## Archives



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### 2.4 Network Structure Analysis

When considering the layout of base stations, you must deeply analyze network structure. Generally, according to network layers, a network can be divided into middle-layer, high-layer, and low-layer. The base stations at the middle-layer bear the greatest traffic in a network

#### 2.4.1 Middle-Layer Station

I. Definition and application

A middle-layer station in big and middle-sized cities is defined as follows:

- The antenna is installed on building tops.
- The antenna height ranges from 25 to 30 meters, which is greater than the average height of the buildings.
- It covers several blocks.

In small towns and countryside areas, except the high-layer stations are designed for controlling traffic flow or for landform reasons, most of the base stations are middle-layer stations.

II. Advantages

Compared with high-layer stations, middle-layer stations can utilize frequency resources more efficiently. Compared with low-layer stations, middle-layer stations can absorb traffic more efficiently. Therefore, the middle-layer stations bear the greatest traffic in a network.

III. Distance between stations

The average distance between most middle-layer stations range from 0.6 to 5 km except in countryside areas. In big cities, the distance between some middle-layer stations is shorter than 0.6 km. However, it is suggested that the distance between middle-layer stations in big cities cannot be shorter than 0.4 km. If this distance is too short, the buildings will produce strong interference against the signals of the base stations. In this case, to control the coverage area is quite demanding.

IV. Challenges

Because no suitable ground objective is available, to ensure the quality of service of a network is quite demanding. According to the experience on project construction and maintenance, great challenge is present in the selection of base station address, station design, project construction, network maintenance, and network quality.

#### 2.4.2 High-Layer Station

I. Definition and application

A high-layer station in big and middle-sized cities is defined as follows:

- The antenna height ranges from 10 to 50 meters, which is far greater than the average height of the buildings.
- Its coverage areas contain the areas covered by multiple middle-layer stations.

Because the high-layer stations make poor use of the frequency resources, they are mainly applied to the traffic networks where people move fast in big and middle-sized cities.

In addition, to control construction cost and meet coverage requirements, you can install some high-layer stations in suburban areas, highroads, small towns, and countryside areas.

II. Functions

The high-layer stations must be as fewer as possible but be as effective as possible. They mainly provide services to the fast-moving subscribers in cities.

& Note:

The coverage of high buildings is realized by indoor distribution systems.

#### 2.4.3 Low-Layer Station

I. Definition and application

A low-layer station is defined as follows:

- The antenna height is shorter than 20 meters, which is shorter than the average height of the buildings.
- The antenna can be installed on the outer walls of the lower floors of a building, on the top of lower roofs, or in the rooms of a building.

Generally, at the early stage of the network construction, signal network design is applied, so most of the base stations are middle-layer stations. After the basic network is established, you must adjust the base stations and add new base stations according to traffic and coverage requirements.

For populated commercial areas where the traffic is heavy, you can use low-layer stations, which are constructed with micro cell layer and distributed antenna system. In this case, not only the requirements on indoor coverage are met, but also the interference and difficulties of base station selection caused by short distance between stations are avoided. With the development of the network, the low-layer stations will develop into the layering network structure.

II. Other considerations

The coverage area of a low-layer station is small, so it can fully use frequency resources but cannot absorb the traffic efficiently. As a result, ideal traffic cannot be ensured if the base station deviates far away from the areas where the traffic is heavy.

Therefore, when constructing a low-layer station, you must consider whether the base station is used to make up coverage or solve the problem of heavy traffic, because the construction purpose is directly related to the selection of the address and type of the base station.

& Note:

A layering network cost much frequency resource, so it is not recommended for the networks where the frequency resource is inadequate.

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