ensures the reliable data transaction in cloud database?

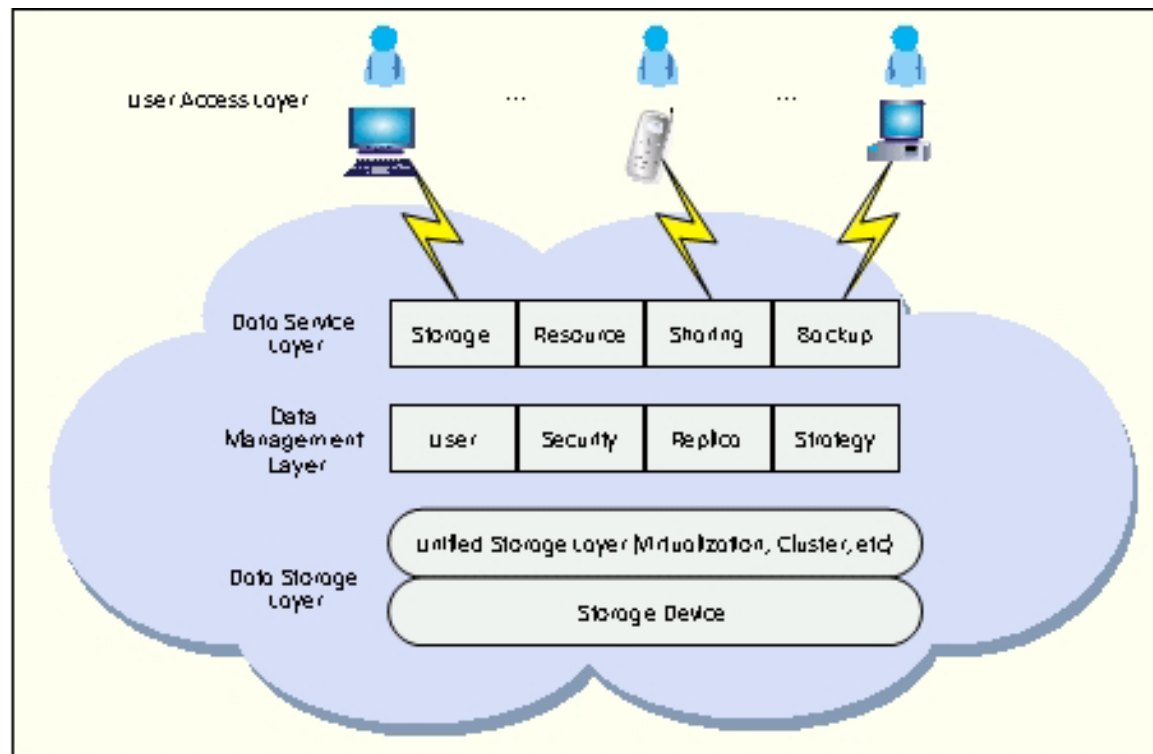
- BASE
- DIGITAL
- ACID
- All of the above

Cloud Storage

Cloud storage differs from traditional storage in many aspects. In terms of functionality, it is designed to deliver many online storage services, whereas traditional storage systems are primarily designed for high performance computing and transaction processing.

- In terms of functionality, it is designed to deliver many online storage services, whereas traditional storage systems are primarily designed for high performance computing and transaction processing.
- In terms of performance, cloud storage places great importance on data security, reliability, and efficiency. With a larger number of users, a wider service range, and a complex and ever-changing network environment, cloud storage systems face greater technical challenges than traditional systems when delivering high-quality services.
- In terms of data management, cloud storage systems not only offer access to traditional files such as Portable Operating System Interface for Unix (POSIX), but also support mass data management for providing public service support functions, and maintaining data in the background.

- A cloud storage platform can be classified into four layers:
 - data storage layer
 - data management layer
 - data service layer
 - user access layer



▲ Figure 1. Architecture of cloud storage platform.

