BUC3219: Web Server Administration

Module 1: The Web Server Ecosystem

Faculty of Computing & Informatics

Beyond the Browser Window

To the average user, the web is a screen. To an administrator, it is an infrastructure. This course transitions your perspective from consuming content to managing the global business environment that delivers it.

USER PERSPECTIVE: CONSUMPTION

ADMIN PERSPECTIVE: INFRASTRUCTURE

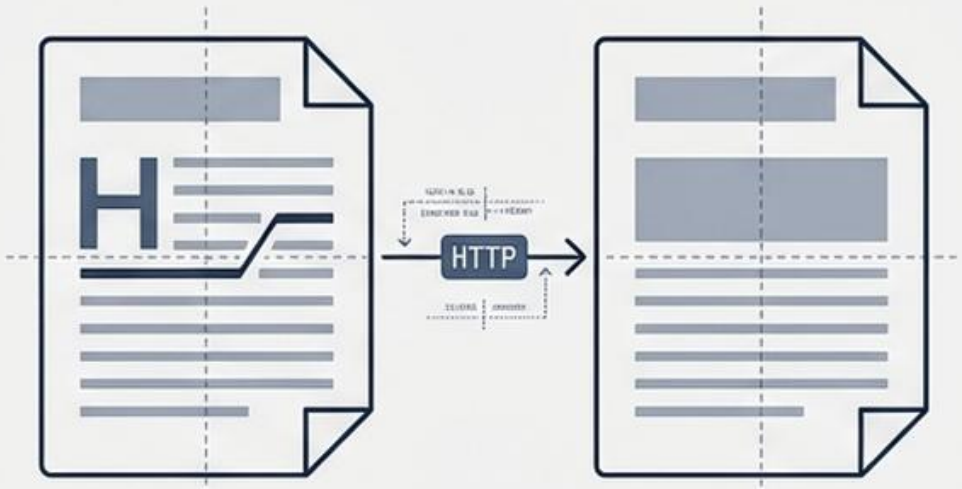
```
admin@server:~$ sudo apt update
Hit:1 http://archive.ubuntu.com/ubuntu focal InRelease

admin@server:~$ tail -f /var/log/nginx/access.log
192.168.1.19 - - [21/May/2024:06:23:32 +0000] 'GET / HTTP/1.1' 200
```

Vendor-Neutral Perspective: We will not limit ourselves to one ecosystem. You will develop to an epaobliens. You will develop proficiency in both Microsoft Windows Server (IIS) and Linux (Apache/Nginx) environments.

THE NETWORK (Internet)

- **DEFINITION:** A "NETWORK OF NETWORKS" (WAN).
- **HISTORY:** 1960S ARPANET (DOD) -> 1995 BACKBONE.
- **INFRASTRUCTURE:** NAPs AND PEERING AGREEMENTS.
- **PROTOCOL:** TCP/IP (VOICE, DATA, PICTURES).

THE SERVICE (Web)



- **DEFINITION:** THE PORTION OF THE INTERNET USING HTTP.
- **FUNCTION:** COMMUNICATION OF DOCUMENTS VIA HYPERTEXT TRANSFER PROTOCOL.
- **RELATIONSHIP:** THE WEB RUNS ON TOP OF THE INTERNET.

