SENG 11232 · Engineering Foundation

STUDENT PRE-LECTURE NOTES · LECTURE 10

Data Communications & Networking Fundamentals

Module 4 — Networks, Security & Professional Practice

HOW TO USE	Read these notes BEFORE the lecture. Highlight terms you don't recognise. Bring your questions to class. Use the blank spaces for your own notes.

Learning Objectives

By the end of this lecture, you should be able to:

- 1. Explain data encoding and transmission fundamentals
- 2. Describe the OSI model layers and identify protocols at each layer
- 3. Explain TCP vs UDP and describe three-way handshake
- 4. Describe HTTP methods, status codes and REST API design principles
- 5. Trace the complete journey of an HTTP request

Signals & OSI Model

Key Transmission Concepts

- Bandwidth: maximum data rate of a channel (bps)
- Latency: time for one bit to travel from source to destination
- Throughput: actual data rate achieved (always ≤ bandwidth)

OSI 7-Layer Model

- Layer 1 Physical: bits on wire — cables, connectors, voltage
- Layer 2 Data Link: frames, MAC addresses, error detection (Ethernet, WiFi)
- Layer 3 Network: packets, logical addressing, routing (IP)
- Layer 4 Transport: end-to-end delivery, TCP (reliable) and UDP (fast)
- Layer 7 Application: HTTP, HTTPS, DNS, SMTP, SSH

KEY	As a software engineer you work primarily at Layer 7 (Application), but understanding all 7 layers helps you diagnose where failures occur.

Your notes:

TCP/IP, HTTP & REST

TCP vs UDP

- TCP: reliable, ordered, connection-oriented. Three-way handshake: SYN → SYN-ACK → ACK
- UDP: fast, connectionless, no delivery guarantee. Used for: streaming, gaming, DNS

HTTP & REST

- HTTP methods: GET (read), POST (create), PUT (replace), PATCH (update), DELETE (remove)
- Status codes: 200 OK, 201 Created, 400 Bad Request, 401 Unauthorised, 404 Not Found, 500 Server Error
- REST: stateless, resource-based URLs, use HTTP methods as verbs
  - Good: GET /users/42 | Bad: GET /getUser?id=42

DNS

- Maps hostnames to IP addresses. Resolution chain: client cache → OS cache → recursive resolver → root → TLD → authoritative

Your notes:

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Key Terms for This Lecture

Term	Your Definition (fill in during/after lecture)
Bandwidth	
Latency	
Throughput	
OSI Model	
IP Address	
Port	
TCP	
UDP	
HTTP	
REST	
DNS	
Three-Way Handshake	
Packet	

Self-Check Questions

Answer these after the lecture to test your understanding:

- Q1. Name the 4 key OSI layers relevant to a web application and state one protocol at each.

Answer: ____

- Q2. What is the difference between TCP and UDP? When would you choose UDP?

Answer: ____

- Q3. Design the REST API endpoints for a blogging platform with users, posts and comments.

Answer: ____

- Q4. Describe, step by step, what happens when a user types https://example.com into a browser.

Answer: ____

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