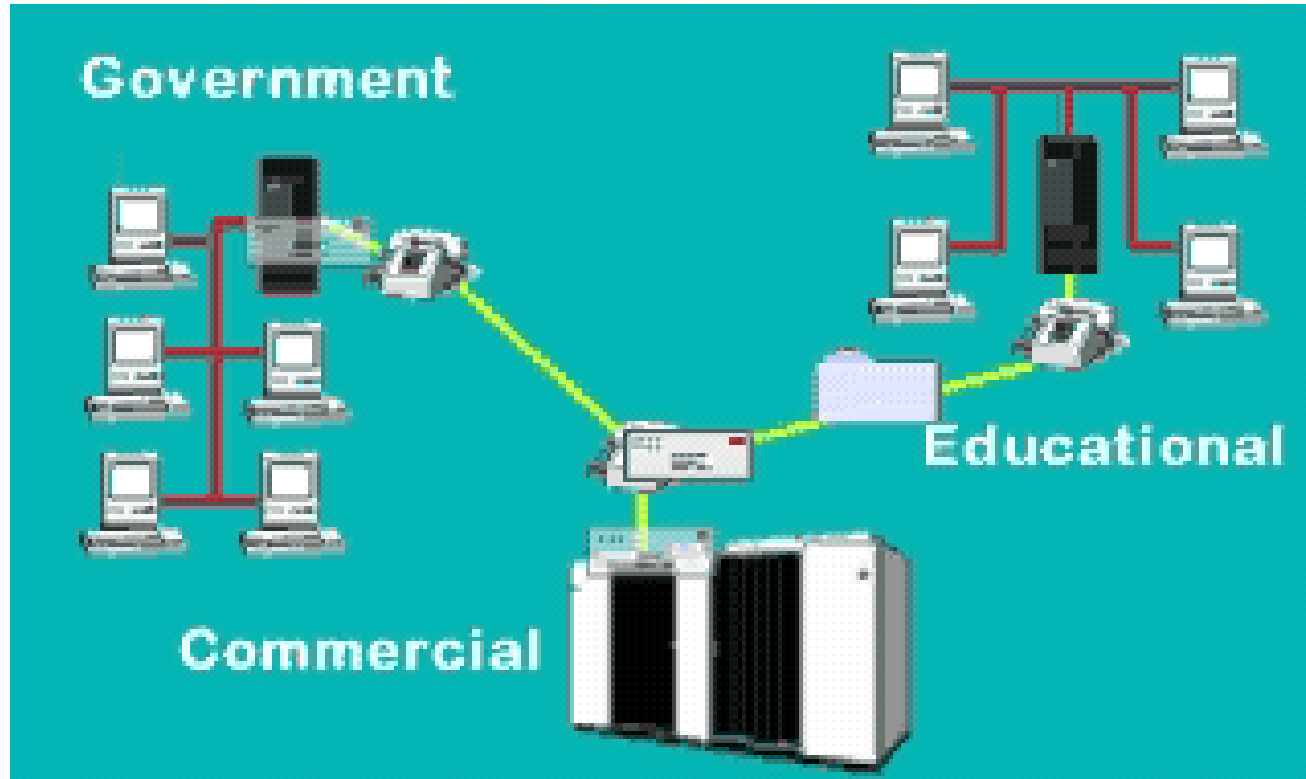


Introduction

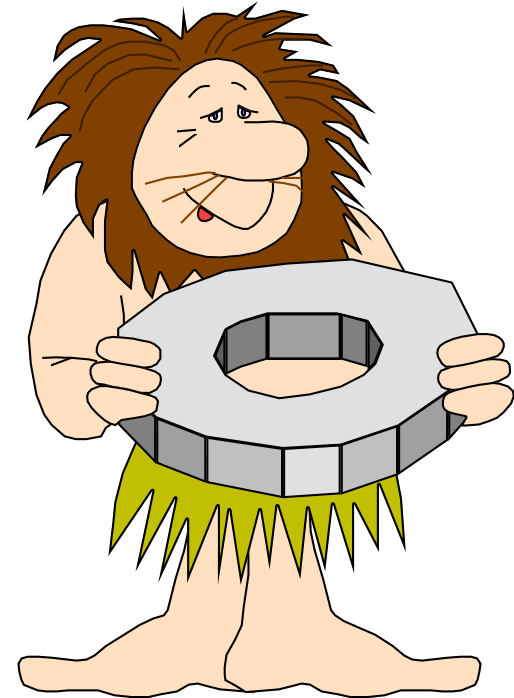
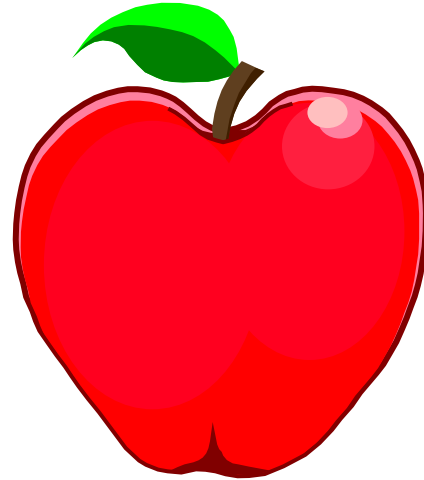
Three Major Players in Internet History



History of Internet & the TCP/IP

Where Did it All Begin???

- In the Beginning . . .
- More specifically,
- The creation of the Internet is dependent on mankind's earlier innovations



Early Innovations

1836 - Telegraph by Cooke and Wheatstone

- Revolutionized human (tele)communications.
- Morse Code a series of dots and dashes used to communicate between humans. This is similar to how computers communicate via (binary 0/1) data today.
