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KEYNOTE SPEAKER

Dane Adams
Arista Networks Solutions Inc.

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THE OSI MODEL

Seven Layers, One Conversation

The Open Systems Interconnection model splits networking into seven stacked layers. Each layer does one job, talks only to its neighbors, and hands a tidy package up or down the stack — so a browser click can become signals on a wire and back again.

L7	**Application**	Network services for the user	PDU **Data**
L6	**Presentation**	Translate, encrypt & compress	PDU **Data**
L5	**Session**	Open, manage & close dialogues	PDU **Data**
L4	**Transport**	End-to-end delivery & reliability	PDU **Segments**
L3	**Network**	Logical addressing & routing	PDU **Packets**
L2	**Data Link**	Frame & address on the local link	PDU **Frames**
L1	**Physical**	Move raw bits over a medium	PDU **Bits**

Remember it: *All People Seem To Need Data Processing* (Layer 7 → 1)

LAYER 1 · PDU: BITS

Physical

L1

Transmits raw, unstructured bits as electrical, optical, or radio signals across a physical medium.

Signaling — Encodes 1s and 0s into voltages, light pulses, or radio waves (line coding, modulation).

Hardware spec — Defines cables, connectors, pinouts, voltage levels, and timing.

Transmission — Sets data rate, simplex/duplex mode, and physical topology.

THE STACK

- L7 Application
- L6 Presentation
- L5 Session
- L4 Transport
- L3 Network
- L2 Data Link
- **L1 Physical**

KEY PROTOCOLS & HARDWARE

Ethernet PHY · Fiber · USB · Bluetooth radio · DSL · RJ45 · Hubs · Repeaters

FOUNDATION

The bedrock. There is no layer below — everything in the stack ultimately depends on these signals physically moving.

LAYER 2 · PDU: FRAMES

Data Link

L2

Groups bits into frames and delivers them node-to-node across a single link, using local (MAC) addresses and error checks.

- **Framing** — Marks where each frame starts and ends in the bit stream.
- **MAC addressing** — Identifies devices on the same link by hardware (MAC) address.
- **Error & access control** — FCS/CRC catches corrupted frames; decides who may transmit (CSMA/CD, CSMA/CA).

THE STACK

- L7 Application
- L6 Presentation
- L5 Session
- L4 Transport
- L3 Network
- **L2 Data Link**
- L1 Physical

KEY PROTOCOLS & HARDWARE

Ethernet (MAC) · Wi-Fi 802.11 · PPP · Switches · NICs · VLANs · ARP

BUILDS ON L1 · PHYSICAL

Takes the raw, meaningless bit stream from Physical and organizes it into addressable, error-checked frames a device can act on.

LAYER 3 · PDU: PACKETS

Network

L3

Moves packets between hosts across multiple interconnected networks using logical addressing and routing.

- **Logical addressing** — Assigns IP addresses independent of hardware so any host is reachable.
- **Routing** — Chooses a path and forwards packets hop-by-hop between networks.
- **Best-effort delivery** — Connectionless; handles fragmentation, but makes no reliability promises.

THE STACK

- L7 Application
- L6 Presentation
- L5 Session
- L4 Transport
- **L3 Network**
- L2 Data Link
- L1 Physical

KEY PROTOCOLS & HARDWARE

IPv4 / IPv6 · ICMP · Routers · OSPF · BGP · IPsec · NAT

BUILDS ON L2 · DATA LINK

Data Link only reaches one local link. Network stitches many links together and routes data beyond the LAN to remote networks worldwide.

LAYER 4 · PDU: SEGMENTS

Transport

L4

Provides end-to-end delivery between applications: segmentation, port-based multiplexing, and optional reliability.

Segmentation	Breaks the data stream into segments and reassembles them in order.
Ports	Multiplexes traffic to the correct application via port numbers (80, 443, 53).
Reliability vs. speed	TCP adds acks, retransmission, flow & congestion control; UDP stays lean and fast.

THE STACK

- L7 Application
- L6 Presentation
- L5 Session
- **L4 Transport**
- L3 Network
- L2 Data Link
- L1 Physical

KEY PROTOCOLS & HARDWARE

TCP · UDP · QUIC · Port numbers · Sequence / ACK · Three-way handshake

BUILDS ON L3 · NETWORK

Network gets packets to the right host; Transport gets them to the right program on that host — and, with TCP, in order and intact.

LAYER 5 · PDU: DATA

Session

L5

Establishes, maintains, synchronizes, and gracefully tears down ongoing conversations (sessions) between applications.

