

Introduction to Network System Administration

Introduction to Network System Administration
Key concepts, responsibilities, tools, and best practices

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 communication between devices, applications, and users.
Scope	Includes LAN/WAN, wireless, VPN, firewalls, DNS, DHCP, routing, switching, server services, and related security controls.

2. Core Responsibilities

Responsibility	Typical Tasks	Example Tools
Network Design & Planning	- Assess requirements (bandwidth, latency, redundancy). - Create topology diagrams. - Choose hardware (switches, routers, APs).	Visio, draw.io, Lucidchart
Installation & Configuration	- Rack and cable devices. - Set IP schemes, VLANs, routing protocols. - Deploy server OS and services.	Cisco IOS, Juniper JunOS, Windows Server, Linux (CentOS/RHEL)
Monitoring & Performance	- Track uptime, latency, packet loss. - Capacity planning. - Alert on thresholds.	Zabbix, Nagios, PRTG, SolarWinds, Grafana + Prometheus

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Responsibility	Typical Tasks	Example Tools
Administration		
Security Management	• Configure firewalls, IDS, IPS.	
	• Apply patches & firmware updates.	pfSense, Cisco ASA, Snort, Nessus, OpenVAS
	• Conduct vulnerability scans.	
User & Access Management	• Manage accounts, groups, and permissions.	Active Directory, FreeRADIUS,
	• Implement RADIUS/LDAP authentication.	OpenLDAP
Backup & Disaster Recovery	• Schedule backups of configs & critical data.	
	• Test restoration procedures.	Veeam, Bacula, rsync, NetBackup
	• Document recovery steps.	
Documentation & Change Control	• Keep topology, IP address plan, config revisions.	Confluence, SharePoint,
	• Use ticketing for changes.	ServiceNow, Jira
Troubleshooting	• Diagnose connectivity issues.	
	• Analyze logs and packet captures.	Wireshark, tcpdump, ping/traceroute, syslog servers
	• Resolve hardware failures.	

3. Fundamental Concepts

3.1 OSI Model (Layers & Relevance)

Layer	Primary Function	Admin Tasks
1 – Physical	Cabling, connectors, media	Verify fiber/copper integrity, PoE
2 – Data Link	MAC addressing, switching	VLAN configuration, STP tuning
3 – Network	IP routing, subnetting	Static routes, OSPF/ EIGRP / BGP
4 – Transport	TCP/UDP port handling	QoS policies, firewall rules
5 – Session	Session management	VPN tunnels, SSL termination

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Layer	Primary Function	Admin Tasks
6 – Presentation	Data translation, encryption, SSL certificates	
7 – Application	End-user services	DNS, DHCP, email, web services

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3.2 IP Addressing & Subnetting

- IPv4: 32-bit, dotted decimal (e.g., 192.168.10.0/24)
- IPv6: 128-bit, colon-hex (e.g., 2001:db8::/48)
- **Subnet mask** determines host vs. network bits.
- **CIDR notation