OSI Model for Dummies WordPress Example

By Laura Magee

Meet Joe

This is Joe. Let's see how he connects to WordPress to publish a blog!
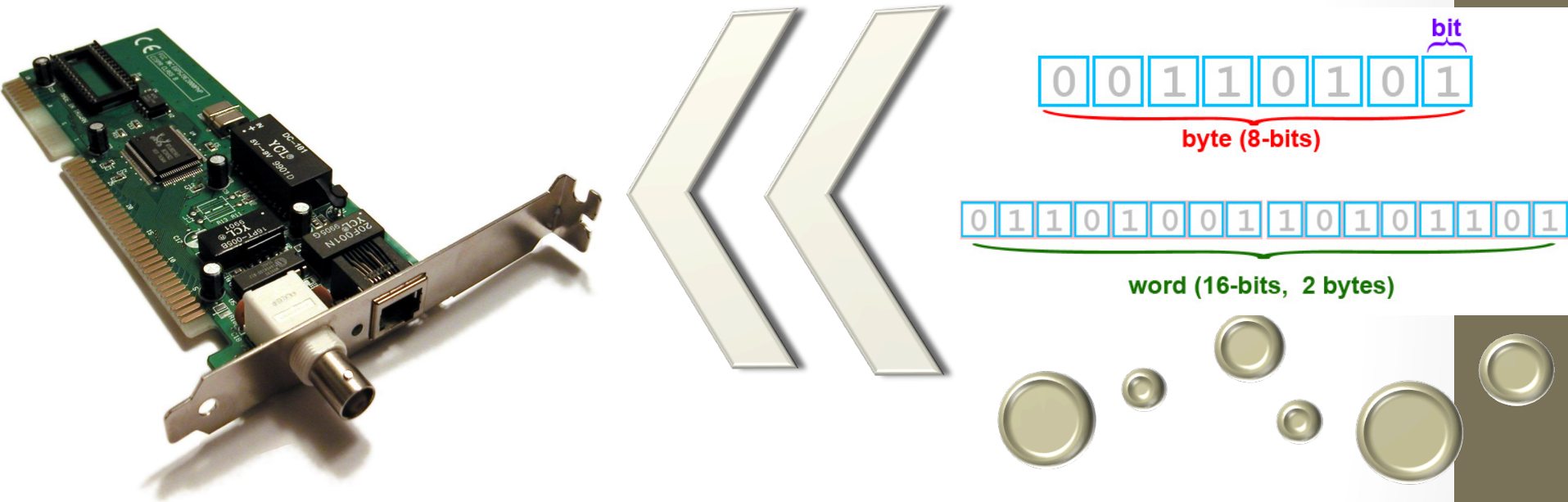
First let's start with Joe's device, a laptop connected wirelessly.

That's easy, right?

1. The Physical Layer Wires and Hardware

bit

0 0 1 1 0 1 0 1

byte (8-bits)

0 1 1 0 1 0 0 1 1 0 1 0 1 1 0 1

word (16-bits, 2 bytes)

Joe's laptop has a Network Interface Card, a circuit board. This constantly listens for a **binary signal**.

Joe is connected wirelessly, so the 0's and 1's are **communicated through radio waves** in this case, but they can also be relayed by **light** (fiber-optics**)** or **electricity** (copper wire).

2. Data Link Layer Intranet and MAC addressing
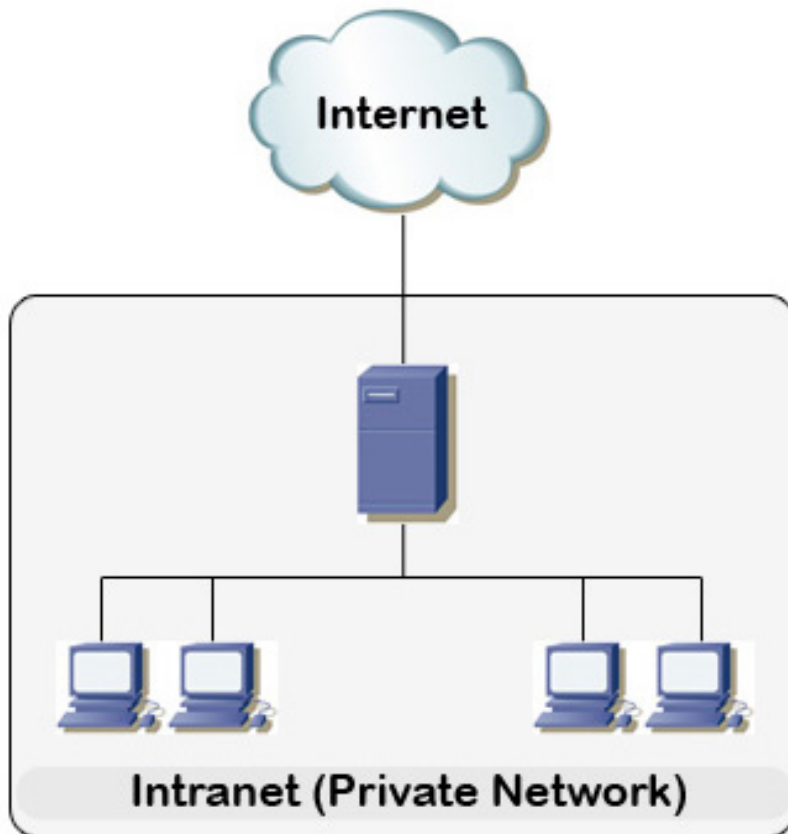
Joe's laptop can connect to another computer on his **local network (intranet)**, but that won't do! He's gotta update that blog!

