7.1. General Applications: Email, WWW, Gopher, Online Systems
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7.3. Broadband Communications, Policy, xDSL and Cable Internet
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7.5. Datacenters and Data warehousing, packet clearing house
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7.1. General Applications: Email, WWW, Gopher, Online Systems

***Email :** Internet e-mail functions through the use of Internet standards. Although many more standards actually apply to e-mail, virtually all mail servers and e-mail clients support at least the following basic set.

- SMTP (or RFC 5321) specifies the protocol by which e-mail is transmitted
- RFC 5322 specifies the basic format for e-mail
- MIME supplements the e-mail formatting rules to allow non-English text in both e-mail headers and bodies, and defines a mechanism for including non-textual attachments in e-mail bodies
- POP3 and IMAP4 specify e-mail retrieval protocols used by e-mail clients

Comparison between IMAP, POP3 and SMTP Protocol:

	IMAP	POP3	SMTP
Definition	IMAP Internet Message Access Protocol is used to retrieve email for multiple devices support.	POP or Post Office Protocol is also a type of email protocol. It is quite different from IMAP as it has been devised for offline reading. The third version of POP is POP3.	It is the standard protocol for sending emails via internet. It is a connection oriented and text based protocol. It sets the communication rules for the servers.
Full Form	IMAP stands for Internet Message Access Protocol	Post Office Protocol third	Simple Mail Transfer Protocol
Function	Retrieving emails	Retrieving emails	Sending emails
Email server port (Typically)	143	110	25
Limitation	Mailbox on the server has a definite quota and thus, one needs to ensure that the mailbox retains space for newer mails.	Once the message gets downloaded on a local computer, it remains accessible on that computer only.	It has no ways of verifying sender. This sometimes leads to Spam issues.

***WWW :** The **World Wide Web** (abbreviated **WWW** or **the Web**) is an information space where documents and other web resources are identified by Uniform Resource Locators (URLs), interlinked by hypertext links, and can be accessed via the Internet.

Functions

- Linking : Most web pages *contain hyperlinks to other related pages* and perhaps to downloadable files, source documents, definitions, and other web resources. In the underlying HTML, a hyperlink looks like this: `<a href="http://www.example.org/home.html">Example.org Homepage</a>` Such a collection of useful, related resources, interconnected via hypertext links is dubbed a *web* of information.

- Dynamic updates of web pages : *Client-side script is delivered* with the page that can make additional HTTP requests to the server, either in response to user actions such as mouse movements or clicks, or based on elapsed time. The server's responses are used to modify the current page rather than creating a new page with each response, so the server needs only to provide limited, incremental information.
- WWW prefix : When a user submits an incomplete domain name to a web browser in its address bar input field, some *web browsers automatically try adding the prefix "www"* to the beginning of it and possibly ".com", ".org" and ".net" at the end, depending on what might be missing.
- Scheme specifiers : The scheme specifiers *http://* and *https://* at the start of a web URI, *Web browsers usually automatically prepend http:// to user-entered URIs, if omitted*
- Web security : Most web-based attacks take place on legitimate websites, and most, as measured by Sophos, are hosted in the United States, China and Russia. The most common of all malware threats is SQL injection attacks against websites. *Through HTML and URIs, the Web was vulnerable to attacks like cross-site scripting (XSS) that came with the introduction of JavaScript*

***Gopher :**

A menu-based system for Internet searching and document retrieval, largely superseded by the World Wide Web.
The Gopher system enabled documents to be listed in a readable, hierarchical method that was relatively easy to navigate.

The Gopher technology is based on a *client-server structure*, where a gopher client program is used to search gopher servers. These servers can store documents, articles, programs, and other information. *Instead of hyperlinks, the gopher interface uses menus of links to other documents and programs.*
The University of Minnesota began a licensing program for the gopher technology in 1993 as the use of gopher was spreading rapidly over the Internet. However, this was around the same time that the World Wide Web was introduced. Because the Web used hypertext and images, it soon became the preferred way to search and browse for information. *While there are still servers and client programs that use gopher technology*, their use is not nearly as widespread as the Web.

Gopher is designed to function and to appear much like a mountable read-only global network file system (and software, such as gopherfs, is available that can actually mount a Gopher server as a FUSE resource). At a minimum, whatever a person can do with data files on a CD-ROM, they can do on Gopher.

A Gopher system consists of a *series of hierarchical hyperlinkable menus.* The choice of menu items and titles is controlled by the administrator of the server.

Similar to a file on a Web server, *a file on a Gopher server can be linked to as a menu item from any other Gopher server.* Many servers take advantage of this inter-server linking to provide a directory of other servers that the user can access.

7.2. Multimedia and Digital Video/Audio Broadcasting: Video/Audio Conferencing, Internet Relay Chat (IRC)

*Video/Audio Conferencing

This is a very broad category of online tools, incorporating a range of options from free one-to-one audio conferencing all the way to more sophisticated and expensive tools such as Polycom which allow multiple sites with entire classes participating using video and audio.

1. *Video and audio, or just audio connection between two computers communicating* via the Internet.
    - Examples of free audio conferencing software: Gizmo, Skype (both cross platform) both enable users to speak to other Gizmo/Skype users free of charge (although users can also pay a fee and make calls to landlines using the computer). For further examples view Wikipedia list.
    - Examples of free video conferencing software: iVisit (cross platform), iChat (Mac only), NetMeeting (Windows only).
    - Breeze can also be used for video conferencing (but Breeze is more than just a video/audio conferencing tool. See Breeze overview)
2. *Transmitted to & received from any computer in any* location that has Internet connection (broadband desirable for effective use). Teacher must have microphone, can have camera. Ideally end users have microphone (camera not essential) for synchronous communication.
3. Technology requirements for video/audio conferencing:
    - *Computer with access (ideally broadband) to the Internet.*
    - *Web Browser or Software.*
    - *Speakers to hear audio.*
    - *Microphone (to contribute audio).*
    - *Web camera to contribute video.*

Methods of Audio/ Video Conferencing

- *Point-to-point Conferencing :* A videoconference that *connects two locations*. Each site sees and hears the other sites at all times
- *Multipoint Conferencing :* A videoconference that *connects to more than two sites* through the use of a multi-point control unit, or MCU. Participants at all sites can hear one another at all times and see the site that is currently speaking.

Uses of Audio/ Video Conferencing

- Presentations
- Virtual meetings
- Videoconference-based learning
- JIT (just in time) events
- Recruitment/search committees
- General meetings
- Project coordination
- Informal work sessions
- Alumni relations
- Question and answer sessions

Benefits of Audio/ Video Conferencing

- Can improve work quality
- Increase productivity
- Reduce costs, Videoconferencing is cost-effective, when you consider the traveling costs for traditional training.
- Improves communication
- Groups can meet more frequently
- Critical meetings can be convened in less time
- More faculty and staff can be involved
- Enables any site to be the provider of the learning activities.
- Videoconference-based learning exploits the already acquired videoconferencing technologies and network infrastructure.

*** Internet Relay Chat (IRC) : in details**

IRC - Internet Relay Chat is a method to broadcast and receive live, synchronous, messages. *There are hundreds of IRC channels (discussion areas) around the world, hosted on servers, on which people type their messages to others on the same channel interested in the same subject.*
There are client IRC programs which provide graphical interfaces which make it easier for people log on and access active channels and send and receive the messages. IRC chat, at present, is not limited to two people, unlike earlier versions.
Internet Relay Chat (IRC) is an application layer protocol that facilitates communication in the form of text. The chat process works on a client/server networking model. IRC clients are computer programs that a user can install on their system. These clients communicate with chat servers to transfer messages to other clients. IRC is mainly designed for group communication in discussion forums, called channels, but also allows one-on-one communication via private messages as well as chat and data transfer, including file sharing.
You need a software program to access the IRC channels. The server acts as a router, making sure that all messages are sent to the discussion participants.

