History Of Internet - The Invention of Internet

- President Eisenhower created the bureau at the Defense Department called ARPA(Advanced Research Projects Agency) during World War II. It was in charge of the space program, which then included computer science. But then NASA took that over. After that, ARPA got renamed to DARPA(used for defense research)
- ARPAnet was the first project they started in 1966 to enable access to remote computers. ARPAnet was laying the foundation of what we called an 'Internet' today.
- At MIT, a graduate student named Leonard Kleinrock began applying queueing theory to data transmission. As letters go through the post office, Kleinrock showed how packages of data would queue or line up at the nodes of a communications network as they transited through. This way, he could determine the overall speed of the network. He then showed how to speed up the network by implementing two techniques - demand access and distributed control
- Kleinrock's work was a dawning light on Licklider's vision. It was possible that computer communication could one day be a reality. It also marked a revolutionary departure from the telephone systems use of a technology called circuit switching.
- When you make a telephone call, you pick up the phone, you dial a number and the switching system that connects you with the other telephone actually creates a circuit between the two telephones. If the connection path is broken, call is lost and this became a problem to the military in the early 60s when they feared a Soviet nuclear attack. To assure retaliation, America needed an indestructible communications network and so there comes Paul Baran into the play
- He came up with the idea of hot potato routing. To do that they have to chop up the data in little pieces. Hot Potato routing meant a message transiting a network goes where it should be going, even if part of the network was destroyed. He got this idea from previous model of mice in a maze
- Taking an idea from the telegraph and post office, Baran decided to chop up each message into small equal sized pieces, called packets. Each packet was like a postcard with a two and a from address. It was launched into the network and they may take any path that is available. No dedicated path was given. A node would keep copies of the packets and keep sending them out until they arrive successfully at the next node. It would work better than a telephone as long as some part of the network functions.
- By 1962, there was enough research and theory to show that a viable computer network could be built, but implementing one had to wait seven years until 1969.

- The old computers had been big machines that you punched cards and you submitted the cards, you got the answers the next day. But in 1969, time sharing was happening where you would actually sit at a terminal and you would type in your questions and your programs and the answer would come back in 2 seconds.
- In 1966, Bob Taylor of ARPA needed a separate terminal to log into each of several shared computers at research centers across the country. No two computers could talk to each other. So Taylor had to move from terminal to terminal to work on a different computer. He knew that a single terminal would work, if all the computers were in the same network.
- He thought that it was crazy that he needs three different terminals to talk to three different machines, instead of one that can talk to all three. So his idea was to pursue the creation of a network, which would link heterogeneous computers to each other through this network.
- After asking money from the boss, he was allocated $1 million to build this computer network.
- Taylor recruited Larry Roberts for that job. Roberts had built the world's first experimental connection between two computers at the MIT Lincoln laboratories in Lexington, Massachusetts.
- He lived with Leonard Kleinrock at MIT and learned about packet switching and queuing, because he was his officemate and so Roberts built the same kind of connection ARPAnet had, except it was distributed to more people.
- Roberts wasn't sure about the best way to network mainframe computers because if you tried to interconnect the large computers directly, then each of those large computers would have to figure out how to work with each of the other large computers. So they would have a tremendous problem in their software to be able to figure out the rules and procedures and protocols for dealing with 10 different kinds of computers out in the country.
- Roberts fellow engineers suggested building identical special purpose mini computers to form the network and tie each time shared computer to one of them. This way they only had to deal with the one little computer. Roberts had the network design figured out on the paper. Now he had to find someone to build it.
- In 1968 Roberts sought out the engineers to build the ARPANET. It was going to be based on special purpose mini computers called interface message processors(IMPs) and a revolutionary technology called packet switching.
- Chopping the data into little pieces called packets, launching them into the network and it tries to find its way to its destination, each packet operating independently.