SYSTEM DIAGRAM: INTERNET VS. WEB

SCALE 1:8

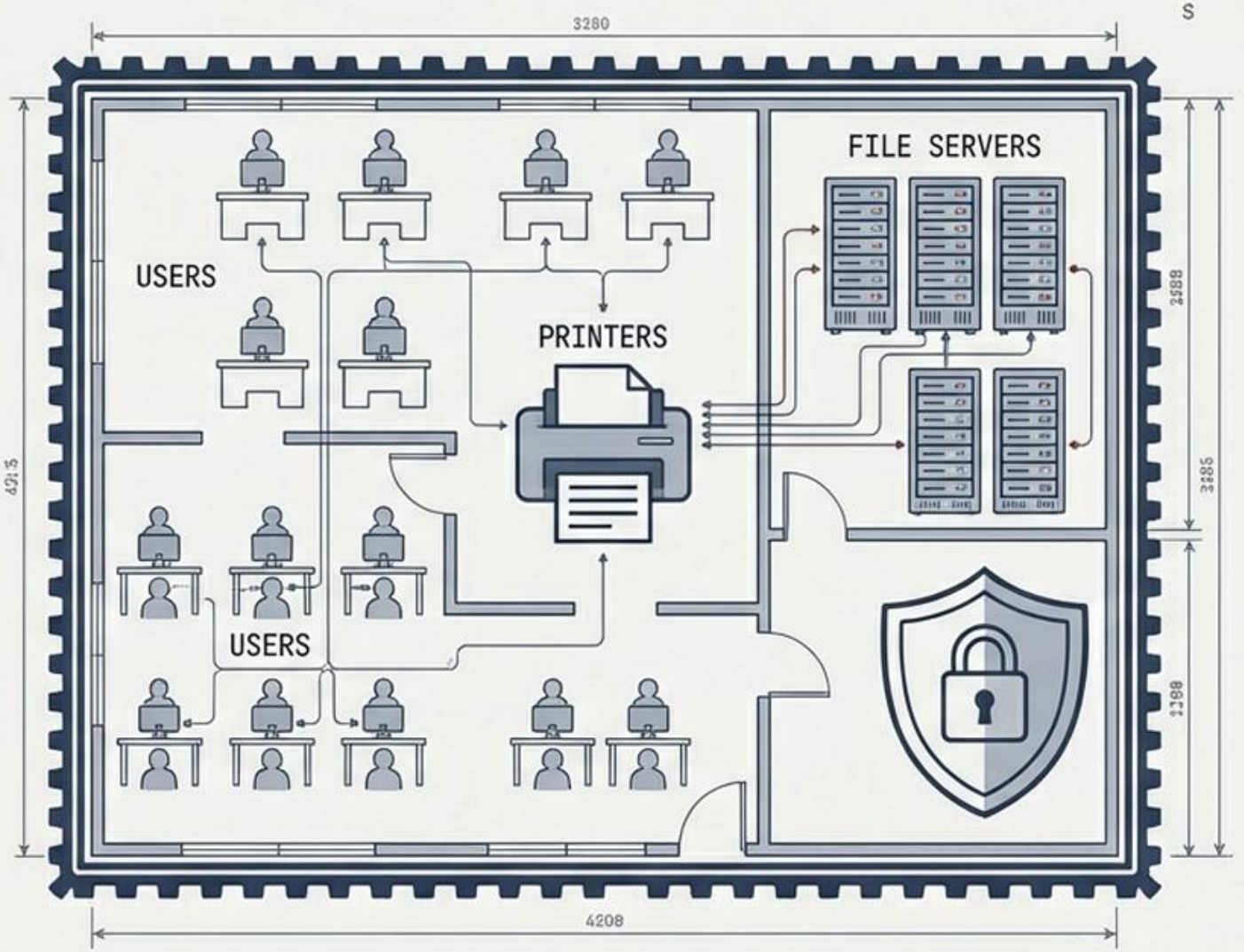
ROLE: SERVER ADMINISTRATOR

The Internal Guardian

FOCUS: Local Area Network (LAN)

CORE RESPONSIBILITIES:

- **User Productivity:** Ensuring reliability for hundreds/thousands of users.
- **Consistency:** Managing 'Roaming Profiles' for personalized desktops.
- **Access Control:** Grouping users (Faculty vs. Students) and setting Read/Modify permissions.
- **Security:** Protecting internal systems from misuse.



SYSTEM DIAGRAM: INTERNAL LAN STRUCTURE

SCALE 1:4

ROLE: WEB SERVER ADMINISTRATOR

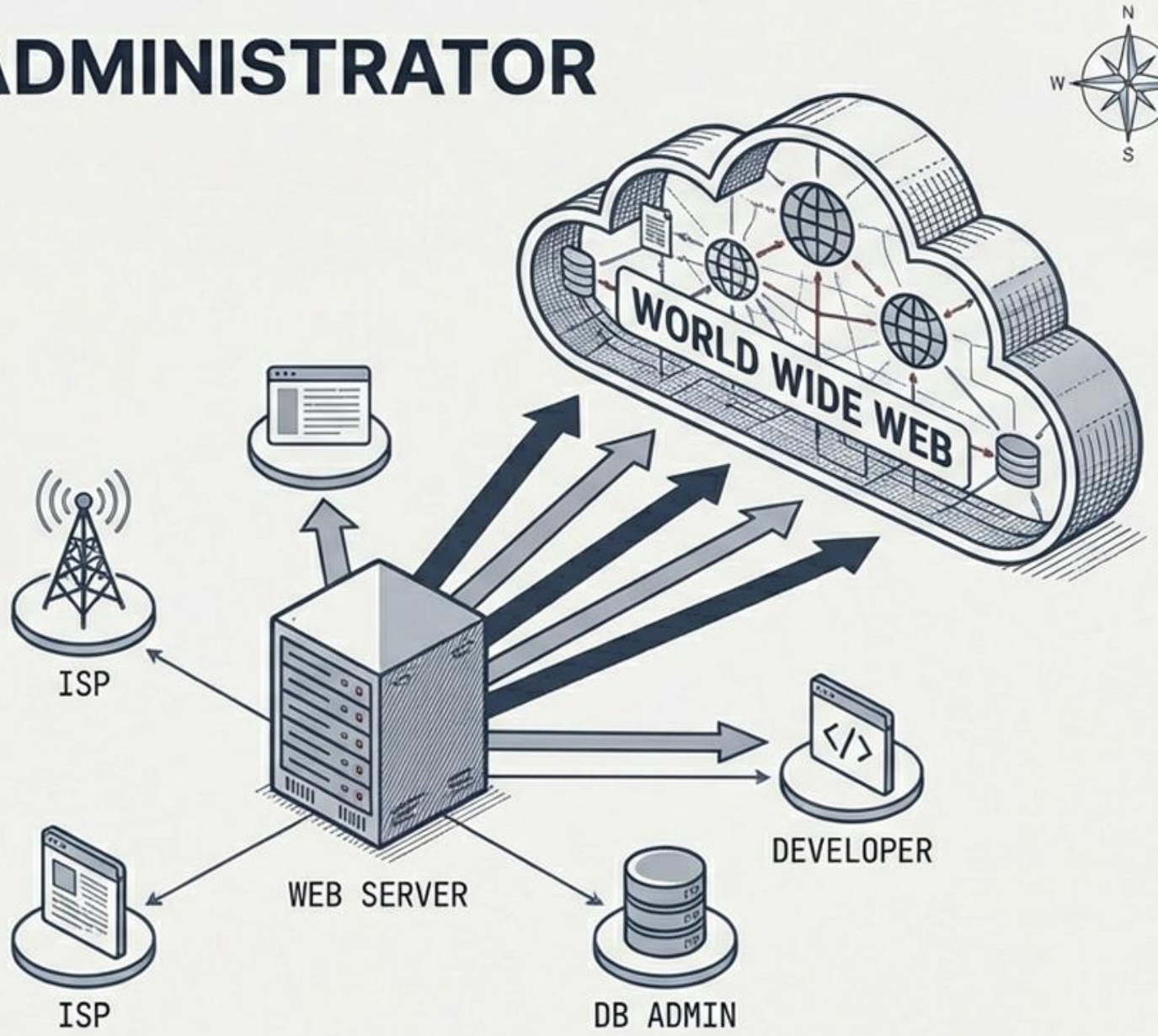
The Public Interface

FOCUS: The Internet (Public Access)

CORE RESPONSIBILITIES:

- **Information Delivery:** Providing data to external requests.
- **Coordination:** Working with ISPs and Web Developers.
- **Delegation:** Managing specialized tasks (DB Design, Programming, Security).