Question

Data storage in cloud ensures the feature of:

- Scalability
- Flexibility
- Interoperatability
- All of the above

Data Analytics

- Businesses have long used data analytics to help direct their strategy to maximize profits.
 - Data analytics helps eliminate much of the guesswork involved in trying to understand clients, instead systematically tracking data patterns to best construct business tactics and operations to minimize uncertainty.
 - Data analytics also recognizes existing patterns in data to help better serve existing customers, which is typically more cost effective than establishing new business.
 - Data analytics provide companies the edge in recognizing changing climates so they can take initiate appropriate action to stay competitive.
- Alongside analytics, cloud computing is also helping make business more effective and the consolidation of both clouds and analytics could help businesses store, interpret, and process their big data to better meet their clients' needs.

Uses of Data Analytics

- **Social Media**

- A popular use for cloud data analytics is compounding and interpreting social media activity.
- Before cloud drives became practical, it was difficult processing activity across various social media sites, especially if the data was stored on different servers.
- Cloud drives allow for the simultaneous examination of social media site data so results can be quickly quantified and time and attention allocated accordingly.

- **Tracking Products**

- Long thought of as one of the kings of efficiency and forethought, it is no surprise Amazon.com uses data analytics on cloud drives to track products across their series warehouses and ship items anywhere as needed, regardless of items proximity to customers.
- Alongside Amazon's use of cloud drives and remote analysis, they are also a leader in big data analysis services thanks to their Redshift initiative. Redshift gives smaller organizations many of the same analysis tools and storage capabilities as Amazon and acts as an information warehouse, preventing smaller businesses from having to spend money on extensive hardware.

- **Tracking Preference**

- One of the highlights of Netflix website is its movie recommendations, which tracks the movies users watch and recommends others they might enjoy, providing a service to clients while supporting the use of their product.
- All user information is remotely stored on cloud drives so users' preferences do not change from computer to computer.
- Netflix retained all their users' preferences and tastes in movies and television, they were able to create a television show that statistically appealed to a large portion of their audience based on their demonstrated taste.

- **Keeping Records**

- Cloud analytics allows for the simultaneous recording and processing of data regardless of proximity to local servers.
- Companies can track the sales of an item from all their branches or franchises across the United States and adjust their production and shipments as necessary.
- If a product does not sell well, they do not need to wait for inventory reports from area stores and can instead remotely manage inventories from data automatically uploaded to cloud drives.
- The data stored to clouds helps make business run more efficiently and gives companies a better understanding of their customers' behavior.

Cloud Collaboration

- Collaboration refers to the ability of workers to work together simultaneously on a particular task.
- **Cloud collaboration** is a way of sharing and co-authoring computer files through the use of cloud computing.
- Cloud collaboration technologies allow users to upload, comment and collaborate on documents and even amend the document itself, evolving the document.
- Businesses in the last few years have increasingly been switching to use of cloud collaboration.

- Document collaboration can be completed face to face. However, collaboration has become more complex, with the need to work with people all over the world in real time on a variety of different types of documents, using different devices.
- The documents are uploaded to a central "cloud" for storage, where they can then be accessed by others.
- Collaboration services includes Google, Microsoft, WebEx, Jive Software, eXo Platform, Synaptop and Salesforce.com.

A 2003 report mapped out five reasons why workers are reluctant to collaborate more:

- People resist sharing their knowledge.
- Safety issues
- Users are most comfortable using e-mail as their primary electronic collaboration tool.
- People do not have incentive to change their behaviour.
- Teams that want to or are selected to use the software do not have strong team leaders who push for more collaboration.
- Senior management is not actively involved in or does not support the team collaboration initiative.

Cloud as Community

- Cloud computing isn't just for home users.
- It has tremendous benefits for the entire community, from neighbourhood groups to sports teams to school organizations.
- Any time any group of people in the community need to communicate and collaborate, web-based applications are the way to go.

Communicating Across the Community

- One of the key components of any community collaboration is communication.
- Communication on community issues is to use a web-based email program, such as Gmail (mail.google.com), Microsoft Windows Live Hotmail (mail.live.com), or Yahoo! Mail (mail.yahoo.com). These programs can be accessed from any computer connected to the Internet.
- You use your web browser to send and view email messages hosted on the web.
- You can send and receive messages at work, at home, or from wherever you happen to be.
- Everything you send and receive is stored in the cloud, accessible from anywhere at any time.

Cloud Collaboration Tools

Many Cloud Service Providers created cloud collaboration tools.

