MESH NETWORK DEVELOPMENT PROJECT IN GREAT STONE INDUSTRY PARK

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Wireless Mesh network (WMN) are increasingly becoming popular as low cost alternatives to wired network for providing broadband access to users. A wireless mesh network (WMN) is a communication networks made up of radio nodes organized in a mesh topology. It is also a form of wireless network. Wireless mesh networks often consist of mesh clients, mesh routers and gateways. The mesh clients are often laptops, cell phones and other wireless devices while the mesh routers forward traffic to and from the gateways, which may, but need not, be connected, to the Internet. In this paper, we discuss different radio frequency range in wireless connected to Access Point (AP) and the project from Belarus-China great stone industry park in Mesh network. The China-Belarus industrial park is a territorial entity with the area of approximately 80 sq.km with a special legal status for the provision of comfortable conditions for business conducting. The Park is located in a unique natural complex 25 km far from Minsk, the capital of the Republic of Belarus. It is in close proximity to the international airport, railway lines, a transnational highway Berlin–Moscow. The result of analysis shows distribution of AP and covering services in great stone industry park. Mesh network provides robustness and load balancing in wireless networks communication.

Keywords: Mesh network, equipment, project, testing.

The characteristics of cellular network and wireless LAN are firstly shown, and then similarities and differences between Mesh network and cellular network are highlighted before trying to understand Mesh network.

Each client has access to the internet through the wireless link connecting access point in cellular network , forming the local BBS (Basic Service Set). The clients have to visit the fixed AP before they communicate with each other. This network structure is called the single hop network.

As cellular network, as its name, its wireless coverage is composed of a number of cellular (cell); each cell is located in the vicinity of the center of a base station. A cellular network consists of mobile units linked together to switch equipment, which interconnects different parts of the network and allows the access to the fixed Public Switched Telephone Network (PSTN). The base station transmits radio signals in the entire coverage area, and each user's equipment is a small handheld unit. When the user is moving to the edge of a cell, its signal falls, and the adjacent cell could provide a better-quality signal. Obviously, the major advantage of the cellular network is that it could keep the user's continuous coverage. However, it also has its drawbacks. If a new coverage is created, a new network planning has to be made, and then multiple cells within the entire coverage are simultaneously deployed, which can maintain the integrity of cellular network coverage. So it means that network operators will cost a lot before the network is put into operation.

The second case is wireless LAN. The wireless local area network (WLAN) is a result of rapid development of wireless communication and computer network. It can be seen from

its name that it is mainly localized-area coverage. It usually is used to cover the place of workplace and home. Typically, the coverage of the wireless LAN is an access points around of 100 meters area. This access point is connected to the next access point via a wired network. The propagation characteristics of wireless LAN do not need to be quite good for it required coverage is relatively small. Besides this, the wireless LAN does not have a dedicated spectrum as that of the cellular network. This requires the designer to consider the immunity of wireless LAN, thereby increasing the cost of the device in operation system. And in extreme conditions, if the information clogging occurs, the efficiency may drop to zero.