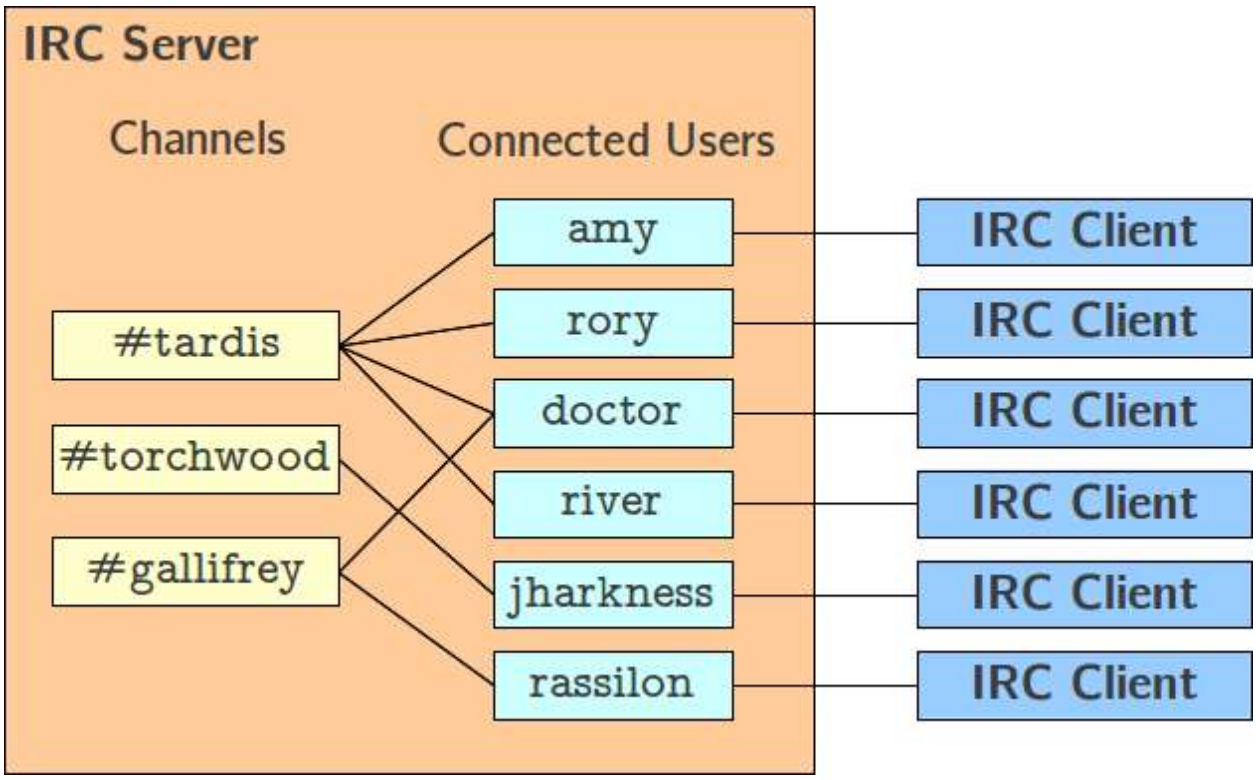
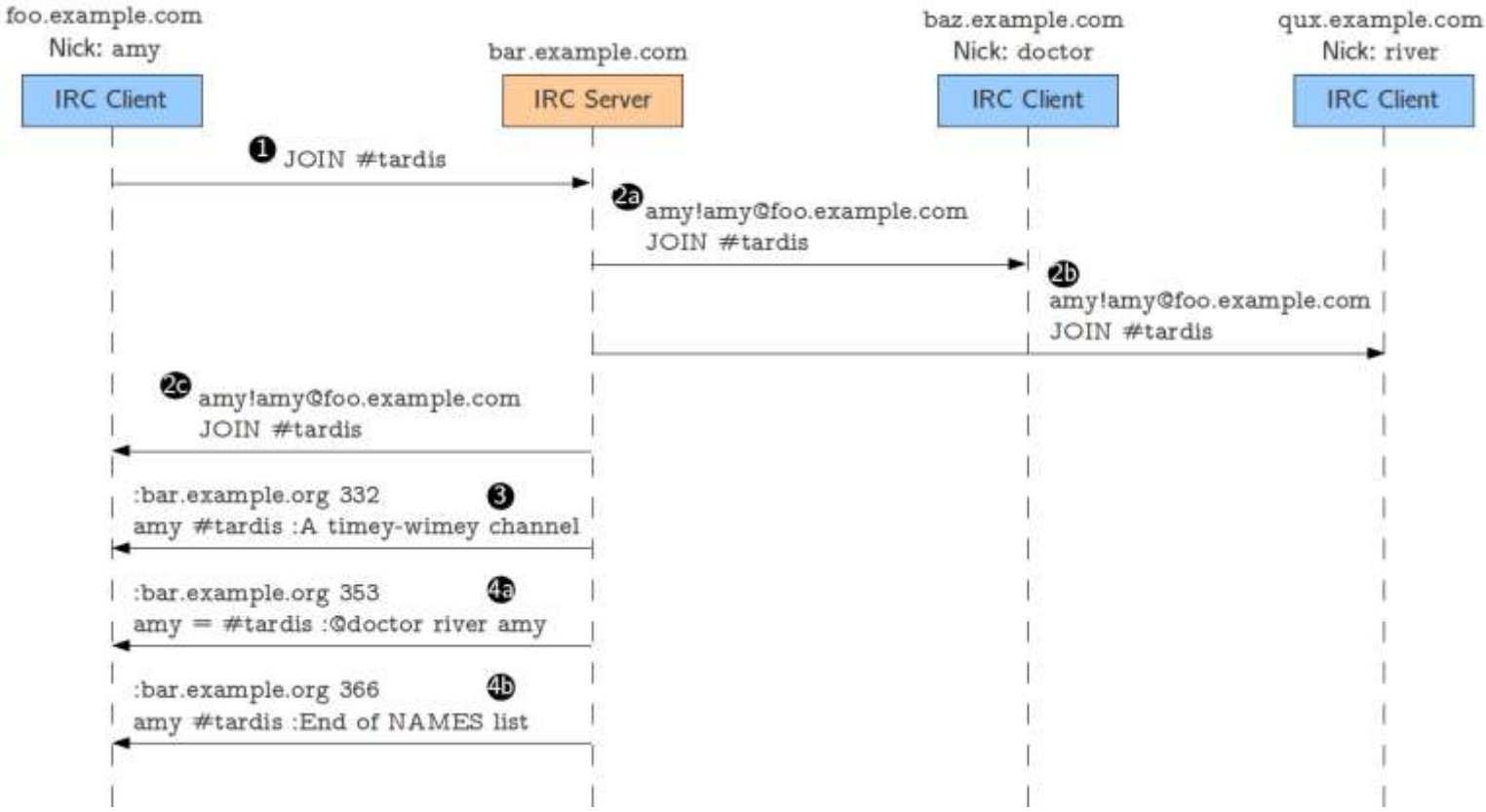


Fig. Basic IRC architecture

The basic architecture of IRC, shown in the figure above, is fairly straightforward. In the simplest case, there is a single *IRC server* to which multiple *IRC clients* can connect to. An IRC client connects to the server with a specific identity. Most notably, each client must choose a unique *nickname*, or "nick". Once a client is connected, it can communicate one-to-one with other users. Additionally, clients can run commands to query the server's state (e.g., to obtain a list of connected users, or to obtain additional details about a specific nick). IRC also supports the creation of chat rooms called *channels* for one-to-many communication. Users can join channels and send messages to the channel; these messages will, in turn, be sent to every user in the channel.

Joining, talking in, and leaving a channel



Users connected to an IRC server can join existing channels by using the JOIN message. The format of the message itself is pretty simple (its only parameter is the name of the channel the user wants to join), but it results in several replies being sent not just to the user joining the channel, but also to all the users currently in the channel. The figure above shows what happens when user amy joins channel #tardis, where two users (doctor and river) are already present.

Message 1 is amy's JOIN message to the server. When this message is received, the server *relays* it to the users who are already in the channel (doctor and river) to make them aware that there is a new user in the channel (messages 2a and 2b). Notice how the relayed JOIN is prefixed with amy's full client identifier. The JOIN is also relayed back to amy, as confirmation that she successfully joined the channel.

The following messages (3, 4a, and 4b) provide amy with information about the channel. Message 3 is a RPL_TOPIC reply, providing the channel's *topic* (this is a description of the channel which can be set by certain users; we'll discuss this in detail later). Messages 4a and 4b are RPL_NAMREPLY and RPL_ENDOFNAMES replies, respectively, which tell amy what users are currently present in the channel. Notice how the doctor user has an at-sign before his nick; this indicates that doctor is a *channel operator* for channel #tardis. As we'll see in the third assignment, users can have *modes* that give them special privileges in the server or on individual channels.

How IRC operates?

- Internet Relay Chat Protocol (IRCP) is an application layer protocol that facilitates communication in the form of text. The chat process works on a client/server networking model. IRC clients are computer programs that a user can install on their system. These clients communicate with chat servers to transfer messages to other clients.
- An IRC server echoes the conversations on each channel to each connected user on that channel and network to provide the illusion that the participants are all in the same virtual room. When you log onto IRC with your client application, it logs onto the server you set as your default in the program settings. You can then join any public chat room running on that server. Every message you enter in a given chat room is then sent by your client application across the Internet to the IRC server, which immediately echoes it to every other user connected to that chat room.

- Because the server copies and echoes the messages across the world sofast, traveling across copper and fiber connections at 2/3 the speed of light, the illusion is maintained that everyone is directly connected to everyone else, even though they are only really connected in common to the server.

7.3. Broadband Communications, Policy, xDSL and Cable Internet

Broadband communications is usually considered to be any technology with transmission rates above the fastest speed available over a telephone line. Broadband transmission systems typically provide channels for data transmissions in different directions and by many different users. *For example, the coaxial CATV system is a broadband system that delivers multiple television channels over the same cable*. In addition, it can handle data transmissions (primarily Internet access for home users) in an entirely different frequency spectrum.

Typical broadband communication systems include the following:

- ISDN (Integrated Services Digital Network) ISDN is *implemented over existing copper telephone cables.* The basic rate variety provides two channels of 64-Kbit/sec throughput that can be bonded to form a 128-Kbit/sec data channel. Primary rate ISDN provides additional bandwidth in increments of 64 Kbits/sec.
- ATM (Asynchronous Transfer Mode) Another high-bandwidth service available from the carriers. The carriers use of ATM benefits everyone, but medium to large companies can install ATM equipment on-site to connect directly into carrier ATM networks and gain all the benefits of those systems.
- Frame Relay A data networking and voice service offered by the carriers that is widely available. Like ATM, frame relay is primarily used for corporate rather than home connections.
- Leased lines and T Carriers Leased T1 lines provide dedicated throughput of 1.544 Mbits/sec over two-pair twisted wire. Existing telephone cable is usually adequate. T3 provides approximately 45-Mbit/sec throughput. Fractional T1 can be leased in increments of 64 Kbits/sec. See "TDM Networks" for more details.
- DSL (Digital Subscriber Line) DSL is a whole family of high-bandwidth digital services that the telephone companies offer over copper telephone cable. Depending on the service, rates can reach into the multimegabit/sec rates.
- Cable (CATV) Data Networks The cable TV system is a well-established broadband network that now makes its system available for data links and Internet access. Nearly 100 million homes in the U.S. have cable access, and it is estimated that 70 to 75 percent of those homes will be able to support Internet access in the year 2000.
- Wireless Communications A variety of wireless broadband services are now available or under development, including satellite-based systems and terrestrial-based systems that are essentially fixed cellular systems. Broadband wireless uses microwave and millimeter wave technology to transmit signals from base stations to customers. See "Wireless Broadband Access Technologies."