- Cloud collaboration today is promoted as a tool for collaboration internally between different departments within a firm, but also externally as a means for sharing documents with end-clients as receiving feedback.
- These include the integration of email alerts into collaboration software and the ability to see who is viewing the document at any time.
- All the tools a team could need are put into one piece of software so workers no longer have to rely on email.
- This makes cloud computing a very versatile tool for firms with many different applications in a business environment.

Characteristics of Cloud Collaboration Tools

- Use **real-time commenting and messaging features** to enhance speed of project delivery.
- **Leverage presence indicators** to identify when others are active on documents owned by another person.
- Allow users to set **permissions and manage** other users' activity profiles.
- Allow users to set **personal activity feeds and email alert profiles** to keep abreast of latest activities per file or user,
- Allow users to **collaborate and share files** with users outside the company firewall.
- Comply with company **security and compliance** framework
- Ensure full **auditability of files and documents** shared within and outside the organization
- **Reduce workarounds** for sharing and collaboration on large files

Collaborating on Schedules

- When it comes to coordinating multiple individuals or families in a community activity, you have your work cut out for you.
- Whether it's a youth sports team, community organization, school event, or some community event, trying to line up who's free and who's not on a given duration of time takes a lot of effort—unless, that is, you're using web-based scheduling tools.
- Examples
 - **Sports Team Schedules**
 - **School Schedules**
 - **Community Group Schedules**
 - **Event Schedules and Management**

Note: follow book contents for deep understanding of this topic.

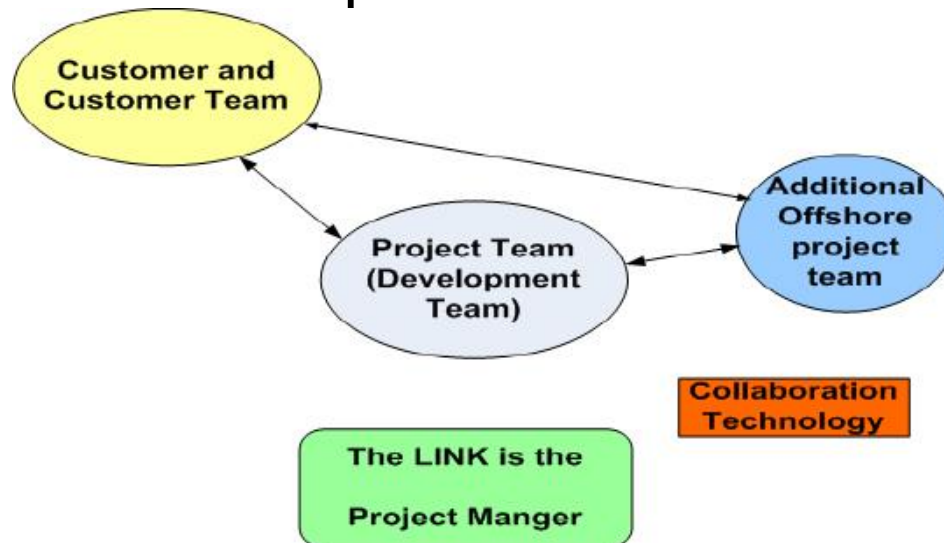
Collaborating on Group Projects and Events

- **Collaborating on To-Do Lists**
- **Collaborating on Task Management**
- **Collaborating on Event Management**
- **Collaborating on Event Marketing**
- **Collaborating on Budgets**

Note: follow book contents for deep understanding of this topic.

Collaborating on Project Management

A project management platform includes policies, procedures, standards, guidelines, integrated project management processes, tools, techniques, templates, project assets library, best practices, learning assets, lessons learned or next practices.



Project Management Titles Role

1. Project Manager

- The person responsible for developing a definition of the project in conjunction with the project sponsor. The Project Manager then ensures that the project is delivered on time, to budget and to the required quality standard (within agreed specifications).
- He/she ensures the project is effectively resourced and manages relationships with a wide range of groups (including all project contributors).
- The Project Manager is also responsible for managing the work of consultants, allocating and utilizing resources in an efficient manner and maintaining a co-operative, motivated and successful team.

