The Design and Implementation of Remote Desktop Using Thin Client

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Abstract. The aim of the study was to facilitate the handling of built computer networks, reduce the cost for client purchases, saving resources. Then tested to measure QOS parameter that is delay, packet loss and throughput. Server is a service provider on a computer network. A computer network can be created by requiring clients and other devices. Usually, the cost to build a computer network is quite expensive. Therefore, built a computer network using the server with EXSi operating system that aims to store a virtual client that will be accessed by clients. While the client using HP T5720 hardware, raspberry pi 3, and laptop that aims to save in terms of cost, and resources compared to the PC as usual. Therefore designed a system with remote desktop using thin client, which In addition, testing is also done to measure CPU performance and server RAM. QOS testing is obtained from the number of clients connected to each other, with delay> 150 ms and packet loss 0%, then the delay and packet loss included into the network category is very good. Based on the tests performed to analyze CPU server performance with 4GB RAM, the number of virtual clients can be operated ± 4 virtual clients. Every client in this system consumes less power than 24V less than power for a Personal Computer.

1. Introduction

Virtual Machine is an application that has the ability to create visual computers that have the same capabilities as the original computer depending on the specifications that are set from the virtual machine software itself. Thin Client and Raspberry are small computers that perform exactly the same as regular desktop PCs, but their power consumption is much lower and cheaper than PCs. Interestingly, this minicomputer has realized the ideas of its users to build and apply various creative projects. Virtualization technology is usually used as a data center [1-3]. Thin clients are small or sleek or thin computer devices at low cost, and centrally managed on servers without CD-ROMs, diskettes and hard drives. The idea is to limit the ability of computers in general from other applications that should not be used.

Virtual machine technology has many functions, such as centralized data. The virtual machine can have different clients, according to its function. These clients can be PCs, minicomputers, or thin clients. The measurement parameter of a virtual machine is the performance of RAM and CPU. Other studies also differ only in the type of client, server service, or network performance measurement

In addition to being a data center, virtualization technology is used as resource management on local network [4-5]. Based on the description, then built a LAN network with a server with EXSi operating system and using HP T5720, Raspberry Pi 3 and laptop as a client that aims to compare the
performance of the server or client and to facilitate the handling of the network, saving power and cost. The aims of the study was to facilitate the handling of built computer networks, reduce the cost for client purchases, saving resources.

2. Methods
The design of this system consists of designing software and hardware. The design of this system is described with a block diagram shown Figure 1, software design is the configuration of operating systems and services for the system. Hardware design is a device built on a local network of this system. (See Figure 1).

![Figure 1. Block Diagram.](image1)

In the system built topology used is a star topology, described with a topology shown Figure 2.

![Figure 2. Topology star.](image2)

Hardware is a component of a computer that runs based on predetermined instructions. Table 1 shown specification for this system.
### Table 1. Specification of Hardware.

| Hardware                | Quantity | Specification                                      |
|-------------------------|----------|----------------------------------------------------|
| Server                  | 1        | Processor AMD Athlon II                             |
|                         |          | RAM 4 GB                                           |
|                         |          | Hard disk 120 GB                                   |
| Raspberry Pi 3 B Model  | 1        | Memory RAM 1 GB                                    |
|                         |          | Processor Broadcom BCM2835                         |
| Switch                  | 1        | TL-SF1008D                                         |
|                         |          | 8 port                                             |
| Micro SD                | 1        | Capacity 32 GB                                     |
|                         |          | Class 10                                           |
| Notebook                | 1        | Intel Side                                         |
|                         |          | RAM 4 GB                                           |
| Thin Client             | 1        | Ram 256                                            |
|                         |          | Processor AMD Atom 1 Ghz                            |

### 3. Results and Discussion

Installation and configuration of the system is done for the design of software and hardware design to build the system created. Here are the steps to build the system. In the system built measurement is done there are 2 stages of network quality measurement and measurement of server and client performance.

QOS measurement data obtained using additional software applications that is Wireshark any method to get data is done that is by filter without IP address and filter IP address by capture data. The results obtained data entered in the table 2. Here are the results of the measurement of network QOS obtained. Table 3 shown of the server performance measurement. (Table 2&3).

#### Table 2. Measurement of Network Performance.

| Information                      | Performance QOS |
|----------------------------------|-----------------|
|                                  | Troughput       | Paket Loss | Delay  |
| Without filter                   | 1.538 KB/s      | 0%         | 6.5ms  |
| Filter IP administrator with IP laptop | 1.538 KB/s      | 4.67%      | 6.5ms  |
| Filter IP administrator with IP thin client | 1.538 KB/s      | 4.73%      | 6.5ms  |
| Filter IP administrator with IP Raspberry pi | 1.538 KB/s      | 4.77%      | 6.5ms  |
| Filter IP administrator with IP virtual client | 1.538 KB/s      | 4.66%      | 6.5ms  |

#### Table 3. Measurement of Server Performance.

| Number of Clients | Performance CPU (GHz) | Performance RAM (GB) |
|-------------------|-----------------------|----------------------|
| 1 Virtual client  | 0.203 GHz             | 2.2 GB               |
| 2 Virtual client  | 1.54 GHz              | 3.3 GB               |
| 3 Virtual client  | 1.65 GHz              | 3.9 GB               |

Performance measurement of each client device on this system is done by measuring RAM, CPU, and resource consumption. For measurement of RAM and CPU of each client can be measured by looking at the task manager on each client when operating. As for the resources used are measured manually by looking at the adapter of each client. The following is a measurement of each client, shown on table 4 for performance and table 5 for power consumption. (Table 4&5).
Table 4. Measurement of Client Performance.

| Device   | Device Capacity | Measurement Performance |
|----------|----------------|-------------------------|
|          | RAM Capacity    | CPU Capacity            | HDD Capacity |
|          | Used            | Used                    | Used         | Over          |
| SEVER    | 4GB             | 3.6 GB                  | 2X3 GHz      | 1.65 GHz      | 120GB         | 79.09 GB      | 40.91 GB      |
| Administrator | 4 GB             | 2 GB                    | 100%         | 20%           | 500GB         | 436.25GB      | 63.75GB       |
| Raspberry | 1GB             | 97 MB                   | 100%         | 8%            | 32GB          | 8.9GB         | 23.1 GB       |
| Thin client | 256 MB          | 190MB                   | 100%         | 10%           | 500MB         | 439.2MB       | 60.8MB        |
| Laptop   | 4GB             | 1.5GB                   | 100%         | 5%            | 320GB         | 210.9GB       | 109.1GB       |

Table 5. Measurement of Power Consumption.

| Device   | Power Consumption |
|----------|-------------------|
|          | Voltage (Volt)    | Power (Ampere) |
| SEVER    | 24                | 28             |
| Raspberry| 5                 | 2              |
| Thin client | 12               | 2.5            |
| Laptop/PC| 19                | 3.5            |

4. Conclusions
The results of design and testing in this study indicate that the device designed to work properly. The writer based on test results and analysis, then got some conclusion is based on the result of power consumption, all client used low power, under power consumption for PC server. Based on the results of testing performed, by using remote desktop hardware Raspberry PI 3, can use Windows 7. Based on test results performed to analyze CPU performance and RAM Server, it is predictable the maximum number of virtual clients that can be created is limited by HDD and RAM server capacity.

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