Assignemnt#0

Start Assignment

- Due Sunday by 5am
- Points 0
- Submitting a file upload
- Available Sep 7 at 12am - Sep 14 at 6am

1. Objectives (what this assignment assesses)

By completing this assignment you will demonstrate that you can:

- Explain and compare the DoD (TCP/IP) model and the OSI model in detail and map protocols/devices to layers.
- Distinguish TCP and UDP, explain reliability mechanisms and identify typical application use-cases.
- Reflect, summarize and report lessons learnt from each of the 17 course modules (observations, experiments, real-world relevance).
- Describe common network topologies, choose appropriate topologies for real scenarios and explain advantages/disadvantages based on experiments.
- Install required software platforms (Packet Tracer, VirtualBox, EVE-NG, VMware optional) and set up virtual devices (Cisco router/switch images, Red Hat Linux, Windows Server, Windows 10 client).
- Prepare a professional written report with screenshots and evidence of installation and Canvas profile updates.
- Commit to course rules in a formal agreement and demonstrate academic integrity.

> **Note:** This assignment **excludes** packet-capture deliverables (PCAPs). Security requirements are restricted to *basic* measures only (change default passwords, keep software patched, enable basic firewall rules) — do **not** perform or require intrusive scanning on networks without explicit permission.

2. Deliverables (what you must submit as one PDF)

1. **Cover page** — Full name, Student ID, Course, Assignment title, Date, One-line originality statement.
2. **Table of contents.**
3. **Task A — DoD (TCP/IP) vs OSI model (detailed write-up)** (see Task 1 below).
4. **Task B — TCP vs UDP (detailed write-up)** (see Task 2 below).
5. **Task C — Module-by-Module Reflection** (17 modules; see Task 3 below).
6. **Task D — Network Topologies (detailed descriptions + experiments/observations).**
7. **Task E — Installation evidence** (screenshots of installed software: Packet Tracer, VirtualBox, EVE-NG, Virtual machines/images list; Canvas profile screenshot). Include short notes about any issues you faced and how you solved them.
8. **Task F — Networking Essentials course evidence** (completion screenshot / certificate, Credly badge screenshot + link, LinkedIn evidence if available).
9. **Task G — Agreement & Commitment Plan** (signed/typed statement).
10. **Appendices** — list of references, commands used, image names and sources, any small diagrams used.

> Keep the main body clear and readable (use headings/subheadings). The whole PDF should be professional and proofread.

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3. Submission checklist (quick)

- PDF filename: `<StudentID>_FullName_Assignment#0.pdf`
- Cover page with originality declaration
- All tasks A–G completed and placed in the PDF in order
- Screenshots embedded (clear and annotated where relevant)

- Credly badge image + link included (if applicable)
- Canvas profile screenshot included
- Agreement & Commitment Plan signed (typed)
- References listed (books, pages, course links)

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4. Task 1 — DoD (TCP/IP) Layers Model vs OSI Model (detailed)

Produce a clearly written section that includes:

1.a) DoD (TCP/IP) Model — Four layers (detailed)

For **each layer**, provide:

- **Name (and short acronym).**
- **Primary responsibilities / functionality** (concise bullets).
- **Typical protocols & services** that belong to that layer.
- **Example real-world operation** (one small scenario sentence showing how it works).

Expectations (what to write):

- **Application Layer (DoD):** Explain that it provides application protocols and user services (HTTP, SMTP, FTP, DNS, SSH, DHCP, SNMP, SMB). Show an example: web browser requesting a webpage (HTTP).
- **Transport Layer (DoD):** Explain TCP and UDP (ports, segmentation, reliability, flow control). List features like sequence numbers, ACKs, retransmission, windowing for TCP. Mention typical ports.
- **Internet Layer (DoD):** Explain logical addressing and routing (IPv4/IPv6, ICMP, ARP interaction note). Show how routers use this layer to forward packets between networks.

- **Network Access / Link Layer (DoD):** Explain framing, MAC addressing, Ethernet protocols, ARP, PPP, Wi-Fi (IEEE 802.11) basics, physical media coupling.

1.b) Compare DoD vs OSI — structural & functional differences

- Provide a clear comparative table showing OSI 7 layers vs DoD 4 layers, and mapping rows (e.g., OSI layers 5–7 → DoD Application).
- Highlight the main conceptual differences: OSI is a teaching model and more granular; DoD/TCP-IP is practical and historically derived from implementation. Discuss implications for troubleshooting and protocol design.

1.c) Inclusions per layer (protocols/services and how they support communication)

- For both models, list key **protocols/services** per layer and briefly explain their role in an end-to-end communication (e.g., DNS at Application resolves names, IP at Internet routes, Ethernet at Link transfers frames).
- Discuss interplay — e.g., how ARP (link layer helper) supports IP addresses resolving to MACs so Ethernet frames can be formed.

