

# INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT

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## A STUDY OF BEHAVIOR ON INFORMATION SYSTEM IN A UNIVERSITY CAMPUS BY ANALYSIS OF PEOPLE MOBILITY

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### ABSTRACT

*Wireless Local Area Networks (WLAN) are mostly used in various standard universities in the world. A WLAN links two or more devices using some wireless distribution method and usually provides a connection through an Access Point (AP) to the wider internet. This enables the users to move around within the university campus and still be connected to the WLANs. WLANs have become popular due to the ease of installation and the increase of Laptop users. Making use of Wireless Distribution System (WDS) many benefits can be obtained. This is a system that enables wireless interconnection of access points in an IEEE 802.11 network. It allows a wireless network to be expanded using multiple APs. WDS preserves the MAC addresses of client packets across links between various APs. This proposed WDS approach provides the information about where the most number of users are using the same APs that leads to congestion. Furthermore, this WDS also gives best solution for the Congestion.*

### KEYWORDS

users mobility, WLANs, congestion, wireless network.

### INTRODUCTION

**W**ireless Local Area Networks are widely used in Universities, Governments etc. This wireless networks are usually based on the IEEE 802.11 standards. This is a set of standards carrying out wireless local area network (WLAN) computer communication in the 2.4, 3.6 and 5 GHz frequency bands. They are created and maintained by the IEEE LAN/MAN Standards Committee (IEEE 802).

WLANs have advantages and disadvantages when compared with wired LANs. A WLAN makes it simple to add or move workstations and to install access points to provide connectivity in areas where it is difficult to lay cable. Temporary or semi-permanent buildings that are in range of an access point can be wirelessly connected to a LAN to give these buildings connectivity. Wired network points would be needed for each of the access points.

#### A WLAN has some specific advantages:

- It is easier to add or move workstations.
- It is easier to provide connectivity in areas where it is difficult to lay cable.
- Installation is fast and easy, and it can eliminate the need to pull cable through walls and ceilings.
- Although the initial investment required for WLAN hardware can be similar to the cost of wired LAN hardware, installation expenses can be significantly lower.
- When a facility is located on more than one site (such as on two sides of a road), a directional antenna can be used to avoid digging trenches under roads to connect the sites.
- In historic buildings where traditional cabling would compromise the façade, a WLAN can avoid the need to drill holes in walls.

#### WLANs also have some disadvantages:

- As the number of computers using the network increases, the data transfer rate to each computer will decrease accordingly.
  - Security is more difficult to guarantee and requires configuration.
  - Devices will only operate at a limited distance from an access point.
  - A wired LAN is most likely to be required to provide a backbone to the WLAN; a WLAN should be a supplement to a wired LAN and not a complete solution.
- Wireless technology is used in the transportation and shipping industry. The automated vehicle location system uses this technology through a combination of satellite and landline systems coupled with the Internet. The other applications of this system is in the applications of wireless VOIP, wireless IPTV etc. In this paper, we have used the data obtained from WLAN so as to study the mobility of the users. This information can be used to know how many users are likely to be at a place and in a specific period of time. This status about the current situation is sent to the users as a message by using the information system thereby reducing congestion of users at a place.

Further this paper is categorized as follows. We discuss about the Related Work and our proposed system approach. We elaborate the Wireless Distribution System, where our university layout and the usage of APs by the users are discussed. People Mobility Tracking shows the implementation part. We use NodeXL tool which is a template for Excel 2007 and 2010 that lets you enter a network edge list, and see the network graph, in the Excel window. This is followed by our Information System that interprets MAC address to IP addresses and sends information to the end users about the current status of population in an area.

### RELATED WORK

Related to our title of people mobility and tracking some of them are of the following. In [2], B. Issac et al. presented a predictive mobility management system which could make mobility on an IEEE 802.11 network more proactive with minimum loss and delay, when compared to existing schemes. Their proposal is focused on WLAN installations within a restricted campus and to predict the mobility path of a mobile node and use that information to lessen the handoff delay.