- Although it is much slower!!

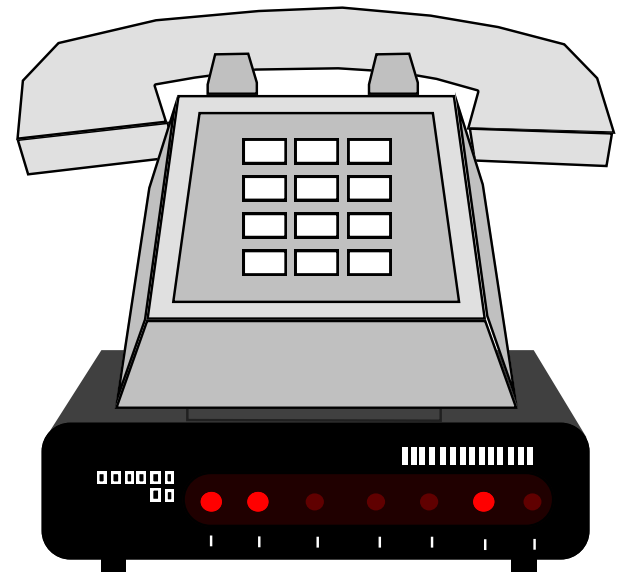
1858-1866 - Transatlantic cable. Allowed direct instantaneous communication across the Atlantic.

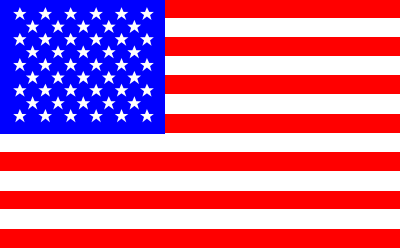
- Today, cables connect all continents and are still a main hub of telecommunications.

Early Innovations

1876 - Telephone. Alexander Graham Bell Exhibits.

- Telephones exchanges provide the backbone of Internet connections today.
- Modems provide Digital to Audio conversions to allow computers to connect over the telephone network.





