

# MESH NETWORK SIMULAION

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Information technology has provided the service to a variety of industries in recent years, especially education industry. The wireless technology has greatly enhanced the information point, which makes teachers and students get the dynamic news timely. The education is taken to a new level.

According to the actual situation, campus network should focus on [1].

1. Safety and efficiency.
2. Less wiring.
3. Coverage without building spots.
4. Good mobility.
5. Simple operation.
6. Good scalability.
7. Convenient unified management

These characteristics are all in line with the mesh network. Therefore, the main technology is that how does the mesh network work in the education management system.

The large class room on school campus is an example. All class rooms are located in the building B, between building A and Building C. The orientation ceremony and important meetings are held here every year. If there is high-speed wireless network coverage, it could support a lot of school activities. An open area in class room provides a good environmental condition for mesh network. There are two AP – 4900M devices in classroom offering the wireless coverage indoor. The AP – 4000M devices are installed in front of the building A as well as the parking place. It is used for intensive forest coverage. The chamber penetration signal will connect AP through outdoor device at this time Fig 2, [2]. The mesh wireless network

transmission link has been constructed.

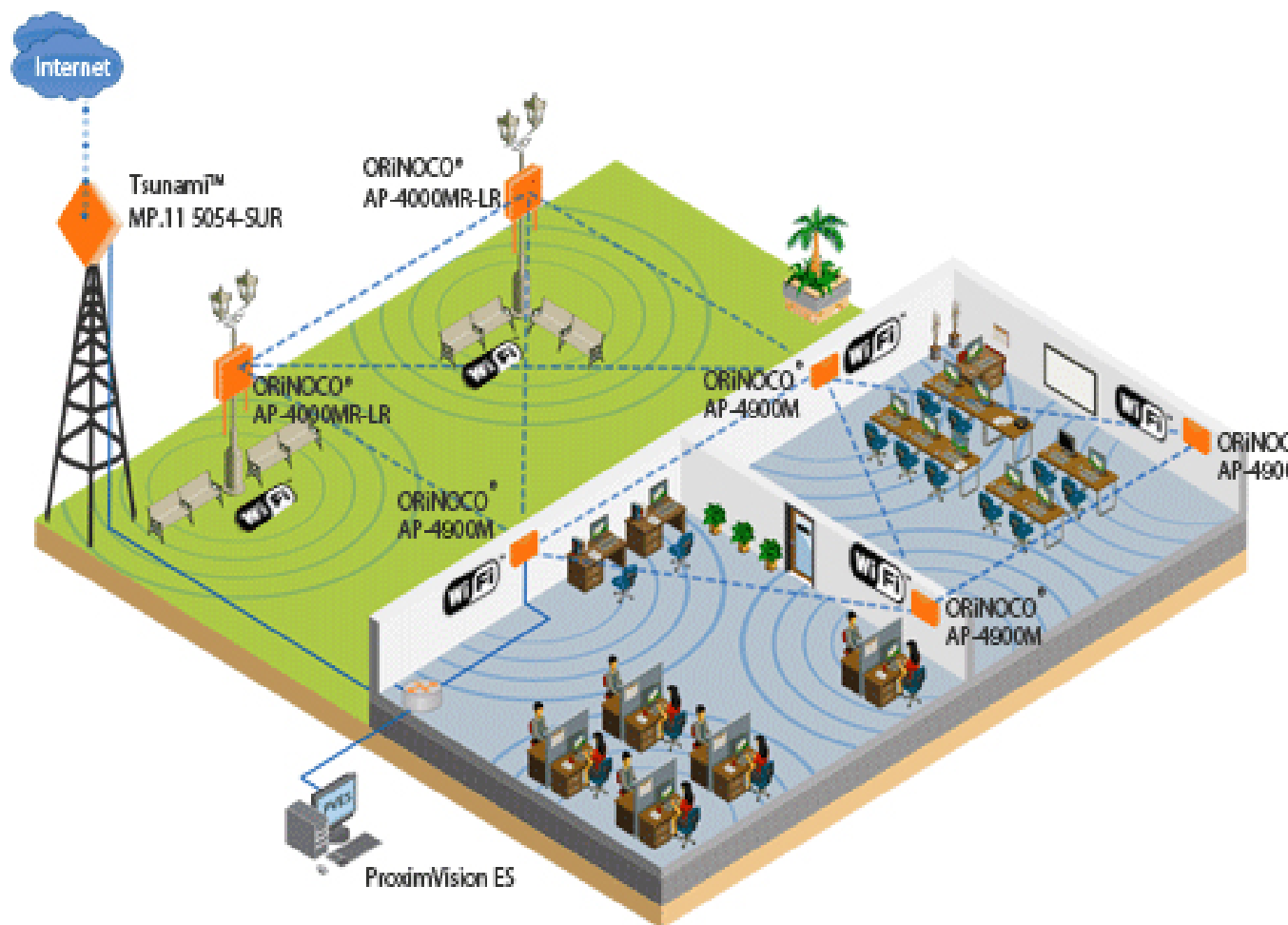


Figure1. Proxim Orinoco AP-4900 MR Indoor, Mesh Network Access point (Keison Internation Ltd 2013)

The indoor wireless often has a blind area, and some people think whether the increase of AP point can resolve this problem or not. The answer is no, because the cost and interference will be correspondingly increased. But there is a device named GBOOM could offer relay equipment and make up the problem of the coverage.