ADDITIONAL SERVICES: Hosting FTP and E-mail.



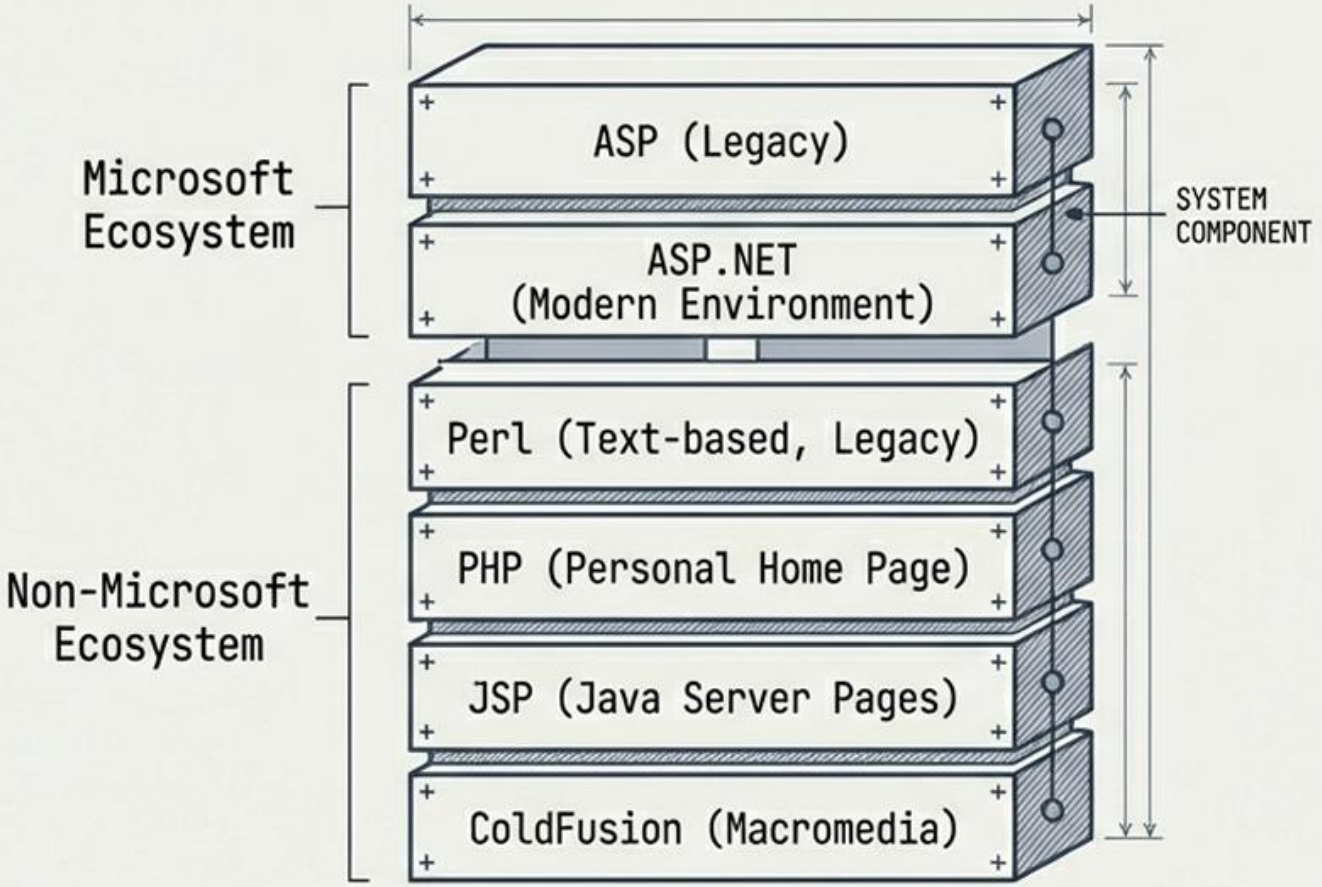
SYSTEM DIAGRAM: PUBLIC WEB ARCHITECTURE

SCALE 1:8

THE SOFTWARE STACK

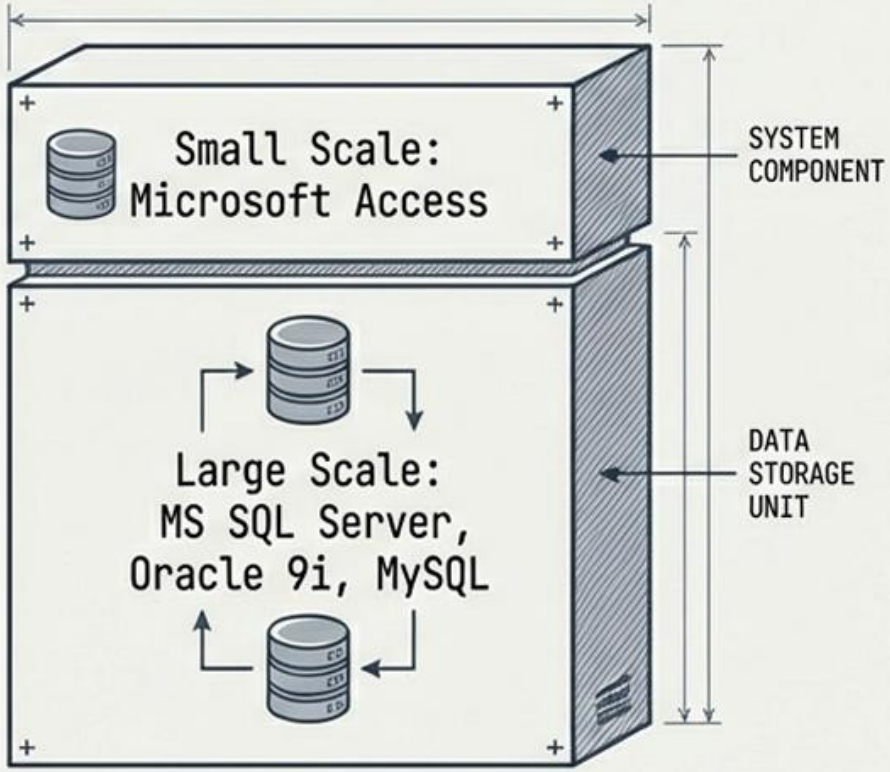
Languages and Databases

LANGUAGES



DATABASES (DBMS)

Definition: Collection of records queried via SQL.



SYSTEM DIAGRAM: THE SOFTWARE STACK

SCALE 1:10

The OSI Model

Open Systems Interconnection

