Technical and Vocational Education and Training Institute



Department of Information Communication Technology

A Research Proposal

On

Automated Diagnosis of LAN Network Performance Problems

By:-

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| --- | --- | --- |
| No | Name | ID Number |
| 1 | Dejitinu Kebede | MTR/311/11 |
| 2 | Woinshet Nigussie | MTR/278/11 |
| 3 | Muhammed Amin Yasin | MTR/309/11 |
| 4 | Tilahun Masresha | MTR/268/11 |

Submitted To: - Taye Alamirew (PhD)

Addis Abab, Ethiopia

January, 2019 G.C

Wollo University, Kombolcha

July, 2016 E.c

**Table of Contents**

Table of Contents Page

[Table of Contents I](#_Toc507844471)

[1. Background/Overview 1](#_Toc507844472)

[2. Problem of the statement 2](#_Toc507844473)

[3. Objective 3](#_Toc507844474)

[3.1. General Objective 3](#_Toc507844475)

[3.2. Specific Objectives 3](#_Toc507844476)

[4. Approach/Methodology 4](#_Toc507844477)

[4.1. Methodology 4](#_Toc507844478)

[4.2. Data Collection Methods 4](#_Toc507844479)

[4.3. Tools and Techniques 4](#_Toc507844480)

[4.4. Sampling Population 5](#_Toc507844481)

[5. Literature Review/Related 5](#_Toc507844482)

[6. Scope and Delimitation of the Study 6](#_Toc507844483)

[7. Significance of the Research 6](#_Toc507844484)

[8. Time Plane 7](#_Toc507844485)

[9. Budget Plan 8](#_Toc507844486)

[Reference 9](#_Toc507844487)

1. **Background/Overview**

A local area network (LAN) supplies networking capability to a group of computers in close proximity to each other, like in an office building, school, or home. LANs are usually built to enable the sharing of resources and services like files, printers, games, applications, email, or internet access. Both Wi-Fi and Ethernet also allow devices to connect to each other directly (e.g. peer to peer or ad hoc connections) rather than through a central device, although the functionality of these networks is limited ([Bradley](https://dl.acm.org/author_page.cfm?id=81100498093&coll=DL&dl=ACM&trk=0) Mitchell, 2017).

Several studies have shown that the majority of network performance problems occur in or near the users’ desktop/laptop computer.  These problems include, but are not limited to, duplex mismatch conditions on Ethernet/Fast-Ethernet links, incorrectly set TCP buffers in the user’s computer, or problems with the local network infrastructure or the machine performance itself (<http://software.internet2.edu/ndt/>).

Failure diagnosis is one of the major challenges that home users and network administrators face  
today. To know the root problem where it is, is time consume and bulky task. Administrators and Users are not sure from where that problem is happening and they think and try so many solutions in order to solve slowness of the PCs in the network without thinking other devices and PCs in the network that affect the speed of the network or internet (Sumathi, et al 2017).

Network performance refers to measures of service quality of a network as seen by the customer. There are many different ways to measure the performance of a network, as each network is different in nature and design.

Today’s managing networks with yesterday’s manual processes is no longer a viable solution. The Automated Network Diagnostic Tool is needed, software that provides network performance testing to a user’s desktop or laptop computer. Identifying problem from server or anywhere is simple and gets detail with efficient information to troubleshooting the machine. It makes administration simple and efficient. We can achieve customer’s satisfaction.

1. **Problem of the statement**

The number of Local Area Networks (LANs) is increasing rapidly and is expected to explicitly over the next few years. From both an economic and operational perspective, the performance of an organization's LANs is critical ([Gil Held](https://dl.acm.org/author_page.cfm?id=81100498093&coll=DL&dl=ACM&trk=0), 1994). T he performance evaluation of local-area networks (LANS) is a multifaceted problem because of the complex interaction among a potentially large number of system components. Therefore, modeling of LANS needs to be performed at various levels, similar to the hierarchical approaches in the analysis of equally complex systems, such as wide-area data networks, telephone networks, or computer systems. The internet traffic reached at LAN network environment with some amount of data rate. The speed is different after it incoming into LAN. However, if a network is congested, performance is degraded and user productivity suffers.