The wireless network equipment and thousands of student users should be controlled by campus network department. There are some software provided by mesh network, such as network device management, user authentication management, and

user billing function [3].

We use three testbed platforms in this study for different purposes. In our settings, wireless mesh network is constructed with laptops. Meanwhile, realizing the hardware differences in computation power, buffer sizes, and number of antenna we also conduct experiments on embedded system equipped with a Wi-Fi. To better analyze IP layer characteristics, we leverage a larger size of outdoor network, QuRiNet that consisted of more than 30 nodes. As for simulators, we choose NS-2 and Qualnet. We now describe them in details in the following. Soekris: We use Soekris boards as the mesh routers. They are 266 MHz x86 Soekris net4826 embedded devices running custom built Linux distribution with 2.6.23 Linux kernel [4]. Each of them has 128MB SDRAM main memory and 64MB compact flash, and equipped with one antenna. Associated clients with the mesh routers are HP nc6000 laptops running Linux kernel of 2.6.25. Each client also has a wireless card with an Atheros chipset for wireless connection to the router. MadWifi (version 0.9.4) is installed in all nodes, including routers and clients. We deliberately configure the wireless mesh network with IEEE 802.11a to reduce interference from existing 802.11b/g networks. All nodes are operating on channel 36 (5.18GHz). This platform represents a series of low-end 802.11 devices with one antenna, and have limited processing capability and buffer size. The Soekris testbed is used for indoor experiments only because it needs AC power. As shown in Fig. 1, [5]. The testbed is composed of nine nodes. The squares represent the laptops, while the circles are the Soekris boards. There are two competing parallel flows. This experiment is done on the second floor of a three-story office building, where concrete walls create non-line-of-sight transmission environment. The solid line indicates the connectivity among nodes. By connected, it means a node can directly (without routing) ping another node in the network with more than 50% successful rate at 6 Mbps. Otherwise, the link between them is defined as unconnected. The interference range, from our measurement, is roughly two-hops away. Laptops: In this testbed, only laptops are used to build up a mesh network platform. Laptops are HP model nc6000. Each of them is equipped with Intel Pentium M 1.6 GHz processor with

512 MB DDR SDRAM, and HP W500 802.11a/b/g wireless LAN cards with an Atheros chipset. The operating system is Linux with kernel version 2.6.25 and WLAN driver is MadWifi (version 0.9.4). As in Soekris, all experiments are conducted on Channel 36. This platform represents a set of modern 802.11 devices with dual antennas (one on each side of LCD screen), and have sufficient processing capability and buffer size.[5]

