

ANDROID WIFI NETWORK MANAGEMENT TOOL BY USING SIMPLE NETWORK MANAGEMENT PROTOCOL

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ABSTRACT: - WiFi is a network technology that allows any electronic device to connect to a wireless LAN (WLAN) network. WiFi is very useful in the university, also WiFi useful for the faculty, staff, students, and visitors to access to the Internet, email, web sites, and other IT services regardless of location and this can change the study manners. We in this project will focus on the monitoring, management, administrative aspect of the wireless by developing an application working in android devices for Diyala University as management application on the Android platform. This application show and save any information about access point by using SNMP (Simple Network Management Protocol) and show the AP location on the Google_map. Also we take a measurement and collect data to visualize and report the network throughput, utilization and active clients of the wifi network.

Keywords: WiFi, mobile networks, Android platform, SNMP, network management.

LITERATURE REVIEW

Many studies written in the network management software. Some of these studies are C. S. Nimodia shows the network state to the network manager on the android devices ⁽¹⁾. Kim, Hyojoon shows the problems network management tasks ⁽²⁾. Enck, W. design a system to configure the network management systems in a way that comprehensive and flexible ⁽³⁾. Harry Li, design a system using SNMP to enhance network management systems to meet wireless network requirements. ⁽⁴⁾

INTRODUCTION

WLAN is a wireless network that connect two or more devices within a limited area such as a campus, home, school, computer laboratory, or office building. This gives clients the ability to move around within a local coverage area and still be connected to the network, and can provide a connection to the wider Internet. Because of wireless (802.11) speed is nearing to the wired networks led to increase the bandwidth and wide adaptation of WiFi ⁽¹⁾. also increase network utilization for many modern life applications, has led to many studies towards analysis and design of ideal wireless network ⁽²⁾.

1. Android Platform

Android is a mobile OS build on the Linux kernel and designed by Google. With an interface based on direct manipulation, Android is developed for touch screen devices such as phones and tablet computers, with specialized user interfaces for televisions, cars (Android Auto), and watches (Android Wear). The operating system uses touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, and a virtual keyboard. Despite being primarily designed for touch screen input, it has also been used in game consoles, digital cameras, regular PCs, and other electronics. As of 2016, Android has the largest installed base of all operating systems ⁽⁴⁾.

Android is an open operating system, and can anyone use it. A also any manufacture can use the operating system by using SDK(software development kit) if they follow development procedure in the SDK. There are no constraints or requirement for the manufacturer to deploy their applications with anyone. Android platform contains a good user interface, JAVA class libraries, application framework, and multimedia support. also Android support built in applications dealing with other features such as SMS (short message service) ⁽⁵⁾.

Android development is the process to create new applications for the Android platform. Applications are usually programmed in Java using the Android (SDK). SDK provide developers, designers, programmer all libraries and tools that needed to building, testing and debugging on android platform ⁽⁶⁾. SDK is available on the android official website. We can also use SDK command prompt to write Android programs, and the most method used is IDE (Integrated Development Environment) such as Eclipse with ADT (Android Development Tools) plug-in ⁽⁶⁾.

2. SNMP

SNMP is a manner that can make servers share the information about their devices current state, and represent a channel between devices and administer who can modify their defined values. The protocol is very simple, and the structure of the programs that implemented SNMP are very complex. ⁽⁷⁾

2.1 SNMP manger

Manager or management system are any devices can send requests to SNMP agents with the correct credentials. This is implemented as part of a monitoring suite. SNMP Manager's has many functions:

1. Queries agents
2. Sets variables in agents
3. Gets responses from agents
4. Acknowledges asynchronous events from agents

Figure 1 shows basic SNMP Communication Diagram

2.2 SNMP Agents

Agents gather information about the system and storing system information. And the database updating called MIB (management information base) ⁽⁷⁾. MIB has two kinds:

- a. *Scalar*: which introduce a single object, and gives one result only.
- b. *Tabular*: which introduce multiple related object in MIB tables.

SNMP agent's has many functions

1. gather management information about its local system
2. Store and restore information in the MIB.
3. Send the events to the manager.