People value their time, and hate waiting for computers because the network traffic well in some environment somewhere is unusable even if the internet connection is available and other environment is slow down. When faced with delays in accessing a web site and the system administrator would often like to know what is causing the delay and since try to fix the problem. To determine and isolate the most probable cause of the issue will like to the aspects related to: (1) time consuming and tedious work for system administrator. (2) Also the end users consume your time in trying to diagnose system performance, cable mismatch, cause of the host that both software and antivirus conflict resulting network problems. This situation will contribute to increased customer dissatisfaction in web access (Sumathi, et al 2017) and (Fitzpatrick and C. Li, 2012).

The proposal of this paper will involve to investigate the root cause of internet traffic performance degrading in the LAN network can be automatically detect and diagnosis the TTL speed, system performance (CPU usage, RAM capacity, Hard disk usage used and free) with identify, designing and implementation of a specific algorithm method.

1. **Objective**
   1. **General Objective**

The general objective of this proposal will to design time effective and simple way automated diagnosis of LAN network performance related to the incoming internet traffic and file server access that enables the system administrators to save time and simplify the work and increase the satisfaction of customer.

* 1. **Specific Objectives**

The implementation of the method of algorithm will cross check the system TTL speed, IP address of System, CPU usage, RAM capacity, hard disk usage, Antivirus conflicts most probably that cause the system initiates to generate the problem.

* To monitoring internet/network traffic at LAN easily
* To simplify the system administrator work
* To encourage customer satisfaction
* To efficiently isolate and diagnosis the problem and provide efficient access to the end users.

1. **Approach/Methodology** 
   1. **Methodology**

The research of this study follows a design science problem solving paradigm approach in order to propose the appropriate solution for the problem of the LAN network performance degradation in accessing internet traffic and file servers.

The goal of this research is to design, develop and implement a new automated diagnosis method for the LAN network that enables the system administrators to detect, he would likely to fix the problem efficiently and effectively the performance degradation issues in their environments in order to provide efficient services and increase the satisfaction for their end users.

And also this research will have made use of design science method to follow the procedures to identify problem, define solution objective, design and develop, demonstration, evaluation and communication.

* 1. **Data Collection and Analysis Methods**

In achieving the goal of the research of this study we will be take up different data collection and analysis methods in order to get relevant and complete data. The methods that the researcher will be used questionnaires, interviews and observation.

Additionally, also used Literature review of the Books, Ph.D. Dissertations, Master Thesis, research papers, Published Journals and other relevant documents will be analyzed to find out what solutions are designed for the specified problems and the relevant outputs that may enhance this research will be optimized and tested.

* 1. **Tools and Techniques**

In our study we will use the instrument that code the algorithm of the proposed system using java programming language for front end design and for back end database Ms SQL server 2014 language will be used. The system takes the IP addresses of the host to crosscheck/process the TTL speed, CPU usage, RAM capacity, and hard disk usage and software bugs of the system. The system administrator will be fix the problem of a host based on the information generated by the designed system and he try to process the diagnosis if no solve the problem.

* 1. **Sampling Population**

The study will be carried out on selected companies that implement LAN networks and their throughput channel is Fiber cable. The research population for this study is the end users for LAN networks those who are accessing the web sites and file servers locally. We also include the system administrator of these organizations. The data sampling method here will be non-probability sampling, since questionnaire will be distributed to system administrators and end users of the selected companies that implement the LAN network. As mentioned above the end users and system administrators will be selected using a purposive non-probability sampling method.

1. **Literature Review/Related**

The current related work is proposed using DYSWIS system to automatically diagnose network failures and determine the root cause of failures and presented a reference implementation for a VoIP system. DYSWIS system can be implemented for any kind of network as long as probes can be defined, queries can be implemented and an expert can define the dependency rules based on existing probes and queries. We used the DROOL rule framework to represent the dependency information.