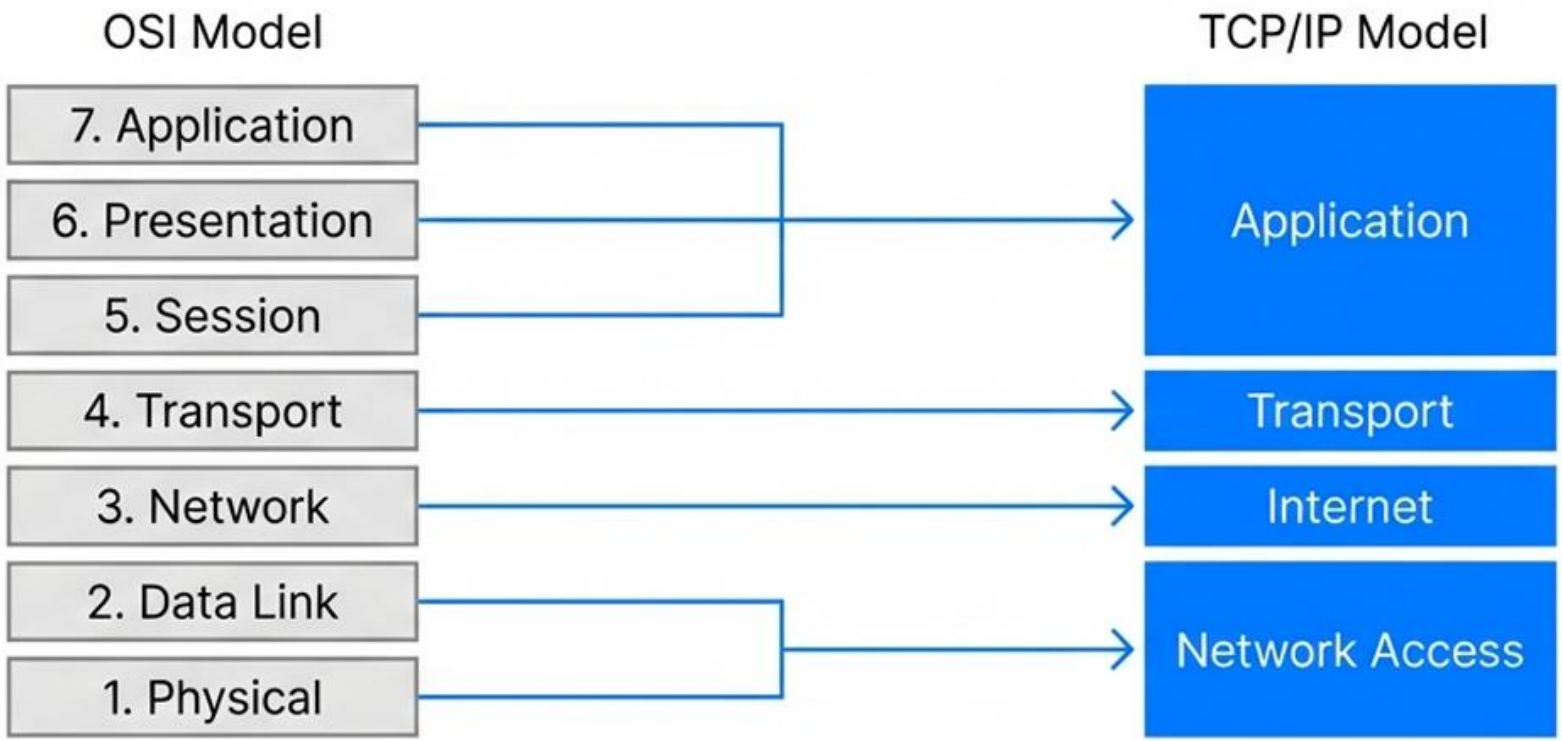
7	Application	User interaction, HTTP, FTP
6	Presentation	Encryption, formatting
5	Session	Connections between apps
4	Transport	TCP/UDP, error handling
3	Network	Routing, IP Addresses
2	Data Link	MAC addresses, switching
1	Physical	Cables, voltage, wireless waves

Web Server Admin Focus

Troubleshooting Focus

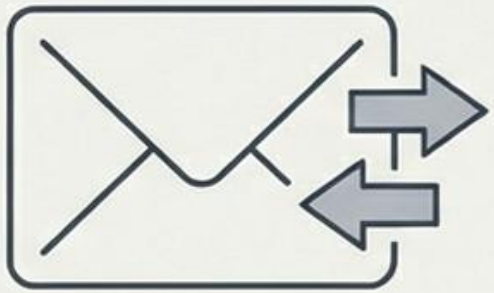
Theory vs. Reality

Mapping OSI to TCP/IP.