2.3 MIB structure and Object Identifier (Object ID or OID)

(MIB) is a gathered information from the network element. The MIBs contains managed objects called Object Identifier (Object ID) or (OID). Every OID has hierarchically organization in MIB. The MIB can be represented as tree structure with Single identifier. A OID will be a dotted in listed integers. For example, OID in RFC3121 for "sys_Descr" is .1.3.6.1.2.1.1.1 as shown in figure 2. ⁽⁷⁾

3. SOFTWARE DESIGN AND IMPLEMENTATION

In this paper we design an android program that help the network managers to visualize and report the traffic congestion of their network. And we will need the following this achieve this application.

- A. Information of access points
- B. Google maps to locate AP.
- C. SNMP used in network analysis.

3.1 System Architecture

Figure (3) illustrate the architecture of the system. The WiFi Manager program installed on Android machine such as smartphone or tablet with that communicates with the SNMP of AP that uses SNMP API. The program can be use all available techniques e.g Wi-Fi, cell towers or satellite to locate AP location and show it on Google Maps. Also we show the UML (Unified Modeling Language) sequence diagram for the proposed application in figure (4).

3.2 System functions

We use Eclipse to develop the application by using the Android software development kit. Our application uses Google maps and has the following main functions:

3.2.1 Main menu

Figure 3 shows GUI activity which provides main options to user to use the application.

3.2.2 AP Scan

This function can be used to list and show all access points in the range. And the manger can select the APs that related to this location and save its information in the application database.

3.2.3 Show in Map

This function is used to show WiFi icons on Google Maps for the selected location as shown in figure 5 & 6.

3.2.4 Site Search

We can use this function to filter APs and listed according the site name, this can help user to find the needed information

3.2.5 APs Show in the site

This used to show the site in the map also we can go to SNMP setting by touch the AP on the map

3.2.6 Setting of SNMP

The user must use the following parameters (IP, MIB file name, version, port, time out and the community) like the Figure 9. The SNMP activity call Tree_Make activity. Then the Tree_make will build the MIB tree file by touching (MIB tree) button as the Figure 6. Finally this activity will call Network Utilization to compute utilization of wifi interface of the selected AP as shown in Figure 7.

4. EXPERIMENT RESULTS

We make an experiment for test the functions and performance of the application and execute the application on Android platform. We chose one of the computer department AP type RB433 with SSID eng_to_dept.

We focuses in our experiments on calculating network utilization and throughput using SNMP.

4.1 Network Utilization

Network utilization represent the amount of traffic over the network compared with the peak amount supported by the network. It's usually showed in percentage. By using MIB tree parameters

ifEntry is a wireless interface table of AP

if_Speed: the maximum speed of wifi interface in used AP is 54 Mbps.

If_OutOctets : counts of the number of output bytes of the interface.

If_InOctets are counts of inbound octets of traffic.

The formula used to calculate Network utilization is:

$$\text{Network_utilization}(\%) = \frac{(\text{data bits} * 100)}{(\text{bandwidth Mbps} * \text{interval in sec})}$$

then:

$$\text{Input utilization} = \frac{\Delta(\text{ifInOctets}) * 8 * 100}{(\text{seconds in } \Delta) * \text{ifSpeed}} \dots\dots\dots (1)$$

where

$\Delta ifInOctets$ is the difference between two poll cycle of collecting the SNMP.

$$\text{Output utilization} = \frac{\Delta(ifOutOctets) * 8 * 100}{(\text{seconds in } \Delta) * ifSpeed} \dots\dots\dots (2)$$

where

$\Delta ifOutOctets$: represent the difference between two reading of the if_Out_Octets

The table bellow (table 1) show the OID reading every 10min. also the output utilization shown in the figure 8

The measurement outcomes show that the network utilization of this AP.

4.2 throughput

Throughput represent the rate of successful delivered message over a communication channel. Usually the throughput measured in bits per time unit, or data packets per time unit or data packets per time slot.

From the MIB, we read values of ipOutRequests OID (packets count) as shown in the figure 9 and table 2

4.3 Active clients

By using MIB tree and then cDot11ActiveDevicesEntry, we read values of cDot11ActiveWirelessClients OID (devices count) (Figure 10 and table 3).

5. CONCLUSION

There are no standard application that used to manage, locate and visualize wireless APs in our application we can do all this also we can show the clients the connected to network to compute the utilization and the traffic in our network.

In this paper we use SNMP protocol tool to showing and access any APs on Google map. And this application gather all APs information and clients information on the wireless network these information will used to make performance better and also used to help the network manager (administrator) to manage the network.

