

# How it Works: 101: Naming, Addressing, Routing

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# Agenda

1

Networking  
by  
Numbers

2

Naming

3

Addressing

4

Routing

# Networking by Numbers

Layer 0 to 9 of the 7-Layer OSI Model



# Layer 0: Physical Realm

Wired  
Copper  
Fiber



VS

Wireless  
Antennas



# Layer 1 Example: Lambda on a fiber

- ◉ Wave length on a fiber pair
- ◉ Point-to-point



# Layer 2 Example: WAN Fiber Path

- How to get fiber connectivity from A to B?
  - Can't always use a single, dedicated fiber
  - Interconnect multiple Layer 1 to create a fiber path from A to B
- Speed:
  - GE, 10GE, 25GE, 40GE, 100GE,...
  - Multiples of the above

# Layer 3: Networking

- The world is NOT flat
- L2 domain == broadcast domain
- Need for topology isolation
- L3 interconnects L2 domains

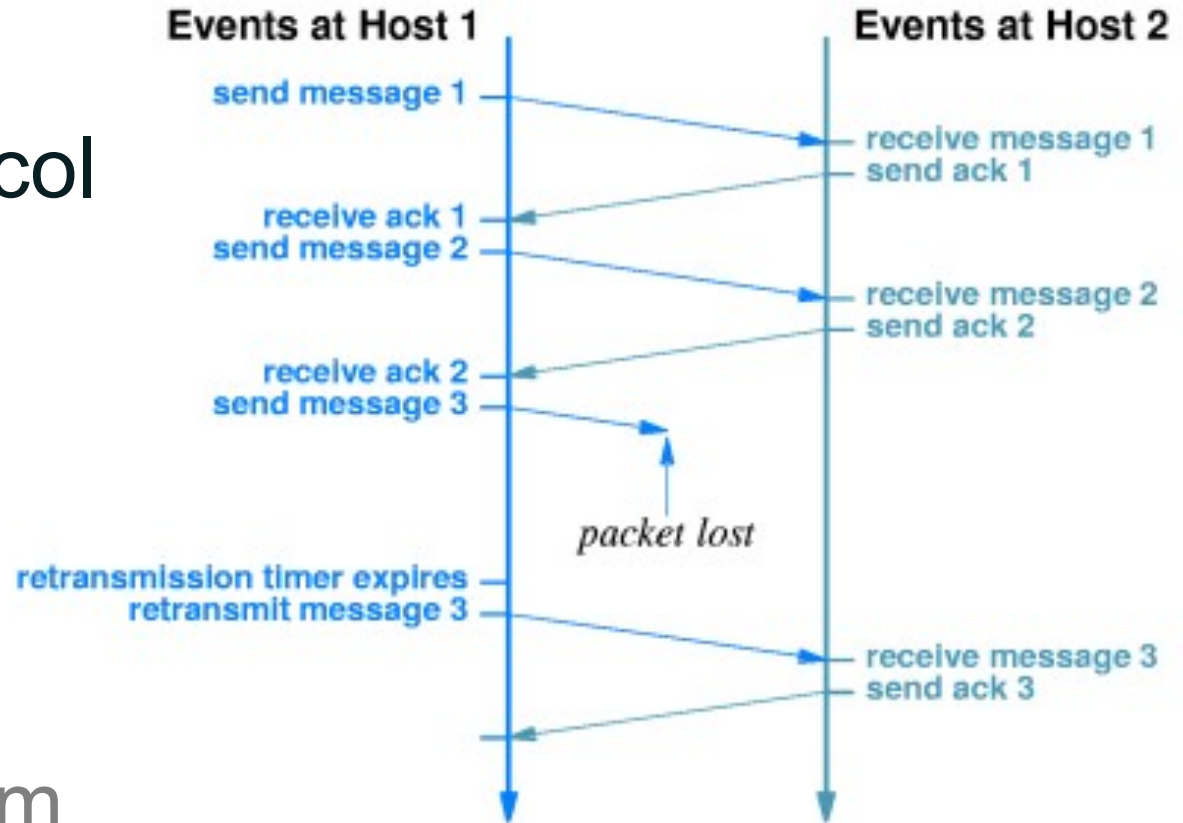
Layer 3 == IP



IP:  
Internet  
Protocol

# Layer 4: Transport

- Transmission Control Protocol (TCP)