Joe needs to go outside of his network with a router to reach the WordPress Server.

BUT HOW?

2. Data Link Layer

Joe's Network Interface Card is connected to a Hub, Switch, or Bridge

- **A Hub** works as a repeater, copying the data it receives and passing along to *all* connected computers on all of its ports.

- A **Switch** is more intelligent than a hub, which can pass data along to *individua*l devices on the local network, allowing for better performance.

- **A Bridge** is used to *segment* a larger network or *connect* separate networks, increasing the overall network performance.

Joe uses one of these to connect to his router.

2. Data Link/3. Network Layer

Switches and Bridges use MAC addresses. MAC addresses are assigned by the computer manufacturer and unique to the individual device. MAC addresses are not flexible, so we need another protocol to identify computers that belong to the same network.
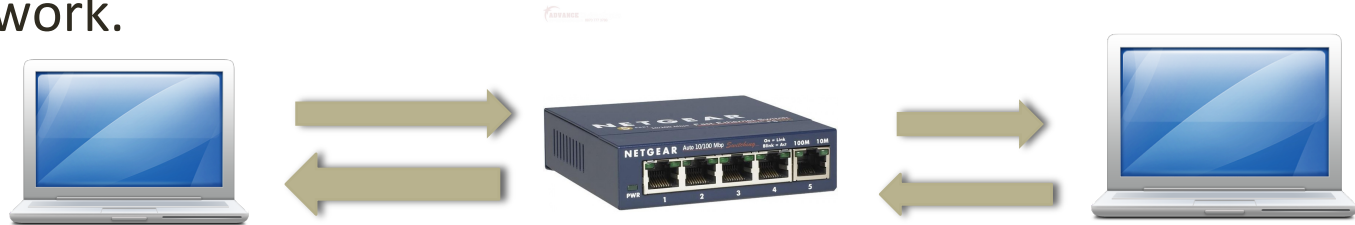
Welcome to the Intranet

Joe will need the IP address of the WordPress website to connect, and he will also provide his IP address so data can be sent back to him.

It will be sent up to the Network layer with the original data, combined they become a data packet.

3. Network Layer IP Adressing and Routing

Give me IP!

Joe's IP address is assigned to him through his Internet Service Provider. Joe is accessing the internet through a LAN in Providence, which has installed their router in his home.

Joe types in www.wordpress.com. His browser checks the cache to see if he has visited this website before.

Cache only
at this stage!

If he hasn't, or if the resource record on the cache set by the domain has expired, he will connect to the DNS to retrieve the IP address of the site.

Joe's IP address and the destination IP address will be sent forward to the next OSI layer

4. Transport Layer

IP addressing alone is an unreliable method to ensure data packets will arrive at their destination. At the Transport Layer, **data will be segmented for delivery and re-assembled** using **TCP or UDP** protocols.

quality

quantity

TCP: Connection-based: Requires confirmation of arrival of data packets. This makes it a more reliable but slower method of transfer than **UDP, which is connectionless.**

Joe's request will be processed using TCP as most HTTP requests are. He wants to access an html document. If Joe were connecting to a video-streaming site, where lost data is immediately replaced, he might use the UDP protocol.

philipp mars flech

4. Transport Layer Ports

- The transport layer also adds more information to the data segments being passed up: Port information.

- 65,535 TCP Ports, 65,535 UPD Ports.

- Joe's destination Port with be Port 40, since he is trying to access a web server using HTTP. He might use Port 20 or 21 if he were transferring files using FTP.

- His port, the remote computer's, will be randomly assigned from a range of ports.