1.d) OSI Model in depth (7 layers with real-life examples)

For each OSI layer (Physical → Application) include:

- **Short definition** (1 sentence), **key protocols/devices**, and **a plain real-world example** (e.g., Physical = copper cable carrying electrical signals; Data Link = switch forwarding frames using MAC addresses; Network = router forwarding IP packets; Transport = TCP ensuring reliable file download; Session = creating/tearing down a remote desktop session; Presentation = TLS encryption and JSON/ASCII conversion; Application = browser rendering HTML).
- Where appropriate show **one small diagram** or a short sequence illustrating how data moves down the stack on the sender and up the stack on the receiver.

Length guidance: ~2 pages for Task 1 (dense, with a table, diagrams optional).

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5. Task 2 — TCP vs UDP (detailed)

Create a well-structured section addressing:

2.a) Transmission Control Protocol (TCP)

- Explain connection setup (three-way handshake), sequence numbers, ACKs, retransmission, flow control (sliding window), congestion control (slow start overview), and ordered in-sequence delivery.
- Provide at least **two real examples** of applications that require TCP (web browsing/HTTPS, SMTP, FTP) and explain *why* TCP is appropriate.

2.b) User Datagram Protocol (UDP)

- Explain connectionless nature, minimal overhead, no retransmissions, no flow/congestion control (as part of UDP), use of ports.
- Provide **two real examples** of applications that choose UDP and why (e.g., DNS queries, real-time streaming, VoIP, gaming). Expl tradeoffs.

2.c) Compare & contrast (table + commentary)

- Create a side-by-side table: reliability, ordering, overhead, latency, typical use cases, handshake, error correction mechanisms.
- Include short advice: how to choose between TCP and UDP for a given service — e.g., choose UDP when low latency is paramount and application handles errors; choose TCP for reliable file transfer.

Length guidance: ~1–1.5 pages with a clear table and examples.

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6. Task 3 — Reflection on Networking Basics Course Modules (17 modules)

You must provide a module-by-module reflection. Below is a recommended list of 17 modules — **use this exact list** for your submission. For **each module**, write **a summary (100–200 words)** that includes: (a) core concepts; (b) what you experimented or observed; (c) a real-

world relevance/example; (d) one question or improvement idea you noted during your experiments.

Recommended 17 Modules (use these headings in your report)

1. Introduction to Computer Networks & Course Overview
2. Physical Layer — Media & Signaling (copper, fiber, wireless basics)
3. Data Link Layer — Ethernet, MAC addressing, VLANs
4. Network Layer — IPv4, IPv6, routing basics
5. Transport Layer — TCP/UDP deep dive
6. Application Layer Services — HTTP(S), DNS, DHCP, SMTP, FTP
7. OSI & TCP/IP Models — comparison and mapping
8. Network Topologies & Design Principles
9. Switching & VLANs — configuration concepts and lab observations
10. Routing Basics — static routing & dynamic routing overview (RIP/OSPF intro)
11. Wireless Networking — Wi-Fi standards, security basics and deployment considerations
12. Network Addressing & Subnetting — CIDR, VLSM and worked examples
13. Network Tools & Troubleshooting — ping, tracert/traceroute, arp, nslookup, netstat, ss
14. Virtualization & Network Emulation — VirtualBox, EVE-NG, Packet Tracer uses and limitations
15. Network Services & Servers — DNS, DHCP, NTP, Directory services (LDAP)
16. WAN Technologies & Remote Connectivity — VPN basics, leased lines overview, MPLS (high level)
17. Professional Practice, Documentation & Ethics in Networking (including academic integrity)

For each module include:

- **Key takeaways (bulleted).**
- **One experiment or observation** (what you did: e.g., configured a VLAN on Packet Tracer and observed MAC learning; set static route and tested reachability).
- **Real world example** (where this is used in practice).
- **Reflection / improvement idea** (what you would change or investigate deeper in class).

Length guidance: each module 100–200 words → total ~2,000–3,400 words. This fulfils the requirement to be detailed.

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7. Task 4 — Network Topologies (Ring, Bus, Mesh, Star, Hybrid)

For each topology provide:

- **Definition & diagram (simple).**
- **How it operates (key mechanics).**
- **Typical real-world uses and examples** (e.g., star: home/office networks; ring: legacy SONET or fiber ring backbones; mesh: critical infrastructure and datacenter interconnects or wireless mesh).
- **Advantages & disadvantages (at least 3 each).**
- **Short experiment or observation:** describe a simple lab you performed (Packet Tracer / EVE-NG / VirtualBox scenario) and your observations (e.g., single point of failure in star, convergence issues in certain ring setups).
- **Recommendation:** where you would select this topology and why.

Length guidance: ~1.5–2 pages.

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8. Task 5 — Installation of Required Software (detailed steps & evidence)

You must install and provide screenshots for the following software. If you cannot install due to system restrictions, explain clearly and include screenshots of the attempted steps and error messages.

