



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Computer Forensics (John Rees) (ACDA5004)

Final Year Major Project Proposal

Shaun Holborow (1704229)

Course: Computer Networks and Cyber Security

Faculty name: SOAC

Subject Specialist: Kapilan Radhakrishnan

Date of Submission: 1/05/2020

1. Introduction:	3
1.1 Background:.....	3
1.2 Literature Review and IPv4/6 Differences	3
1.3 Justification	4
1.4 Outcomes	5
1.5 Research Methods.....	5
1.6 Resources	5
2. References:	6
3. Bibliography:	6
 Figure 1 - Differences Between IPv4 and IPv6	4
Figure 2 - Project Objectives Estimated Timescale	6

1. Introduction:

The project proposal chosen for this assignment was the Comparison of IPv4 and IPv6 in terms of general performance (throughput, delay, packet loss, jitter etc.).

1.1 Background:

It was the introduction of the 4th iteration of the Internet Protocol "IPv4" (Internet Protocol) that led to the possibilities of the internet that we have currently today with it first being developed for ARPANET (Advanced Research Projects Agency Network), the first wide-area packet-switching network along with the first to implement TCP/IP (Internet Protocol Suite).

It is still currently responsible for routing most of the Internet's traffic as referenced by BGP Reports and uses a 32-bit address space.

IPv6 (Internet Protocol version 6) is the latest version of said protocol and was developed by IETF (Internet Engineering Task Force) mainly to deal with the long running problem of IPv4 which is address exhaustion and thus is intended to replace IPv4[1] with it becoming a "Draft Standard" for IETF in December 1998[2] and then officially ratified it as an Internet Standard on 14th July 2017.[3][4]

It uses a 128-bit address which allows far more addresses to be utilised than IPv4.

1.2 Literature Review and IPv4/6 Differences

Based on the author's research, a consensus can be made of the general differences as well as pros/cons of each protocol with one website presenting its own take on these said differences as the following table below.[5]

	IPv4	IPv6
General Performance	Internet Protocol version 4 was introduced 1981, provides 32 bit IP address	Internet Protocol version 6, was officially made Internet Standard in 2017 and provides 128 bit IP address
Configure Performance	Whole new system is required to be configured and installed before communication with other systems.	Basic configuration is optional and performance is dependent on required functions.
Networking Performance	Networking structure requires manual configuration or by utilising a protocol like DHCP (Dynamic Host Configuration Protocol) while also incorporating several layers to increase networking performance but this does require	Doesn't require manual configurations as a "auto-configuration" feature is already implemented by default which also improves networking performance at the same time.

	maintenance.	
Fragmentation Testing/Performance	Uses both normal sending and forwarding routes for fragmentation processes.	Only uses the sending process to implement and improve the fragmentation process.
Mobility Performance	Utilises constrained network topologies which restricts mobility movements and interoperability.	Provides embedded interoperability and mobility capabilities for networking devices.
Security Performance	Although this mainly dependant on application, the main issue security wise the lack of internal layers for security.	IPv6 uses what is known as IPSec (Internet Protocol Security) which built into the protocol thus providing a proper level of safe architecture.
Support and Performance Upgradation	Support is provided at large with good documentation libraries.	Provided by a large community similarly to IPv4
Routing Performance	Comes with a routing protocol (RIP) which is supported by routed daemon.	No specific routing protocol support similar to RIP exists meaning only static routes are used.
Advanced Feature Performance	NAT (Network Address Translation) is used with IPv4 on devices to allow single NAT address to mask thousands of addresses.	Provides larger space availability thus enabling direct addressing processes.

Figure 1 - Differences Between IPv4 and IPv6

Based on these facts, a conclusion can be made that each protocol performance varies depending on task required most likely due to how recent IPv6 is in comparison to IPv4 which has been put to use for quite some time thus providing most current users with more flexibility and performance however this will change over time as IPv6 utilisation is increased from maturity potentially someday outperforming IPv4 altogether.

1.3 Justification

The topic research at hand is worth it mainly because of the author's interest in said material as well as the controversy surrounding it but also based on sources or existing literature that mention the various differences between IPv4 and IPv6 that make investigating via experimentation with simulation software more notable.

It is the author's opinion that by investigating each protocol's differences and then simulating each type in its own network with tests for things like delay or jitter etc that this experiment can be presented as a new study made that provides a better picture for any viewers who wish to get a better idea as to the pros/cons of each protocol and as to which is ultimately superior in overall performance with the author's recommendations.

Various entities/organisations/industries were investigated.

The main aim of this study will be to determine the general differences between IPv4 and IPv6 as well as to ultimately determine which one is deemed superior in terms of overall performance.

In order to achieve the desired result of said study/experiment, 3 to 4 objectives must be completed before the final result can be achieved and a list of each objective is listed below as the following.

1. Analyse: To analyse the meanings and facts behind each internet protocol.
2. Evaluate: To evaluate each protocol in its entirety.
3. Design: To design a suitable plan/model in handling and finding out the differences of each protocol.
4. Develop: To develop a viable solution in achieving the desired result of said author for the project (create networks via simulation and benchmark).

1.4 Outcomes

The expected outcomes/deliverables of this project will be a submission of recommendations based on the author's primary/secondary research as well as models and algorithms developed to address specific problems etc.