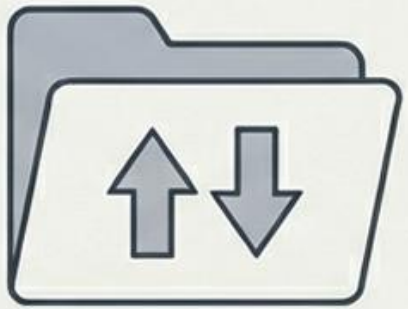
The Internet runs on the 4-layer TCP/IP suite. When you configure “Internet Information Services” (IIS) or Apache, you are configuring the Application Layer.

ESSENTIAL SERVER SERVICES



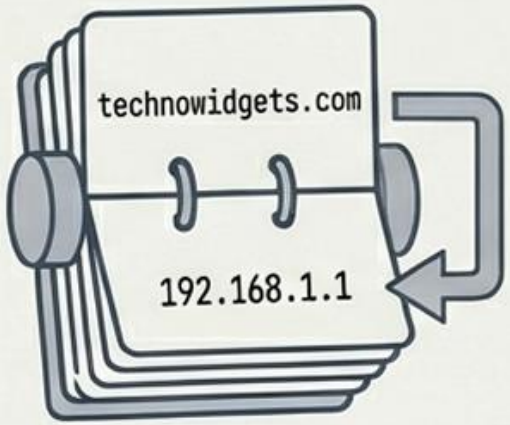
E-MAIL

SMTP (Sending) & POP3 (Receiving). Challenges: Spam and Virus management.



FTP

File Transfer Protocol. Uploading and downloading files to the server.



DNS

Domain Name Service. Translates 'technowidgets.com' to IP address.

FIREWALL

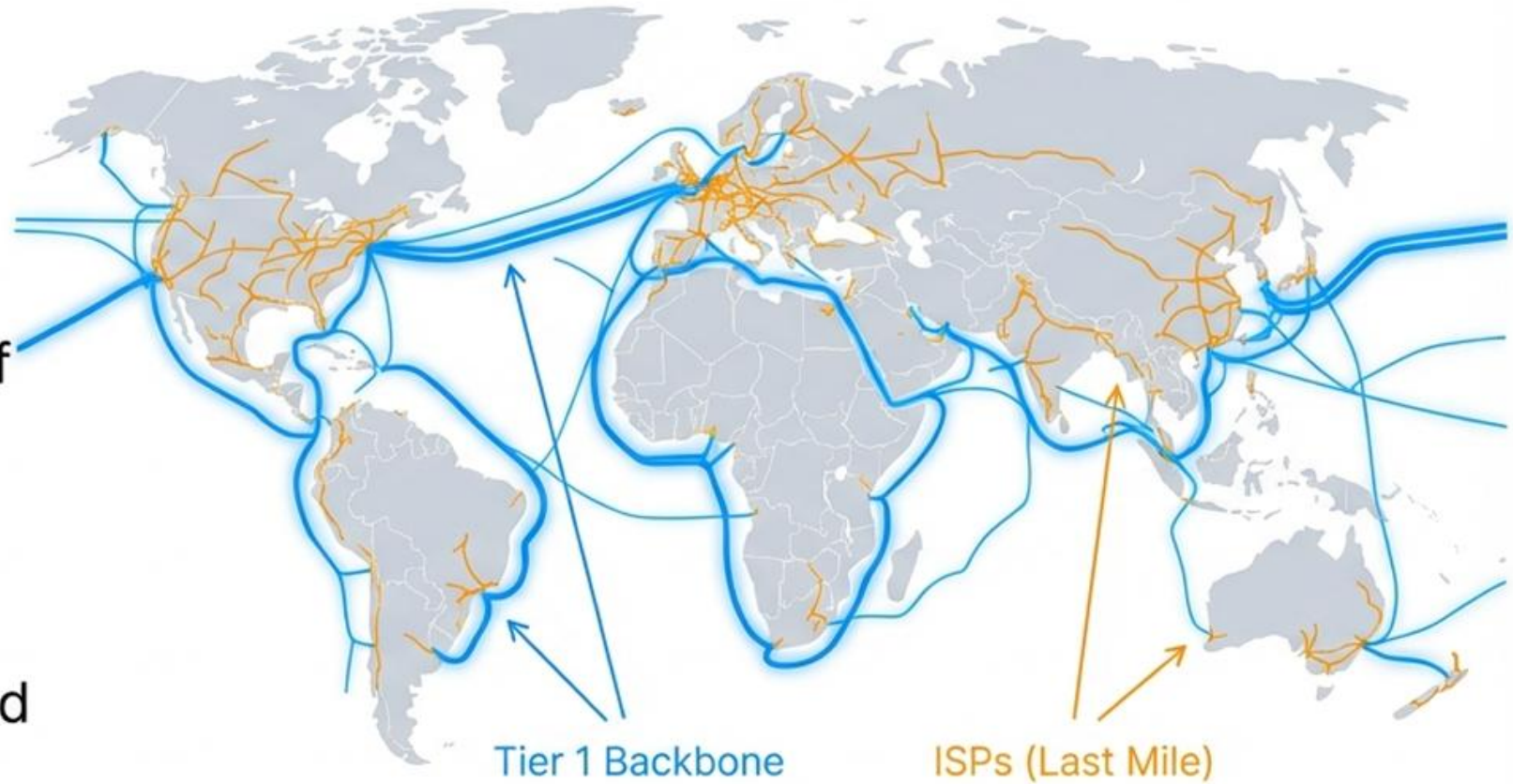
Security perimeter protecting the environment from external attack.