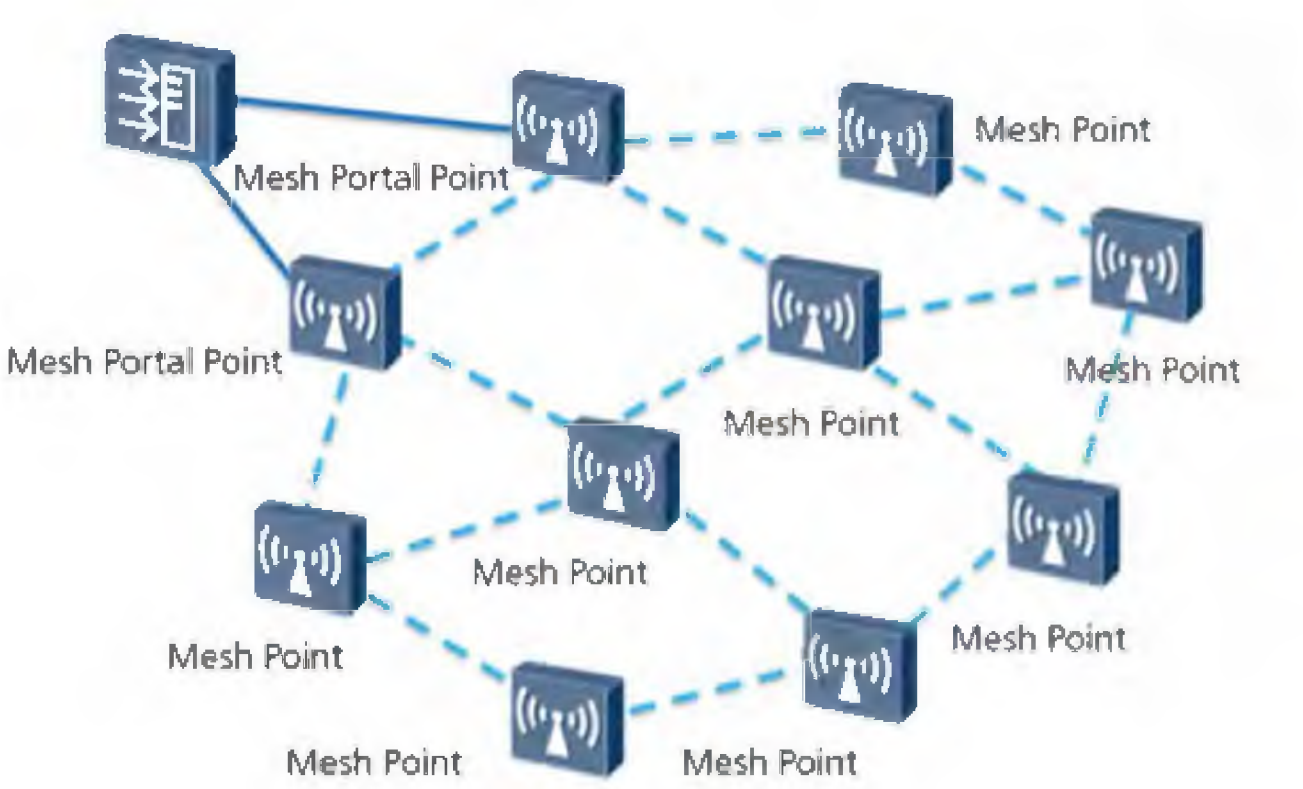

Рис. 1: Mesh Network Structure

The wireless LAN is much simpler than the cellular network. The wireless LAN does not need to switch one cell to another, it only provides a data link among users. The main purpose of wireless LAN is data transmission. So how to better support media application will be the future development direction of the wireless LAN system.

In Mesh networks, sophisticated digital modulation schemes, traffic routing algorithms, and multi-hop architectures are employed to use minimal transmission power to transmit data over greater distances.

There are a lot of Mesh things in our life, like cobweb or modern city street. The following part goes to the introduction of the Mesh network. Fig. 1 [1].

1. Mesh network has no master node, so it is regarded as multi-hop network. It constitutes the distribution network wireless access point (AP). The access point (AP) is connected by wireless internet with a point to point protocol method. So it could change from point coverage to regional coverage.

2. When the data is transmitted in Mesh network, it could reach any other node through intermediate nodes.

3. The wireless Mesh network AP has equipped with automatic configuration and utilized centralized management, which greatly simplify network management and maintenance.

Thus, the difference structure between Mesh network and the cellular network or wireless LAN is shown. All nodes are peers, and there is no central control in Mesh network. Therefore, all nodes need to be involved in the entire network. The connection from node to base station and the connection from node to node should be together in wireless Mesh network. The multi-hop feature brings a great deal of flexibility for network expansion.

In an unstructured wireless mesh network, each mesh node typically uses an Omnidirectional antenna and is able to communicate with all the other mesh nodes that are within the transmission range. Wireless links in an unstructured wireless mesh network are not planned and link availability is not always guaranteed. Depending on the density of the mesh network, there may be many different links available to other mesh nodes or none at all. Unstructured mesh networks are usually implemented with nonline of sight radios (NLOS) using low frequency and low bandwidth radios operating, for example, in the UHF bands, such as 400 MHz or in the licensefree band at 900 MHz. Unstructured wireless mesh networks leverage one single channel shared by all the radios. Therefore, the higher the number of hops a transmission requires, the lower the overall throughput of the network will be.

