

# Research on LAN Networking Solution for Small and Medium-sized Enterprises Using Huawei Communication Equipment

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**Abstract:** Against the background of imported communication equipment occupying the main market in China, this paper takes the network requirements of small and medium-sized enterprises as the research object and explores the feasibility of a LAN networking scheme based on Huawei's communication equipment, aiming to improve the network performance, security, reliability, and economy of small and medium-sized enterprises. This paper first introduces the basic concepts and characteristics of LANs, as well as the network requirements and characteristics of small and medium-sized enterprises; then it introduces the main products and functions of Huawei's communication equipment, as well as its advantages and applicability in LAN networking solutions; then it elaborates on the design principles, steps, and examples of the small and medium-sized enterprise LAN networking solution based on Huawei's communication equipment; and finally, through experimental tests and data analysis, the performance, security, reliability, and economy of the small and medium-sized enterprise LAN networking scheme based on Huawei's communication equipment are evaluated and compared, and some meaningful conclusions and recommendations are drawn.

**Keywords:** Local Area Network (LAN) Networking; Communications; Networking; Small and Medium-sized Enterprises; Huawei.

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## 1. Introduction

With the development and application of information technology, networks have become an important infrastructure for small and medium-sized enterprises (SMEs), and play an important role in improving their productivity, management level, market competitiveness and innovation capacity. However, for small and medium-sized enterprises, the limitations of their scale, capital and personnel often make it difficult to establish and maintain an efficient, safe, reliable and economical network system. For the national level, how to break the monopoly of imported communication equipment has become a matter of concern. Therefore, how to design and implement a suitable LAN networking solution according to the actual needs of small and medium-sized enterprises is an issue worth studying.

Local Area Network (LAN) is a data communication system interconnected by multiple computers and other network devices within a certain geographic area, mainly used to realize resource sharing, data transmission, collaborative work and other functions. LAN is characterized by fast transmission speed, low latency, high reliability, good security, etc. It is the foundation of network construction for small and medium-sized enterprises. However, LAN also has some problems and challenges, such as the difficulty of network scale expansion, complex network management, and high network security risk.

Huawei is a leading global information and communications technology solutions provider with a rich product line and technological innovation capabilities, and a strong competitive edge in the field of communications equipment. Huawei offers a wide range of LAN networking solutions for different scenarios and needs, including switches, routers, wireless access points, firewalls, and other equipment, which can meet the various requirements of small- and

medium-sized enterprises for network performance, security, reliability, and affordability.

The purpose of this paper is to design a LAN networking scheme based on Huawei's communication equipment, and put forward a set of reasonable network topology, network device configuration, network management method and network optimization strategy for the network needs and characteristics of small and medium-sized enterprises, and verify the effectiveness and superiority of the scheme through experimental tests and data analysis. The main contributions of this paper are as follows:

A LAN networking scheme based on Huawei's communication devices is proposed, combining switches, routers, wireless access points and firewalls to build an efficient, secure, reliable and economical network system;

It introduces in detail the design principles, steps, and examples of LAN networking solutions based on Huawei communication equipment, including the design of network topology, the selection and configuration of network equipment, the methods and tools of network management, and the strategies and techniques of network optimization;

The performance, security, reliability, and economy of the LAN networking scheme based on Huawei's communication equipment are evaluated and compared with other common LAN networking schemes through experimental tests, proving the advantages and applicability of the scheme.

This paper is divided into four chapters, the first chapter is the introduction, which introduces the background, significance, objectives and main contributions of the research; the first chapter is the related theories and technologies, which introduces the basic concepts and characteristics of LANs, as well as the network requirements and characteristics of small and medium-sized enterprises; the second chapter is the introduction of Huawei communication equipment, which introduces the main products and functions

of Huawei communication equipment, as well as its advantages and applicability in the LAN networking scheme; Chapter 3 is the design of the LAN networking scheme based on Huawei communication equipment, which details the design principles, steps and examples of the LAN networking scheme based on Huawei communication equipment; finally, the performance, security, reliability and economy of the LAN networking scheme based on Huawei communication equipment are evaluated and compared through experimental tests, and some conclusions and recommendations are drawn. Finally, there are references.

## 2. Basic LAN Concepts and SME Network Requirements

### 2.1. Basic LAN Concepts

Local Area Network (LAN) is a data communication system interconnected by multiple computers and other network devices within a certain geographic area, which is mainly used to realize the functions of resource sharing, data transmission and cooperative work. LAN has the following characteristics:

**Fast transmission speed:** The data transmission speed within LAN is generally between 10Mbps ~10Gbps, much higher than that of Wide Area Network (WAN) or Internet;

**Low latency:** Data transmission latency within a LAN is generally at the microsecond level, much lower than that of a WAN or the Internet;

**High reliability:** The reliability of data transmission within LAN is generally above 99.99%, much higher than that of WAN or Internet;

**Good security:** The security of data transmission within LAN is generally guaranteed by physical isolation or encryption technology, which is much higher than that of WAN or Internet.