As well the authors own input with hard data provided from said experiment to give a better picture as to which Internet Protocol should be utilised as per recommendation.

1.5 Research Methods

The author's planned research methods are mainly in the form of, experimentation as well as reliability and validity.

The data collected from said experiment will be in the form of observation followed by documentation of said data which will contain the information based on benchmarking of throughput, delay, packet loss, jitter etc.

- Any risks/limitations will be dealt with through the use of appropriate software monitoring as well documentation.

All data will be analysed and evaluated using appropriate software (benchmarking) based on the user requirements, objectives specified and user/software tests etc.

1.6 Resources

Resources required for this project experiment are listed below as the following.

- Computer
- Simulation software

A Gantt chart was also created to demonstrate evidence of the project's planning and management with timescales.

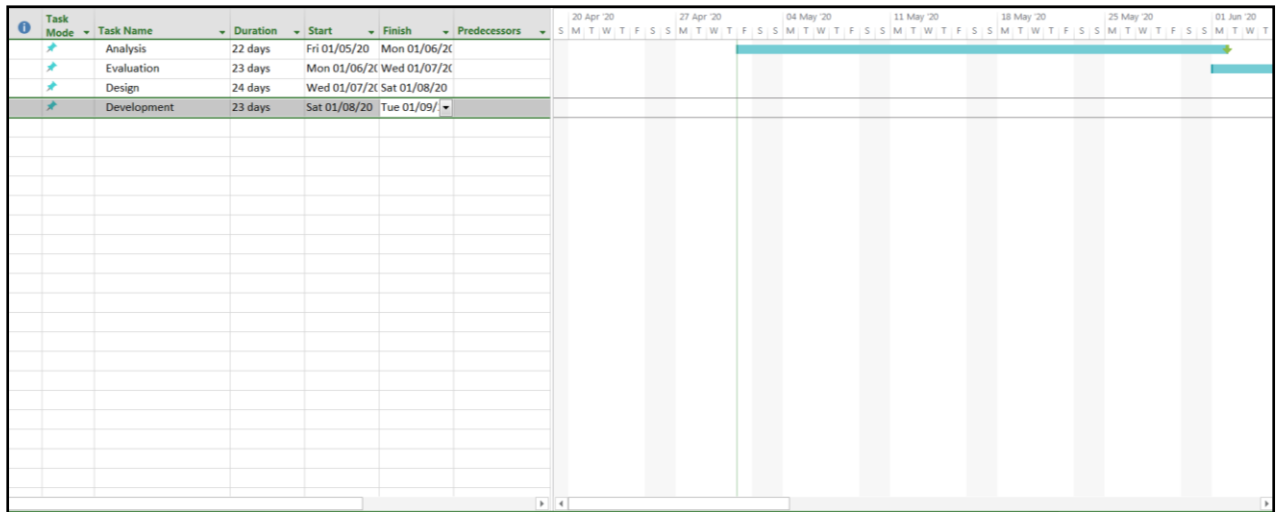


Figure 2 - Project Objectives Estimated Timescale

2. References:

- [1]D. Pemberton, "New Zealand IPv6 Task Force |", *Ipv6.org.nz*, 2020. [Online]. Available: [2]"RFC 791 - Internet Protocol", *Tools.ietf.org*, 2020. [Online]. Available: <https://tools.ietf.org/html/rfc791>. [Accessed: 01- May- 2020].. [Accessed: 01- May- 2020].
- [2]"RFC 2460 - Internet Protocol, Version 6 (IPv6) Specification", *Tools.ietf.org*, 2020. [Online]. Available: <https://tools.ietf.org/html/rfc2460>. [Accessed: 01- May- 2020].
- [3]"RFC 8200 - Internet Protocol, Version 6 (IPv6) Specification", *Tools.ietf.org*, 2020. [Online]. Available: <https://tools.ietf.org/html/rfc8200>. [Accessed: 01- May- 2020].
- [4]"RFC 8200 - IPv6 has been standardized | Internet Society", *Internet Society*, 2020. [Online]. Available: <https://www.internetsociety.org/blog/2017/07/rfc-8200-ipv6-has-been-standardized/>. [Accessed: 01- May- 2020].
- [5]"IPv4 vs IPv6 | Know The 9 Most Useful Differences", *EDUCBA*, 2020. [Online]. Available: <https://www.educba.com/ipv4-vs-ipv6/>. [Accessed: 01- May- 2020].

3. Bibliography:

"BGP Reports", *Bgp.potaroo.net*, 2020. [Online]. Available: <https://bgp.potaroo.net/index-bgp.html>. [Accessed: 01- May- 2020].

"RFC 760 - DoD standard Internet Protocol", *Tools.ietf.org*, 2020. [Online]. Available: <https://tools.ietf.org/html/rfc760>. [Accessed: 01- May- 2020].

"RFC 791 - Internet Protocol", *Tools.ietf.org*, 2020. [Online]. Available: <https://tools.ietf.org/html/rfc791>. [Accessed: 01- May- 2020].

[1]*Www-sciencedirect-com.ezproxy.uwtsd.ac.uk*, 2020. [Online]. Available: <https://www-sciencedirect-com.ezproxy.uwtsd.ac.uk/science/article/pii/S0308596114001128>. [Accessed: 01- May- 2020].