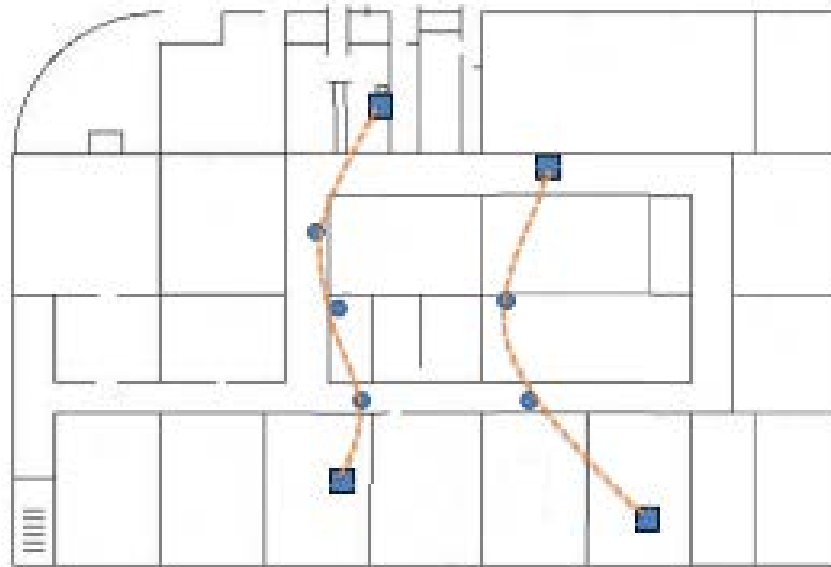
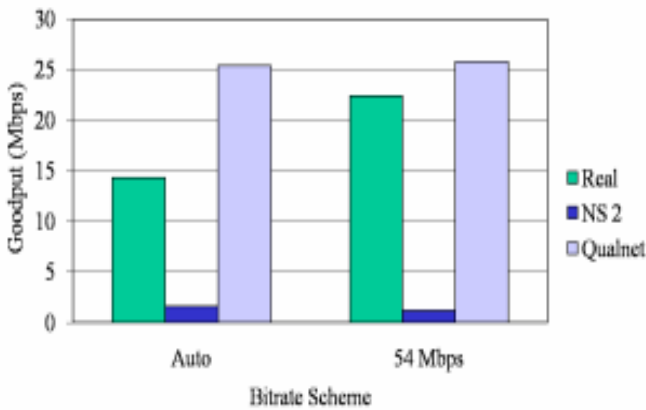
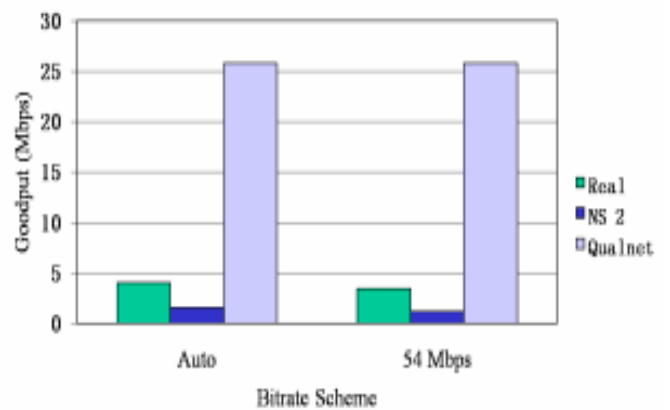


Figure 1 - Soekris indoor mesh network topology.

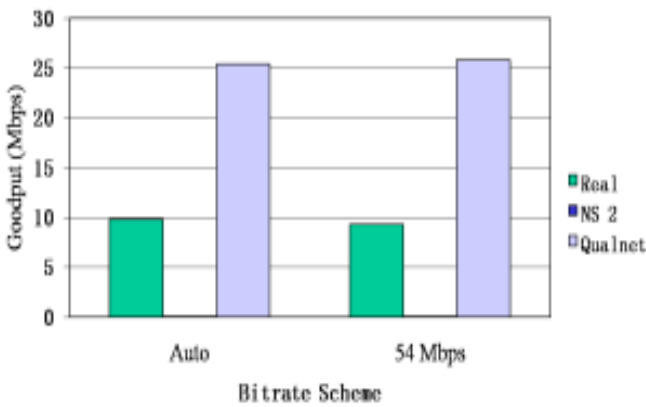
In this set of tests, we send packets from one laptop to another at different bitrate schemes, distances, traffic loads and with TCP protocol respectively.



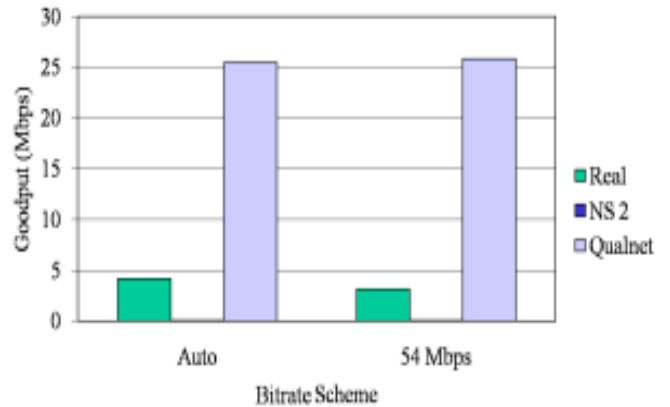
(a) TCP goodput: 40m apart indoor



(b) TCP goodput: 40m apart outdoor



(c) TCP goodput: 80m apart indoor



(d) TCP goodput: 80m apart outdoor

Figure – 2 Point to Point TCP Goodput Comparisons

1. Methley, S. 2009. Essentials of wireless Mesh networking. Cambridge: Cambridge University Press
2. Farrel, A. 2009. Network Management. Burlington: Elsevier Inc
3. Hossain, E. – Leung, K. K. 2008. Wireless Mesh Networks: Architectures and Protocols. New York: Springer.
4. Soekris engineering, <http://www.soekris.com/>
5. Kefeng Tan, Daniel Wu, An Chan, Prasant Mohapatra. Comparing Simulation Tools and Experimental Testbeds for Wireless Mesh Networks