TASC talk – The History of the Internet

Summary of the talk given by Dr Andrew Smith from the Open University on 16/03/17

Dr Andrew Smith is a self-styled "Nerd" who has spent most of his life immersed in computer and IT technology and as such runs courses for both the OU and other organisations which endeavour to teach students all about this mysterious subject. One of his main focuses is on the inner workings of the Internet or Web – "*I spend a great deal of my time teaching network engineers to run little systems like the Internet*".

In his talk "History of the Internet", Andrew took us through a high level overview of why, when, where and how the Internet came into being and its development into an all-encompassing and far reaching entity, leading to the World Wide Web (WWW).

From the original concept of a "Galactic Network" by J.C.R. Licklider at the Massachusetts Institute of Technology, MIT, in 1962, the first steps in connectivity were taken by Lawrence Roberts and Thomas Merrill in 1965 when they were able to connect a TX-2 computer in Massachusetts to a Q-32 in California over a slow dial-up connection.

In 1966 Roberts went to the "Defence Advanced Research Projects Group" or DARPA, and came up with the concept of the "Advanced Research Projects Agency Network" or ARPANET. As you will have noticed, anything IT/computer related is full of long acronyms!

Around the same sort of time, the UK's National Physical Laboratory came up with a concept of how to transmit data in such a way that it could be broken into a number of parts, called packets, and then routed over many different paths to a single destination, where the data would be re-assembled back in its correct sequence. This was the beginning of what is now called the Packet Switched Network and is the basic foundation on which the Internet and the WWW is built.

Andrew discribed some of the original bits of hardware which were developed to do the "Routing" of these packets. In the 1970s many new developments occurred allowing for increasing Internet traffic with increased security and Email of sorts made its appearance.

So far the Internet was composed of individual computers linked over a Wide Area Network (WAN) using dial-up and leased line connections. Computers working together locally required the

development of a number of new technologies, especially a protocol called TCP/IP or Transmission Control Protocol/Internet Protocol. This had the job of ensuring that data could be sent from one specific computer over a network to another specific computer, guaranteeing its safe and error free delivery.

Andrew next took a look at the development of the up and coming computer technology and programming languages such as UNIX which played a great part in the development of the Internet, and how these led to the birth of embryonic User groups, Bulletin Boards and Social Media sites.

Of course, for the Internet to be used by the public, communication technology had to become less expensive and also had to undergo a bit of a revolution, and this was provided by Dennis Hayes and Dale Heatherington. The Hayes protocol became a standard way for controlling modems (stands for

MODulator DEMODulator) and made it a relatively straight forward affair getting modems to communicate with each other over dial up connections. Now computer programs could be developed to automatically control modem communication with little or no user input. This all encouraged development of new public information systems such as Prestel and teletext.
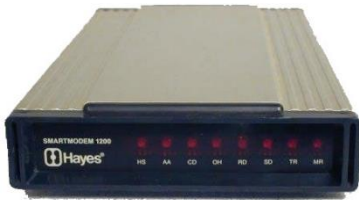
The development and introduction of the first IBM PC in the early 80's heralded the age of data communications for small businesses and the proliferation of bulletin boards and services such as Compuserve, AOL, Pipex and Demon. Also new technology such as ISDN (Integrated Services Digital Network) allowed data transmission speeds to increase to 64Kbps (Kilo Bits per Second) and Fibre Optics which was invented in the 50's to become widely used in trunk routes.

In 1985 the first domain name was registered, *Symbolics.com*. Up to now the only means of communicating with another device over the Internet was to know and use its Internet Protocol or IP Address, however as technology improved with the introduction of Domain Names in 1983, IP addresses could be hidden behind more meaningful, user friendly and easier to remember names. Other developments such as multi-protocol routers allowed diverse systems to communicate over the Internet.
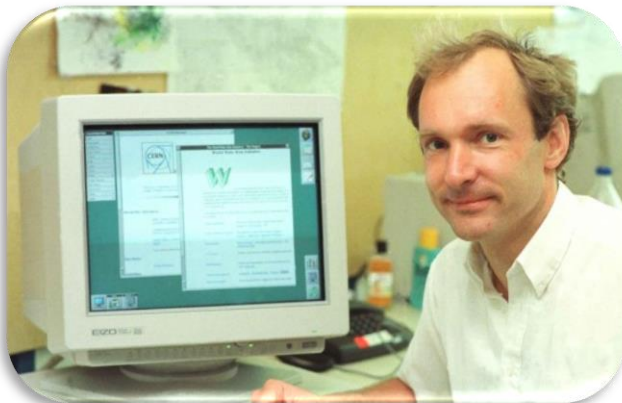
In 1990 Sir Tim Burners-Lee, who worked at CERN in Switzerland started development on an easier way for his team to communicate with other researchers over the Internet and in 1991 the WWW was born along with the world's first web browser, Nexus. Nexus utilised what was called HyperText Mark-up Language or HTML, to read and communicate with Web Pages. These developments saw the start of the Browser Wars with companies such as Microsoft, Netscape, Google and others vying for top position.

Along the way in the 90s a chap called Linus Torvalds created an operating system called Linux, this became the de facto standard for the most popular webservers. The Linux based Apache server was released in 1995 and is one of the most widely used in the world. As of July 2016, Apache was estimated to serve 46.41% of all active websites and 43.18% of the top million websites.

Also in the 90's the Open Source movement gained popularity with many useful programs being made available for free to the public and this had had a knock on effect on standardisation within the industry with the development of many "Open Standards". Voice over IP or VoIP, Streaming, Routing, Smartphones all depend on this.

By now wireless communication was becoming popular for connecting devices to the home network, mobile phones were also becoming much more powerful in their own right. It is not a well-known fact that early development of the Frequency Hopping Spread Spectrum system used in today's wireless networks were a result of work carried out by 1930s Hollywood actress Hedy Lamarr, who was not just a pretty face but a very talented engineer and inventor. Unfortunately she had an uphill struggle to get any of her ideas seriously looked at. She had developed a method for remotely controlling torpedoes during the WW2 using this frequency hopping system and sent proposals to the US war office outlining how it worked but unfortunately these were ignored until well after the WW2 was over. It's one of those ideas well before its time!

From here we looked at Peer to Peer or P2P communication with the compressed digital sound and video files being streamed and at the time, illegally shared online by companies such as Napster and Kazaa who later morphed into Skype. New versions of HTML were released and companies such as Amazon started selling Books online.

This all progressed with the launch of BBC iPlayer and YouTube becoming two of the most popular video streaming sites available. Live streaming using apps. such as Periscope (from Twitter) and Facebook Live are now being widely used. This is already being used by the Open University to teach large numbers of teachers. However there is a Dark Side, this same technology is also being used by criminals, the mentally unstable and terrorists to promote some pretty horrific real time atrocities. There is currently growing pressure on these companies to block or remove such vile material from their system as soon as it is possible. We will have to wait and see what companies such as FaceBook do to try and comply, though I think this is not going to be an easy task.

Coming to the end of the talk Andrew discussed the growth of Cloud Computing and storage, the Internet of Things or IoT, and the exponential rise of Social Media and how just about all forms of daily life are now affected by what originally started as a couple of computers communicating over a slow dial-up telephone line.

Marius Stuart – The Adstock Science Club