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Research paper

Design and implementation of large scale network

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Abstract

The paper talks about designing and implementation of large scale wireless network in Engineering Campus. The main goals of this work is designing a network which able to bring sharing information, remote desktop, secured network and mobility to all network users in the coverage area of the network. Coverage range testing had been carried out at the university building. Since the result of old network is not so satisfying, a new design based on the characteristic of mikrotik, the access points and the building structure was done. This design can be applied in hotels, companies, restaurants, airports, and university departments.

Keywords: *Large Scale Networks; Mikrotik; Smart Government; Wide Coverage Networks.*

1. Introduction

In the world, there are quite a number of universities, which implemented wireless network to replace existing fixed local area network. However, in Iraq, designing and implementing wireless local area network by using Mikrotik in University is a new issue. The advantages of wireless network are many such as improving the quality of delivery of education as students and teachers are able to access teaching material instantaneously. Enhance the interaction between parents, students, and teachers through IP communication tools. Increase productivity of staffs by using IP communication tools. Cultivate students' interest in learning process[1].
Increase students' productivity as they can access to portal web and proceed with assignments without the constraint of place and time. Students are able to take exams with laptop and save their answer through the school's network. Enhance safety in the campus by having video based surveillance. Overlaid wireless network on existing Ethernet can be used in order to solve problem of installing additional ports endlessly.

2. Design and implementation of large scale network

The scale network work depending on receive and distribute information through network, the structure of network depend on issues (building size, number of building, and user requirements)[2]. The issues of this work use two types of design wired and wireless technology. As shown in figure (1, 2). In figure (3) show the implementation of large scale network using access point and number of pc device to control the sending and receiving information[3].

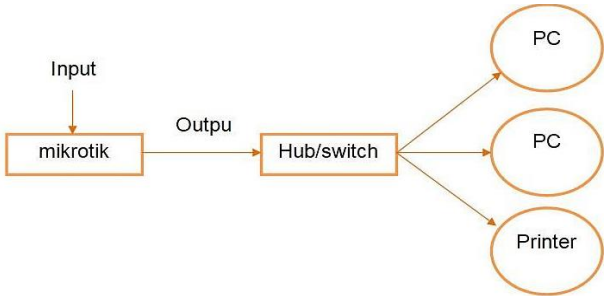

Fig. 1: Block Diagram of Large Scale Network (Wired).

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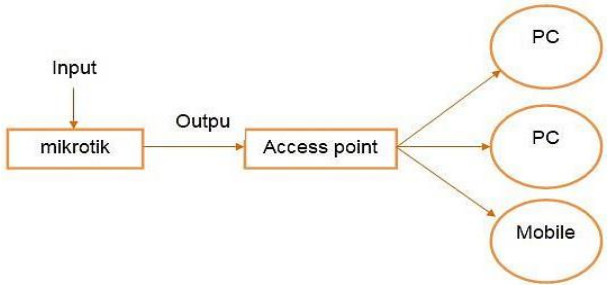

Fig. 2: Block Diagram of Large Scale Network (Wireless).

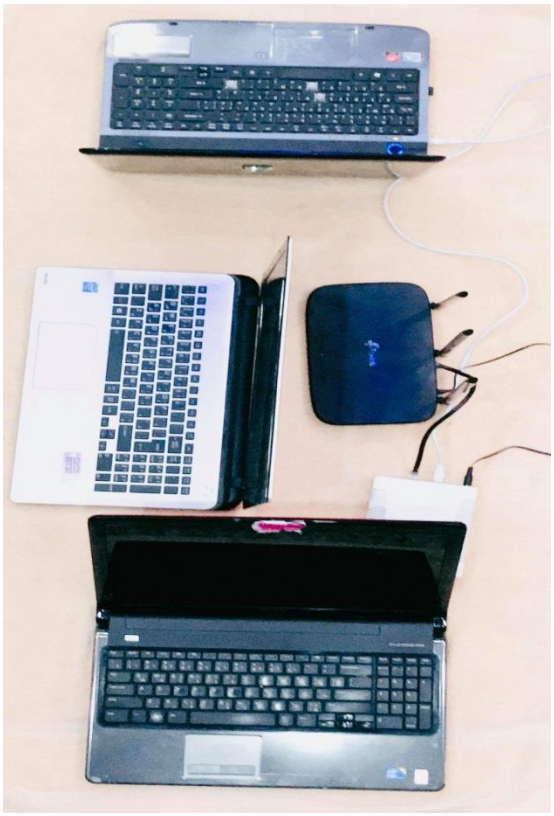

Fig. 3: Implementation of the Design of large Scale Network.