Policy (National Broadband Policy, 2071)

- Radio frequency spectrum to expand broadband access by means of both mobile and fixed wireless technologies consistent with international standards and best practices will be released. Along these lines, prevailing spectrum management regime in Nepal will be reformed to provide for more transparent and responsive action on frequency allocation, assignment and pricing. Provisions will also be made to make some unlicensed spectrum available for rollout of wireless broadband services to unserved and underserved areas. Availability of adequate spectrum for IMT and IMT Advanced services will be ensured. Also, arrangements will be made to ensure the availability of sufficient microwave spectrum to meet current and future demand for wireless backhaul especially in prime bands below 12 GHz, in addition to higher spectrum bands.
- *Fixed-mobile convergence will be* promoted for optimized delivery of services to the consumers irrespective of their devices and locations
- The telecommunications *regulatory framework will be modernized and liberalized* with simplified, unified and technology-neutral licensing regime to enable the convergence of services on digital platforms and foster the development of open competition with providers able to choose the most appropriate technologies.
- *Roadmap for availability of additional spectrum for every 5 years* will be prepared beginning the year 2014.
- *Infrastructure sharing will be promoted* through legal and regulatory instruments and directives so as to minimize the overall cost of service provision and increase choices for users in urban, rural and underserved areas.
- *Capacity of the regulator will be strengthened* to deal with unfair competition, protect consumer interests and facilitate converged services (including mixed broadcasting and communication business models) with enhanced competition in all the elements of broadband value chain (national and international infrastructure, networks, services and applications).
- *Coordination among all relevant ministries and government agencies will be strengthened* in order to achieve efficient and effective implementation of seamless broadband services. Along these lines, formulation of special programs to improve the efficiency, effectiveness and reach of government services and specific eGovernment initiatives to enable people to maximize online transactions with all levels of Government will be incentivized encouraged.
- *Measures will be taken to secure the unbundling of the local loop* under favorable terms and conditions.
- *Comprehensive measures* will be taken to lower infrastructure rollout costs
- *Broadband services will be extended* to all the 75 district headquarters of Nepal by 2015 and measures will be taken to ensure competitive roll-out of infrastructure and services into the rural and remote areas.

- Least-cost subsidy program to expand wireless broadband services to areas that are likely to remain unserved by commercial services will be developed and implemented.
- Measures will be taken to *incorporate futuristic role of IPV6* and its potential areas of application in various sectors of Nepali economy. Along these lines, the development of an ecosystem for provision of large number of services on IP platform will be encouraged.
- Steps will be taken *to ensure inclusion of IT enabled, broadband based service delivery models* into annual plans and strategies of sectoral agencies of the government including those in education, health and agriculture sectors, in order to create demand for broadband services and encourage deployment of ICTs to bridge gaps in delivery of public services. Special emphasis will be given to the role of ICT and broadband in improving access to education and educational outcomes.
- Adoption of measures aimed at *reducing environmental impact and* strategies to incentivise use of green technologies for meeting energy requirements of telecommunications and broadband infrastructure will be encouraged.
- *Broadband Accessibility Working Group will be created* within the Ministry of Information and Communication to facilitate broadband adoption by people with disabilities
- *Specific programs and strategic frameworks* will be developed to harness broadband connectivity to promote sustainable development. Along these lines, innovative deployment of ICT based solutions will be encouraged in the areas ranging from food security, managing urbanization, supporting and securing the natural ecosystem and biodiversity, curbing human-induced climate change and transforming governance.
- Telecom including broadband connectivity will be recognized as a basic necessity and efforts will be made towards *ensuring Rights to Broadband.*

* xDSL and Cabel Ethernet

- DSL *technologies use sophisticated modulation schemes to pack data onto copper wires*. They are sometimes referred to as last-mile technologies because they are used only for connections from a telephone switching station to a home or office, not between switching stations.
- xDSL is similar to ISDN in as much as both operate over existing copper telephone lines (POTS) and both require the short runs to a central telephone office (usually less than 20,000 feet). However, xDSL offers much higher speeds - up to *32 Mbps for upstream* traffic, and from *32 Kbps to over 1 Mbps for downstream traffic.*
- DSL is a family of technologies that are used to transmit digital data over telephone lines. In telecommunications marketing, the term DSL is widely understood to mean asymmetric digital subscriber line(ADSL), the most commonly installed DSL technology, for Internet access. DSL service can be delivered simultaneously with *wired telephone service on the same telephone line.* This is possible because *DSL uses higher frequency bands for data.* On the customer premises, a DSL filter on each non-DSL outlet blocks any high-frequency interference to enable simultaneous use of the voice and DSL services.

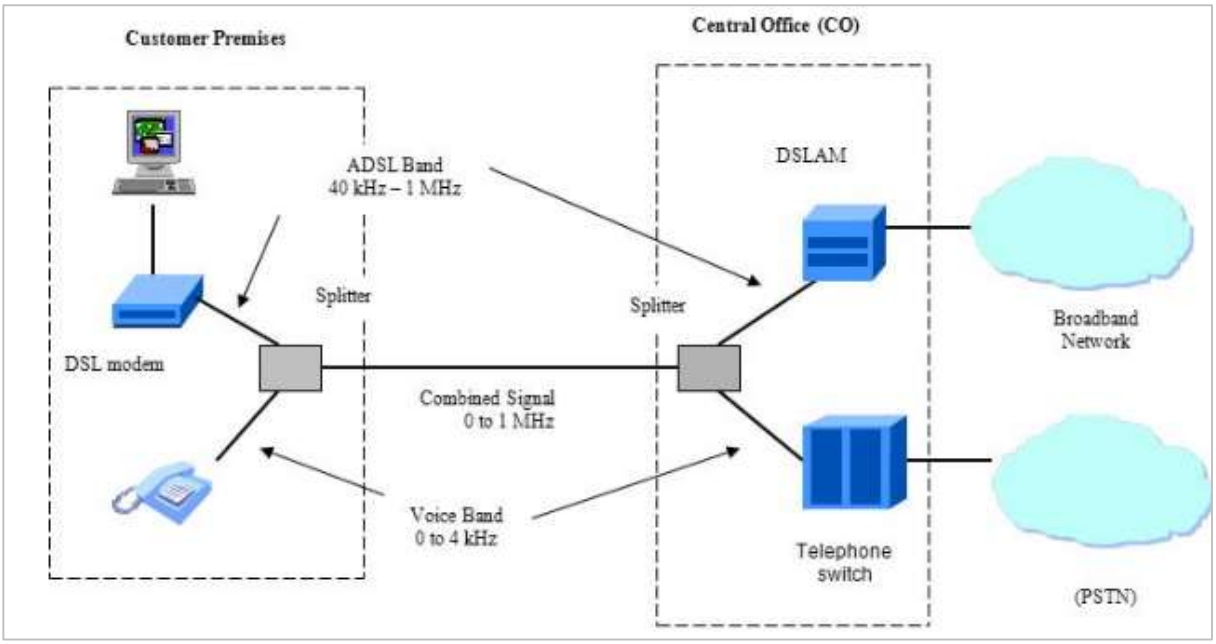


Fig. DSL Architecture

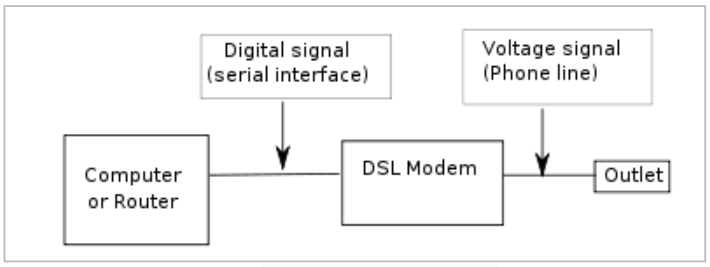


Fig. DSL Modem schematic

VARIOUS TYPES OF DSL BROADBAND INTERNET CONNECTIONS

Depends on equal upstream and downstream speed, categories as follows :-

I. *RADSL - (Rate Adaptive Digital Subscriber Line) :* Most robust business DSL available today, developed to overcome line impediments. *Automatically adjusts for environmental conditions; - Because RADSL is a type of SDSL, it supports symmetric (equal downstream and upstream) data transmissions up to 768K.*

II. *ADSL - Asymmetrical Digital Subscriber Line :* ADSL supports a range of asymmetric *(higher downstream than upstream)* data speeds that can reach up to 7 mbps downstream and 1.5 mbps upstream. ADSL can *deliver simultaneous high-speed data and telephone service over the same line.*

III. *ADSL Lite (or G.lite) :* This is a *lower speed version of ADSL* and provides *downstream speeds of up to 1Mbps* and *upstream speeds of 512 kbps*, at a *distance of 18,000* feet from the service provider's premises.

IV. *R-ADSL - Rate-Adapative Digital Subscriber Line :* The R-ADSL provides the same transmission rates as ADSL, but an R-ADSL modem can *dynamically adjust the speed of the connection depending on the length and quality of the line.*

V. *HDSL - Hight Bit-Rate Digital Subscriber Line :* The HDSL *provides a symmetric connection*, that is, upstream speeds and downstream speeds are the same, and range from *1.544 Mbps to 2.048 Mbps at a distance of 12,000–15,000 feet*. Symmetric connections are more useful in applications like *videoconferencing*, where data sent upstream is as heavy as data sent downstream. HDSL-II, which will provide the same transmission rates but over a single copper-pair wire, is also round the block.

VI. *IDSL - ISDN Digital Subscriber Line :* The ISDN Digital Subscriber Line provides up *to 144 kbps transmission speeds at a distance of 18,000 feet (can be extended),* and uses the same techniques to transfer data as ISDN lines. The advantage is that, unlike ISDN, this is an 'always on' connection.

VII. *SDSL - Symmetric Digital Subscriber Line* : SDSL supports symmetric (*equal downstream and upstream*) *data transmissions up to 1.54 mbps.*

VIII. *VDSL - Very High Bit-rate Digital Subscriber Line* : VDSL is the fastest of all xDSL flavors and provides transmission rates of *13–52 Mbps downstream and 1.5–2.3 Mbps upstream over a single copper-pair wire, at a distance of 1,000–4,500 feet* from the service provider's premises.

* Cable Ethernet : LAN technology

Ethernet is a type of *network cabling and signaling specifications developed by Xerox in the late 1970*. While Internet is a global network, Ethernet is a *local area network (LAN*). With Ethernet, file sharing and printer sharing among machines became possible. In short, "ether" is said to be a kind of substance that exists everywhere. Although this is a misconception, network developers still adopted the term "ether" and therefore "Ethernet" means "a network of everywhere."