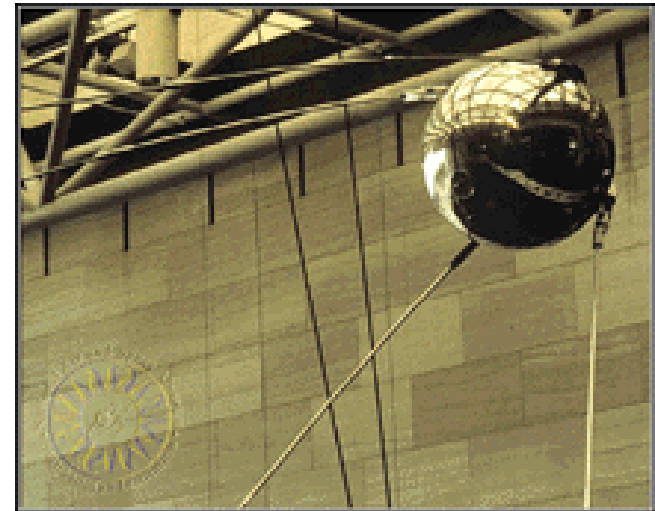
Political Events



1940's to 1980's - U.S. vs. Soviet Cold War

1957 - U.S.S.R. launches Sputnik. The US forms the Advanced Research Projects Agency (ARPA) within the Department of Defense (DoD) to build US skills in computer technology.

- The start of global telecommunications. Satellites play an important role in transmitting all sorts of data today.



The Birth of the Internet

1957 - In response, US forms the Advanced Research Projects Agency (ARPA) within the Department of Defense (DoD) to establish US lead in science and technology applicable to the military.

1962 - Dr. J.C.R. Licklider was chosen to head ARPA's research in improving the military's use of computer technology.

- Licklider was a visionary who sought to make the government's use of computers more interactive.
- moved ARPA's contracts from the private sector to universities and laid the foundations for what would become the ARPANET.

The Birth of the Internet

1962-1968 - Packet-switching (PS) networks developed

- The Internet relies on packets to transfer data.
- Data is split into tiny packets that may take different routes to a destination.
- The origin is military : for utmost security in transferring information of networks (no single outage point).
- More than one route available -- if one route goes down another may be followed.
- Networks can withstand large scale destruction (Nuclear attack - This was the time of the Cold War).

The Birth of the Internet

- **1969** - ARPANET commissioned by DoD for research into networking
- First node at UCLA and
- soon after at:
- Stanford Research Institute (SRI)
- UCSB
- U of Utah
- use of Information Message Processors (IMP) [Honeywell 516 mini computer with 12K of memory] developed by Bolt Beranek and Newman, Inc. (BBN)

The Birth of the Internet

- The plan was unprecedented: Kleinrock, a pioneering computer science professor at UCLA, and his small group of graduate students hoped to log onto the Stanford computer and try to send it some data.
- They would start by typing "logwin," and seeing if the letters appeared on the far-off monitor.
- Kleinrock : "We set up a telephone connection between us and the guys at SRI...,"

The Birth of the Internet

"We typed the L and we asked on the phone,

"Do you see the L?"

"Yes, we see the L," came the response.

"We typed the O, and we asked, "Do you see the O."

"Yes, we see the O."

"Then we typed the G, and the system crashed"...

Yet a revolution had began"...

Source: Sacramento Bee, May 1, 1996, p.D1

L
O
G

The Birth of the Internet

1971 - Ray Tomlinson of BBN invents email program to send messages across a distributed network. The original program was derived from two others:

- an intra-machine email program (SNDMSG) and an experimental file
- transfer program (CPYNET)
- 15 nodes (23 hosts) on ARPANET.

1973 - Global Networking becomes a reality

- First international connections to the ARPANET: University College of London (England) and Royal Radar Establishment (Norway)

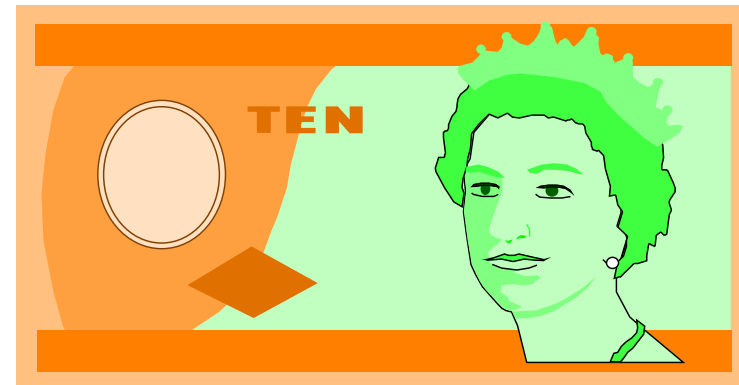
The Birth of the Internet

1974 - Packets become mode of transfer

- Transmission Control Program (TCP) specified. Packet network Intercommunication -- the basis of Internet Communication.
- Telenet, a commercial version of ARPANET, opened -- the first public packet data service.