2. Project Sponsor

- The person who commissions others to deliver the project and champions the cause throughout the project.
- They will normally be a senior member of staff with a relevant area of responsibility that will be affected by the outcome of the project.
- They are involved from the start of the project, including defining the project in conjunction with the project manager.
- Once the project has been launched they should ensure that it is actively reviewed.

3. Project Board

- This group, normally containing management grade personnel, is responsible for overseeing the progress of the project and reacting to any strategic problems.
- The group is optional, as the sponsor-manager relationship may be seen as the best means of control, but is usually required in large projects that cross-functional boundaries.

4. Project Team Members

- The staff who actively work on the project, at some stage, during the lifetime of the project. Some may have a specific role such as Project Administrator.

5. Project Administrator or Coordinator

- Responsible for maintenance of the project plan, maintenance and updating of a project website (if appropriate).
- Provides administrative support to the Project Manager.

6. Systems Developer

- To work with the project manager on defining and executing development requirement

7. System Administrator

- Management and support of the IT system environments.

8. Program Manager

- This role is relevant if there are several related projects.

Considerations When Moving to a Web-based Project Management Tool

1. Project compatibility with the tool
2. Multiple views into project data
3. Flexible subscriptions
4. Social media component
5. Online document storage and collaboration
6. Mobile client/accessibility

What Makes Projects Successful?

1. Close Relationships
2. Good Project Management
3. Risk Management
4. Measurement as a Way of Life
5. Technological Changes

The Triple Constraint

- The project management triangle is used by managers to analyse or understand the difficulties that may arise due to implementing and executing a project. All projects irrespective of their size will have many constraints.
- There are main three interdependent constraints for every project; time, cost, and scope. This is also known as Project Management Triangle.



- **Time:**

- A project's activities can either take shorter or longer amount of time to complete.
- Completion of tasks depends on a number of factors such as the number of people working on the project, experience, skills etc.
- Time is a crucial factor which is uncontrollable. On the other hand, failure to meet the deadlines in a project can create adverse effects.
- The main reason for organizations to fail in terms of time is due to lack of resources.

- **Cost:**

- It's imperative for both the project manager and the organization to have an estimated cost when undertaking a project.
- Budgets will ensure that project is developed or implemented below a certain cost.
- Sometimes, project managers have to allocate additional resources in order to meet the deadlines with a penalty of additional project costs.

- **Scope:**

- Scope looks at the outcome of the project undertaken. This consists of a list of deliverables which need to be addressed by the project team.
- A successful project manager will know to manage both the scope of the project and any change in scope which impacts time and cost.

● Quality

- Quality is not a part of the project management triangle, but it is the ultimate objective of every delivery. Hence, the project management triangle represents implies quality.
- Many project managers are under the notion that ‘high quality comes with high cost’, which to some extent is true.
- By using low quality resources to accomplish project deadlines does not ensure success of the overall project.
- Like with the scope, quality will also be an important deliverable for the project.

Stages of Project Management

A project undergoes six stages during its life cycles and they are noted below.

1. **Project Definition:** This refers to defining the objectives and the factors to be considered to make the project successful.
2. **Project Initiation:** This refers to the resources as well as the planning before the project starts.
3. **Project Planning:** Outlines the plan as to how the project should be executed. This is where project management triangle is essential. It looks at the time, cost and scope of the project.
4. **Project Execution:** Undertaking work to deliver the outcome of the project.
5. **Project Monitoring & Control:** Taking necessary measures, so that the operation of the project runs smoothly.
6. **Project Closure:** Acceptance of the deliverables and discontinuing resources that were required to run the project.

Advantages of Managing Projects Online

- **Better Efficiency in Delivering Services:** Project management provides a “roadmap” that is easily followed and leads to project completion. Once you know where to avoid the bumps and pots holes it stands to reason that you’re going to be working smarter and not harder and longer.
- **Improved/Increased/Enhanced Customer Satisfaction:** Whenever you get a project done on time and under budget, the client walks away happy. And a happy client is one you’ll see again. Smart project management provides the tools that enable this client/manager relationship to continue.
- **Enhanced Effectiveness in Delivering Services:** The same strategies that allowed you to successfully complete one project will serve you many times over.

