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School of Business, Law and Computing

CO451 Networking: CW1

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A research report on the development of TCP/IP as a networking standard; past; present and future.

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Introduction

This report aims to provide research for, and address, the subject of the development of TCP/IP as a networking standard; past; present and future. This includes the origins of these standards, how they have changed over time, and any considerations that could be made about the future of these networking standards. As well as to analyse this research and attempt to draw conclusions from it.

These protocols have developed to accommodate for changing technologies in multiple ways. However it started off on a much smaller scale, initially being developed by United States Defence Advanced Research Projects Agency (alternatively known as ARPA) (Radu, 2019) by two scientists named Vint Cerf and Bob Kahn in 1973, naming it the ARPANet (History-Computer, n.d.). Initially just being a research project, the foundations built by Cerf and Kahn were built upon in further with more practical uses in mind. In 1983 MILNET was developed as the earliest successor to the ARPANet that utilised TCP/IP for practical use outside of research, being used for DoD traffic (Radu, 2019). From then onwards the protocols were tweaked over time as to improve efficiency and security. It quickly became an important and useful set of protocols that came to define the web as it had been developing through the 90's to the present day, having been through multiple versions, currently up to IPV6.

Discussion

While the history of these protocols has been discussed, the way modern TCP/IP functions has not, here I will describe the purpose of each TCP and IP within their relevant areas in relation the moving of data.

Unlike radio signals, online data, when being sent or received, needs to know directly where it is going, which is what TCP/IP is used for, to move data from one place to another with a specific starting and finishing point. The process of moving data from one place to another through the internet can be broken down into 4 sections, for the sake of this they will be referred to as “layers”. These layers are; application, transport, internet and network.

The Application layer is the starting point of the data. It is the layer that interacts with the applications on your device, be it your web browser, online game etc. Each type of application has its own set of protocols that are used here to prepare data from transmission.

The data is then sent through different ports to the transport layer. The port used is determined by the protocols used in preparation, for example HTTP for web browsers or SMTP for email services. Here TCP is used to separate the data received from the application layer into small packets, so that each one can individually find its quickest route across the internet to the destination device, which is a process known as packet switching. TCP will also ensure that each packet has a 24-byte header at the beginning of the data stream that includes information regarding how the packet should be arranged upon reaching its destination in relation to the other packets being sent and received. It also uses error checking to ensure that data has arrived properly and in order in case any packets needed to be sent again.

Next the packets are pushed onto the internet layer, where IP is utilized. Here Ip will add IP addresses to the packets so they have information on where they came from, and exactly where they are going respectively. Having these unique IP addresses serves many useful purposes on the web, from web security to device location tracking.

Finally, the data is moved to the network layer. Here MAC addresses are utilized in order to determine what specific device the packets are being sent to on a given network (Techquickie, 2016), it allows for more precise delivery than using a standalone IP address.

So far as future technologies and protocols are difficult to predict with certainty. It is thought that the current IPv6 used is to be the last version developed and used before new protocols will be put in place aside from it that are more efficient, there is of course the possibility however that further versions of IP will be developed, where instead the current technologies will be further refined and improved upon.

One such protocol which has potential to be a successor to TCP for instance is QUIC (Quick UDP Internet Connections) which would offer increased versatility and efficiency when compared to its more outdated TCP counterpart (SIGCOMM, 2017).

Conclusions

When looking at the way that TCP/IP has developed over time as a standard it is clear to see that it has indeed been improving, becoming more efficient and effective with the research and development that is always being done in said area. However, the question of whether going down a different route of protocols would be more beneficial brings an interesting question to the table.

On one hand there is a point to be made that having a change in direction of development of protocol standards. While a drastic move and change in development could be detrimental due to having to start a new from the ground up, it is possible that this risk could pay off if the end product of the new standards and protocols are significantly more efficient than the current TCP/IP standards that are being used worldwide.

This obvious risk must not be taken lightly by developers and researchers given the amount of money and infrastructure that would be on the line if they were to consider changing directions away from TCP/IP. The other option is to of course continue to develop TCP/IP further rather than take the risk of changing direction. This however also brings forth the issue that the capabilities of TCP/IP could be reached and developing it further past this ceiling caused by its very nature and architecture

In conclusion there are certainly many factors to take into consideration for the future of networking technologies Further research should be taken into these areas before any large-scale decision is made as to whether or not to change the protocols used in networking.

References

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