The Backbone and the Edge

The internet is not a cloud; it is cables.

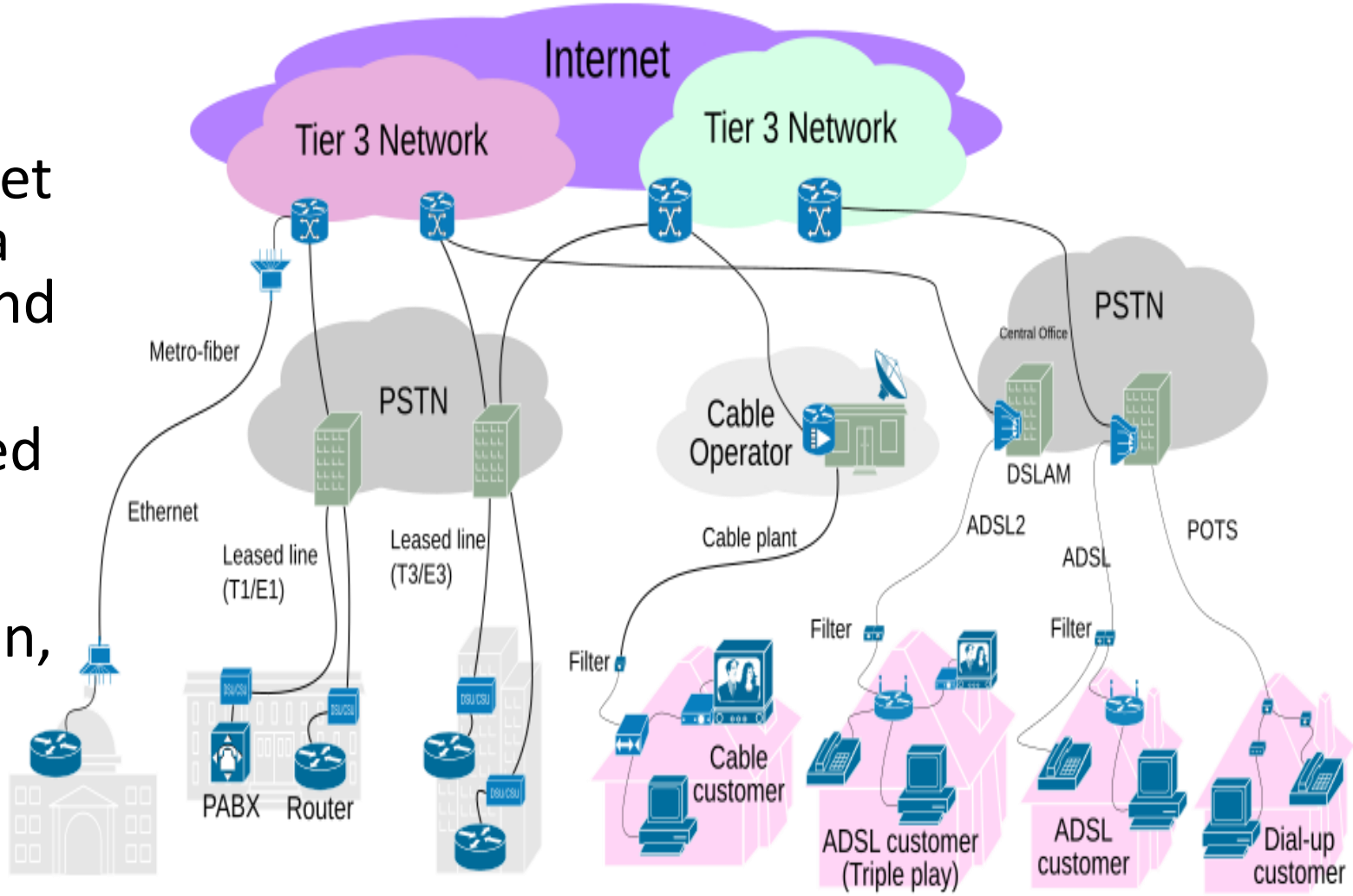
1. The Internet Backbone: High-capacity fiber-optic cables carrying the bulk of global traffic (Tier 1).

2. ISPs (Internet Service Providers): The bridge between the backbone and the end-user (Last Mile).



Internet service provider (ISP)

- ISP is a company that provides you with Internet access, usually through a dial-up, DSL, or broadband connection.
- ISPs can also offer related services like email accounts, web hosting, domain name registration, and even data communications and telephone services



ISP CONT”