- **Improved Growth and Development within your Team:** Positive results not only command respect but more often than not inspire your team to continue to look for ways to perform more efficiently.
- **Greater Standing and Competitive Edge:** This is not only a good benefit of project management within the workplace but outside of it as well; word travels fast and there is nothing like superior performance to secure your place in the marketplace.
- **Opportunities to expand your Services:** A by-product of greater standing. Great performance leads to more opportunities to succeed.

- **Better Flexibility:** Perhaps one of the greatest benefits of project management is that it allows for flexibility. Sure project management allows you to map out the strategy you want to take see your project completed. But the beauty of such organization is that if you discover a smarter direction to take, you can take it.
- **Increased Risk Assessment:** When all the players are lined up and your strategy is in place potential risks will jump out and slap you in the face. And that's the way it should be.
- **Increase in Quality:** Goes hand-in-hand with enhanced effectiveness
- **Increase in Quantity:** Saved the best for last and increase in quality is often the result of better efficiency, a simple reminder regarding the benefits of project management.

Collaborating on Databases

A database does many of the same things that a spreadsheet does, but in a different and often more efficient manner. In fact, many small businesses use spreadsheets for database-like functions.

- A database file contains individual index (called *records*) filled with specific information (arranged in *fields*).
- A database application can be used to create a database and store anything that includes a large amount of data.
- A database management program not only stores this data but also automates data entry, retrieval, and analysis.

Working of Online Databases

- A local database is one in which all the data is stored on an individual computer.
- A networked database is one in which the data is stored on a computer or server connected to a network, and accessible by all computers connected to that network.
- Finally, an online or web-based database stores data on a cloud of servers somewhere on the Internet, which is accessible by any authorized user with an Internet connection.

Advantages

- The primary advantage of a web-based database is that data can easily be **shared** with a large number of other users, no matter where they may be located.
- When your employee database is in the cloud, users sitting at **different location can have easy access** to the information stored in the database.
- As the data itself is stored in the cloud, when someone at one location updates a record, everyone accessing the database sees the new data. **Synchronization is not an issue.**
- Therefore, most online databases are oriented toward quick information sharing among members of workgroups who've assembled to attack a project for a month or two.
- When accessing data in this manner, ease of use is paramount, which most of these cloud applications address with **simple and intuitive interfaces.**

Exploring Web-Based Databases

- Blist
- Cebase
- Dabble DB
- Lazybase
- MyWebDB
- QuickBase
- TeamDesk
- Trackvia
- Zoho Creator
- Zoho DB and Reports

Note: follow book contents for deep understanding of this topic.

Collaborating via Web-Based Communication Tools

There are three main categories:

- Web e-mail services
- Instant messaging services
- Web conferencing tools

Groups located anywhere in the world can use these tools to communicate with other group members—and further their collaboration on group projects.

Traditional e-mail

- Traditional email is anything but cloud based.
- The type of email program you probably have installed on your PC uses a protocol called the Post Office Protocol (POP).
- POP email requires the use of a dedicated email *client* program, such as Microsoft Outlook or Outlook Express, and at the ISP level email servers are used to send and receive messages.

The problem with traditional POP email is that

- You're tied to the client program installed on your PC.
- The messages you receive are stored on that PC. You usually can't access them when you're traveling or away from that PC.
- There are none of the “anytime, anywhere” advantages you're used to with cloud-based services.

Web based e-mail Services

- Web based e-mail services are also known as web mail or HTTP email.
- Web mail can be accessed from any PC using any web browser, and all your messages are stored on the web, not locally.
- Web mail is more versatile than traditional POP email, it's also easier to set up.
- All you need to know is your user ID and password, and then you access a page that lets you view the contents of your inbox, read and reply to messages, create new messages, and (in many cases) store messages in folders.
- You can even, on some services, use your web mail account to access your ISP's POP email.
- The three largest web mail services today are hosted by Google, Microsoft, and Yahoo!

