

Introduction to Network System Administration

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Key concepts, responsibilities, and best-practice guidelines

1. What Is Network System Administration?

Aspect	Description
Definition	The discipline of planning, deploying, configuring, monitoring, and maintaining computer networks and the servers that support them.
Goal	Ensure reliable, secure, and efficient connectivity for users, applications, and services.
Scope	Includes LAN/WAN design, IP addressing, routing & switching, security controls, performance tuning, backup/recovery, and documentation.

2. Core Responsibilities

Area	Typical Tasks
Network Design & Planning	- Assess capacity needs - Choose topology (star, mesh, hybrid) - Select hardware (routers, switches, firewalls)
Configuration & Deployment	- Set up VLANs, subnets, DHCP scopes - Install and configure operating systems (Windows Server, Linux) - Apply routing protocols (OSPF, BGP)
Security Management	- Implement firewalls, ACLs, and IPS/IDS - Enforce strong authentication (RADIUS, LDAP, MFA) - Patch OS and firmware regularly
Monitoring & Performance	- Use tools (SNMP, NetFlow, Syslog, Grafana, Zabbix) - Track latency, jitter, packet loss, bandwidth utilization - Set alerts for threshold breaches
Troubleshooting	- Diagnose connectivity failures (ping, traceroute, nslookup) - Analyze logs and packet captures (Wireshark) - Perform root-cause analysis and document fixes

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Area

Typical Tasks

Administration

Backup & Disaster Recovery

- Perform regular backups of configs & critical data
- Test restoration procedures
- Maintain a documented recovery plan
- Keep network diagrams, IP address plans, and device

Documentation & Change

Management

- inventories up-to-date
- Log all changes in a ticketing system (Jira, ServiceNow)
- Follow a change-approval workflow

3. Fundamental Concepts

3.1 OSI & TCP/IP Models

Layer (OSI)	TCP/IP Equivalent	Primary Function
7 – Application	Application	End-user services (HTTP, SMTP)
6 – Presentation	—	Data formatting, encryption
5 – Session	—	Connection management
4 – Transport	Transport (TCP/UDP)	End-to-end reliability, flow control
3 – Network	Internet (IP)	Routing, logical addressing
2 – Data Link	Link (Ethernet, Wi-Fi)	MAC addressing, frame handling
1 – Physical	Physical	Cabling, signaling

3.2 IP Addressing & Subnetting

- **IPv4** – 32-bit address, dotted decimal (e.g., 192.168.10.0/24)
- **IPv6** – 128-bit address, colon-hex notation (e.g., 2001:db8::/48)
- **Subnet mask** determines the network portion; CIDR notation (/n) simplifies representation.

Quick tip: Use a calculator or `ipcalc` to verify host count and broadcast address.

3.3 VLANs & Trunking

- **VLAN** – Logical broadcast domain; isolates traffic without additional hardware.
- **Tagging (802.1Q)** – Allows multiple VLANs over a