1976 - Networking comes to many

- Queen Elizabeth sends out an e-mail.



The Birth of the Internet

1977 - E-mail takes off, Internet becomes a reality

- Number of hosts breaks 100.
- THEORYNET provides electronic mail to over 100 researchers in computer science (using a locally developed E-mail system and TELENET for access to server).
- Mail specification

The Birth of the Internet

1979 - News Groups born

- Computer Science Department research computer network established in USA.
- USENET established using UUCP.
 - USENET still thrives today.
 - A collection of discussions groups, news groups.
 - 3 news groups established by the end of the year
 - Almost any topic now has a discussion group.

The Birth of the Internet

- 1982** - TCP/IP defines future communication • DCA and ARPA establishes the Transmission Control Protocol (TCP) and Internet Protocol (IP), as the protocol suite, commonly known as TCP/IP, for ARPANET.
- Leads to one of the first definitions of an Internet as a connected set of networks, specifically those using TCP/IP, and Internet as connected TCP/IP internets.

1983 - Internet gets bigger

Name server developed.

- There is such a large number of nodes that its hard to remember exact paths
- Use meaningful names instead.

The Birth of the Internet

1984 - Growth of Internet Continues

- Number of hosts breaks 1,000.
- Domain Name Server (DNS) introduced. Instead of 123.456.789.10 it is easier to remember something like www.myuniversity.mydept.mynetwork.mycountry
- (e.g. www.cs.cf.ac.uk).

1986 - Power of Internet Realised

- 5, 000 Hosts. 241 News groups.
- NSFNET created when NSF establishes 5 super-computing centers to provide high-computing power for all -- This allows an explosion of connections, especially from universities.

The Birth of the Internet

1987 - Commercialization of Internet Born

- Number of hosts 28,000.
- UUNET is founded with Usenix funds to provide commercial UUCP and Usenet access.

1988

- Internet Relay Chat (IRC) developed

1989 - Large growth in Internet

- Number of hosts breaks 100,000
- First relays between a commercial electronic mail carrier and the Internet

The Birth of the Internet

1990 - Expansion of Internet continues

- 300,000 Hosts. 1,000 News groups
- ARPANET ceases to exist
- Archie released files can be searched and retrieved (FTP) by name.
- The World comes on-line (world.std.com), becoming the first commercial provider of Internet dial-up access.

The Birth of the Internet

1991 - Friendly User Interface to WWW established

- Gopher released by Paul Lindner and Mark P. McCahill from the U of Minnesota.
- Text based, menu-driven interface to access internet resources.
- No need to remember or even know complex computer command. User Friendly Interface (?).
- Largely superseded by WWW, these days.

The Birth of the Internet

1992 - Multimedia changes the face of the Internet

- Number of hosts breaks 1 Million. News groups 4,000
- The term "Surfing the Internet" is coined by Jean Armour Polly.

The Birth of the Internet

1993 - The WWW Revolution truly begins

- Number of Hosts 2 Million. 600 WWW sites.
- The Mosaic Web browser is released (by a group of 10 students from UI at Champaign-Urbana) on the Net, gaining 2 million and fueling a 341,634% annual growth rate for Web traffic.
- The White House opens its Web page and the President gets an e-mail address.
- Business and Media really take notice of the Internet.
- Mosaic takes the Internet by storm.
 - User Friendly Graphical Front End to the World Wide Web.
 - Develops into Netscape -- most popular WWW browser to date.