As a part of this work, we came up with requirement for a rule-based language which would meet the goals of a rule language for network diagnosis. Our framework uses SIP event notification framework for sending requests and receiving responses. The initial results were obtained by inducing failures manually and observing how DYSWIS triggers diagnostic processing.

*In our study we will propose to investigate the instrument of the code that provides application to detect and report failures in order to generate diagnosis to get root cause network performance problem.*

1. **Scope and Delimitation of the Study**

The proposal of this study will be delimited to degradation diagnosis of the internet traffic after incoming to the LAN network with some amount of data rate and isolate the root cause that why these variation of the speed rate happens at different environments. Geographically, limit to a host in which it covers the companies that configured with private IP addresses and any areas related to it configure and implement the LAN network.

The scope and core assumption of the research of this study will be mostly focus on answer to the questions of the blame and dissatisfaction of end users due to slow access. And loss of time both the end users and system administrators would likely to finding the cause of the problem of the performance degradation and in trying to fix them in the most usable area of the LAN network. It also gives attention for system administrators in simplifying and quick response of the work related to the issues.

1. **Significance of the Research**

The significant of this research is to create an approach to managing LAN network performance diagnosis that is efficient enough to run constantly, can automatically detect and report performance information as possible. System administrators and developers will be able to monitor the health of communication; they save their time and resource. Individual hosts in a network will be able to detect simply widespread network problems and report them manner to a monitoring service for cross correlation and analysis. This is making customer satisfaction and access reliability high. This research also sample research for other researcher for further investigation.

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| No. | Activities | Time Schedule | | | | | | | | | | | | Remark |
| Jan | Feb | Mar | Apr | May | Jun | July | Aug | Sep | Oct | Nov | Dec |
| 1 | Submission and approval of proposal  Collection of literature | ✓ |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | **Research design**  Data collection preparation  Collecting questionnaires  Selection of questionnaire respondents |  | ✓ | ✓ | ✓ | ✓ |  |  |  |  |  |  |  |  |
| 3 | **Research Execution**  analysis, develop software, testing and evaluation |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |  |  |
| 4 | writing final Report |  |  |  |  |  |  |  |  |  |  |  | ✓ |  |
| 5 | Final research presentation |  |  |  |  |  |  |  |  |  |  |  | ✓ |  |

1. **Time Plane**
2. **Budget Plan**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No. | Descriptions | Measurement (in Unit) | Quantity | Unit Price (Birr) | Total Price (Birr) | Remark |
| **Material cost** | | | | | | |
|  | paper | Packet | 1 | 130 | 130 |  |
|  | printing | Pieces | 300 | 2 | 600 |  |
|  | Stationary (pen, notebook, pencil, Lapis etc… | Pieces | - | 200 | 200 |  |
|  | Binding | Lump sum | - | 120 | 120 |  |
|  | Flash Disk | Pieces | 2 | 250 | 500 |  |
|  | External Hard disk | Pieces | 1 | 2500 | 2500 |  |
|  | Typing and editing | pieces | 60-80 | 2 | 160 |  |
|  | copying | pieces | 200 | 1 | 200 |  |
|  | Software Tools | pieces | - | 500 | 500 |  |
| **Communication cost** | | | | | | |
|  | Telephone | Minutes | 3650 | 0.75 | 2737.5 |  |
|  | Internet access | Minutes | 5400 | 0.35 | 1890 |  |
|  | Transportation | Round Trip | 300 | 4 | 1200 |  |
| **Total Cost** | | | | | **10737.5** |  |
| **Contingency (20%)** | | | | | **1073.75** |  |
| **Ground Total** | | | | | **11811.25** |  |

# Reference

[Bradley](https://dl.acm.org/author_page.cfm?id=81100498093&coll=DL&dl=ACM&trk=0) Mitchell (2017). An Introduction to the essential concept of a LAN

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