A wireless indoor tracking system, based purely in software because no additional hardware and costs are required, is described in [10]. It can be used to track and locate both moving and static WLAN-enabled devices inside a building. The system uses complex mathematic algorithms and determines the locations of the mobile devices according to the received signal strength from visible access points. The author categorizes the WLAN-based location determination algorithms, into two groups: deterministic and probabilistic algorithms. Finally, he concludes the paper making some reflections about the number of APs and their correct localization in order to obtain reliable results, among other things.

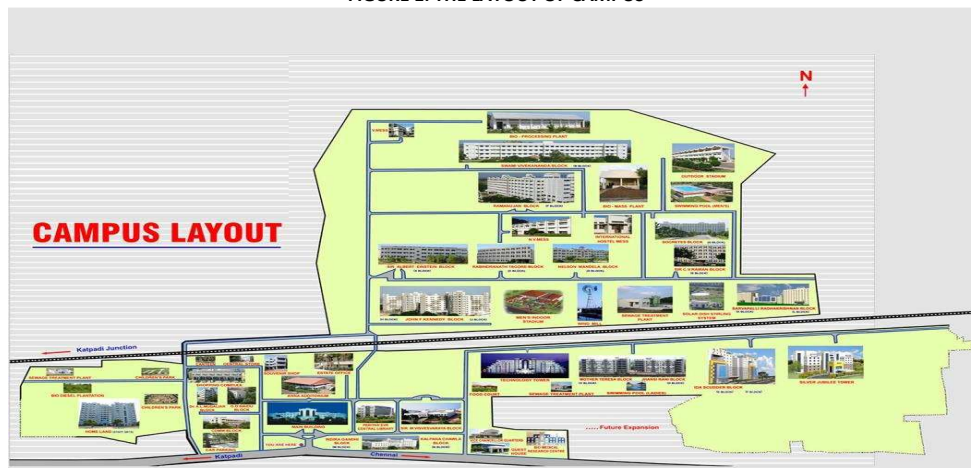
The Authors in [11] have presented a user mobility study based on the roaming of the MACs in WLAN of the “Universidad politcnica de Valencia”. They have studied the buildings with higher mobility in the campus. SNMP agent is activated in all APs. Everytime a MAC address is registered to an AP, it sends a SNMP trap message to a central server which is stored in a database and then analyzed. The data of total no. of registered users in a day and in a month is collected from the central server. This analysis presents the maximum amount of roaming of users between buildings. This study recommends the relocation of bandwidth scenarios to increase the comfort of the end user. According to the user mobility, the system will be giving more bandwidth in the areas where there are more users.

**WIRELESS DISTRIBUTION SYSTEM (WDS)**

A Wireless Distribution System (WDS) is a system that enables the wireless interconnection of access points in an IEEE 802.11 network. It allows a wireless network to be expanded using multiple access points without the need for a wired backbone to link them, as is traditionally required. The notable advantage of WDS over other solutions is that it preserves the MAC addresses of client frames across links between access points.

VIT University is distributed on two campuses. One of them is located in Vellore and contains about 75% of the students and staff of the University. There are around 725 faculties, 795 Administrative and Technical staffs and around 13500 students among the two campuses. These campuses are equipped with wireless IEEE802.11 b/g network. It has about 300 access points to have full coverage. Vellore Campus has 245 access points and Chennai campus has 55 access points. The distribution of APs in Vellore campus is: 30 APs are in Main Building (MB), 25 APs are in Sir. M. Visweswaraya block (SMV), 50 APs are in Technology Tower (TT), 75 APs are in Silver Jubilee Tower (SJT), 50 APs are in GD Naidu Block (GDN), 10 APs are in Guest House (GH) and 5 APs are in Food Court. These APs are installed to allow the users to freely roam around the campus. For indoor environments, APs coverage area varies between 30 m at 54 Mbps and 137m at 1 Mbps.

FIGURE 1: THE LAYOUT OF CAMPUS



**PEOPLE MOBILITY TRACKING**

The mobility tracking involves analysis of registered MACs in a building. This study helps in relocating some schools, staff rooms, labs and cafeteria in order to release over traffic of users in an area. This helps in construction of new university with effective mobility ease. In this section we discuss about the measurements and parameters involved in the analysis.