This applications can provide many benefits such as:

- Mobile technology has become widely used and this can enhanced ability for administer network.
- Analysts, Staff, and others received information is efficient and with fewer errors can assets the mangers to receive data in real time also this make his decisions better.

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Table (1) OutOctets OID every ten min.

Time interval (sec)	First reading (Bytes)	next reading (Bytes)	Output utilization%
600	1498528456	2222928924	34.1156603
600	2629355348	3517395284	41.82226563
600	3991603508	4754002616	35.90520732
600	4754002616	5167152800	19.45731947
600	5400401284	5871964356	22.20827607
600	17120307996	17520399700	18.84232999
600	17560396488	17995061720	20.47057126
600	18429256444	18829726996	18.86017185
600	19229852620	19598003996	17.33809935
600	19998221620	20351633284	16.6439322

Table (2) ipOutRequests OID

Date	1/4/2016	IP	
time		10:00 AM	
packets	packets	time	IP throughput (packets/min)
408478	409590	10:00	250
409862	410890	10:10	230
411992	412852	10:20	240
412951	413758	10:30	199
414530	415358	10:40	320

Table (3) cDot11ActiveWirelessClients

Date	1/4/2016	
Active Devices at interval start	Active Devices at interval end	time
5	11	12:00
6	5	12:10
8	8	12:20
11	9	12:30
10	10	12:40