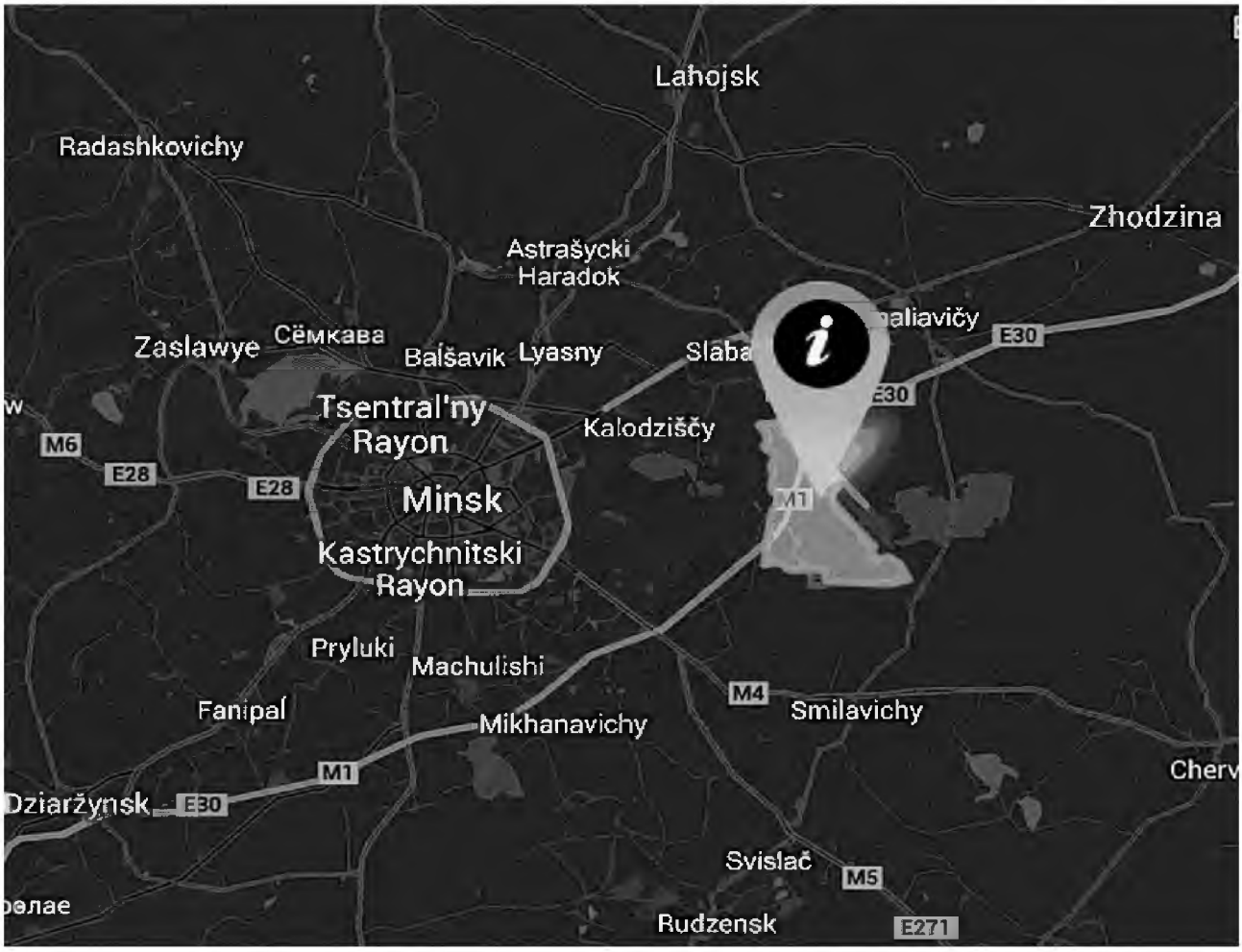

Рис. 2: The location of great stone industrial park

Structured wireless mesh networks are planned networks typically implemented using multiple radios at each node location and multiple directional antennas. A ring topology using multiple directional wireless links is commonly used in a structured wireless mesh network to enable each radio to seamlessly reroute traffic through differend paths in the event of node or link failures. Structured wireless mesh networks can provide two or more alternative paths from each mesh node location and typically use high frequency radios and microwave links with

directional antennas. The distance between nodes in a structured wireless mesh network can be up to tens of miles using long range directional microwave links. Structured wireless mesh networks are often used for mission critical applications such as wireless video surveillance, public safety, and industrial automation. They provide the ideal network architecture in case a site requires a highly reliable and available wireless network for a broadband application such as video, voice and data streaming. Each link in a structured wireless mesh network operates on an independent channel and, therefore, the number of hops for a special mission does not affect the overall throughput of the network.

The China-Belarus Industrial Park. Fig. 2 [2]. (Russian: Китайско-Белорусский индустриальный парк, Chinese: 中国-白俄罗斯工业园) is a special economic zone in Belarus, established under the intergovernmental agreement between the People's Republic of China and the Republic of Belarus. The planning area is 91.5 square kilometers. Park infrastructure will include industrial, transportation facilities and residential areas, providing social occasions, office and shopping centers, as well as financial and research centers.