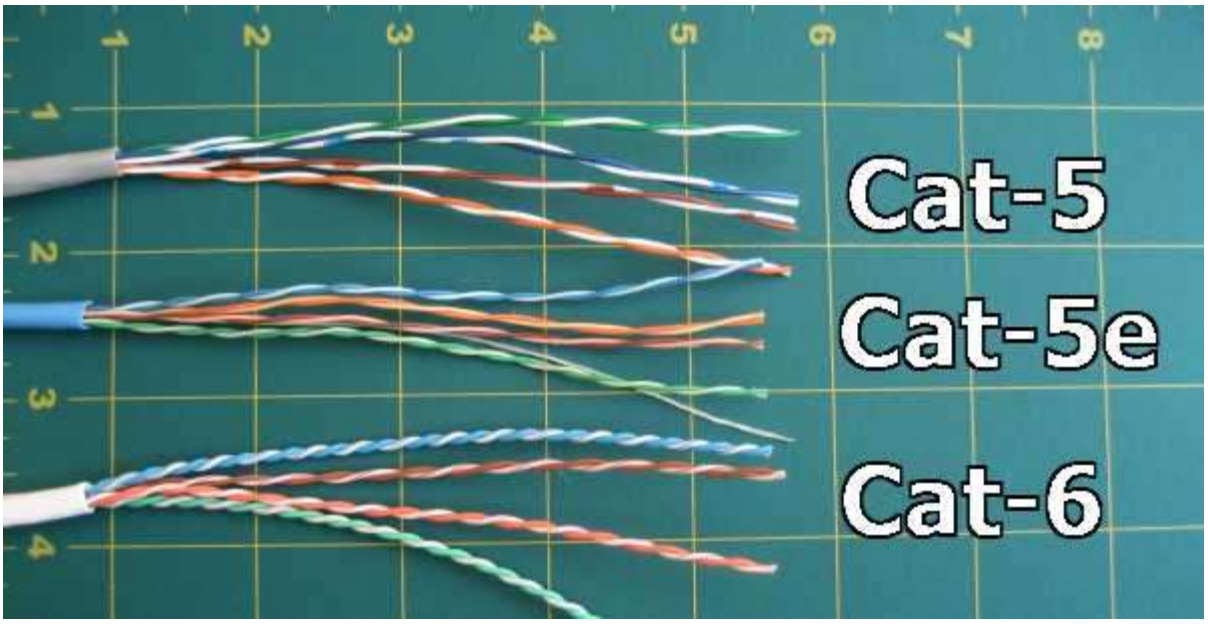
Ethernet uses a communication concept called datagrams to get messages across the network. The Ethernet datagrams take the form of self-contained packets of information. These packages have *fields containing information about the data, their origin, their destination and the type of data.* The data field in each package can contain up to 1500 bytes. It is also provided with the sender address, the receiver address, the stamp indicating what the package's contents are.

There are several standards of Ethernet, such as 1000BaseT, 10GBaseT...etc. Where,

- The number stands for signaling speed: "1000" is *1000 Mbps*.
- *"Base" means **B**aseband*, which *uses digital signals, bi-directional transmission for short distance* so that all devices connected to the network *can hear all transmissions*.
- "T" stands for **T**wisted pair cable.

The Major Categories of Ethernet Cables

There are two main physical differences between Cat-5 and Cat-6 cables, the number of twists per cm in the wire, and sheath thickness.



*** DSL vs Ethernet**

- Ethernet is used to connect computers locally, such as in a home or office setting. DSL is used to connect a computer to the Internet.
- Ethernet is a standard for home and office networking. It is not a practical solution for Internet because of its high cost of deployment in comparison to other network types.
- DSL is an Internet technology based on sending and receiving data through copper telephone lines. It requires a modem that usually connects by way of an Ethernet cable to a computer's network interface card.
- The cables used for DSL and Ethernet connections are similar. Both are constructed of copper wiring, but typical Ethernet cables have two extra pairs of twisted copper wires. Ethernet also uses a larger plug, whereas DSL uses the standard phone plug. They are not interchangeable.
- DSL speeds range from 768 Kilobits per second to 7 Megabits per second. Ethernet networks can run at different speeds, depending on the technology used: the Ethernet standard can run at up to 10 Megabits per second; the Fast Ethernet standard up to 100 Megabits per second; and the Gigabit Ethernet standard up to 1 Gigabit per second.

7.4. VoIP, FoIP and IP Interconnection

VOIP

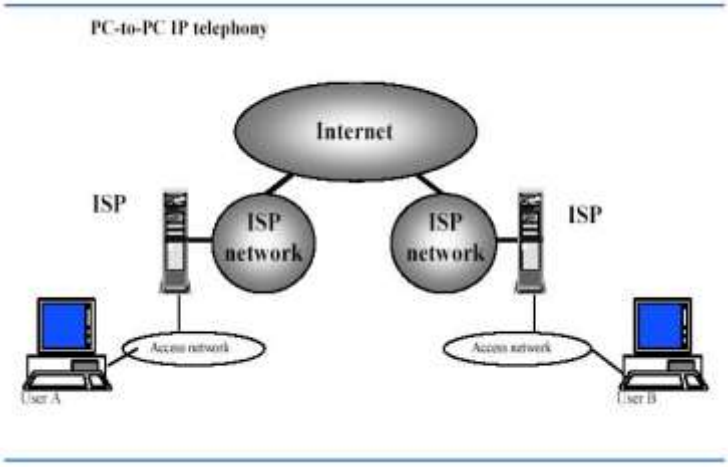
Voice over Internet Protocol (**Voice over IP**, **VoIP** and **IP telephony**) is a methodology and group of technologies for the delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks, such as the Internet. The terms **Internet telephony**, **broadband telephony**, and **broadband phone service** specifically refer to the provisioning of communications services (voice, fax, SMS, voice-messaging) over the public Internet, rather than via the public switched telephone network (PSTN).
Voice over IP has been implemented in various ways using both proprietary protocols and protocols based on open standards. VoIP protocols include: SIP(Session Initiation Protocol), RTP(Real-time Transport Protocol), Skype

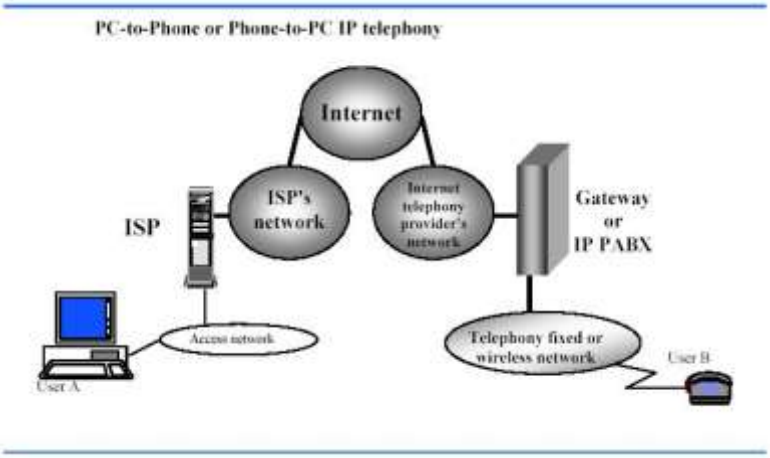
Classification of VoIP

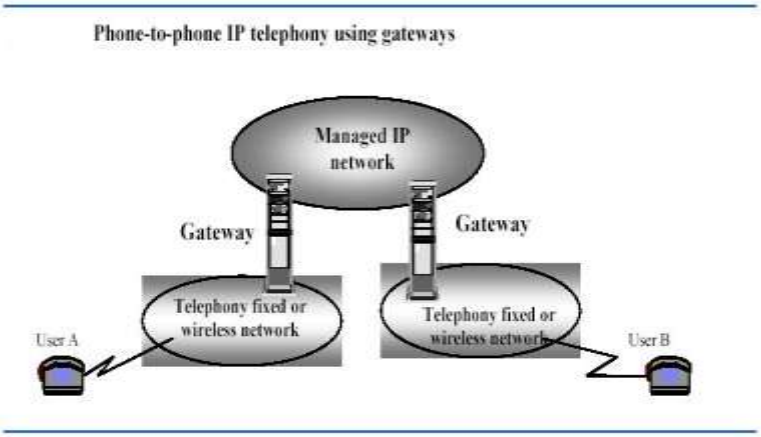
***VoIP** M—* Communication by transmitting the IP Voice to PSTN Voice or PSTN Voice to IP Voice by using Managed Gateway from one place to another place or one country to another country. This type of service has good QoS(Quality of Service.
Internet Telephony M— communication is performed by using Internet Protocol. PSTN is not used for this type of communication.

Operation Mode of VoIP/ Internet Telephony

*PC-to-PC or IP Device-to- IP Device
*PC-to-Phone
*Phone-to-Phone







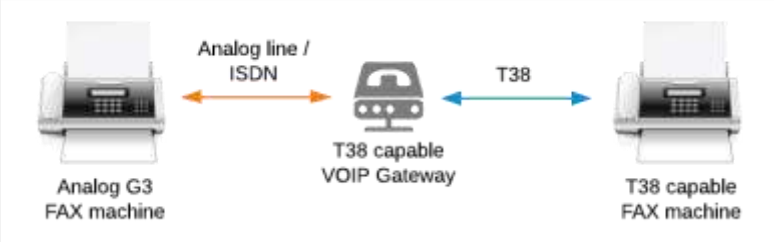
Incoming Call Bypass : Call termination in mobile or telephone incoming in our country from outer country by using internet but without using licensed ISP Gateway. Required for call bypass is Gateway Device, Internet Link (Wireless or Wire-line preferably optical fiber), Public IP Address .

***FoIP :** **FoIP**, also called **IP Faxing**, is a method of sending faxes over the Internet. FoIP changes the transmission medium of faxing in much the same way that VoIP (Voice over Internet Protocol) changes the transmission medium of a phone call. In both cases, data makes all or most of the trip between sending and receiving devices on a packet-switched network (usually the Internet), avoiding the long-distance phone lines of the circuit-switched telephone network . This reduces the cost of transmission and can be a more efficient setup for a business that already has access to Internet bandwidth.

The FoIP setup is a lot like the VoIP setup, and you can even send IP faxes using a VoIP server. However, since a fax requires more bandwidth than a voice, a VoIP server doesn't automatically work seamlessly for transmitting faxes. It typically requires some modifications, which you can make by installing a piece of software. Some companies also make servers that are optimized for both VoIP and FoIP applications. There are a lot of ways to implement FoIP. In the next section, we'll find out what a simple IP faxing system looks like.

How FoIP Works

Fax over IP works via T38 and requires a T38 capable VoIP Gateway as well as a T38 capable fax machine, fax card or fax software. Fax Server software that can talk 'T38' allows the great Unified Communications feature, Fax to Email, which sends faxes directly via a VoIP gateway and converts the fax message into an email. The plus side is that no additional fax hardware is needed for the Fax to Email feature to work seamlessly!