3. Design facilities

This Design offers multiple services such as[4]:

- Providing a temporary internet service to the visitor or tourist, for example (one hour or more) according to the request under a specific range.
- Splitting the network and set the required speed according to the speed required for each user.
- Files sharing: we can share the files by two methods (wire and wireless).
- Security system: by providing special accounts for users can only be used for the work of the company or office controlled by the administrator. Also cannot take or add any information on the computer by disabling the ports of USB and CD\DVD.
- Remote desktop: Administrator can open user accounts remotely and add programs or files to them or modify the account.

4. Wireless devices & its characteristics

The wireless channel is susceptible to a variety of transmission impediments such as path loss, interference and blockage[5]. These factors restrict the range, data rate, and the reliability of the wireless transmission. Depending on the Effective and efficient on different device we chose the flowing component for our work[6]:

- Mikrotik RB951-2n: is the home wireless AP you have been waiting for. It is small and compact, has five Ethernet ports and a 802.11b/g/n wireless AP with an antenna built in. This device is very small and will look good in any home or office, wall mounting anchor holes are provided. Box contains: RB951-2n, plastic case, power supply[7].
- Router TL-WR940N: 450Mbps Wireless N Router TL-WR940N is a combined wired/wireless network connection device designed specifically for small business and home office networking requirements. With MIMO Technology, TL-WR940N creates an exceptional and advanced wireless and online gaming. Also, WPS button on the sleek and fashionable exterior ensures WPA2 encryptions, preventing the network from outside intrusions[8].

Fig. 4: (Mikrotik Rb951-2n Router Board).

Fig. 5: (Mikrotik Rb951-2n Router Board).

- Switch TL-SF1005D: The TL-SF1005D 5-Port 10/100Mbps desktop switch provides an easy way to expand your wired network. All 5 ports support auto-MDI/MDIX, eliminating the need to worry about the type of cable to use. Featuring full duplex mode, the TL-SF1005D can process data at a rate of up to 200Mbps making it an ideal choice for expanding your high performance wired network. Moreover, with innovative energy-efficient technology, the TL-SF1005D can save power consumption, making it an eco-friendly solution for your home or office network[9].

5. Wireless data rate & coverage range

Complying with the IEEE 802.11n standard, TL-WR940N can establish a wireless network and get up to 18X the speed and 6X the range of conventional 11g products. Also, with transmission rates up to 450Mbps, it shows more excellent abilities of mitigating data loss over long distances and through obstacles in a small office or a large apartment, even in a steel-and-concrete building[10]. Above all, you could easily pick up the wireless network during long-distance connection where legacy 11g products may not.

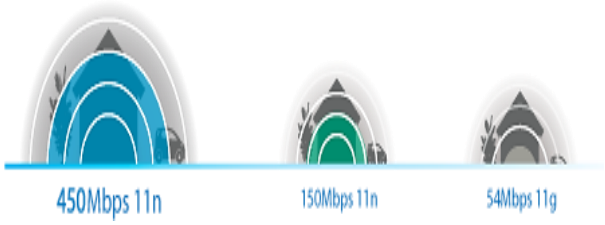

Fig. 6: (The Speed and Range of Router LT-WR940N.

6. Improve the wireless performance

The router has the speed to work smoothly with almost any bandwidth intensive application including VoIP, HD streaming, or online gaming, without the lag. Using its powerful N technologies, the router is also able to mitigate data loss over long distances and through obstacles turning your home and even your yard into one big hot - spot[11].

Fig. 7: (Router TL-WR940N Device).