Primary Types of ISP by Technology

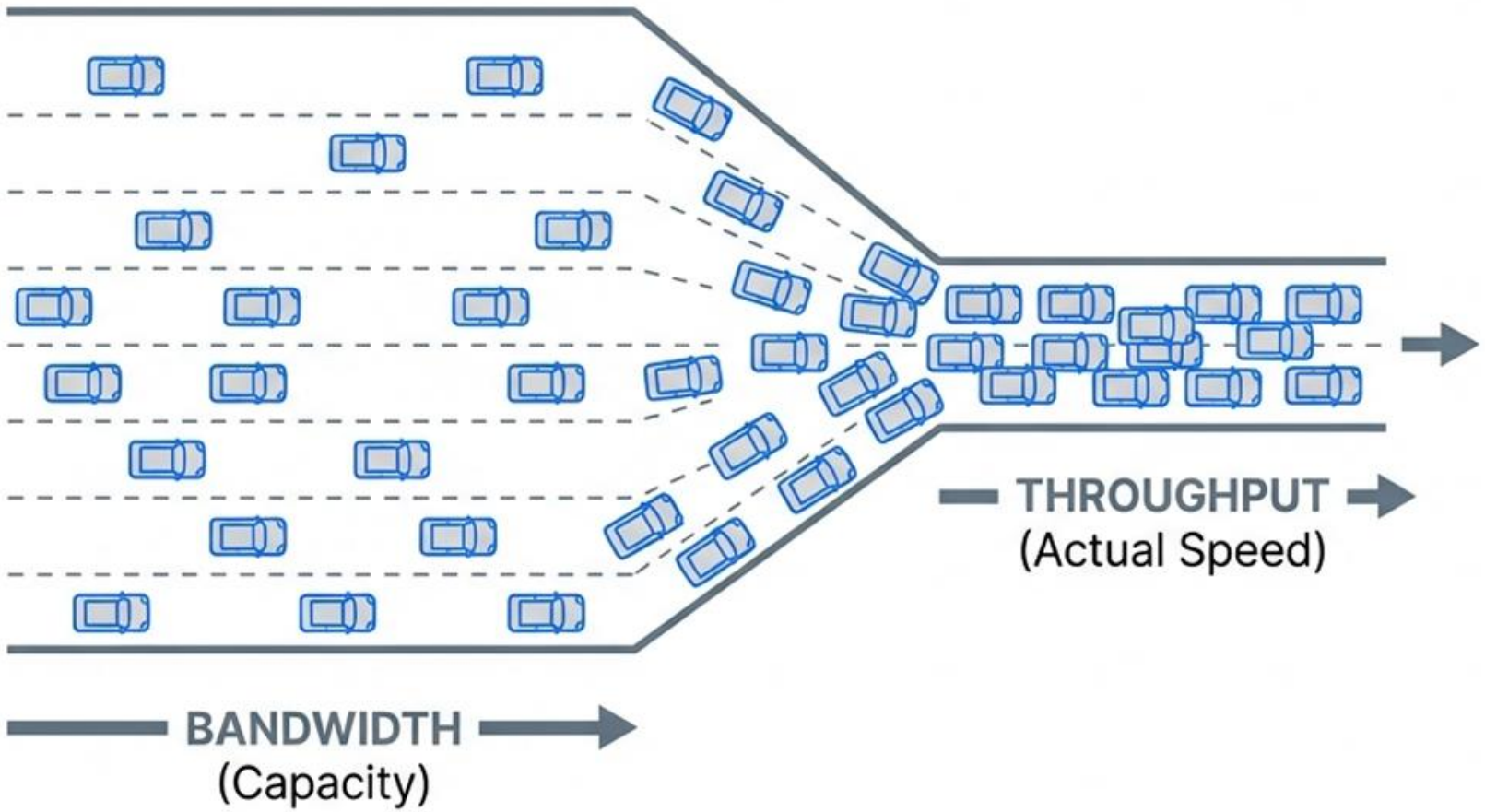
- Fiber Optic (FTTH/FTTP)
- Cable Broadband
- DSL (Digital Subscriber Line)
- Satellite
- Wireless/Fixed Wireless
- Dial-Up

Classification by Network Tier

1. **Tier 1 ISPs:** These are massive, global networks that make up the Internet backbone, requiring no one else to pay for access.
2. **Tier 2 ISPs:** Regional or national carriers that connect to Tier 1 for access to the wider internet, often through peering agreements.
3. **Tier 3 ISPs:** Localized providers that buy internet transit from higher tiers to sell to final consumers ("last-mile" providers).

Measuring Performance

Bandwidth vs. Throughput.



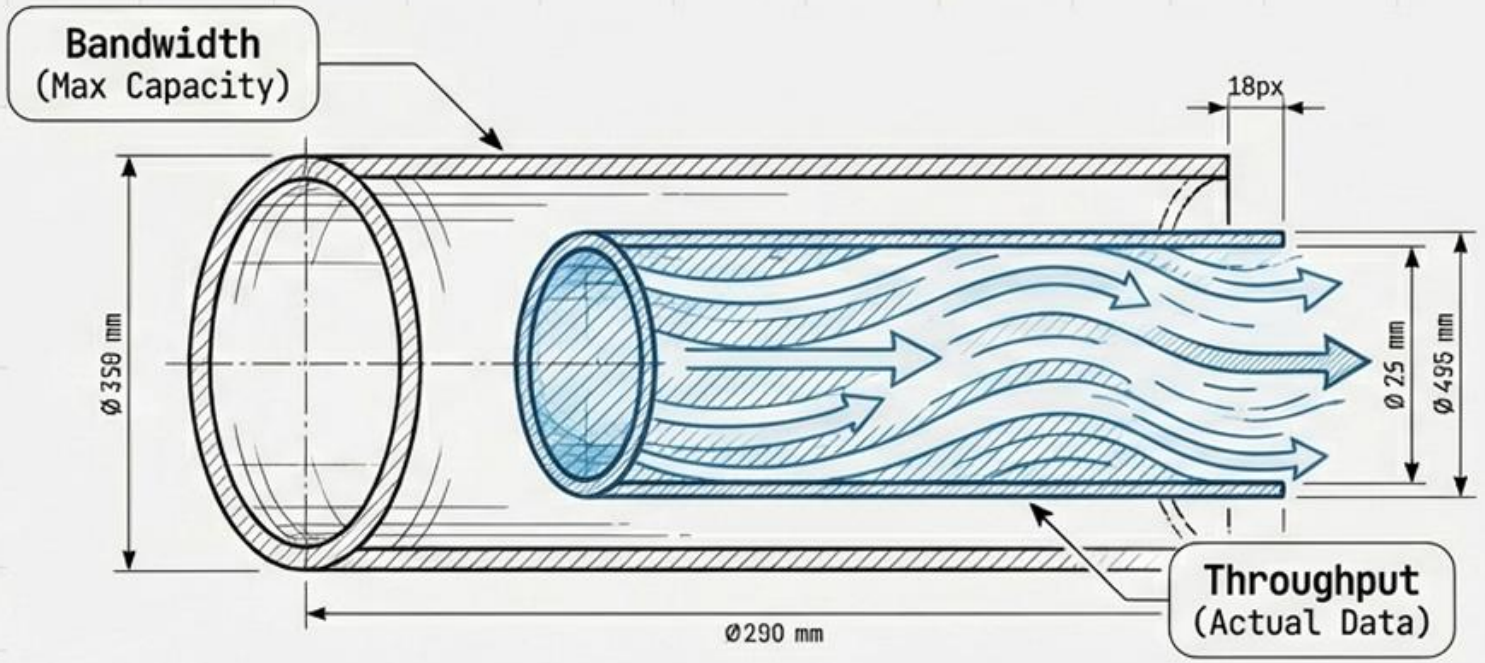
Bandwidth: The theoretical maximum capacity of the connection (The Pipe).