3CX includes a full featured T38 fax server that allows faxes to be received from anywhere in the network. Faxes can be received as PDF and forwarded via email. Other fax servers currently in the market require the use of separately licensed and expensive Dialogic SoftIP drivers.

How Does FAX Work in VoIP Environments?

FAX was designed for analog networks, and can not travel over a digital VoIP network. The reason for this is that FAX communication uses the analog signal in a different way to regular voice communication. When VoIP technologies digitize and compress analog voice communication it is optimized for voice and not FAX signaling.

If you want to continue using your old fax machine, and you want to connect it to your VoIP phone system, its best to use a VoIP Gateway and an ATA (Analog Telephony Adapter) that supports T38. T38 is a protocol designed to allow fax to "travel" over a VoIP network.

It is also possible to convert to computer based fax and choose a VoIP phone system that supports fax. 3CX Phone System for Windows includes a full featured fax server that is able to receive faxes and forward them in PDF format to e-mail.

Another way to deal with fax when you switch to a VoIP phone system is to connect the fax machine directly to the existing analog phone line and bypass your VoIP system.

7.5. Datacenters and Data warehousing, packet clearing house

*Data Centers

A **data center** is a facility used to house computer systems and associated components, such as telecommunications and storage systems. It generally includes redundant or backup power supplies, redundant data communications connections, environmental controls (e.g., air conditioning, fire suppression) and various security devices. Large data centers are industrial scale operations using as much electricity as a small town

Importance of Data Centers

- Running the IT systems applications that handle the core business and operational data of the organization. Such systems may be proprietary and developed internally by the organization, or bought from enterprise software vendors. Such common applications are Enterprise resource planning (**ERP**) and Customer relationship management (**CRM**) systems.
- For quick deployment or disaster recovery, several large hardware vendors have developed mobile/modular solutions that can be installed and made operational in very short time e.g. CISCO, IBM, HP, Huawei, Google Data Centers
- A data center may be concerned with just operations architecture or it may provide other services as well.
- Data centers are also used for offsite(away from the place of a business or activity.) backups. Companies may subscribe to backup services provided by a data center.

Design considerations

- Design programming
- Modeling criteria
- Design recommendations
- Conceptual design
- Detailed design
- Mechanical engineering infrastructure designs
- Electrical engineering infrastructure design
- Technology infrastructure design
- Availability expectations
- Site selection
- Modularity and flexibility
- Environmental control : Metal whiskers
- Electrical power
- Low-voltage cable routing
- Fire protection
- Security

Energy use

- Greenhouse gas emissions
- Energy efficiency
- Energy use analysis
- Power and cooling analysis
- Energy efficiency analysis
- Computational fluid dynamics (CFD) analysis
- Thermal zone mapping
- Green data centers

Source: https://en.wikipedia.org/wiki/Data_center

Data Centers Level and Tiers

Tier Level	Requirements
I	• Single non-redundant distribution path serving the critical loads • Non-redundant critical capacity components
II	• Meets all Tier I requirements, in addition to: • Redundant critical capacity components • Critical capacity components must be able to be isolated and removed from service while still providing N capacity to the critical loads.
III	• Meets all Tier II requirements in addition to: • Multiple independent distinct distribution paths serving the IT equipment critical loads • All IT equipment must be dual-powered provided with two redundant, distinct UPS feeders. Single corded IT devices must use a Point of Use Transfer Switch to allow the device to receive power from and select between the two UPS feeders. • Each and every critical capacity component, distribution path, and component of any critical system must be able to be fully compatible with the topology of a site's architecture isolated for planned events (replacement, maintenance, or upgrade) while still providing N capacity to the critical loads. • Onsite energy production systems (such as engine generator systems) must not have runtime limitations at the site conditions and design load.
IV	• Meets all Tier III requirements in addition to: • Multiple independent distinct and active distribution paths serving the critical loads • Compartmentalization of critical capacity components and distribution paths • Critical systems must be able to autonomously provide N capacity to the critical loads after any single fault or failure • Continuous Cooling is required for IT and UPS systems.

Q.What are the major challenges of modern data center?

***Data Warehousing**

A **data warehouse** (**DW** or **DWH**), also known as an **enterprise data warehouse** (**EDW**), is a system used for reporting and data analysis, and is considered a core component of business intelligence. DWs are central repositories of integrated data from one or more disparate sources. They store current and historical data in one single place and are used for creating analytical reports for knowledge workers throughout the enterprise. Examples of reports could range from annual and quarterly comparisons and trends to detailed daily sales analysis.

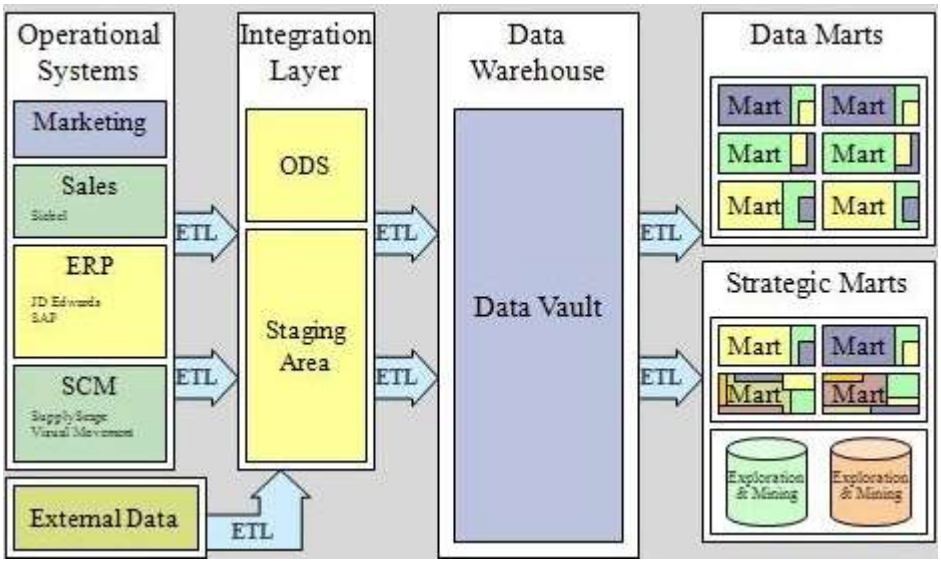


Fig. Data Warehouse Overview

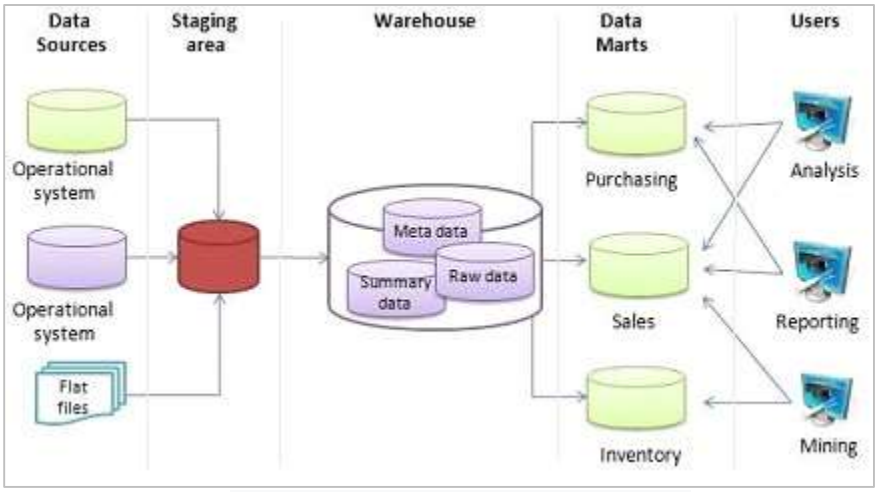


Fig. The basic architecture of a data warehouse

Benefits of Data Warehouse

A data warehouse maintains a copy of information from the source transaction systems. This architectural complexity provides the opportunity to:

- Integrate data from multiple sources into a single database and data model. Mere congregation of data to single database so a single query engine can be used to present data is an ODS.
- Mitigate the problem of database isolation level lock contention in transaction processing systems caused by attempts to run large, long running, analysis queries in transaction processing databases.
- Maintain data history, even if the source transaction systems do not.
- Integrate data from multiple source systems, enabling a central view across the enterprise. This benefit is always valuable, but particularly so when the organization has grown by merger.
- Improve data quality, by providing consistent codes and descriptions, flagging or even fixing bad data.
- Present the organization's information consistently.
- Provide a single common data model for all data of interest regardless of the data's source.
- Restructure the data so that it makes sense to the business users.
- Restructure the data so that it delivers excellent query performance, even for complex analytic queries, without impacting the operational systems.
- Add value to operational business applications, notably customer relationship management (CRM) systems.
- Make decision–support queries easier to write.
- Optimized data warehouse architectures allow data scientists to organize and disambiguate repetitive data

Difference between Data Centers, Data Warehouse and Data Mart

- **A data center**, also called a server farm, is a facility used to house computer systems and associated components, such as telecommunications and storage systems.
- **Data warehouse** is a repository of an organization's electronically stored data. Data warehouses are designed to facilitate reporting and analysis. Also a Data Warehouse may host many Data Marts
- A **data mart** is a subset of an organizational data store, usually oriented to a specific purpose or major data subject, that may be distributed to support business needs.

So there can be **one or more Data Marts**, that exist **in a Data Warehouse** that is **hosted in a Data Center** that may contain more than one Data Warehouse plus other services.

***Packet Clearing House(PCH)**

PCH is the international organization responsible for providing operational support and security to critical Internet infrastructure, including Internet exchange points and the core of the domain name system.

Internet Exchange Points: Packet Clearing House provides support both to Internet exchange facilities in the process of formation and to those that are already up and running. Although we supply the switching equipment that forms the technological core of exchanges, often our most valuable contribution is in the form of education, technical expertise, and mediation with policy and economic officials of the local government. The IXP Directory has a list of all the IXPs worldwide.

