

Overview of Network System Administration

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(A concise, structured guide for students and junior admins)

1. What Is Network System Administration?

Aspect	Description
Definition	Management, configuration, monitoring, and troubleshooting of network infrastructure and related services.
Scope	- Physical hardware (switches, routers, firewalls, cabling) - Virtual/network layer services (DHCP, DNS, VPN, proxy) - Security policies and access controls - Performance tuning and capacity planning
Goal	Deliver reliable, secure, and efficient connectivity for users, applications, and devices.

2. Core Responsibilities

1. Network Design & Implementation

- Assess requirements (bandwidth, latency, redundancy).
- Choose topology (star, mesh, spine-leaf).
- Select hardware/software (Cisco, Juniper, open-source).

2. Configuration Management

- Create and maintain device configs (CLI scripts, templates).
- Use version control (Git) for config files.
- Apply changes via automation tools (Ansible, SaltStack, Puppet).

3. Monitoring & Alerting

- Deploy monitoring platforms (Zabbix, Nagios, Prometheus, SolarWinds).
- Track KPIs: latency, packet loss, CPU/memory usage, interface errors.
- Set thresholds and integrate with alert channels (email, Slack, PagerDuty).

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4. Security Administration

- Harden devices (disable unused services, apply ACLs).
- Manage firewalls, IDS/IPS, and VPN gateways.
- Conduct regular patching and vulnerability scans.

5. Troubleshooting & Incident Response

- Follow a systematic methodology (identify, isolate, resolve).
- Use tools: ping, traceroute, mtr, tcpdump, Wireshark, NetFlow/sFlow.
- Document incidents and perform post-mortem analysis.

6. Capacity Planning & Optimization

- Analyze traffic trends (NetFlow, sFlow, SNMP).
- Forecast growth and schedule upgrades.
- Optimize routing protocols (OSPF, BGP) and QoS policies.

7. Documentation & Knowledge Management

- Maintain network diagrams (Visio, draw.io, Lucidchart).
- Keep runbooks, SOPs, and change request logs up-to-date.
- Share knowledge via internal wiki or Confluence.

3. Typical Toolset

Category	Popular Tools	Primary Use
Configuration	Cisco IOS/Junos CLI, Ansible, Netmiko, NAPALM	Automate device provisioning
Monitoring	Zabbix, Nagios, Prometheus + Grafana, PRTG	Real-time health checks
Logging	Syslog servers (Graylog, ELK), Splunk	Centralized log analysis
Security	pfSense, FortiGate, Cisco ASA, Snort, Suricata	Firewalls, IDS/IPS
Network Analysis	Wireshark, tcpdump, nmap, mtr	Packet capture & diagnostics

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Category	Popular Tools	Primary Use
Documentation	Visio, draw.io, NetBox, RackTables	Asset inventory & topology maps
Version Control	Git, GitLab, Bitbucket	Track config changes

4. Key Protocols & Technologies

| Layer | Protocol/Technology | Purpose | |-----