The Birth of the Internet

The Stats Map of Net History				
30 Years of the Net in Brief Stats Story				
Date	Hosts	Domains*	WebSites	WHR(%)***
Jan-98	29,670,000	2,500,000**	2,450.000**	8.3
Jul-97	19,540,000	1,301,000	1,200,000	6.2
Jul-96	12,881,000	488,000	300,000	2.3
Jul-95	6,642,000	120,000	25000	0.4
Jul-94	3,212,000	46,000	3,000	0.1
Jul-93	1,776,000	26,000	150	0.01
Jul-92	992,000	16,300	50	0.005
Jul-89	130,000	--	--	--
Jul-81	210	--	--	--
1969	4	--	--	--

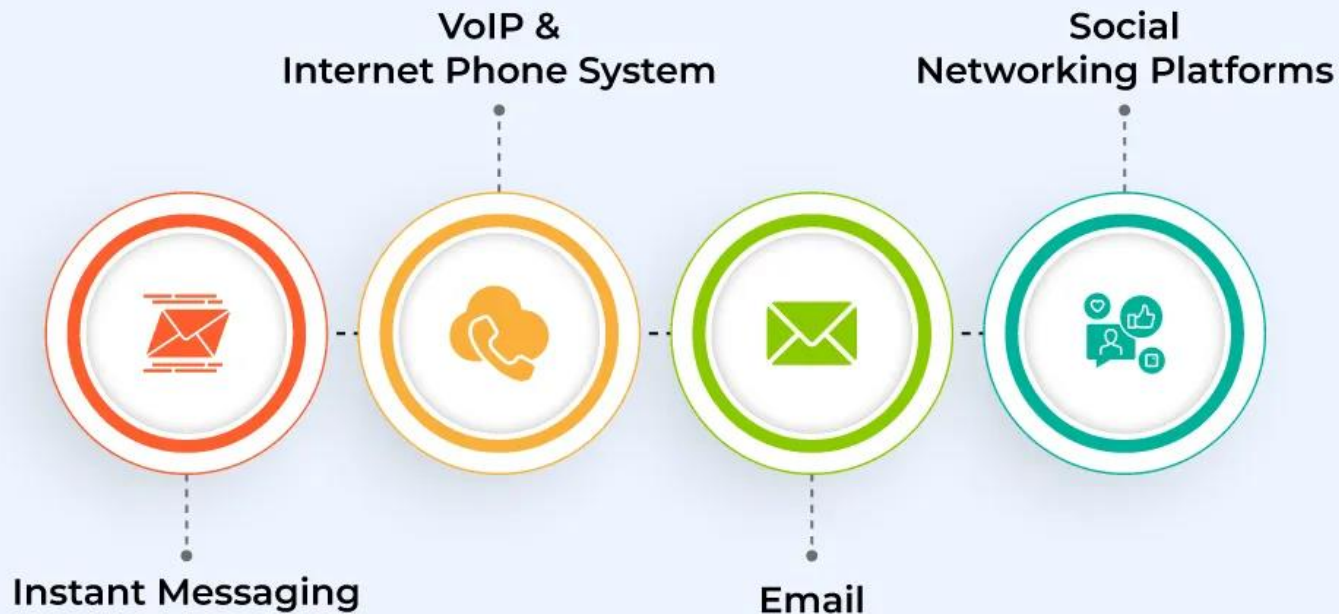
Communicating via the Internet

- Internet communication refers to communicating with people over the internet. It could be in any form: messages, voice, or video calls.
- One of the major advantages of internet communication tools over traditional communication is cost savings. In addition, many free tools make internet communication easier, such as WhatsApp, Skype, Google Meet, and Messenger.
- Even businesses can communicate with overseas customers at pocket-friendly prices using the internet.

Web based Communication

- Web based communication refers to exchanging information, i.e., sending and receiving information via the internet. It can be done through various means, including email, instant messaging, social networking, and video conferencing.
- It has become an increasingly popular communication method, as it is often quicker and easier than traditional methods such as face-to-face conversation or telephone calls.

What Are The Different Types Of Internet Communication?