TABLE 1: MAC ADDRESSES WITH ITS RELEVANT IP ADDRESS

S. No.	MAC ADDRESS	IP ADDRESS
1	00-1C-BF-10-E9-67	192.168.145.13
2	00-1C-BF-10-BE-AE	192.168.145.14
3	00-1C-BF-11-38-47	192.168.145.21
4	00-1C-BF-11-2F-31	192.168.145.25
5	00-1C-BF-10-DD-EA	192.168.145.27
6	00-1C-BF-11-52-51	192.168.145.31
7	00-1C-BF-10-B6-8C	192.168.145.36
8	00-1C-BF-11-47-E8	192.168.145.40
9	C0-CB-38-26-C3-94	192.168.145.42
10	00-1C-BF-11-3C-2B	192.168.145.43

TABLE 2: BUILDING PEOPLE REGISTERED IN A DAY

S. No.	Building	No. of systems registered
1	Main Building	3501
2	Sir.M. isweswaraya block	2562
3	Technology Tower	1457
4	SilverJubilee Tower	4214
5	G.D Naidu Block	2562
6	Guest House	15
7	Food Court	525
	Total	14836

**ONLINE MOBILITY TRACKING INFORMATION SYSTEM**

The online mobility tracking system is based on the no. of systems registered in an AP. AP sends the SNMP trap message to the central server that controls all APs. The MAC addresses registered in an AP is traced out in the server. At an instant, the no. of users registered in all APs in the university is collected and are categorized

based on building names. With this data the total no. of users registered in all buildings are computed and the building with maximum population is found. This message of building with maximum population is conveyed to all users or to a particular user from the central server by using NET SEND command. To send a message to a particular user who is connected to the network at that instant, we use IPScanner tool. This tool confirms the systems which is live within the coverage area of APs. Message is sent to a particular system by having either the hostname or IP.

FIGURE 2: MESSAGE TO THE USERS

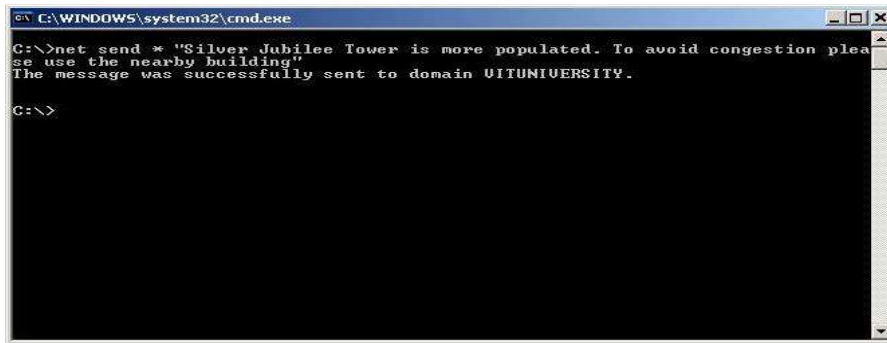
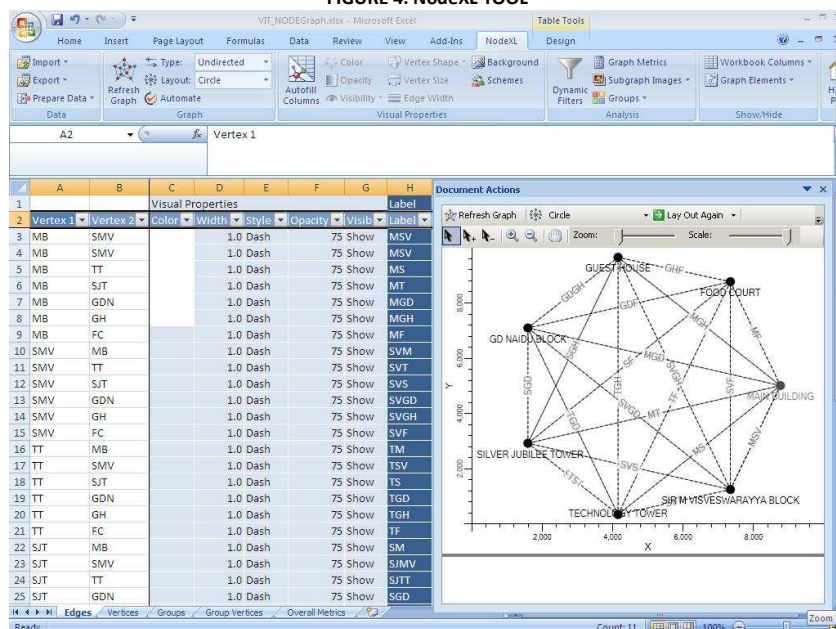