Required software to install (take clear screenshots of successful install pages or application start pages):

- **Packet Tracer** (from Cisco NetAcad — enroll if required). Screenshot of Packet Tracer main window and NetAcad enrollment page (https://www.netacad.com/courses/packet-tracer (https://www.netacad.com/courses/packet-tracer)).
- **VirtualBox** (Oracle) — screenshot of VirtualBox Manager (https://www.virtualbox.org/wiki/Downloads (https://www.virtualbox.org/wiki/Downloads)).
- **EVE-NG (Community Edition)** (https://www.eve-ng.net/index.php/download/ (https://www.eve-ng.net/index.php/download/))— install either on a local VirtualBox/VMware VM or use a hosted instance. Provide screenshots: EVE-NG web console and the running lab list. **Important:** Use legally obtained images and follow vendor license rules.
- **Optional: VMware Workstation Player / Pro** — only if you choose VMware. Screenshot if used.

Virtual devices to provision in EVE-NG / VirtualBox / VMware:

- **Cisco Router and Switch images** (use lab/education images you are licensed to use, or use Packet Tracer routers/switches for logical labs). *Do not* include copyrighted images illegally — state the source/license. Screenshot the EVE-NG topology showing at least: one Cisco router node and one Cisco switch node.
- **Red Hat Enterprise Linux** (or CentOS/AlmaLinux/Rocky as a free alternative if you do not have RHEL subscription) — show VM listing and VM console login prompt screenshot.
- **Windows Server** (evaluation image is acceptable) — show VM manager listing or server Desktop screenshot (Server Manager).
- **Windows 10 client** — show VM login/desktop screenshot.

What to include in the Installation Evidence section:

1. For each software/tool, include one screenshot showing successful installation or startup (annotate with short caption and date/time).
2. For EVE-NG: brief note how you imported images (mention filenames and legal source), and a screenshot of topology with the devices above connected.
3. Short troubleshooting log (1 paragraph) explaining any issues faced (e.g., virtualization extensions disabled, network bridging problems) and how you resolved them.
4. Confirm on Canvas: screenshot showing you have enrolled/confirmed participation in the course — include your Canvas profile screenshot (after update) with name and picture (or user initials).

Important legal/ethical note: Use only legally-obtained software images/ISOs. If you used evaluation images, document where you obtained them (vendor or official trial link).

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9. Task 6 — Networking Essentials Course

You are required to **enroll in and complete** the **"Networking Essentials (https://www.netacad.com/courses/networking-essentials?courseLang=en-US) "** course (SkillsForAll or other platform as directed). Provide evidence and reflections.

Requirements:

- Enroll and complete all modules and assessments (**https://www.netacad.com/courses/networking-essentials?courseLang=en-US (https://www.netacad.com/courses/networking-essentials?courseLang=en-US)**).
- Take screenshot(s) of course completion/grade page.
- Obtain digital badge on **Credly (https://www.credly.com/users/sign_in)** and include screenshot + direct badge link in the assignment report. Also include **LinkedIn (https://www.linkedin.com/)** screenshot if you added the badge.
- In your reflection: provide module-by-module, summary (one paragraph each), experiments done and key takeaways.

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10. Task 7 — Agreement & Commitment Plan (template)

Add a signed (typed name is acceptable) agreement including these points:

Template (students must adapt):

- I, **[Full Name — StudentID]**, commit to attend classes, participate actively, follow instructor directions, and complete assignments on time.
- I will maintain academic integrity: submit original work, cite sources, and avoid plagiarism.
- I will not perform network scanning or packet capture on networks where I am not authorized.

- I will avoid distractions in class (phone on silent, minimize unrelated browsing).
- I understand consequences for violations (grade penalties, academic review) and accept them.

Include a typed signature/date at the end.

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11. Task 8 — Comprehensive Report & Screenshots (formatting guidance)

- Use clear headings for each task. Use numbered lists and bullets. Keep text readable (font ≥11, 1.15 line spacing).
- **Screenshots:** crop to relevant areas, add a short caption describing the image and date/time. Embed images near the relevant text.
- **References:** list at least 4 credible sources (textbook, vendor docs, NetAcad pages, official docs). Use simple citation format (Author — Title — Year or Link).
- **File size:** keep PDF under 25 MB if possible. Compress images if necessary.

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12. Academic integrity & similarity rules (must read)

- Submissions with **>20% similarity** will be reviewed and may lead to sanctions. Cite all sources. Paraphrase rather than copy large blocks.
- You must **not** share or publish unauthorized software images or proprietary material.
- Do not capture traffic or perform intrusive scans on networks without explicit permission.

Final reminders

- Follow the deadline **14 Sept 2025 — 05:00 A.M.** exactly. Late uploads will not be accepted.

- Keep a copy of your submission and all screenshots.
- Maintain academic integrity: cite sources and paraphrase.