Course content

This course aims to provide a comprehensive understanding of the fundamental principles and technologies of computer networks, with an emphasis on the development trends of networking technologies. The course is structured around the five-layer TCP/IP model and adopts a top-down approach to systematically introduce the operation principles and technologies of each layer.

Key topics covered include:

1. Introduction to Computer Networks and the Internet: Overview of networking concepts, Internet architecture, and protocol layering.
2. Application Layer: Study of application-layer protocols, including HTTP, FTP, DNS, and email protocols.
3. Transport Layer: Principles of reliable data transfer, congestion control, and protocols such as TCP and UDP.
4. Network Layer: Routing algorithms, IP addressing, and Internet routing protocols.
5. Data Link Layer and Local Area Networks: Concepts of error detection, flow control, and LAN technologies like Ethernet and Wi-Fi.
6. Network Simulations: Use of simulation tools for modeling and analyzing network behaviors (optional advanced topics for self-study).

Course objectives

Knowledge

1. Understand the fundamental principles, structures, and technologies of computer networks.
2. Gain detailed knowledge of the five-layer TCP/IP model and the roles of each layer in networking.
3. Learn the theoretical foundation of protocols, routing, and data communication.

Skills

1. Represent algorithms, communication protocols, or user applications using pseudocode or programming languages.
2. Analyze networking requirements and propose suitable solutions based on computer network knowledge.
3. Use network simulation tools to model and evaluate communication protocols and network scenarios.

Competencies

1. Apply knowledge of networking principles to analyze and solve complex engineering problems related to computer networks.
2. Evaluate, design, and optimize communication protocols using simulation tools and modern engineering resources.
3. Understand and utilize common tools and environments for network simulation and analysis, recognizing their advantages and limitations.