- User Datagram Protocol (UDP)



# Layer 5: Session

- Real Time Streaming Protocol (RTSP)



# Layer 6: Presentation

- In reverse chronological order:
  - JSON
  - XML
  - ASN.1
  - "fixed width"
  - "anything goes"

```
{"menu": {  
  "id": "file",  
  "value": "File",  
  "popup": { "menuitem": [  
    {"value": "New", "onclick":  
      "CreateNewDoc()"},  
    {"value": "Open", "onclick":  
      "OpenDoc()"},  
    {"value": "Close", "onclick":  
      "CloseDoc()"} ] } } }
```

# L7: Applications



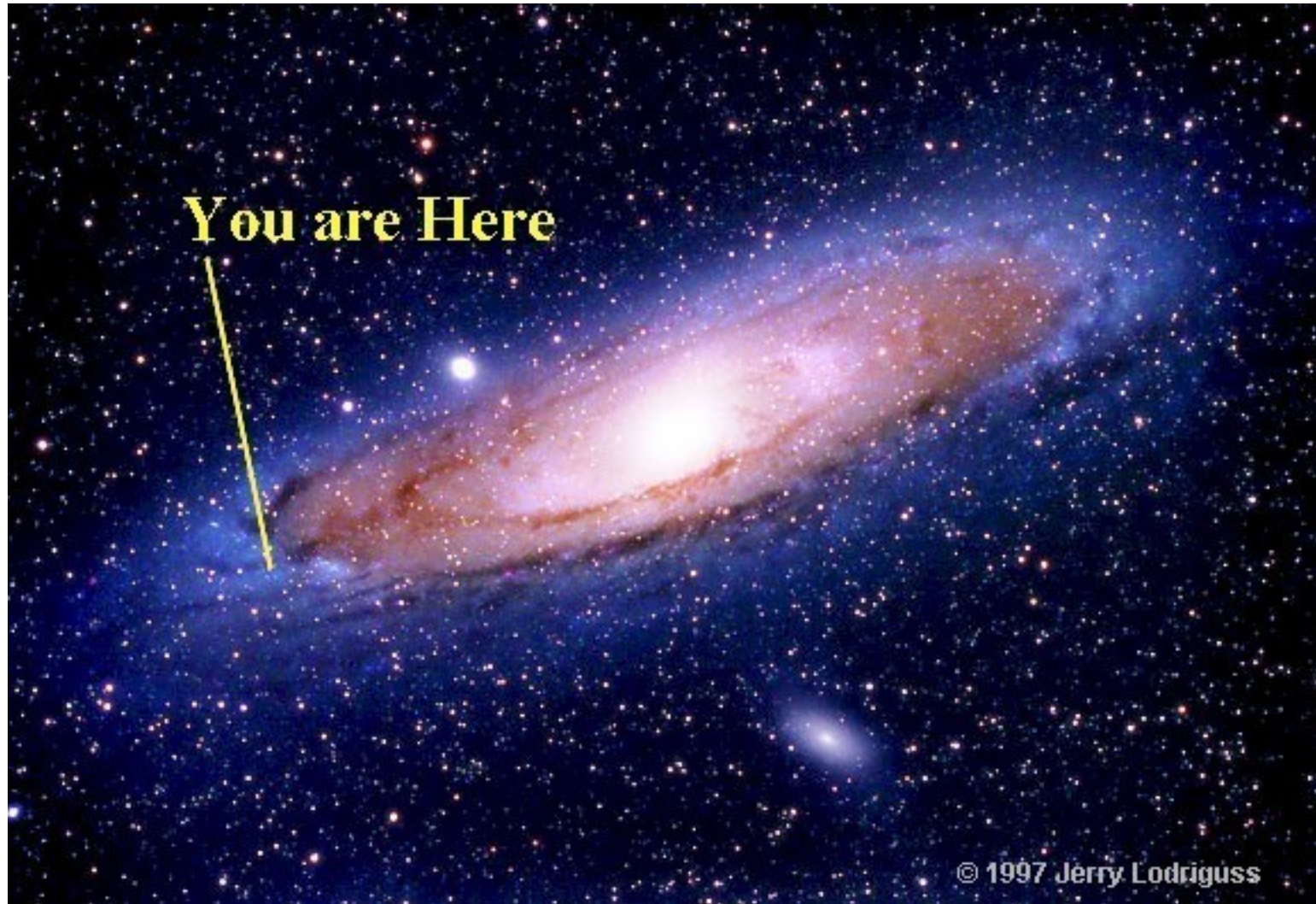
- Hypertext Transfer Protocol (HTTP)
- HTTP Secure (HTTPS)