7. High performance

TL-SF1005D Fast Ethernet Switch provides 5 10/100Mbps Auto-Negotiation RJ45 ports. All ports support Auto MDI/MDIX function, eliminating the need for crossover cables or Uplink ports. Featuring non-blocking switching architecture, TL-SF1005D forwards and filters packets at full wire-speed for maximum throughput. With 2K Jumbo frame, the performance of large files transfers is improved significantly. And IEEE 802.3x flow control for Full Duplex mode and backpressure for Half Duplex mode alleviate the traffic congestion and make TL-SF1005D work reliably[12].

Fig. 8: (Switch TL-SF1005D Device).

8. Configuration steps of mikrotik (RB951-2N)

- Using the winbox313 program, connect mac address of 1enterface to configure Mikrotik.

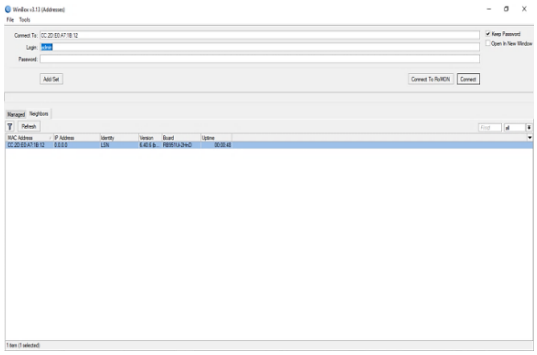

Fig. 10: (Mikrotik Configuration Steps).

- Reconfigure the Mikrotik.
- Renames of the input and output interfaces.

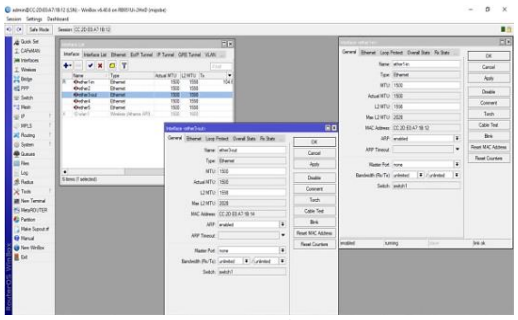

Fig. 11: (Mikrotik Configuration Steps).

- Add addresses for output interface

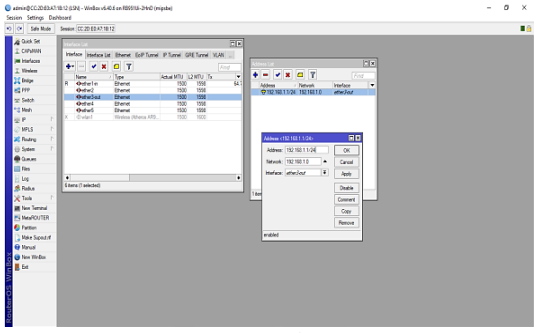

Fig. 12: (Mikrotik Configuration Steps).

- Enter to DHCP Client to find out the addresses of inter 1-in automatically.

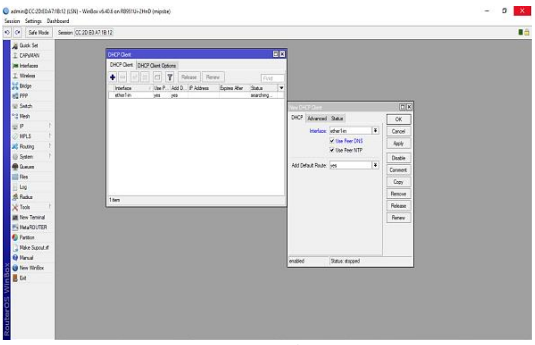

Fig. 13: (Mikrotik Configuration Steps).

- Setup hotspot for internet division and speed control and set a specific time for each user.

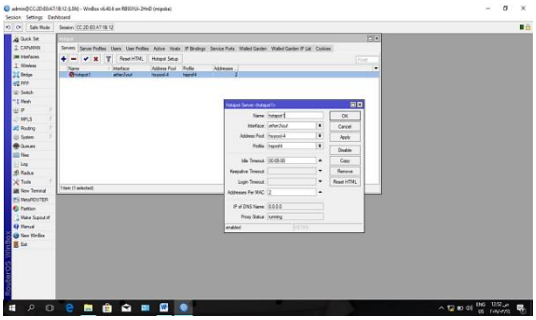

Fig. 14: (Mikrotik Configuration Steps).