- was originally formed in 1994 by Chris Alan and Mark Kent to provide efficient regional and local network interconnection alternatives for the west coast of the United States.
- It has since grown to become a leading proponent of neutral independent network interconnection and provider of route-servers at major exchange points worldwide. PCH provides equipment, training, data, and operational support to organizations and individual researchers seeking to improve the quality, robustness, and accessibility of the Internet.
- As of 2013, major PCH projects include
  - the construction and support of more than a third of the world's approximately 350 Internet exchange points (IXPs);
  - operation of the INOC-DBA global Internet infrastructure protection hotline communications system;
  - support for globally anycast Domain Name System (DNS) resources including root nameservers and more than one hundred and thirty top-level domains (TLDs);
  - operation of the only FIPS 140-2 Level 4 global TLD DNSSEC key management and signing infrastructure, with facilities in Singapore, Zurich, and San Jose;
  - implementation of network research data collection initiatives in more than three dozen countries; and
  - the development and presentation of educational materials to foster a better understanding of Internet architectural principles and their policy implications among policy makers, technologists, and the general public.

PCH works closely with the United States Telecommunications Training Institute (USTTI) to offer courses on telecommunications regulation, Internet infrastructure construction and management, domain name system management, and Internet security coordination, three times yearly in Washington D.C., in addition to the eighty to one hundred workshops PCH teaches on-location throughout the world each year.

7.6. Unified Messaging Systems

Unified Messaging (or UM) is the integration of different electronic messaging and communications media (e-mail, SMS, Fax, voicemail, video messaging, etc.) technologies into a single interface, accessible from a variety of different devices.

- Unified messaging (sometimes referred to as the *unified messaging system* or *UMS*) is the handling of voice, fax, and regular text messages as objects in a single mailbox that a user can access either with a regular e-mail client or by telephone. The PC user can open and play back voice messages, assuming their PC has multimedia capabilities. Fax images can be saved or printed.
- A user can access the same mailbox by telephone. In this case, ordinary e-mail notes in text are converted into audio files and played back.
- Unified messaging is particularly convenient for mobile business users because it allows them to reach colleagues and customers through a PC or telephone, whichever happens to be available. Some services offer worldwide telephone access.

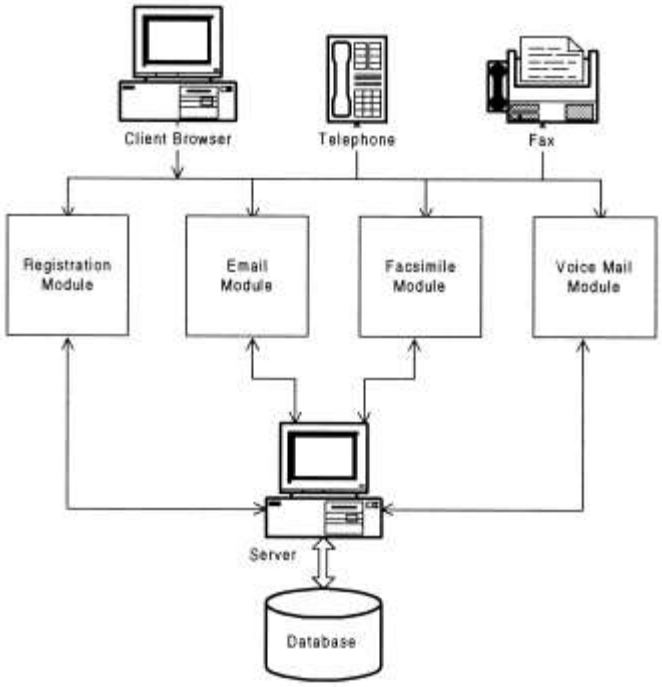


Fig. 1. Architecture for a typical unified messaging system.

- **Unified messaging** (or **UM**) is a marketing buzzword describing the attempt at integrating different electronic messaging and communications media (e-mail, SMS, fax, voicemail,video messaging, etc.) technologies into a single interface, accessible from a variety of different devices.[1] While traditional communications systems delivered messages into several different types of stores such as voicemail systems, e-mail servers, and stand-alone fax machines, with Unified Messaging all types of messages are stored in one system. Voicemail messages, for example, can be delivered directly into the user's inbox and played either through a headset or the computer's speaker. This simplifies the user's experience (only one place to check for messages) and can offer new options for workflow such as appending notes or documents to forwarded voicemails.
- Unified messaging was expected by many in the consumer telecommunications industry to be a popular product, first augmenting and eventually replacing voicemail. However, UM was slow to gain consumer acceptance, and UM vendors such as Comverse were badly hit when the slowdown in the telecommunications industry in 2001 made carriers wary of spending large amounts of money on technology with little proven consumer demand.
- Today, UM solutions are increasingly accepted in the corporate environment. The aim of deploying UM solutions generally is to enhance and improve business productivity while decreasing communication issues.[2] UM solutions targeting professional end-user customers integrate communications processes into the existing IT infrastructure, i. e. into CRM,ERP and mail systems (e.g. Microsoft Exchange, Lotus Notes, SAP)

Why Unified Communication is important ?

Unified Communications (UC) helps companies save time, money and IT resources. Today office communication takes place via different devices and media types – telephone land lines, mobile phones, video conferencing, email and soft phones. Employees can feel stressed and overwhelmed trying to juggle all these channels and still work effectively.

Unified Communications brings together all these devices and interfaces into one single integrated application. In short, UC makes it easier for people to connect, communicate and work together. The result is more productive employees and smoother interactions – and at a fraction of the cost. There are many reasons why Unified Communications is so important.

-Boosts Productivity & Workplace Collaboration : Unified Communications enables employees to carry out their work faster and more efficiently, and from virtually anywhere. With advanced telephony functions, such as short-number dialing, advanced call forwarding, multiple device rings, and single voicemail, employees can work and collaborate effectively across the organization.
-Reduces travel and administrative costs : Unified Communications can help reduce travel and administrative costs. With Unified Communications technology, companies can make calls using a digital public network, and thereby reduce the company's telephone bills. Unified Communications enable companies to reach out, connect and communicate with employees no matter where they are working. It's possible to attend a meeting via a smartphone, cell phone, in your car, at home or at the office, and decrease travel budgets.
-Lowers IT and other Operational Costs : Integrating your company's voice system with the other communication modes helps to reduce the need for IT resources, thereby lowering operating costs. In addition, saving IT and operational costs gives companies the opportunity to innovate more.
*-Better Workforce Collaboration:*With Presence and other messaging capabilities, Unified Communications allows colleagues to check availability of and find the best way to contact an individual. Much like the status indicator used in social networking applications, the Presence function in Unified Communications solutions tells you whether the person you want to contact is on the phone, in a meeting and where they are located. Users can also indicate if they don't want to be disturbed. It's also possible to find the right person for the right job quickly with Unified Communications.
-Secure Communication : Unified Communications combines telephony and business data on the same network and can encrypt the information that is being sent across the network. You can be sure that sensitive information being shared via video, phone calls, fax or other ways is secure.

7.7. Fundamental of e-Commerce

E-commerce is a transaction of buying or selling online. Electronic commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange(EDI), inventory management systems, and automated data collection systems. Modern electronic commerce typically uses the World Wide Web for at least one part of the transaction's life cycle although it may also use other technologies such as e-mail.
E-commerce businesses may employ some or all of the following:

- Online shopping web sites for retail sales direct to consumers
- Providing or participating in online marketplaces, which process third-party business-to-consumer or consumer-to-consumer sales
- Business-to-business buying and selling
- Gathering and using demographic data through web contacts and social media
- Business-to-business (B2B) electronic data interchange
- Marketing to prospective and established customers by e-mail or fax (for example, with newsletters)
- Engaging in retail for launching new products and services
- Online financial exchanges for currency exchanges or trading purposes

Types of E-Commerce

- Business-to-consumer e-commerce (B2C) : Online connects individual consumers with company/ sellers , in the absence of middleman E.g. Online Shopping - Amazon.com.
- C2B (Consumer-to-Business) : consumers offer their products or services online and companies post their bids. Then consumers review the bids and choose companies that meet their price expectations. E.g. A consumer posts his project with a set budget online and within hours companies review the consumer's requirements and bid on the project. The consumer reviews the bids and selects the company that will complete the project.
- Business-to-business e-commerce (B2B) : companies sell their goods online to other companies
- Consumer-to-consumer e-commerce (C2C) : consumers sell their goods to other consumers. E.g. hamrobazar.com
- Government to government (G2G) is the electronic sharing of data and/or information systems between government agencies, departments or organizations. The goal of G2G is to support e-government initiatives by improving communication, data access and data sharing. E.g. *Northeast Gang Information System (NEGIS). NEGIS is used by states in the northeast to share information about street gangs, including gang-related activities and gang intelligence. The system connects all the state police departments of the participating states, and the police departments transmit the collected information to their states' other law enforcement and public service agencies.*

Electronic Payment System : E-Commerce or Electronics Commerce sites use electronic payment where electronic payment refers to paperless monetary transactions. Electronic payment has revolutionized the business processing by reducing paper work, transaction costs, labour cost. Being user friendly and less time consuming than manual processing, helps business organization to expand its market reach / expansion. Some of the modes of electronic payments are following.

I. Credit Card : When a customer purchases a product via credit card, credit card issuer bank pays on behalf of the customer and customer has a certain time period after which he/she can pay the credit card bill. It is usually credit card monthly payment cycle.
II. Debit Card : Debit card, like credit card is a small plastic card with a unique number mapped with the bank account number. It is required to have a bank account before getting a debit card from the bank. The major difference between debit card and credit card is that in case of payment through debit card, amount gets deducted from card's bank account immediately and there should

be sufficient balance in bank account for the transaction to get completed. Whereas in case of credit card there is no such compulsion.
Debit cards free customer to carry cash, cheques and even merchants accepts debit card more readily. Having restriction on amount being in bank account also helps customer to keep a check on his/her spending.

III. **Smart Card** : Smart card is again similar to credit card and debit card in appearance but it has a small microprocessor chip embedded in it. It has the capacity to store customer work related/personal information. Smart card is also used to store money which is reduced as per usage.
Smart card can be accessed only using a PIN of customer. Smart cards are secure as they stores information in encrypted format and are less expensive/provides faster processing. Mondex and Visa Cash cards are examples of smart cards.

IV. **E-Money** : E-Money transactions refers to situation where payment is done over the network and amount gets transferred from one financial body to another financial body without any involvement of a middleman. E-money transactions are faster, convenient and saves a lot of time.
Online payments done via credit card, debit card or smart card are examples of e-money transactions. Another popular example is e-cash. In case of e-cash, both customer and merchant both have to sign up with the bank or company issuing e-cash.