Primary residence and secondary residence are located in the southwest and central industrial park continues about 8–9 km away. There will be check-expected 120 000 employees. In order to create a cozy and comfortable living environment for employees and provide convenience of information (to different international customers and experts) to visit, at the same time in order to increase competitiveness and attract more talent, industry Park raised the need for residential requirements of the overall wireless coverage. At the beginning of this program for the apartment building all the rooms offer broadband Internet access, the latter for security considerations will increase the number of video surveillance and Wi-Fi languages. Fig. 3 [3].

Case for modern apartments in the southwest area coverage. As shown in this area there is an apartment about apartment 50m, width 34m, 24-storey (#1), another apartment 70 meters long from north to south, east to west 50m, has 19 stores (#2). There are two apartments around 6–4 layers of low apartment.

Figure 3: Location of Marked building in industrial park

Designing

1. The cover from the outdoor to indoor.
2. Equipment laying try to select relatively high position.
3. For network services, can provide a private network and public network separate VLAN settings.

According to conclusions, per square kilometer (0.62137 square miles), and finally by calculating the entire industrial park would need at least 315 to ensure complete coverage of AP obtained. According to calculations required at this time covering at least two AP.

According to Building 2 were covered with projections at this time need 4 AP. Fig. 4[4].

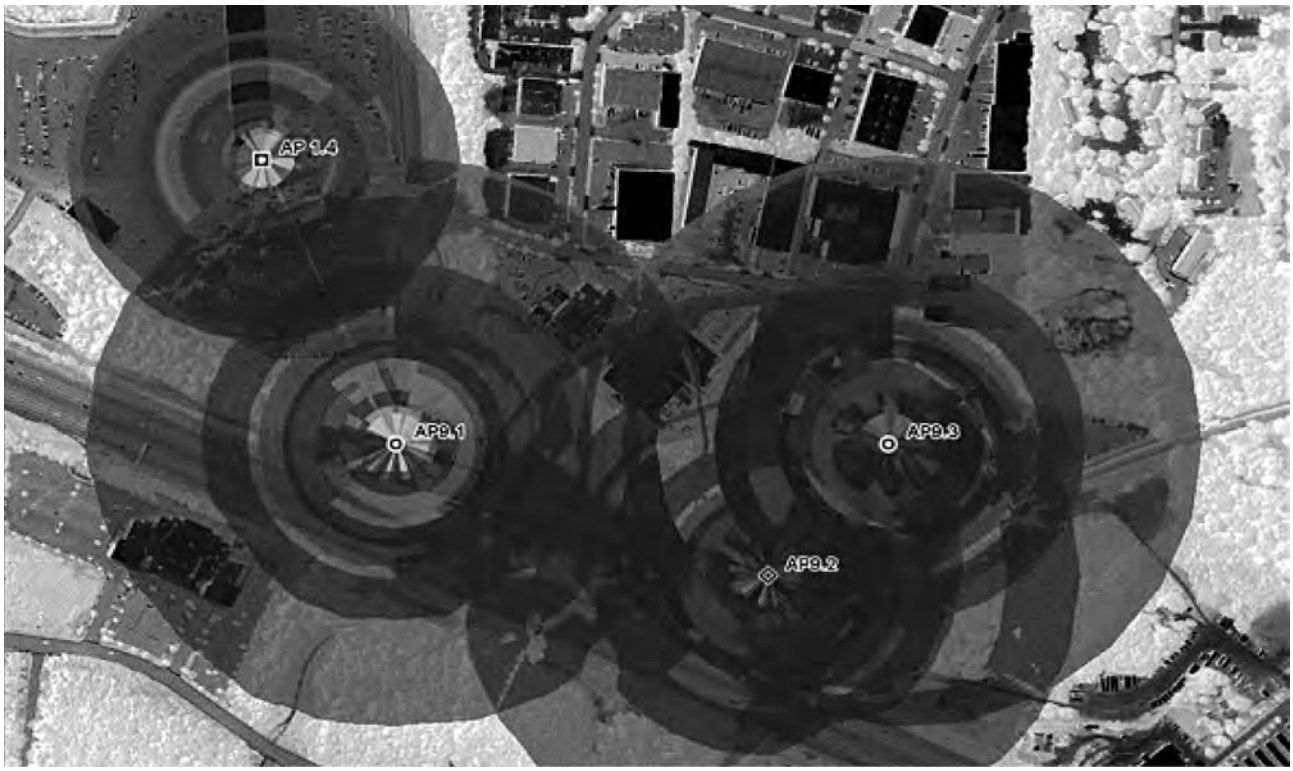

Figure 4: Coverage distance of mesh access point

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