- Add users in hotspot and select uptime limits of each users.

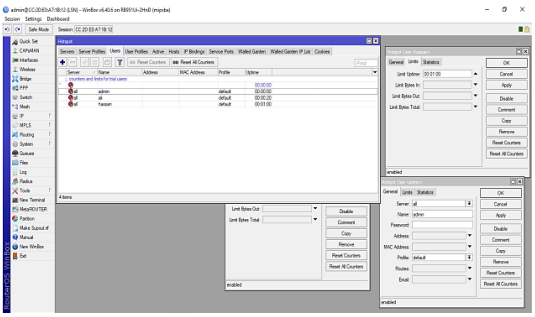

Fig. 15: (Mikrotik Configuration Steps).

- Enter user profile to select number of shared users and rate limits (Tx, Rx).

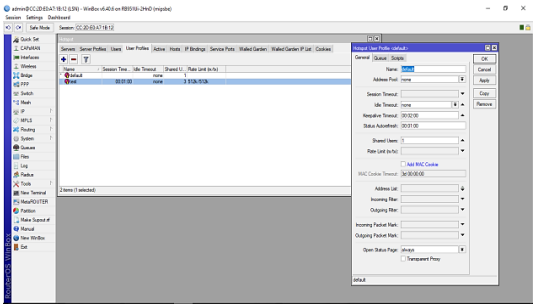

Fig. 16: (Mikrotik Configuration Steps).

- To connect from mikrotik: enter any browser example as (goggle chrome, opera, Firefox) and write address of inter3-out.

Fig. 17: (Mikrotik Configuration Steps).

9. Configuration steps of information sharing & other services

To share files and informations follow the steps below:

- add a new account to user from control panel.

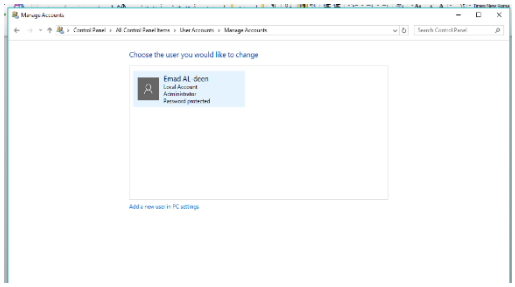

Fig. 18: (Steps of Sharing Files).

- Connect two or more computers by wired or wireless.
- Add IP for each computer, As the picture.

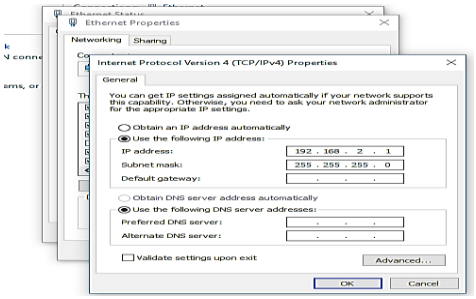

Fig. 19: (Steps of Sharing Files).

- Make sure the link between the computers is through a specific instruction as in the picture.

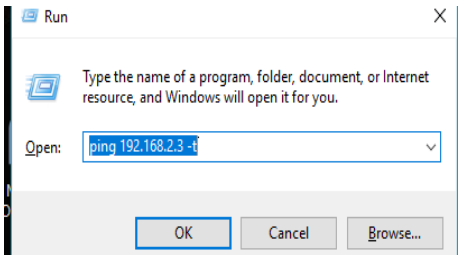

Fig. 20: A) Steps of Sharing Files**.**

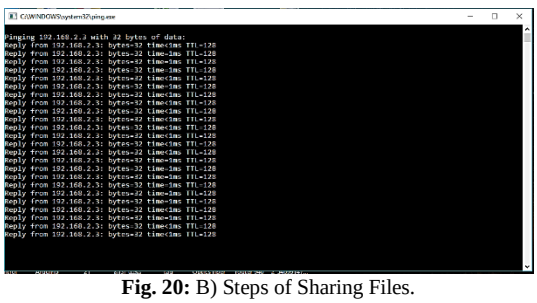

Fig. 20: B) Steps of Sharing Files.