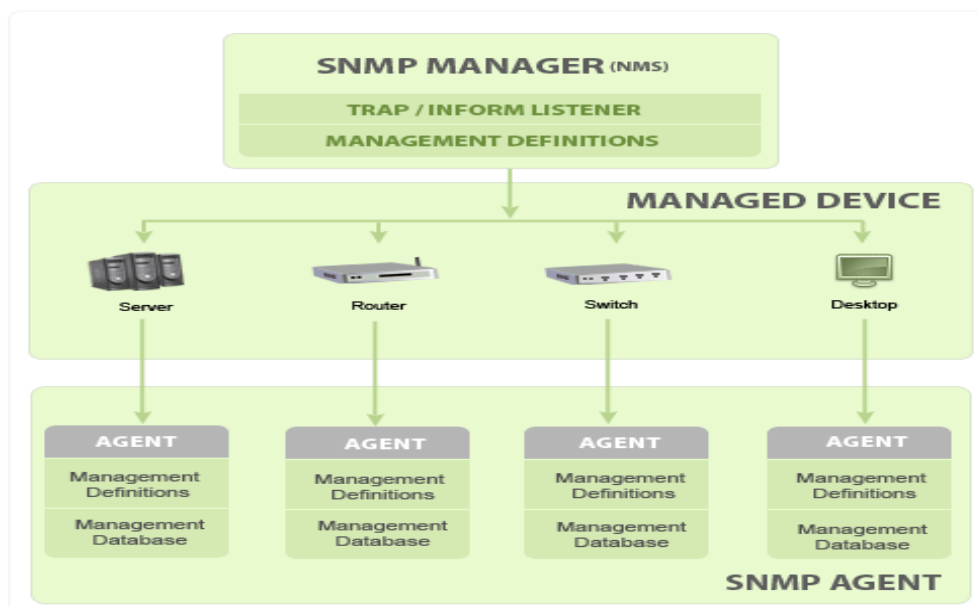


Figure 2 Basic SNMP Communication Diagram

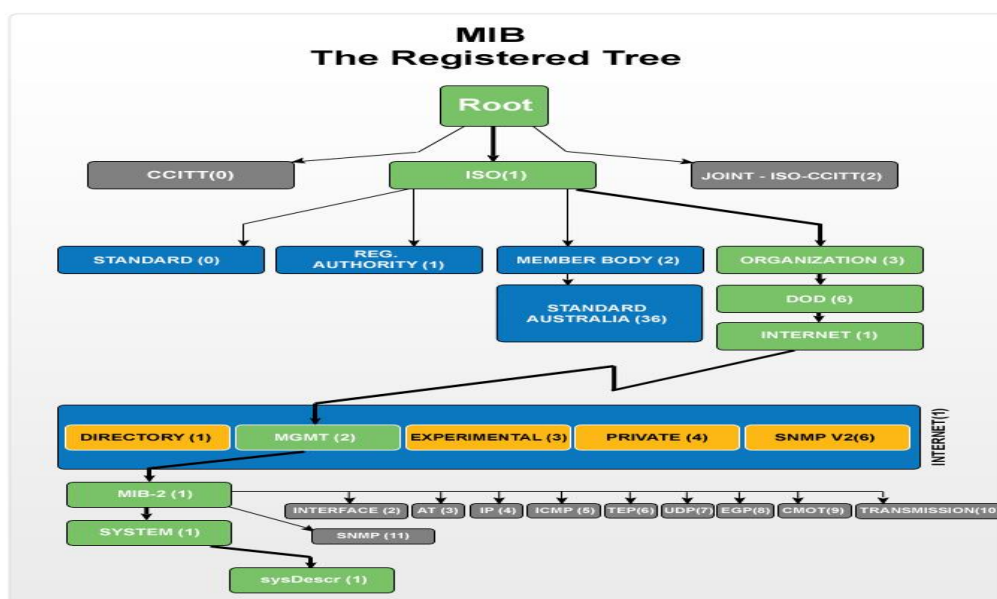


Figure 3 MIB Tree Diagram

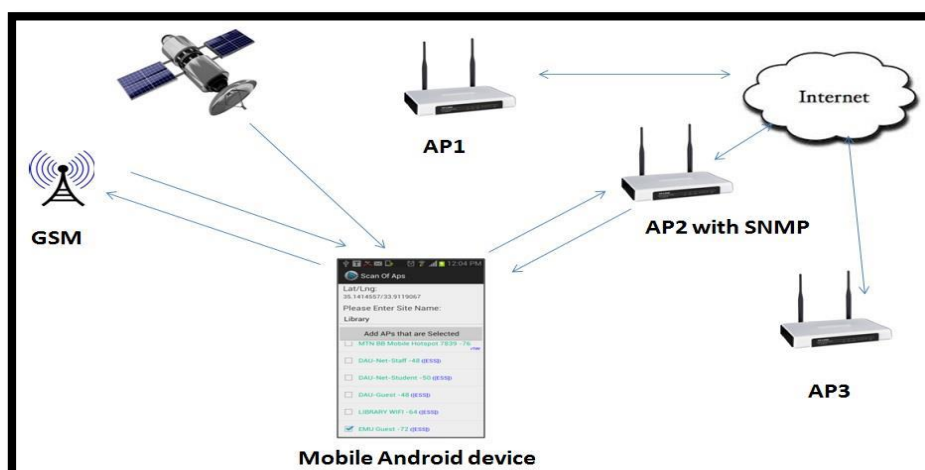


Figure 3 System Architecture

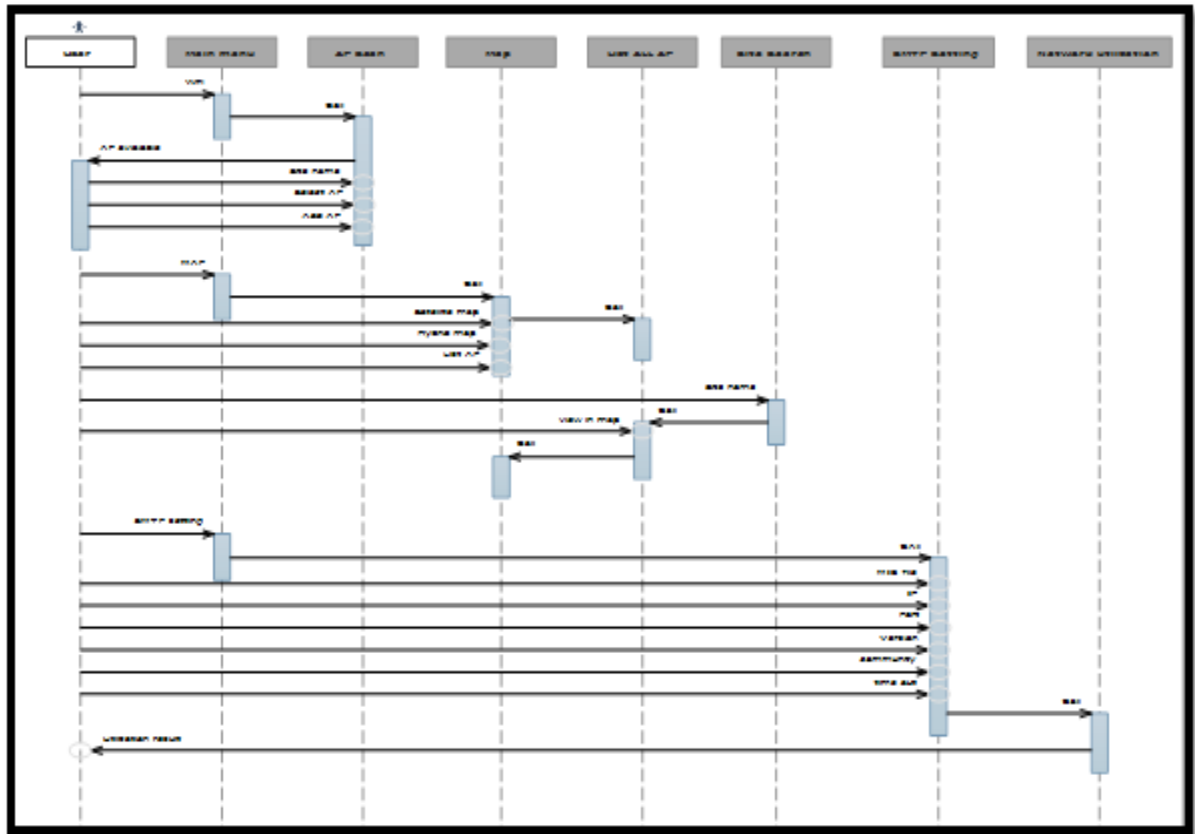


Figure 4 UML sequence diagram

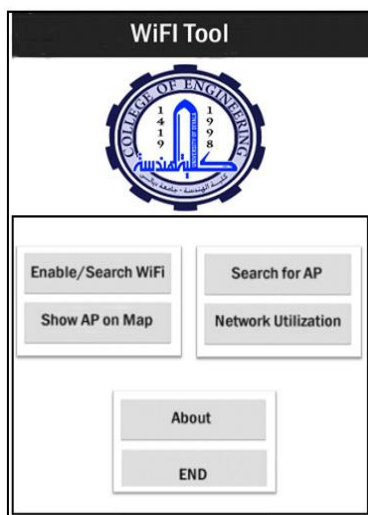


Figure 5 shows main menu activity of the application



Figure 6 Satellite map

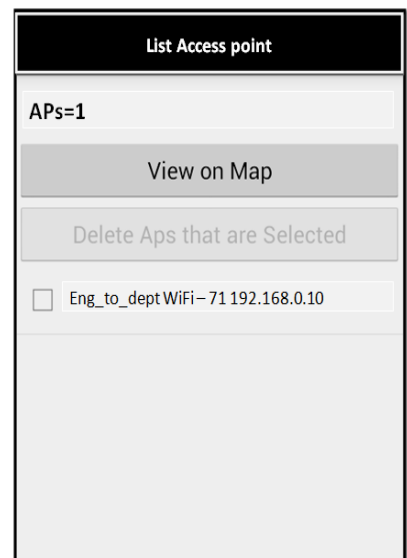


Figure 7 Aps_Site activity

IP	192.168.0.10
PORT	160
VERSION	V2
COMMUNITY	DauSNMP
TIMEOUT	5
MIB TREE	
NET UTILIZATION	
1. Mib file should be into /storage/sdcard0/mibs Touch on file name to load mibs files 2. Version of Mib file should be v1 or v2 or v3 3. TimeOut in seconds	