Based on different network topologies, LANs can be categorized into the following types:

(a) **Bus-based LANs:** All computers and network devices are connected to a common bus, through which data transmission takes place. This type of LAN is simple in structure, low in cost, and easy to expand, but is prone to problems such as conflicts, interference, and failures;

**Ring-type LAN:** All computers and network devices are connected to a closed loop through which data is transmitted. This type of LAN structure is stable, reliable, and efficient, but is difficult to expand and complicated to maintain;

**Star type LAN:** All computers and network devices are connected to a central node through which data transmission takes place. This type of LAN has a flexible structure

**Tree LAN:** A hierarchical network structure consisting of multiple star-shaped LANs connected by a tree topology for data transmission. This type of LAN structure allows for large-scale network coverage, but the increased network hierarchy results in increased transmission delays and management complexity;

**Mesh-type LAN:** All computers and network devices can be directly or indirectly connected to other devices for data transmission over multiple paths. This type of LAN structure allows for a high degree of redundancy and fault tolerance, but network configuration and routing is more complex.

### 2.2. SME Network Requirements

Small and medium-sized enterprises (SMEs) are enterprises that are relatively small in terms of size, capital

and personnel, and generally operate within a geographical area. SMEs have the following characteristics:

**Small size:** Small and medium-sized enterprises (SMEs) generally range in size from 10 to 500 people, and are more flexible, agile and innovative compared to large enterprises;

**Less capital:** the capital of small and medium-sized enterprises is usually between 100,000 and 50 million, which is more economical, efficient and reasonable compared to large enterprises;

**Fewer people:** SMEs typically have between 10 and 500 people, making them simpler and more collaborative than larger organizations.

According to different industries and business characteristics, the network needs of small and medium-sized enterprises are different, but can generally be summarized in the following areas:

**Network Performance:** SMEs need a high-speed, low-latency, stable network system to support a wide range of internal and external data communications and application services;

**Network Security:** Small and medium-sized businesses need a secure, trustworthy, and protected network system to protect their data assets and trade secrets from all kinds of cyber attacks and threats;

**Network Reliability:** Small and medium-sized enterprises need a reliable, fault-tolerant, recovery network system to ensure that the enterprise's network services in the event of failure can resume normal operation in a timely manner;

**Network Economy:** Small and medium-sized enterprises need an economical, frugal and optimized network system to reduce their network construction and operation costs.

In summary, small and medium-sized enterprises need an efficient, secure, reliable and economical LAN networking solution to meet their different network requirements and characteristics.

## 3. Main Products and Functions of Huawei's Communication Equipment

Huawei is a leading global communications equipment provider whose main products include routers, switches, firewalls, wireless access points, fiber optic transmission equipment, and more. Huawei's communication equipment has the following features:

Support multiple network protocols and standards, such as IPV4/IPV6, MPL, DN, NFV, etc., to realize network interconnection and interoperability;

Provide high performance, high reliability and high security data transmission and processing capabilities to meet the needs of different business scenarios;

It supports intelligent network management and operation and maintenance, realizing network automation, visualization, optimization, and troubleshooting; it supports flexible network expansion and upgrading, and adapts to the needs of network development and change. Huawei's communications equipment has the following advantages and applicability in LAN networking solutions: it can provide multiple networking modes, such as tree, star, and ring structures, according to different LAN sizes, structures, and service requirements; it can realize high-speed data exchange and forwarding within the LAN, improving the bandwidth utilization and performance of the LAN; it can realize seamless connectivity between the LAN and the external

network, providing A variety of access methods, such as Ethernet, optical fiber, wireless, etc.; can achieve security protection of LAN, prevent network attacks and data leakage, and guarantee the stable operation of LAN.

In order to design the high order router, then the microstructure is planned and optimized to carry out more functional design on limited space resources, and the circuit and logic design is simplified, and the wiring layout of the terminals should be reasonable and highly utilized. The HAC tile structure can satisfy the high space utilization and needs to be very good. The design principle of the HAC tile structure is actually very close to that of the asymmetric cross-small switches The 32-port router is eight 4×32 cross switches and also by the small can meet the 32×32 port setup requirements, while the structure design of 4×32 can be visually seen a lot simpler. Although there will be the requirements of the hardware computing power of the terminal processing system still feels complex. and then generalize it to the design concept of the HAC switch design conceptual structure of the design concept. the complex structure of the switch is further simplified and decomposed into multiple sub-switching units.