FIGURE 3: IP SCANNER TOOL

IP Address	Workgroup Name	Host Name	User	MAC Address
192.168.145.1	N/A	N/A	N/A	N/A
192.168.145.2	N/A	SCSBKT02	N/A	N/A
192.168.145.3	N/A	N/A	N/A	N/A
192.168.145.4	N/A	N/A	N/A	N/A
192.168.145.5	N/A	SITEHRV005	N/A	N/A
192.168.145.6	N/A	N/A	N/A	N/A
192.168.145.7	N/A	N/A	N/A	N/A
192.168.145.8	N/A	N/A	N/A	N/A
192.168.145.9	N/A	N/A	N/A	N/A
192.168.145.10	N/A	N/A	N/A	N/A
192.168.145.11	N/A	N/A	N/A	N/A
192.168.145.12	N/A	N/A	N/A	N/A
192.168.145.13	N/A	N/A	N/A	N/A
192.168.145.14	N/A	N/A	N/A	N/A
192.168.145.15	N/A	N/A	N/A	N/A
192.168.145.16	N/A	N/A	N/A	N/A
192.168.145.17	N/A	SCSEKLN0246	N/A	N/A
192.168.145.18	N/A	N/A	N/A	N/A
192.168.145.19	N/A	N/A	N/A	N/A
192.168.145.20	N/A	VITSCS0128	N/A	N/A
192.168.145.21	N/A	N/A	N/A	N/A
192.168.145.22	N/A	N/A	N/A	N/A
192.168.145.23	N/A	N/A	N/A	N/A
192.168.145.24	N/A	N/A	N/A	N/A
192.168.145.25	N/A	VITSCS0101	N/A	N/A
192.168.145.26	N/A	VITSHB0067	N/A	N/A
192.168.145.27	N/A	VITSCS0071	N/A	N/A
192.168.145.28	N/A	N/A	N/A	N/A
192.168.145.29	N/A	N/A	N/A	N/A
192.168.145.30	N/A	N/A	N/A	N/A
192.168.145.31	N/A	N/A	N/A	N/A
192.168.145.32	N/A	N/A	N/A	N/A
192.168.145.33	N/A	N/A	N/A	N/A
192.168.145.34	N/A	N/A	N/A	N/A
192.168.145.35	N/A	UBUNTU	N/A	N/A
192.168.145.36	N/A	N/A	N/A	N/A
192.168.145.37	N/A	VITSCS037	N/A	N/A

In order to analyze the data, we have used a spreadsheet Excel 2007 with NodeXL tool. NodeXL is an extensible tool kit for network overview, discovery and exploration. The core of NodeXL is a special Excel 2007 workbook template that structures data for network analysis and visualization. Five main worksheets currently form the template. There are worksheets for Edges, Vertices, Groups, Group Vertices and Overall Metrics. NodeXL supports analysis and visualization of network data easier by combining common analysis and visualization functions with the familiar spreadsheet paradigm for data handling.

FIGURE 4: NodeXL TOOL



CONCLUSION

The present study has shown that users congestion can be avoided, thereby eliminating the problem of over load in WLAN network usage. We have studied the roaming behavior of people inside the campus between the buildings. Using the obtained data, we have analyzed the behavior of users in the campus. This lets us relocate the bandwidth scenarios to increase the comfort of the faculty staffs and students. According to the proposed system the users can be relocated to the networks where there is less bandwidth usage to enjoy the better performance.

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