Figure 8 SNMP Setting

Network Utilization

InterfaceSpeed:
54000000

ifoutoctets:
70561451

Output Utilization

-1.5006858710562415E-4
% for time interval=-54.0 sec

Refresh

Figure 9 Network_Utilization activity

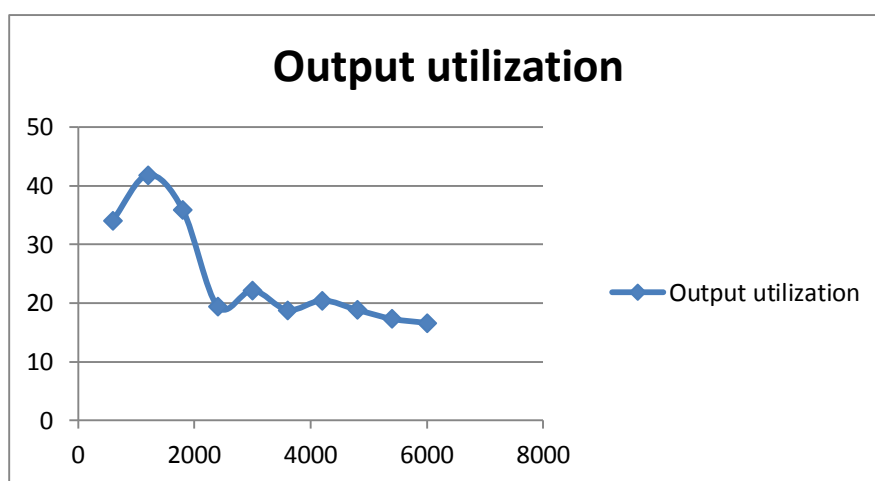


Figure 10 Output utilization

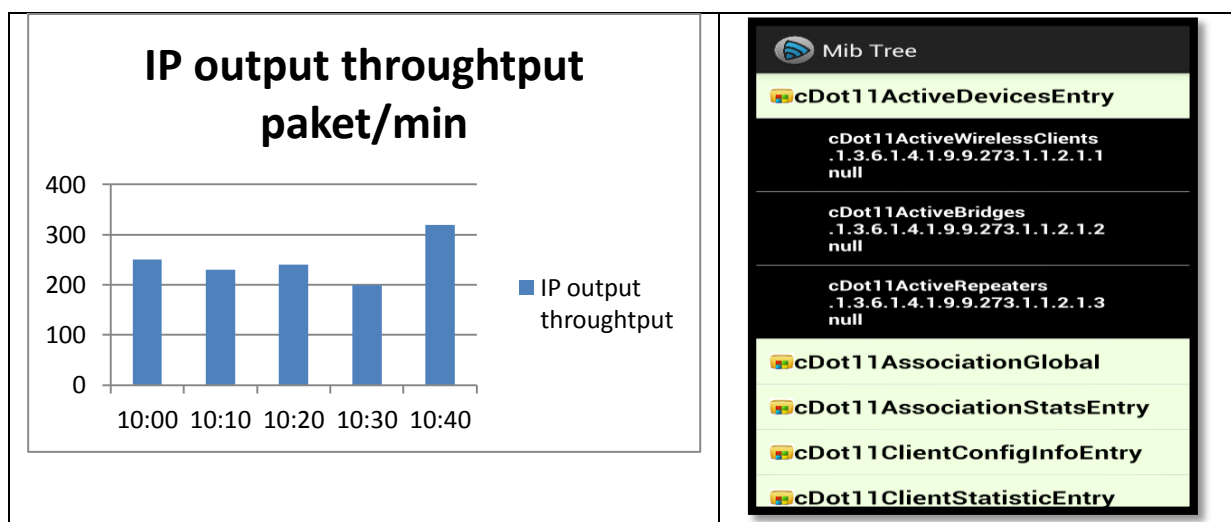


Figure 11 ipOutRequests OID throughput

Figure12 Mib tree (cDot11ActiveDevicesEntry)

أداة اندرويد لإدارة شبكة الواي فاي عن طريق استخدام بروتوكول إدارة الشبكة البسيط

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الخلاصة

واي فاي هي تكنولوجيا شبكة تسمح لأي جهاز إلكتروني للاتصال بشبكة لاسلكية (WLAN). الواي فاي مفيد جدا في الجامعة ويعتبر تجربة إيجابية للغاية لأعضاء هيئة التدريس والموظفين والطلاب والزوار. حيث يوفر إمكانية الوصول الفوري إلى البريد الإلكتروني، والمواقع على شبكة الإنترنت، والإنترنت، وغيرها من خدمات تكنولوجيا المعلومات بغض النظر عن الموقع، وهذا يمكن ان يغير طريقة الدراسة. ونحن في هذا البحث سنركز على تطوير تطبيق يعمل على نظام الاندرويد لرصد وإدارة ومراقبة الشبكة اللاسلكية من خلال الأجهزة التابعة لجامعة ديالى. هذا التطبيق سوف يعرض ويحفظ أي معلومات عن نقاط الوصول (APs) باستخدام بروتوكول SNMP (بروتوكول إدارة الشبكة البسيط) من خلال اظهار موقع الـ (AP) على Google_map. أيضا جمع البيانات إلى تعطي تصور وتقدم تقرير عن استخدام الشبكة لتحسين استخدام شبكة الجامعة.