V. **Electronic Fund Transfer (EFT)** : It is a very popular electronic payment method to transfer money from one bank account to another bank account. Accounts can be in same bank or different bank. Fund transfer can be done using ATM (Automated Teller Machine) or using computer.

7.8. Concept of Grid and Cloud Computing

Grid Computing

Grid computing is the collection of computer resources from multiple locations to reach a common goal. The **grid** can be thought of as a distributed system with non-interactive workloads that involve a large number of files. Grid computing is distinguished from conventional high performance computing systems such as cluster computing in that grid computers have each node set to perform a different task/application. Grid computers also tend to be more heterogeneous and geographically dispersed (thus not physically coupled) than cluster computers.[1] Although a single grid can be dedicated to a particular application, commonly a grid is used for a variety of purposes. Grids are often constructed with general-purpose grid middleware software libraries. Grid sizes can be quite large.[2]
Grids are a form of distributed computing whereby a "**super virtual computer**" is composed of many networked loosely coupled computers acting together to perform large tasks. For certain applications, distributed or grid computing can be seen as a special type of parallel computing that relies on complete computers (with onboard CPUs, storage, power supplies, network interfaces, etc.) connected to a computer network (private or public) by a conventional network interface, such as Ethernet. This is in contrast to the traditional notion of a supercomputer, which has many processors connected by a local high-speed computer bus.

Grid Computing Characteristics

- ***Large scale:*** a grid must be able to deal with a number of resources ranging from just a few to millions. This raises the very serious problem of avoiding potential performance degradation as the grid size increases.
- ***Geographical distribution:*** grid's resources may be located at distant places.
- ***Heterogeneity:*** a grid hosts both software and hardware resources that can be very varied ranging from data, files, software components or programs to sensors, scientific instruments, display devices, personal digital organizers, computers, super-computers and networks.
- ***Resource sharing***: resources in a grid belong to many different organizations that allow other organizations (i.e. users) to access them. Nonlocal resources can thus be used by applications, promoting efficiency and reducing costs.
- ***Multiple administrations***: each organization may establish different security and administrative policies under which their owned resources can be accessed and used. As a result, the already challenging network security problem is complicated even more with the need of taking into account all different policies.
- ***Transparent access:*** a grid should be seen as a single virtual computer.
- ***Dependable access:*** a grid must assure the delivery of services under established Quality of Service (QoS) requirements. The need for dependable service is fundamental since users require guarantees that they will receive predictable, sustained and often high levels of performance.
- ***Consistent/Reliable access:*** a grid must be built with standard services, protocols and inter faces thus hiding the heterogeneity of the resources while allowing its scalability. Without such standards, application development and pervasive use would not be possible.
- ***Pervasive/Universal access:*** the grid must grant access to available resources by adapting to a dynamic environment in which resource failure is commonplace. This does not imply that resources are everywhere or universally available but that the grid must tailor its behavior as to extract the maximum performance from the available resources.

How Grid Computing Works

If a machine on a computing grid has a large task to be performed, the program must first be parallelized. The flow of the program needs to be analyzed and each module is separated. The modules are then arranged to illustrate which ones can be executed independently. Those

modules are then sent to different machines for execution. The results are then resent to the original machine, where they are amalgamated into one whole.

Advantages/ Disadvantage of Grid Computing

Advantages

- Can solve larger, more complex problems in a shorter time
- Easier to collaborate with other organizations
- Make better use of existing hardware

Disadvanges

- Grid software and standards are still evolving
- Learning curve to get started
- Non-interactive job submission

Cloud Computing

Cloud computing is a new form of Internet-based computing that provides shared computer processing resources and data to computers and other devices on demand. It is a model for enabling universal, on-demand access to a shared pool of configurable computing resources (e.g., computer networks, servers, storage, applications and services), which can be rapidly provisioned and released with minimal management effort. Basically, Cloud computing allows the users and enterprises with various capabilities to store and process their data in either privately owned cloud, or on a third-party server in order to make data accessing mechanisms much more easy and reliable. Data centers[3] that may be located far from the user–ranging in distance from across a city to across the world. Cloud computing relies on sharing of resources to achieve coherence and economy of scale, similar to a utility (like the electricity grid) over an electricity network.

The United States government is a major consumer of computer services and, therefore, one of the major users of cloud computing networks. The U.S. National Institute of Standards and Technology (NIST) has a set of working definitions that separate cloud computing into service models and deployment models. Those models and their relationship to essential characteristics of cloud computing are shown in Figure 1

-Deployment Models

A deployment model defines the purpose of the cloud and the nature of how the cloud is located. The NIST definition for the four deployment models is as follows

Public cloud: The public cloud infrastructure is available for public use alternatively for a large industry group and is owned by an organization selling cloud services.

Private cloud: The private cloud infrastructure is operated for the exclusive use of an organization. The cloud may be managed by that organization or a third party.

Hybrid cloud: A hybrid cloud combines multiple clouds (private, community of public) where those clouds retain their unique identities, but are bound together as a unit. A hybrid cloud may offer standardized or proprietary access to data and applications, as well as application portability.

Community cloud: A community cloud is one where the cloud has been organized to serve a common function or purpose. It may be for one organization or for several organizations, but they share common concerns such as their mission, policies, security, regulatory compliance needs, and so on. A community cloud may be managed by the constituent organization(s) or by a third party.

Service Models

- **Infrastructure-as-a-Service(IaaS)** is the delivery of huge computing resources such as the capacity of processing, storage and network. Sometimes the IaaS is also called Hardware-as-a-Service (**HaaS**)

IaaS Characteristics

Some characteristics to look for when considering IaaS are:

- Resources are available as a service
- The cost varies depending on consumption
- Services are highly scalable
- Typically includes multiple users on a single piece of hardware
- Provides complete control of the infrastructure to organizations
- Dynamic and flexible

When to Use IaaS

Just as with SaaS and PaaS, there are specific situations when it is the most advantageous to use IaaS. If you are a startup or a small company, IaaS is a great option so you don't have to spend the time or money trying to create hardware and software. IaaS is also beneficial for large organizations who wish to have complete control over their applications and infrastructures, but are looking to only purchase what is actually consumed or needed. For rapidly growing companies, IaaS can be a good option as you don't have to commit to a specific hardware or software as your needs change and evolve. It also helps if you are unsure what demands a new application will need as there is a lot of flexibility to scale up or down as needed.

- **Platform-as-a-Service (PaaS)** generally abstracts the infrastructures and supports a set of application program interface to cloud applications. It is the middle bridge between hardware and application.

PaaS Characteristics

PaaS has many characteristics that define it as a cloud service, including:

- It is built on virtualization technology, meaning resources can easily be scaled up or down as your business changes
- Provides a variety of services to assist with the development, testing, and deployment of apps
- Numerous users can access the same development application
- Web services and databases are integrated

When to Use PaaS

There are many situations that utilizing PaaS is beneficial or even necessary. If there are multiple developers working on the same development project, or if other vendors must be included as well, PaaS can provide great speed and flexibility to the entire process. PaaS is also beneficial if you wish to be able to create your own customized applications. This cloud service also can greatly reduce costs and it can simplify some challenges that come up if you are rapidly developing or deploying an app.

- **Software-as-a Service(SaaS)** aims at replacing the applications running on PC. There is no need to install and run the special software on your computer if you use the SaaS.

SaaS Characteristics

There are a few ways to help you determine when SaaS is being utilized:

- Managed from a central location
- Hosted on a remote server
- Accessible over the internet
- Users not responsible for hardware or software updates

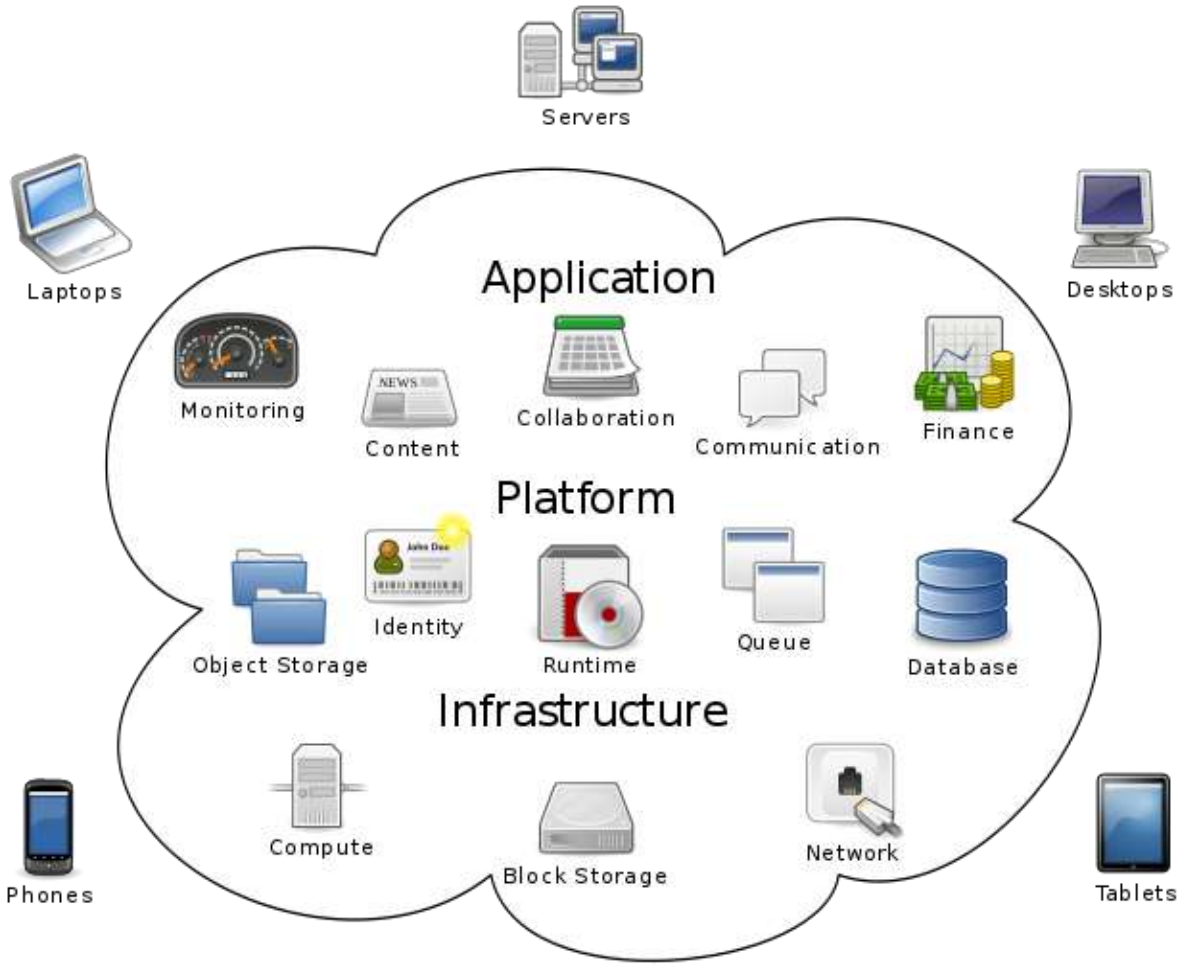
When to Use SaaS

There are many different situations in which SaaS may be the most beneficial, including:

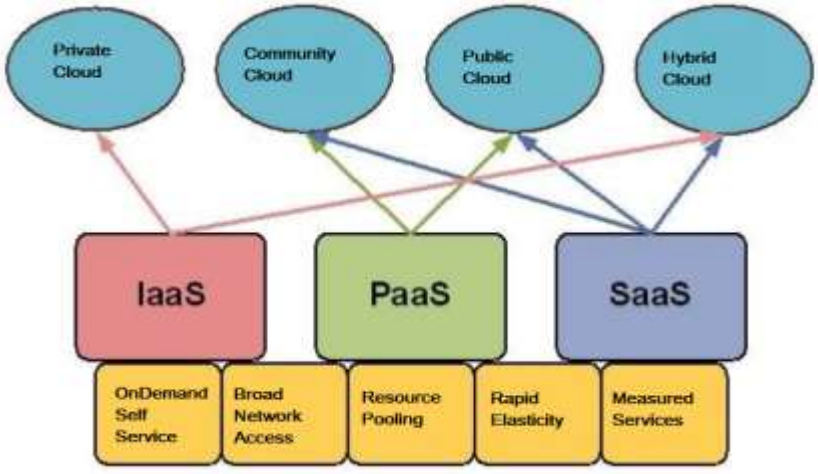
- If you are a startup or small company that needs to launch ecommerce quickly and don't have time for server issues or software
- For short-term projects that require collaboration
- If you use applications that aren't in-demand very often, such as tax software
- For applications that need both web and mobile access

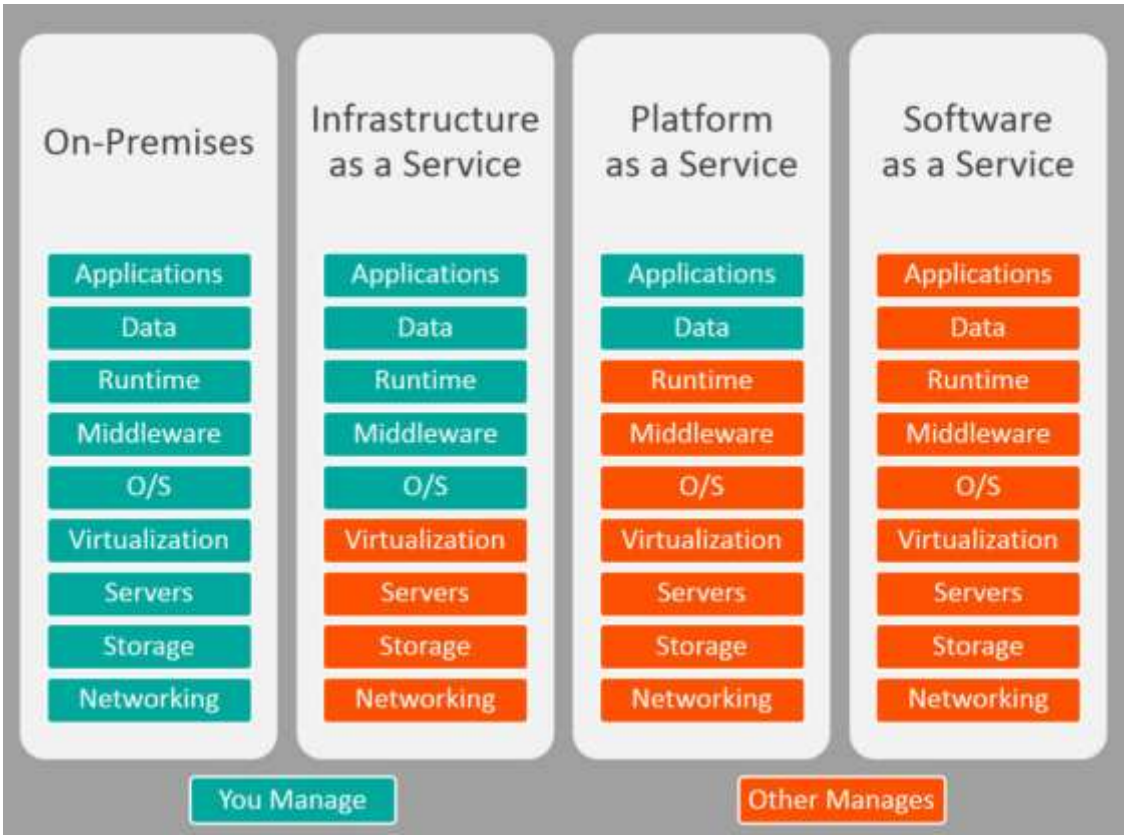
Examples of SaaS, PaaS, & IaaS

Platform Type	Common Examples
SaaS	Google Apps, Dropbox, Salesforce, Cisco WebEx, Concur, GoToMeeting
PaaS	AWS Elastic Beanstalk, Windows Azure, Heroku, Force.com, Google App Engine, Apache Stratos, OpenShift
IaaS	DigitalOcean, Linode, Rackspace, Amazon Web Services (AWS), Cisco Metapod, Microsoft Azure, Google Compute Engine (GCE)



Cloud computing

- 



Advantages of Cloud Computing

If used properly and to the extent necessary, working with data in the cloud can vastly benefit all types of businesses. Mentioned below are some of the advantages of this technology:

- ***Cost Efficient :*** Cloud computing is probably the most cost efficient method to use, maintain and upgrade. Traditional desktop software costs companies a lot in terms of finance. Adding up the licensing fees for multiple users can prove to be very expensive for the establishment concerned. The cloud, on the other hand, is available at much cheaper rates and hence, can significantly lower the company's IT expenses. Besides, there are many one-time-payment, pay-as-you-go and other scalable options available, which makes it very reasonable for the company in question.
- ***Almost Unlimited Storage :***Storing information in the cloud gives you almost unlimited storage capacity. Hence, you no more need to worry about running out of storage space or increasing your current storage space availability.
- ***Backup and Recovery :*** Since all your data is stored in the cloud, backing it up and restoring the same is relatively much easier than storing the same on a physical device. Furthermore, mostcloud service providers are usually competent enough to handle recovery of information.Hence, this makes the entire process of backup and recovery much simpler than other traditional methods of data storage.
- ***Automatic Software Integration :*** In the cloud, software integration is usually something that occurs automatically. This means that you do not need to take additional efforts to customize and integrate your applications as per your preferences. This aspect usually takes care of itself. Not only that, cloud computing allows you to customize your options with great ease. Hence, you can handpick just those services and software applicationsthat you think will best suit your particular enterprise.
- ***Easy Access to Information :*** Once you register yourself in the cloud, you can access the information from anywhere, where there is an Internet connection. This convenient feature lets you move beyond time zone and geographic location issues.
- ***Cloud Computing –*** Is it Possible to Assign a Standard?
- ***Quick Deployment :*** Lastly and most importantly, cloud computing gives you the advantage of quick deployment. Once you opt for this method of functioning, your entire system can be fully functional in a matter of a few minutes. Of course, the amount of time taken here will depend on the exact kind of technology that you need for your business.

Disadvantages of Cloud Computing

In spite of its many benefits, as mentioned above, cloud computing also has its disadvantages. Businesses, especially smaller ones, need to be aware of these cons before going in for this technology.

The Risks Involved in Cloud Computing

- ***Technical Issues :***Though it is true that information and data on the cloud can be accessed anytime and from anywhere at all, there are times when this system can have some serious dysfunction. You should be aware of the fact that this technology is always prone to outages and other technical issues. Even the best cloud service providers run into this kind of trouble, in spite of keeping up high standards of maintenance.
- Besides, you will need a very good Internet connection to be logged onto the server at all times. You will invariably be stuck in case of network and connectivity problems.
- ***Security in the Cloud :***The other major issue while in the cloud is that of security issues. Before adopting this technology, you should know that you will be surrendering all your company's sensitive information to a third-party cloud service provider. This could potentially put your company to great risk. Hence, you need to make absolutely sure that you choose the most reliable service provider, who will keep your information totally secure.
- What Strategies Should an Enterprise Adopt in Order to Ensure Data Protection?
- ***Prone to Attack***
- Storing information in the cloud could make your company vulnerable to external hack attacks and threats. As you are well aware, nothing on the Internet is completely secure and hence, there is always the lurking possibility of stealth of sensitive data.

Comparison between Grid Computing and Cloud Computing :-

Parameters	Grid Computing	Cloud Computing
Goal	Collaborative sharing of resources	Use of services
Workflow Management	In one physical mode	In EC2 e.g. AmazonEC2+S3
Level of abstraction	Low	High
Degree of scalability	Normal	High
Transparency	Low	High
Time to run	Not real-time	Real-time services
Request type	Few but large location	Lots of small allocation
Allocation Unit	Job or task(small)	All shapes and size(wide and narrow)
Virtualization	Not a commodity	Vital
Portal accessible	Via a DNS system	Only using IP(no DNS registered)
OS	Any standard OS	A Hypervisor(VM) on which multiple OS run
Ownership	Multiple	Single
Discovery	Centralized indexing and decentralized info services	Membership services
User Management	Decentralized and also Virtual Organization(VO) based	Centralized or can be delegated to third party
Types of services	CPU, Network, Memory, Bandwidth, Device, Storage	IaaS, PaaS, SaaS, Everything as a service
Future	Cloud Computing	Next Generation of Internet