

Introduction to Network System Administration

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(A concise, easy-to-read reference guide)

1. What Is Network System Administration?

Aspect	Description
Definition	The practice of planning, deploying, configuring, monitoring, and maintaining computer networks and the servers that support them.
Goal	Ensure reliable, secure, and efficient communication between devices, applications, and users.
Scope	- Physical infrastructure (cabling, switches, routers) - Logical components (IP addressing, VLANs, routing protocols) - Services (DNS, DHCP, VPN, firewalls, email, web) - Server platforms (Windows, Linux, virtualization) - Monitoring, backup, and disaster recovery.

2. Core Responsibilities

Responsibility	Typical Tasks
Network Design & Planning	- Assess requirements (bandwidth, latency, security). - Create topology diagrams (star, mesh, hub-and-spoke). - Choose hardware and software platforms.
Installation & Configuration	- Rack and wire devices. - Configure IP schemes, VLANs, routing protocols (OSPF, EIGRP, BGP). - Set up services (DHCP, DNS, NTP). - Implement firewalls, ACLs, and intrusion detection/prevention systems.
Security Management	- Enforce patch management and hardening guidelines. - Manage VPNs, two-factor authentication, and endpoint protection.

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Responsibility

Typical Tasks

Administration

• Implement SNMP, NetFlow, sFlow, PRTG, Zabbix, SolarWinds).

Performance Monitoring

- Track latency, jitter, packet loss, utilization.
- Generate alerts and capacity?planning reports.
- Diagnose connectivity issues (ping, traceroute, nslookup).
- Resolve hardware failures, misconfigurations, and software bugs.

Troubleshooting & Support

- Provide Tier?1/2 support to end users.
- Schedule configuration backups (router/switch configs, DNS zones).

Backup & Disaster Recovery

- Implement redundant paths (LACP, HSRP/VRRP).
- Test failover and recovery procedures.

Documentation & Change Management

- Maintain network diagrams, IP address management (IPAM) records, and SOPs.
- Log changes in a ticketing system (ITIL best practice).
- Write scripts (PowerShell, Bash, Python) for repetitive tasks.

Automation & Scripting

- Use configuration management tools (Ansible, Chef, Puppet).

3. Fundamental Concepts

Concept	Key Points
OSI Model (Layers 1?7)	Provides a framework for troubleshooting; most admin work occurs in Layers 2 (Data Link) and 3 (Network). • IPv4: 32?bit, dotted?decimal (e.g., 192.168.1.0/24).
IP Addressing	• IPv6: 128?bit, colon?hex (e.g., 2001:db8::/64). • Subnetting, CIDR, VLSM.
Routing vs. Switching	<i>Routing</i> moves packets between networks (Layer 3). <i>Switching</i> forwards frames within a LAN (Layer 2).
VLANs	Logical segmentation of a LAN; reduces broadcast