- **Session lifecycle** — Opens, manages, and cleanly closes the dialogue between two endpoints.
- **Dialog control** — Coordinates who sends when (full / half duplex at the application level).
- **Synchronization** — Inserts checkpoints so a long transfer can resume after an interruption.

THE STACK

- L7 Application
- L6 Presentation
- **L5 Session**
- L4 Transport
- L3 Network
- L2 Data Link
- L1 Physical

KEY PROTOCOLS & HARDWARE

RPC · NetBIOS · PPTP · SIP (control) · Session tokens · SQL sessions

BUILDS ON L4 · TRANSPORT

On top of Transport's reliable pipe, it adds structure — a named, resumable conversation rather than a raw, anonymous byte stream.

LAYER 6 · PDU: DATA

Presentation

L6

Translates data between application and network formats — handling encoding, encryption, and compression.

Translation — Converts between character sets and data formats (ASCII, Unicode, JPEG, PNG, MPEG).

Encryption — Encrypts and decrypts the payload — TLS/SSL lives here.

Compression — Shrinks data to use less bandwidth before it travels.

THE STACK

- L7 Application
- **L6 Presentation**
- L5 Session
- L4 Transport
- L3 Network
- L2 Data Link
- L1 Physical

KEY PROTOCOLS & HARDWARE

TLS / SSL · ASCII · Unicode · JPEG · PNG · GIF · MPEG · Serialization

BUILDS ON L5 · SESSION

Inside the session, it guarantees both ends read the bytes the same way — same encoding, decrypted correctly, decompressed properly.

LAYER 7 · PDU: DATA

Application

L7

The layer closest to the user — the protocols and interfaces that applications use to reach network services.

- **Service protocols** — Speaks the language apps need: HTTP, SMTP, DNS, FTP, and more.
- **Requests & responses** — Defines methods, status codes, and resource identifiers (URLs).
- **User-facing access** — Surfaces the network to browsers, mail clients, and apps people actually use.

THE STACK

- L7 Application
- L6 Presentation
- L5 Session
- L4 Transport
- L3 Network
- L2 Data Link
- L1 Physical

KEY PROTOCOLS & HARDWARE

HTTP / HTTPS · DNS · SMTP · IMAP · FTP · SSH · DHCP

BUILDS ON L6 · PRESENTATION

Consumes the translated, secured data handed up from Presentation and turns it into the services and content a person sees.

PUTTING IT TOGETHER

OSI in a Packet Capture

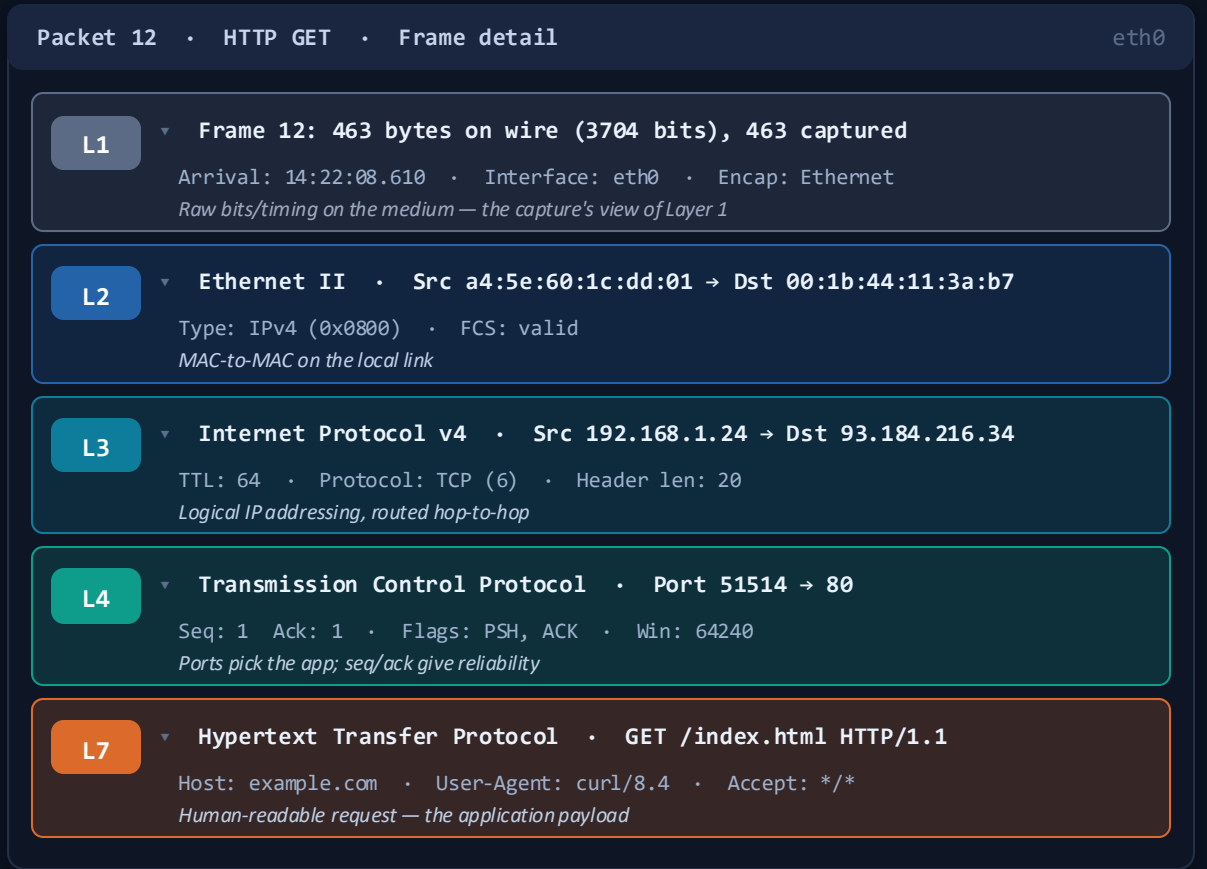
Open one HTTP request in Wireshark and the layers are literally stacked in the packet-detail pane. Expand a packet and you read the OSI model top-to-bottom — each protocol is one layer wrapping the one above it.