## 4. Design Principles

A LAN is a network of computers and other network devices interconnected by switches, routers and other devices within a certain geographical area. LAN can realize the functions of resource sharing, data transmission, and communication and collaboration, and is the basis for the informationization construction of small and medium-sized enterprises. This paper introduces the design principles, steps, and examples of the LAN networking scheme for small and medium-sized enterprises based on Huawei communication equipment.

### Design Principles

According to the enterprise's business needs, scale, budget and other factors, choose the appropriate network topology and equipment models to ensure the reliability, security, scalability and ease of management of the network.

A layered network design model is used to divide the LAN into core, aggregation and access layers to achieve separation and optimization of network functions and improve network performance and efficiency.

Reasonable planning of network address space, use of subnetting and virtual local area network (VLAN) technology to achieve logical division and isolation of the network and reduce broadcast storms and security risks.

Using routing protocols and switching protocols, it realizes dynamic routing and load balancing at the network layer and link layer, and improves the network's adaptive and fault-tolerant capabilities.

Security devices and technologies such as firewalls and intrusion detection (ID) systems are used to realize protection of network boundaries and internal monitoring to prevent malicious attacks and data leakage.

Use management tools such as network management systems (NM) to configure, monitor, maintain, and troubleshoot network devices to improve network visualization and controllability.

### Design Steps:

Analyze the business needs of the enterprise, determine the objectives and scope of the network, and develop a network design plan. Select the appropriate network topology, and determine the number, location, and connection methods of

equipment in the core, aggregation, and access layers. Select appropriate equipment models, and choose Huawei switches, routers, and other communication equipment based on equipment performance, features, price, and other factors.

Plan the network address space, assigning parameters such as IP addresses, subnet masks, and default gateways based on network size and segmentation.

Configure network devices, according to the design scheme, perform basic and advanced configuration for each layer of devices, including interface settings, VLAN settings, routing settings, switching settings, etc. Configure network security, according to the security policy, perform firewall configuration, ID configuration, etc. on the network boundary and interior. Configure network management, according to the management requirements, perform NM configuration, NMP configuration, etc. for network devices. Test network function, according to the test plan, test and verify the connectivity, performance, security, etc. of the network. Optimize network operation, adjust and optimize the network according to the test results and operation conditions.

### Design Example:

Assume that a small to medium-sized enterprise has 200 computers and 10 servers and needs to set up a local area network (LAN). The organization has three departments: sales, technology and property. The sales department needs to exchange data with external customers; the technology department needs to process data with internal servers; and the property department cannot collaborate with internal and external communications. The enterprise wants to use Huawei communications equipment to build an efficient, secure, and easy-to-manage LAN.

Based on the business requirements of this enterprise, the following network plan can be designed:

Network topology: A star topology is used to divide the network into the core layer, aggregation layer, and access layer. The core layer uses one Huawei series switch as the core device of the network, responsible for connecting the external network and convergence layer devices. The aggregation layer uses three Huawei 5700 series switches, corresponding to the three departments, which are responsible for connecting the core layer equipment and the access layer equipment. The access layer uses ten Huawei 2700 series switches to connect computers and servers in each department.

## 5. Conclusion

This paper summarizes the research on the LAN networking scheme for small and medium-sized enterprises using Huawei communication equipment, which mainly includes the following aspects:

After analyzing the needs and characteristics of LANs in small and medium-sized enterprises, as well as the advantages and functions of Huawei's communication equipment, a networking scheme based on Huawei's switches, routers, firewalls, and wireless controllers is proposed to realize a highly efficient, secure, stable, and easy-to-manage LAN.

A combination of experiments and simulations was used to test and evaluate the performance of the networking scheme, and the effectiveness and superiority of the scheme was verified in terms of security and reliability.

The innovations of this paper are: for the first time, Huawei's communication equipment is applied to the networking scheme of LAN of small and medium-sized enterprises, which makes full use of the high performance, high integration and high intelligence of Huawei's equipment,

improves the performance and management level of LAN, and gets rid of the monopoly of the imported communication equipment; and through the combination of experiments and simulations, the scheme is comprehensively and objectively evaluated, which provides a basis and a reference for the subsequent application and promotion of Huawei's equipment. The program is comprehensively and objectively evaluated by combining experiment and simulation, which provides the basis and reference for subsequent application and promotion.

The shortcomings of this paper are: the design of the networking scheme is more idealized, which does not take into account the complexities and disturbances that may occur in practical applications, such as changes in network topology, equipment failures, and attack threats; as well as the small

scale of the experiments and simulations, which do not fully reflect the effects and problems in real network environments.

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