5. Session Layer

- Once Joe's device has connected to the WordPress server, the two devices will establish a **constant communication** as Joe logs into his account. Here, Joe's login and other page information may be stored as HTTP cookies.

6. Presentation Layer

- Joe's data will be encrypted to keep his connection secure. Encryption typically occurs at the Presentation Layer of the OSI. The Presentation Layer also identifies the format of data so it can be implemented properly in the Application Layer. ASCII is a popular example.

- Presentation Layer has become tremendously important with the emergence of XML. Funny, since it was being phased out as developers found ways for programs to read many different objects!

7. Application Layer

- The application layer deals with a program in relation to the network. Application layer protocols include: HTTP, FTP, SMTP, and TelNet. In Joe's case, he is using a browser and HTTP (mostly).

- Now that Joe is connected, he can make changes to the HTML document on their server. When his site sends data down to friends, the OSI steps reverse, re-assembling and stripping down the data segments that were added.
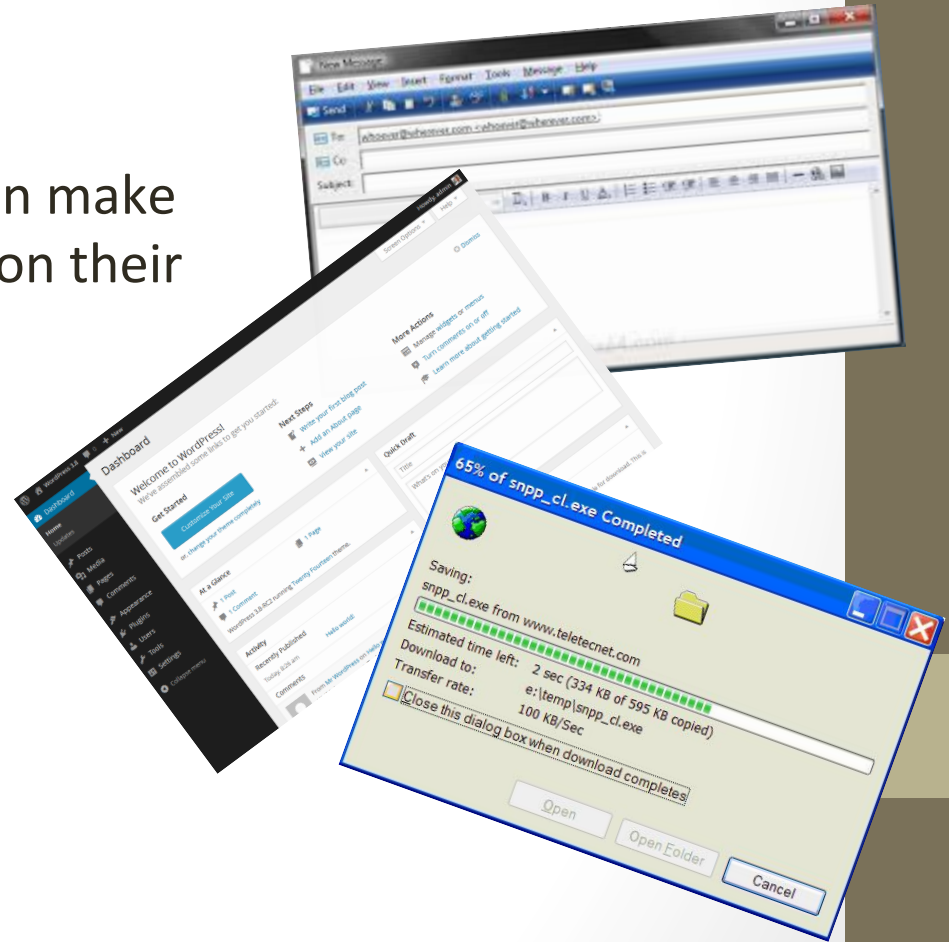
Recommended Pages

- Here's an article about a Layer 3 attack, which we can now all understand:
https://blog.cloudflare.com/the-ddos-that-knocked-spamhaus-offline-and-ho/

- If you're a visual learner, this series is fantastic. It also includes a comparison with the TC/IP model:
http://www.lynda.com/Network-tutorials/OSI-model-vs.-TCPIP-model/410333/422271-4.html

- More Physical Layer Examples:
http://www.utilizewindows.com/networking/devices/219-types-of-network-interface-cards

- In class we worked our way from level 1 to 7 of the OSI. I started watching other videos which worked backwards, from 7 to 1. It really helped to hear this breakdown:
https://www.youtube.com/watch?v=0Rb8AkTEASw