

OSI Model Fundamentals

Lesson plan · Objective N-1.1 · 50 minutes

Objective: students will name the 7 layers of the OSI model (Open Systems Interconnection) in order, identify the protocol data unit (PDU) at each layer, match common devices and protocols to their layers, and apply the model as a troubleshooting checklist.

1. Bell ringer (5 min)

Review of A+ networking fundamentals. Write the answers in your notebook before the bell rings.

1. What is the difference between TCP (Transmission Control Protocol) and UDP (User Datagram Protocol) at a high level?
2. An IP (Internet Protocol) address identifies what?
3. True or false: a switch and a router do the same job.

Teacher answers

1) TCP is reliable and connection-oriented (3-way handshake, retransmits lost data). UDP is fast and connectionless (fires and forgets, used for video calls and DNS). 2) A device on a network. 3) False. Switches forward by MAC (media access control) address inside one network. Routers forward by IP address between networks.

2. Quick facts

Domain	1.0 Networking Fundamentals
Objective	N-1.1 Compare and contrast the OSI model layers
Duration	50 minutes (one class period)
Audience	HS CTE (Career and Technical Education) students or community college IT majors with A+ background
Prereqs	A+ Core 1 L2.1 Networking Basics, L2.5 Networking Hardware. Knows what an IP address, MAC address, and port number are.

3. Learning outcomes

By the end of class, students can:

- Name the 7 OSI layers in order, top to bottom and bottom to top.
- Match the PDU (protocol data unit) at each layer: bits, frame, packet, segment or datagram, data.
- Identify which device or protocol operates at which layer (switch at Layer 2, router at Layer 3, etc.).
- Use the OSI model as a checklist to troubleshoot a help-desk ticket.

4. Career connection

Why this matters in the real world

The OSI model is the shared vocabulary every network team uses. A Tier 2 NOC technician (Tier 2 means second-line, NOC means network operations center) opens a ticket and immediately asks "what layer is broken?" Cable unplugged is Layer 1. Switch port misconfigured is Layer 2. Wrong subnet is Layer 3. Web app down is Layer 7. Once you know the layer, you know which tool to grab and which team to escalate to. Students who memorize the 7 layers cold can troubleshoot like a senior tech on day one of a networking job.

5. NICE Framework + CTE (Career and Technical Education) alignment

NICE Framework

OM-NET (Network Operations), OM-STS (System Administration)

CTE Cluster

Information Technology · Network Systems pathway

CompTIA

Network+ N10-009 Objective 1.1

Cross-cert

Foundation for Security+, CCNA, and any vendor networking cert

6. Materials

- Slide deck (slide-deck.pptx, 25 slides).
- Student handout (1 page, embedded at end of this plan).
- Assignment 1: Layer Matching worksheet.
- Assignment 2: The Help Desk Ticket (guided real-world scenario).
- Whiteboard or projector for the 7-layer diagram.
- Optional: paper "packet" props for the encapsulation extension activity.

7. 50-minute pacing block

Time

Block

What happens

0:00-0:05	Bell ringer	Students answer 3 review questions on TCP, UDP, IP, switches, routers from A+ Core 1. Teacher previews the OSI model.
0:05-0:25	Lecture	Walk through all 7 OSI layers using slides 6-12. For each layer: name, PDU, common protocols, one device or example. Use the "Please Do Not Throw Sausage Pizza Away" mnemonic on slide 20.
0:25-0:40	Guided practice	Students complete Assignment 1 (Layer Matching) in pairs. Circulate. Spot-check the device-to-layer matching section. Address misconceptions live.
0:40-0:45	Exit ticket	Students answer 3 short prompts on slide 25 and turn in.
0:45-0:50	Wrap + preview	Recap the mnemonic. Preview Assignment 2 (Help Desk Ticket) as homework or next-class warm-up. Tease tomorrow: TCP/IP deep dive.

8. HS + CC dual rubric

Two scales side by side. HS uses 4-point standards-based. CC uses percentage.