Throughput: The actual rate of data transfer achieved (The Water/Traffic).

Why it Matters: A 1Gbps network card (Bandwidth) does not guarantee 1Gbps transfer speeds if the network is congested.

SPEED VS. CAPACITY

Bandwidth (BW) vs. Throughput (TH)



- **Bandwidth:** Max bits per second (e.g., T1 = 1.544 Mbps)
- **Throughput:** Actual data moved. TH ≤ BW

The Math Section

Example: 9600 bps connection

Overhead: 1 Start bit + 8 Data bits + 1 Stop bit = 10 bits total.

Efficiency: 8/10 = 80%.

Result:
9600 bps = 960 bytes/sec (NOT 1200).

SYSTEM DIAGRAM: SPEED VS. CAPACITY

ENTERPRISE CONNECTIONS

T-Carrier Leased Lines

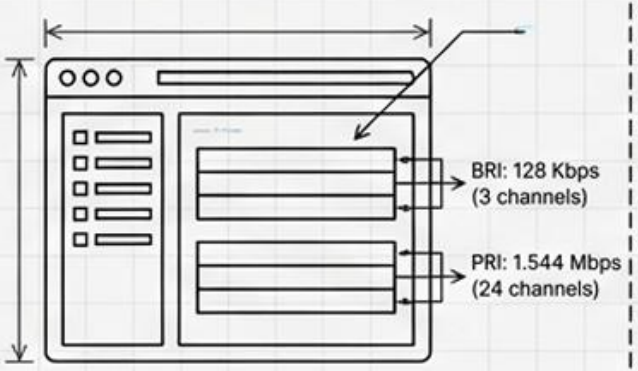
DATA INTERFACE SPEC

CONNECTION TYPE	SPEED	DESCRIPTION
Fractional T1	Speed: 64 Kbps increments	Description: Single channel chunks of a full T1.
T1 Line	Speed: 1.544 Mbps	Description: 24 channels (64 Kbps each). Common for dedicated voice/data.
T3 Line	Speed: 44.736 Mbps	Description: Equivalent to 28 T1 circuits.

SYSTEM DIAGRAM: T-CARRIER SPECIFICATIONS	SCALE 1:5	SDEC	ASTE

ALTERNATIVE CONNECTIONS

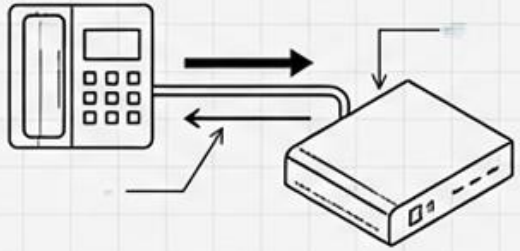
ISDN (Integrated Services Digital Network)



Fully digital service.

- **BRI:** 128 Kbps (3 channels)
- **PRI:** 1.544 Mbps (24 channels)

DSL (Digital Subscriber Line)

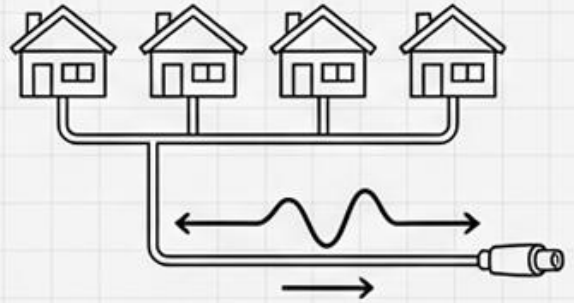


Uses standard telephone lines.

- **ADSL**: Asymmetric speeds (Download > Upload).
- **Example:** 6.1 Mbps Down / 1.5 Mbps Up.

Download
Upload

CABLE MODEM



Uses TV Coaxial Cable infrastructure.

- **Shared Access:** Bandwidth fluctuates based on neighborhood usage.

SYSTEM DIAGRAM: ALTERNATIVE CONNECTIONS		
SCALE 1:10	SDEC	ASTE

Week 1 Lab: Environment Setup

Preparing the Virtualization Platform.

- [x] **Virtualization Tool:** Install VirtualBox or VMware.
- [ ] **Microsoft Source:** Download Windows Server 2022 Evaluation ISO.
- [ ] **Linux Source:** Download Ubuntu Server 24.04 LTS ISO.

Next Week:
We proceed to OS Installation, static IP assignment, and preparing the foundation for IIS and Apache.

“Great administration starts with a clean installation.”

Module 1 Synthesis

Mindset: You are now an architect of infrastructure, not just a user.

Geography: The web relies on physical backbones (WAN) replicated in our labs (LAN).

Standards: The OSI and TCP/IP models provide the rules for interoperability.

Protocols: We manage traffic via HTTP/S, DNS, FTP, and SMTP.