Instant Messaging

- An online chat technology that allows people to communicate via messages in real-time within an internet-based chat room.
- When users log into an IM system, their friends are notified of their presence, and they can talk to each other synchronously. In addition, various types of online team chat apps are available in the market.

Instant Messaging (Cont.)

- A time-saving tool, instant messaging allows employees to instantly reach their managers and colleagues working remotely or in other branches. It eliminates the need to place calls immediately when you require some information and simplifies life.
- Some popular IM services are AOL Instant Messenger, Yahoo Messenger, and MSN Messenger. Although the features of these service providers are similar, they have their benefits and drawbacks.

VoIP and Internet Telephony System

- Internet telephony uses the internet to route telephone calls instead of traditional phone lines. For example, voice over Internet Protocol (VoIP) sends voice packets using IP instead of PSTN (Public Switched Telephone Network).
- As soon as the voice packets reach their destination, it again gets converted into voice data for the receiver.

VoIP and Internet Telephony System (Cont.)

- Users and businesses making calls worldwide can benefit immensely from an internet phone system. They are cost-effective and allow you to make calls from anywhere. Other benefits of internet telephony include:
 - Is highly cost-efficient
 - Helps offer better customer service
 - Offers comprehensive features
 - Is highly scalable

Email

- Did you know that the number of active email users will touch 4.6 billion by 2025?
- Email or electronic technology is a way of exchanging messages and files. Email communication is extremely fast and reliable. You can send emails any time of the day or year; it is free of cost! This is one of the reasons why email marketing is buzzing in the business world today.
- You can create emails through software like Microsoft Outlook or Gmail and send them to another person, given that you have the recipient's email address.

Email (Cont.)

- Unlike Instant Messaging, professionals mostly use email to communicate with each other. For example, 62.86% of business professionals prefer email while communicating for official purposes.
- Most emails contain a subject line, giving the recipient a glimpse of what they can expect in the email.
- The biggest advantage of emails is that they allow you to go paperless. Even the documents can be digitized and sent over email to multiple people simultaneously instead of printing and distributing the papers.

Social Networking Platforms

- Last but not least, social media is one of the most popular internet communication methods. While Facebook was and still is the most widely used social channel, numerous platforms now make internet based communication easier than ever.
- For example, Twitter makes it easier for customers to talk with brands and public figures. Similarly, TikTok helps to connect with GenZ. Post engaging videos and get some TikTok views to get the content trending. WhatsApp enables users to talk to each other for free via messaging, audio, and video.

Social Networking Platforms (Cont.)

- Here are some major benefits of using social media for communication through the internet.
 - Faster and easier communication with friends and customers.
 - Businesses can enhance their brand awareness.
 - A great way to redirect traffic to your landing page and website.
 - Social media platforms help businesses interact with customers and provide real-time feedback to increase customer loyalty and lifetime value.
 - Social media portals help in advertising, promotions, and market research.

Client-Server Computing

- Client-server is a relationship in which one program, the client, requests a service or resource from another program, the server. The label client-server was previously used to distinguish distributed computing by PCs from the monolithic, centralized computing model used by mainframes.
- Today, computer transactions in which the server fulfils a request made by a client are very common. The client-server model has become one of the central ideas of network computing. In this context, the client establishes a connection to the server over a LAN or WAN, such as the internet.

Client and server requests and responses



Client-Server Computing (Cont.)

- Once the server fulfils the client's request, the connection terminates. Because multiple client programs share the services of the same server program, a special server called a daemon might activate to await client requests.
- In the early days of the internet, most network traffic travelled through what is known as north-south traffic. This is when data moves between remote clients that request web content and data centre servers that provide the content. Today, with the maturity of virtualization and cloud computing, network traffic is more likely to flow server-to-server -- a pattern known as east-west traffic.

Client-Server Protocols

- Clients typically communicate with servers by using the TCP/IP protocol suite. TCP is a connection-oriented protocol, which means the protocol establishes and maintains connections until the application programs at each end have finished exchanging messages. TCP protocols help with the following:
 - Determines how to break application data into packets.
 - Sends packets to and accepts packets from the network layer.
 - Manages traffic flow control.
 - Handles retransmission of dropped or garbled packets.
 - Acknowledges all packets that arrive in the network.