- The plan was to network 4 identical IMPs. Each one was to be attached to a different kind of mainframe computer and they were - a sigma seven at UCLA, and SDS 940 at the SRI, and IBM 360/75 at the UCSB, and a PDP 10 at the University of Utah.
- Roberts asked 140 companies including AT&T and IBM, but everyone refused. So he created packet switching on his own.
- A small company in Cambridge, Bolt Beranek and Newman known as BBN wasn't sure either, but they were willing to try. Frank Heart headed the BBN team
- BBN won the contract and had to build the IMP for the ARPANET on January 1st 1969, which was due in 9 months with UCLA. Heart's team faced many obstacles doing it.
- Stephen Crocker wrote the code to join UCLA's computer to the first IMP.
- Back at BBN, Heart's team was facing numerous challenges like how do you stop the packets from circulating forever? How do they know when to stop at their destination?
- On September 1 1969, the first piece of hardware created for the computer network that was the forerunner of the internet arrived at UCLA. It needed a lot of improvements, but was just sent on it's due date.
- By the end of 1969, all four sites were interconnected. In April 1971 the ARPANET had 18 mainframe computers hooked into the network.
- Bob Metcalf was a grad student who connected MIT's computer to it. He was able to form packets of bits and send them over a long distance.
- Raymond Tomlinson was working on a mail program, but it was a program for a single computer, so that you could send messages from yourself to another user on the same time sharing computer. He thought that it could be also done across the network. So he put the code together, modified it a little bit and then the first email program was created. He was the one to get the @ sign
- Telephone, television, radio and postal systems are essential communication infrastructures. But as the world enters a new millennium, it appears as if the internet began in 1969, as an experimental computer network is gradually absorbing many of their functions. The Internet can do that because it was built with an open architecture.
- By 1972, the ARPANET had 25 sites online. There was the first International Conference on computers and communication sponsored by ARPA. Robert Metcalfe, grad from MIT and Harvard was in charge of compiling a list of just what the network could do. So by calling people who have ARPAnet he found out 19 different things that could be done through the net.
- He was chosen to give a demo tour of ARPAnet to 10 executives from AT&T. In the middle of the tour, just during that time of 2-3 days, the net(IMP) crashed and the demo froze.

- There were LANs and WANs to link computers but each new network was like a foreign country speaking its own language. How can they be interconnected to make an internet work?
- In 1973, Vint Cerf and Bob Kahn teamed up to develop a set of rules or procedures known as the TCP/IP protocol, that would allow computers to pass their message packets back and forth.
- Bob and Cerf concluded that they needed something called gateway that knew how to talk to each of the networks it was connected to(could be two or more) and could encapsulate packets coming from the host computers into packets going through the underlying networks.
- Finally, in 1983, after 10 years of refinement and bureaucratic haggling, TCP/IP was adopted as the universal standard, marking a milestone in the development of the internet. A common network of interconnected networks.
- Mainframe computer power down to the size and cost of a desktop PC. The silicon chip, the high speed modem, and the computer mouse are as significant in shaping the use of the internet as the first IMP.
- However, one of the internet's major milestones was achieved not by technology, but by an act of Congress. On June 9 1992, Congress passed a bill taking the internet out of the exclusive hands of the government and into the public. The following November, President Bush signed it into law.
- By allowing free enterprise and individuals access to the internet, it was evolving into a rapid growth of previously unimagined uses.
- Under 1980s technology, it was difficult to research a topic without being a computer wizard. Around the same time Tim Berners-Lee at the CERN Research Institute in Switzerland, created an easier way.
- He developed the software to click on a word or phrase linked across the internet, one could instantaneously follow a link from site to site around the web in pursuit of a topic. He named this invention the World Wide Web(WWW).
- It started growing on itself into billions and trillions of dollars of commerce.
- But still in 1992, there were only 50 web pages on the internet.
- In 1993 at the University of Illinois, a 22 year old student named Marc Andreessen developed user friendly software to browse www called Mosaic and later commercialized by Netscape. It was very hit like a killer app.
- By the late 90s, the Internet was so famous that it completely redefined the use of personal computers. Everything happened to work by the brick of one scientist at a time bringing into this huge thing of what we call the Internet.
- Everything is happening now by a few clicks sitting at home in a matter of just a few seconds. After the Internet many applications, softwares were built on it and came into the market booming and making a huge impact on society. Microsoft, Netscape, Yahoo, Youtube, Google, Facebook and so on.

- All the devices need to have some sort of unique addresses in order to connect to each other. The protocol was designed called Internet Protocol(IP address). IPv4 address was designed in 1973 and widely adopted in the early 80s. It provides 4 billion unique addresses, but it was not enough in today's world and so they came up with IPv6.
- End users don't see or care about the IP addresses, since they only see names such as www.example.com Something called Domain Name System(DNS) takes care of this IP address as it associates with the name of the site and it's IP address.
- Your computer uses DNS to look up the domain names and get's that associated IP address which is then used to connect your computer to the destination.
- The Internet is still in its early stage and it's growing so rapidly. 30 years into existence and had already changed how mankind lives.