Web Based Communication Tools

- **Gmail**
- **Yahoo! Mail**
- **Windows Live Hotmail**
- **Apple MobileMe Mail**
- **Other Web Mail Services**
 - AOL Mail (mail.aol.com)
 - BigString (www.bigstring.com)
 - Excite Mail (mail.excite.com)
 - FlashMail (www.flashmail.com)
 - GMX Mail (www.gmx.com)
 - Inbox.com (www.inbox.com)
 - Lycos Mail (mail.lycos.com)
 - Mail.com (www.mail.com)
 - Zoho Mail (zoho.mail.com)

Instant Messaging Services

- Instant messaging is a better way to talk.
- it's more immediate, because you can send text messages in real time to your friends and coworkers.
- No more waiting for people to respond to your emails—when both parties are online at the same time, it's just like having a one-on-one conversation.
- There are several big players in the instant messaging market today, including America Online (with both AOL Instant Messenger and ICQ), Google (Google Talk), Microsoft (Windows Live Messenger), and Yahoo! (Yahoo! Messenger).

- Instant messaging, however, doesn't use servers at all.
- When you send an instant message to another user, that message goes directly to that user's PC; it's not filtered by or stored on any servers.
- The technical name for this type of connection is *peer-to-peer* (P2P), because the two computers involved are peers to each other.
- All instant messaging needs to work is a piece of client software (one for each computer involved, of course) and the IP addresses of each computer.
- The messages go directly from one IP address to another, with no servers in the middle to slow things down.

Instant Messaging Tools

- **AOL Instant Messenger**
- **Google Talk**
- **ICQ**
- **Windows Live Messenger**
- **Yahoo! Messenger**

Web Conferencing Services

- When you need to include more than two people in your communications, or when you want to give a presentation to a group of people who aren't all in the same location, a different communications tool is needed.
- This new tool is called a *web conference*, and it's a way to conduct live meetings and presentations over the Internet.
- In a typical web conference, each participant sits at his own computer in his own location. Each participant's computer is connected to the conference via the Internet, and each participant sees the presentation on his or her screen, in real time.

- A web conference can be **one way**, as when the presenter delivers some sort of PowerPoint-like presentation, or two way, where each participant can join in and show the contents of their active applications or desktops.
- Communication between participants can be audio only (via streaming audio, VoIP, or traditional telephony) or include audio and video (typically using webcams).
- Most web conferencing services are hosted on the vendor's servers. You typically have to arrange a conference in advance, and the hosting service will help you set everything up.
- Depending on the vendor, this can be a costly service, viable only for larger organizations. Make sure you check the price before you commit to using a particular service.

Features of Web Conferencing Services

Here are some of the most common features expected from a web conferencing service:

- **Application sharing**, where the presenter and participants can all access and use the same application in real time. This is useful for smaller group meetings, when all participants are collaborating on a project.
- **Desktop sharing**, similar to application sharing, but with the presenter's entire desktop visible and accessible to participants.
- **File and document sharing**, with individual files and documents open for all to edit, also useful for group collaboration.
- **PowerPoint presentations**, the core component of large presentations; the presenter gives a PowerPoint presentation in real time, complete with slide transitions and animations, using audio conferencing tools to narrate the presentation.

- **Presenter notes**, which let the presenter take notes during the course of the conference for future action.
- **Annotation**, which lets the presenter mark up the document or presentation being shared or given, typically by drawing or highlighting on the screen.
- **Whiteboard**, which is a blank screen on which the presenter or participants can draw or highlight objects.
- **Text-based chat**, which lets participants discuss the presentation with each other in real time.
- **Audio conferencing**, which adds the spoken words of the presenter to a PowerPoint presentation. With two-way audio, all participants can speak—assuming that they all have microphones, of course.

- **Video conferencing**, which puts a picture of the presenter in a corner of the conference webtop, typically generated via webcam. With two way video conference participants can also show pictures of themselves onscreen.
- **Polling**, which lets the presenter ask questions of the audience.
- **Quizzes**, which lets participants answer test questions, typically with results tabulated in real time.

Some of the Web Conferencing Tools are:

- | | |
|----------------------------------|----------------------------------------|
| • Adobe Acrobat Connect | • Microsoft Office Live Meeting |
| • Skype | • Persony Web Conferencing |
| • Convenos Meeting Center | • Pixion PictureTalk |
| • Genesys Meeting Center | • WebEx |
| • Glance | • Yugma |
| • IBM Lotus Sametime | • Zoho Meeting |