ENCAPSULATION

As data goes down the stack each layer adds its own header (and L2 a trailer) around the payload above it. The receiver peels them off in reverse.

WHERE ARE LAYERS 5 & 6?

The TCP/IP stack folds Session and Presentation into the application. They have no separate row here. Over HTTPS, a TLS record sits between TCP and HTTP — that encrypted layer is your real-world Layer 6.



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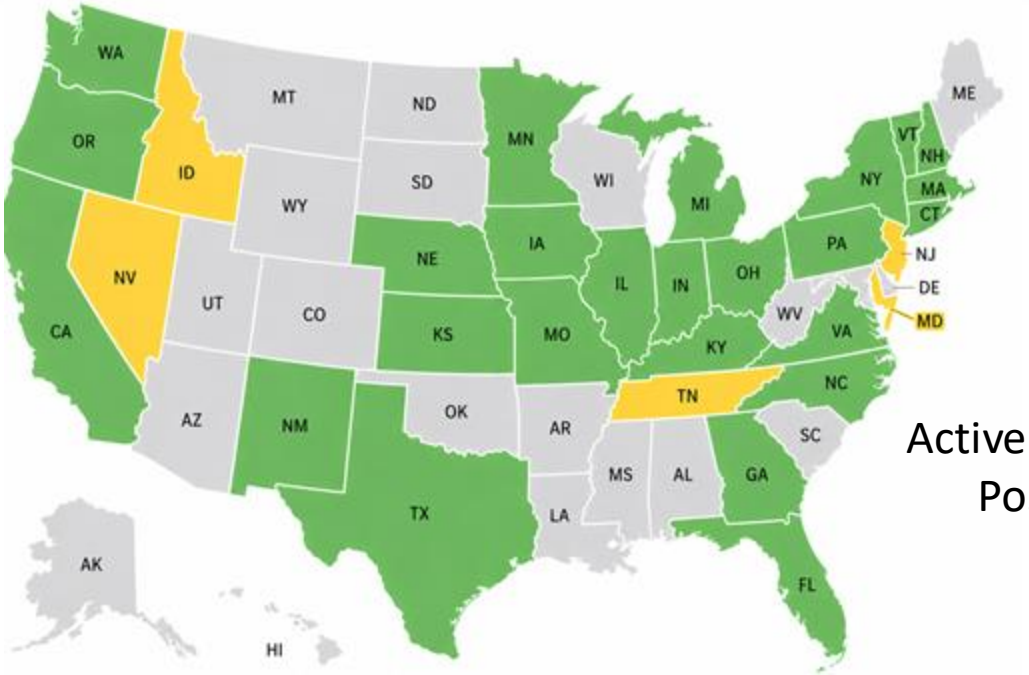

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Open Forum on Emerging Networking Trends & Innovations

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