- Through a computer designed to control the computers used by the Remote Desktop. Through the following directive.

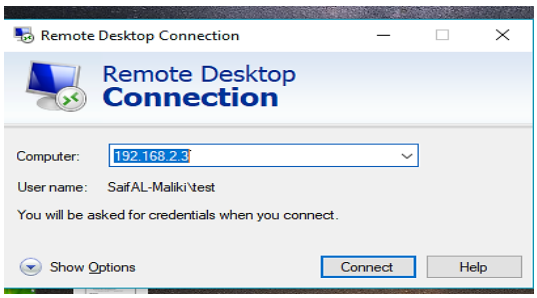

Fig. 21: (Steps of Sharing Files).

- We enter the user's account by the Add-on account.

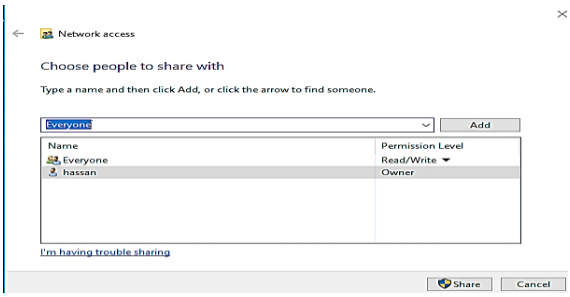

Fig. 22: (Steps of Sharing Files).

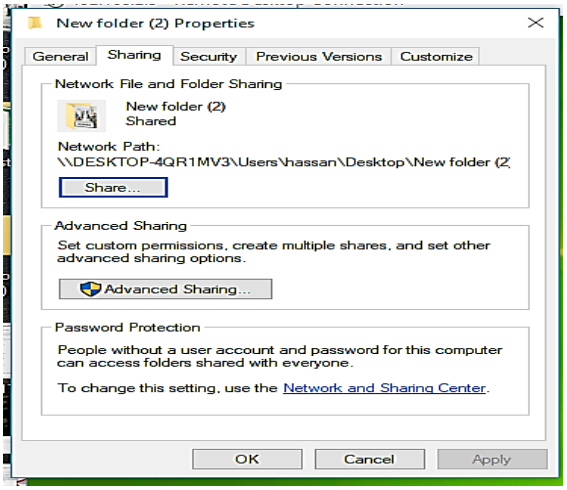

Fig. 23: (Steps of Sharing Files).

Fig. 24: (Steps of Sharing Files).

Note: if file sharing is not done, we turn off windows firewall because sometimes it prevents it.

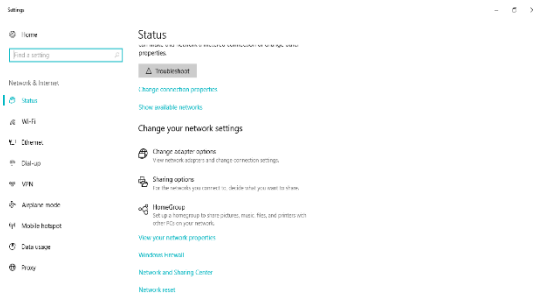

Fig. 25: A) (Turn Off Windows Firewall).

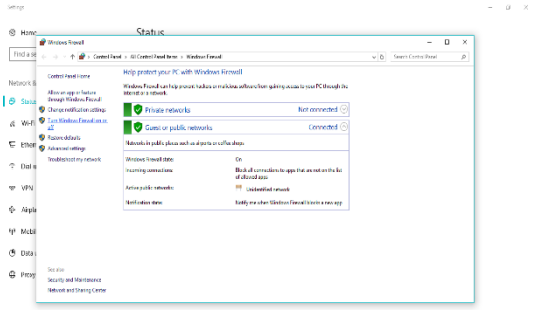

Fig. 25: B) (Turn Off Windows Firewall).

10. Conclusion

We conclude from this design that we can control the speed of the internet as well as determine the length of time per user through hotspot in mikrotik RB951-N. Also provide a security system, also provide remote desktop to administrator where he can add files or programs for user accounts.

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