Client-Server Protocols (Cont.)

- In the Open Systems Interconnection (OSI) communication model, TCP covers parts of Layer 4, the transport layer, and parts of Layer 5, the session layer.
- By contrast IP is a connectionless protocol, which means endpoints don't continue to communicate following the initial transmission because there is no connection. The internet treats each packet that travels through the network as an independent unit of data without any relation to any other unit, while TCP organizes packets in the correct order. In the OSI communication model, IP is in Layer 3, the network layer.

Cloud Computing Drivers

- Cloud computing is a popular technology that offers many benefits, including cost savings. According to GlobeNewswire, the primary driving force behind the global cloud services market is its cost-effectiveness. The deployment of cloud services enables organizations to achieve over 35% in annual operating cost savings.

Business Drivers for Cloud Transformation

- Companies see many benefits of a cloud environment like small investments, digitized services, increased efficiency, etc. As the cloud hides the entire costly and complex infrastructure, moving to the cloud has become almost inevitable. Every business needs to move to the cloud, and so has its unique business drivers. A business driver is an interface or resource used for the development and success of the business. They are the inputs that drive the businesses operationally and financially to achieve the organizational goals.

Top 10 business drivers leading companies to cloud adoption

1) Security: one of the main reasons businesses are moving to the cloud. As cyber-attacks increase, companies want to bolster cyber security by moving to modern platforms. Phishing and Malware attacks have also grown to be more sophisticated and are very difficult to combat. Cloud computing makes the business more secure against all these invading threats, and hence it is a key business driver for cloud adoption.

2) Cost Saving: Hardware, storage, and network devices for an on-premises data centre require a considerable investment. With the cloud, your capital expenditure (CapEx) gets reduced significantly. The pay per use cloud model enables you to pay only for what you use and thus saves a big chunk of your investment which you can use in other productive pursuits of business expansion.

3) Efficiency: removes unnecessary steps to streamline the process. It increases productivity and gives a faster customer delivery approach.

4) Flexibility and Scalability: Your computing services increase with your business growth. Maintaining them on your means increased costs and new infrastructure. But with the cloud, you can purchase more storage to meet your needs and have instant access to expanded capabilities. Cloud solutions are highly flexible and scalable.

5) Rapid recovery: If you store your data on-premises, you need to have a replication of it on some other location, and if that is not done, then you have to replace the entire infrastructure if a disaster strikes. Both these things prove very costly. But with cloud backup, your data is stored across several storage centers, and so even when a disaster strikes at one of the centers, it can be overcome quickly, thanks to the other storage centers and backups.

6) Increased Convenience: Cloud-based storage enables users to easily access the files they need, wherever they are stored. It becomes more convenient for the employees to use the technology and focus on other tasks leading to business growth.

7) Speed and Productivity: It takes weeks or months to get new applications to run on traditional platforms. But in the cloud, it is a matter of hours. This reduces your time significantly and thus increases your productivity.

8) Strategic value: Migrating to the cloud gives a competitive edge to businesses as they can give their clients and customers innovative technologies that are easily accessible. With the cloud, organizations can provide their customers with quick solutions and thus increasing business agility and customer satisfaction.

Top 10 business drivers leading companies to cloud adoption

9) Multi-tenancy: Cloud servers are architected so that several customers can share the underlying infrastructure resources without compromising their privacy and security.

10) Service and Innovation: With the cloud, you can use many cloud services and application programming interfaces (APIs) and use flexible cloud tools and environments to build new and innovative applications and processes.

Cloud Capabilities

- Cloud computing capability refers to the capacity to offload data and computation to a third-party provider, enabling users to access scalable resources like files, data, and programs via the Internet for powerful processing and sharing beyond individual device capabilities.

Cloud Capabilities (Cont.)

- Thanks to its speed, scale, and capacity, the cloud offers more functionality with more automation than nearly every on-premises solution.