Outcome	HS (4-point)	CC (%)
Names all 7 layers in order	4 = exact order, 3 = one slip, 2 = two slips, 1 = three+ slips	90+ = exact, 80 = 6/7 correct, 70 = 5/7, below = reteach
Matches PDUs to layers	4 = all 5 PDUs correct, 3 = one error, 2 = two errors, 1 = three+ errors	90+ all correct, 80 = 4/5, 70 = 3/5
Matches devices to layers	4 = all 7 devices, 3 = one error, 2 = two errors, 1 = three+ errors	90+ all 7, 80 = 6/7, 70 = 5/7
Troubleshoots using OSI	4 = picks right layer + explains, 3 = right layer no reason, 2 = wrong layer right reason, 1 = neither	90+ both, 80 = layer only, 70 = reasoning only

9. Teacher notes: common misconceptions

- Confusing PDUs across layers. Students mix up "packet" and "frame." Drill the PDU stack: bits at Layer 1, frame at Layer 2, packet at Layer 3, segment (TCP) or datagram (UDP) at Layer 4, data at Layers 5-7.
- Mixing OSI with TCP/IP. The TCP/IP model has 4 layers, not 7. They are different. Walk through the comparison on slide 14.
- Thinking Layer 1 = WiFi only. Layer 1 is anything physical: copper Ethernet cable, fiber optic, radio waves, satellite link, even sound (acoustic modems). The cable itself is Layer 1.
- Putting routers at Layer 2 or switches at Layer 3. A standard switch is Layer 2 (forwards by MAC address). A standard router is Layer 3 (forwards by IP address). Multi-layer switches blur this, but for Net+ test purposes, stick to switch=L2, router=L3.
- Treating OSI as something only test-takers care about. Reinforce that real network teams reference the layers in every ticket and every escalation. The vocabulary is the value.

10. Sub-plan reference

A school-agnostic substitute plan is included as a separate file: sub-plan.docx. Print and leave on the desk alongside the printed roster. The sub plan keeps students on track with self-directed work that does not require hands-on lab equipment.

11. Student handout (1 page)

Print 1 per student. This is their reference for the rest of Domain 1.

OSI MODEL • ONE-PAGE REFERENCE

Layer	Name	PDU	Common protocols	Example device or use
7	Application	Data	HTTP, HTTPS, FTP, SMTP, DNS	Web browser, email client
6	Presentation	Data	TLS (Transport Layer Security), SSL, JPEG, ASCII	HTTPS encryption, image format
5	Session	Data	NetBIOS, RPC	Login session, voice call setup
4	Transport	Segment (TCP) / Datagram (UDP)	TCP, UDP	Port 443 (HTTPS), Port 53 (DNS)
3	Network	Packet	IP, ICMP (Internet Control Message Protocol)	Router, firewall (L3 mode)
2	Data Link	Frame	Ethernet, ARP (Address Resolution Protocol)	Switch, NIC (network interface card)
1	Physical	Bits	(none)	Cable, fiber, radio

Mnemonic for the 7 layers (bottom to top)

Please Do Not Throw Sausage Pizza Away. P=Physical, D=Data Link, N=Network, T=Transport, S=Session, P=Presentation, A=Application. Layer 1 is the cable. Layer 7 is the app.

Troubleshooting tip

When something breaks, start at Layer 1 (cable, power, link light) and work up. Most problems are at Layer 1, 2, or 3. If those are fine, then check Layer 4 (ports, firewall) and Layer 7 (the app itself).

Pacing extensions

Use these when class time stretches to 75 or 90 minutes, when running this lesson over multiple periods, or for HS CTE year-long programs that move at a slower pace. Each extension reinforces the same N-1.1 objective in a deeper way.

Extension A: Paper packet encapsulation lab (30-45 min)

Students physically build a packet using folded paper and sticky notes. Each "header" is a different colored note. They start at Layer 7 with a message ("hello"), then add a Layer 4 TCP header, then a Layer 3 IP header, then a Layer 2 Ethernet header, then "transmit" by walking the packet across the room. The receiver peels off each header in reverse order. Concrete, kinesthetic, and unforgettable.

Materials: sticky notes in 4 colors, paper, markers. Total cost under \$5 per class.

Extension B: Wireshark intro lab (45-60 min)

Install Wireshark on student laptops. Capture 30 seconds of normal web traffic. Students identify which OSI layer each captured field belongs to. The Wireshark UI literally maps to the OSI layers (frame, then IP packet, then TCP segment, then HTTP (Hypertext Transfer Protocol) data), which makes the abstract model click.

Note: confirm Wireshark is allowed on the school network before running. May need IT approval.

Extension C: OSI Socratic seminar (40 min)

Split the class into 7 groups, one per layer. Each group becomes the "expert" on their layer. They prepare a 2-minute case: what they do, why the network would fail without them, and one real-world example. Run a panel where each group defends their layer against challenge questions from the others. Builds depth and vocabulary fluency at the same time.

Extension D: OSI vs TCP/IP project (1 week, take-home)

Students produce a side-by-side infographic comparing OSI (7 layers) and TCP/IP (4 layers). They must show where layers map, where they differ, and which model is used more often in industry today. Pairs well with a 1-page written reflection on why both models still get taught.