**Network Performance Evaluation on Linux Based Operating Systems**

**Date: 18/03/2025**

**Version: 1.0**

**Client**

* Raymond Lutui

**Mentor**

* Daniel Vaipulu

**Team Members**

* Nathan Quai Hoi
* Win Phyo
* Zafar Azad
* Thomas Robinson (Team Lead)
* Larissa Goh
* Charmi Patel
* Kylie Afable

## Executive Summary

*This will include*

* *Scope*
  + *Evaluating IPv4 and IPv6 network performance on three Linux-based software routers using iPerf/D-ITG.*
  + *4 Computers*
    - *1 Sender*
    - *2 Configured as routers*
      * *Each with have 2 network cards*
    - *1 Reciever*
  + *Static IPs Configured*
  + *Operating Systems*
    - *Ubuntu*
    - *FadoraOS*
    - *Kali*
  + *Mainly use D-ITG but use IPerf to compare*
* *Time*
  + *The estimated time it will take to complete this project would be 300 hours to 360 hours.*
* *Methods*
  + *Performance testing using TCP/UDP over 12 packet sizes, collecting throughput, delay, jitter, and packet loss data.*
  + Packet Sizes - 128, 256, 384, 512, 640, 768, 896, 1024, 1152, 1280, 1408, 1536 Bytes.
* *Risks*
  + *Lack of experience with Linux networking, hardware limitations, configuration errors.*
* *Costs*
  + *Mentor*
    - *From the estimate of around an hour per week with the mentor came up with $3,919.20 being the estimated cost of the mentor.*
  + *Equipment*
    - *TBA*

Terms of Reference

*This will include:*

* *Project purpose*
* *Context of the project*
* *Client details*
* *Problem / opportunities*

Rationale:

*This will include:*

* *Why is the project needed*
  + *IPv4 is widely used but has scalability issues; IPv6 is the replacement but comes with larger data overhead.*
* *Existing systems*
  + *IPv4 is widely used but has scalability issues; IPv6 is the replacement but comes with larger data overhead.*
* *Key issues / opportunities*
  + *IPv6 adoption barriers, need for empirical performance testing.*

Objectives / Scope:

*This will include:*

* *Deliverables*
  + *Configured Linux software routers (Fedora, Ubuntu, third OS of choice).*
  + *Performance test results (throughput, delay, jitter, packet loss).*
  + *Statistical analysis (confidence interval re-runs).*
  + *Comparison of IPv4 vs. IPv6 performance.*
* *High level functional and non-functional requirements*
  + *Functional: Must route traffic, measure performance under TCP/UDP.*
  + *Non-Functional: Must handle various packet sizes accurately.*
* *Infostructure needs*
  + *Three Linux-based OS installations.*
  + *Testbed setup for network performance testing.*
  + *Software tools (iPerf, D-ITG).*

Skills Analysis:

*This will include:*

* *Required skills to complete the project*
  + *Linux server configuration.*
  + *Networking (IPv4, IPv6, TCP/UDP).*
  + *Performance testing tools (iPerf, D-ITG).*
  + *Data analysis for performance metrics.*
* *Any knowledge gaps*
  + *Team may need additional training in Linux networking and performance testing.*
  + *Team may need upskilling on testing tools such as iPerf, D-ITG*
* *Upskill plan (how will we upskill to learn what is needed)*
  + *TBA*

Team Roles:

*This will include:*

* *Responsibilities of each team member*
  + Team Leader
    - Thomas Hugh Robinson
  + Team Members
    - Nathan Quai Hoi
    - Win Phyo
    - Zafar Azad
    - Larissa Goh
    - Charmi Patel
    - Kylie Afable

Team Schedule:

*This will include:*

* *Weekly schedule (what is happening each week)*
  + *Weekly Commitment: 12–15 hours.*
  + *Meetings: Weekly Meeting with Mentor*

Project Management and Methodology:

*This will include:*

*-Management methodology*

*-Justification for the project*

*-Work Breakdown Structure (WBS)*

*-Key Tasks*

*-Deliverables*

|  |  |  |  |
| --- | --- | --- | --- |
| ***Project Methodologies*** | ***Core approach*** | ***Pros*** | ***Cons*** |
| *Waterfall* | *A fixed set of phases, where each phase must be completed before moving to the next phase* | *Waterfall outlines a clear project structure; this demonstrates clear cost and goals. Due to the fixed nature of the methodology, tracking is linier and easier. The upfront planning approach also minimises risk factors as most of them are accounted for in the initial planning phase. Waterfall approach also expects fewer delays that can occur from additional requirements* | *Due to the fixed nature of the methodology its benefit can also be a drawback depending on the nature of the project. Project s that requires continual interactions with end users and the team to review current direction and course correction do not fit in the waterfall approach. Its fixed approach is ultimately limiting flexibility.* |
| *Agile* | *Working quickly and collaboratively while promoting an environment that allows changes during the development cycle* | *The agile framework is the suggested approach for software development projects that prioritises customer needs constantly changing throughout the development lifecycle. The phase’s of this approach is broken down into sprints. Once a sprint is completed review and feedback commence to improve the efficiency of the next sprint.* | *Due to the agile approaches being constantly changing and reviewed after each sprint, limitation on resource planning can occur due to the unclear end object, in most cases the dev team can only have sight on a few sprints Ahed. Agile is also difficult to measure due to its nature of change which can also result in scope creep.* |
| *Lean* | *A methodology that focuses on maximising efficiency by reducing waste and continually looking for workflow improvements* |  |  |

Deliverables

* *Results of the performance of IPv6 / IPv4 at the 12 packet sizes. Measuring the throughput, delay, jitter, and packet loss. (Excel File + Log)*
* *Comparing them*

Risk and Issue Management:

*This will include:*

* *Risk Register*
  + *Incorrect router configuration affecting test results.*
  + *Lack of Linux networking expertise.*
  + *Hardware/software compatibility issues.*
* *Issue register*
  + *TBA*
* *Mitigation strategies*
  + *Research best practices for Linux router setup.*
  + *Conduct preliminary tests before the main experiment.*

Project Plan:

*This will include:*

* *Gantt chart / timeline*
* *Milestones*
* *Key assessments*

Estimated Costs:

*This will include:*

* *Resource estimates*
  + *Linux Operating systems are free*
  + *D-ITG / IPerf are free*
  + *4x computers*
  + *2x network cards*
* *Labour Hours*
  + *Team’s time (not monetized).*
    - *15h per week*
    - *12 weeks in a semester*
    - *15h x 12 weeks = 144h x 2semesters = 360h (estimate)*
    - *Average pay for a network engineer in NZ per hour = $30.99 NZD (Network Engineer Salary in New Zealand, n.d.)*
    - *$30.99 x 360h = $11,156.40 (High end estimate)*
* *Mentor Costs (which is put at $142 + GST per hour)*
  + *$142+GST per hour.*
  + *GST = 15%*
  + *$142 x 15% (1.15) = $163.30*
  + *At about an hour per week*
    - *12 weeks x 1h = 12h x 2 semesters = 24h*
  + *24h x $163.30 = $3,919.20 (estimate)*

# Appendix A - Disclaimer

**Auckland University of Technology**

**Bachelor of Computer & Information Sciences**

**Research & Development Project**

**Disclaimer: Network Performance Evaluation on Linux Based Operating Systems**

**Clients should note the general basis upon which the Auckland University of Technology undertakes its student projects on behalf of external sponsors:**

*While all due care and diligence will be expected to be taken by the students, (acting in software development, research or other IT professional capacities), and the Auckland University of Technology, and student efforts will be supervised by experienced AUT lecturers, it must be recognised that these projects are undertaken in the course of student instruction. There is therefore no guarantee that students will succeed in their efforts.*

*This inherently means that the client assumes a degree of risk. This is part of an arrangement, which is intended to be of mutual benefit. On completion of the project it is hoped that the client will receive a professionally documented and soundly constructed working software application, some part thereof, or other appropriate set of IT artefacts, while the students are exposed to live external environments and problems, in a realistic project and customer context.*

*In consequence of the above, the students, acting in their assigned professional capacities and the Auckland University of Technology, disclaim responsibility and offer no warranty in respect of the “technology solution” or services delivered, (e.g. a “software application” and its associated documentation),both in relation to their use and results from their use.*

# References

*Network engineer salary in New Zealand*. (n.d.). Indeed. <https://nz.indeed.com/career/network-engineer/salaries>

Atlassian. (n.d.). Waterfall methodology: A comprehensive guide. Atlassian. <https://www.atlassian.com/agile/project-management/waterfall-methodology>

Laoyan, S. (2025, February 20). *What is Agile methodology? (A beginner’s guide)*. Asana. <https://asana.com/resources/agile-methodology>