# Layer 8: Financial





# Layer 9: Political



# Naming

“Who is your dentist?”

# What is a Name?

- Name |nām|

- Noun

- 1: A word or set of words by which a person, animal, place, or thing is known, addressed, or referred to: my name is Parsons, John Parsons | Köln is the German name for Cologne.
- 2: A famous person: as usual, the big race will lure the top names.  
[ in sing. ] a reputation, especially a good one: he set up a school that gained a name for excellence.

à If I know your name,  
I know 'who' you are

# Name as a Handle

- “A word or set of words by which a person, animal, place, or thing is known...”
  - Having a name is only meaningful when other people know about it.
  - Knowing a name enables us to relate to it
    - We can talk –to– someone, or we can talk –about– someone.
  - Names can be passed from one party to another as a referral.



Here is the name of my dentist:



# Names have Scopes

- Names need to be unique within a scope to avoid ambiguity
  - I'm the only Alain in my family
  - There were several Alains in my elementary classes, so teachers had to use a combination of first name/last name.

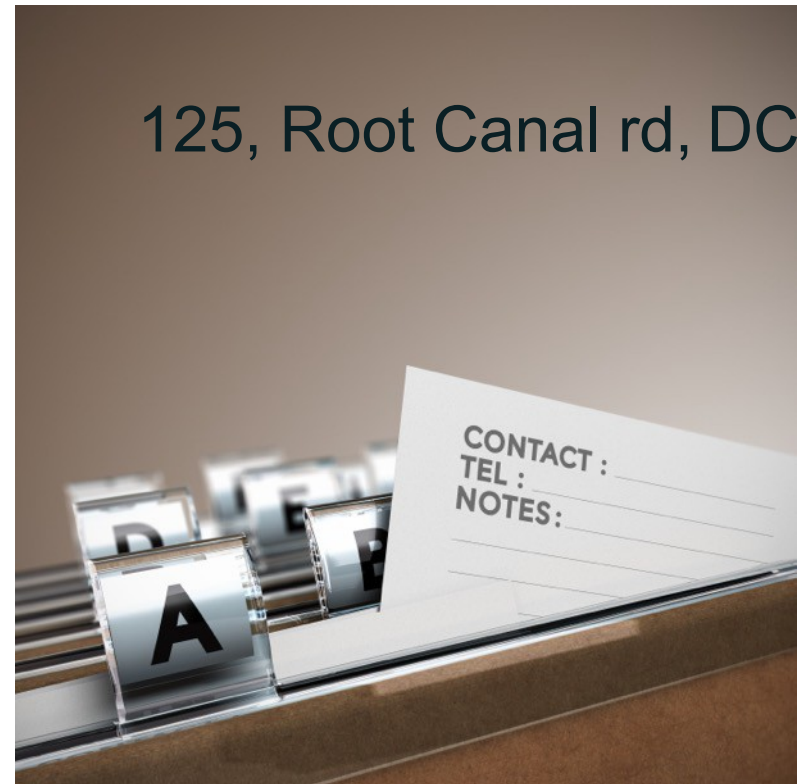
# A name is Not Enough to

## Communicate

- Ok, I have your friend's name, but what is his address?

Names must be mapped to a lower level identifier that will enable communication.

This process is called name resolution.



# Addressing

“Where is your dentist?”

# What is an Address?

- Address |əˈdres, ˈaˌdres|
  - Noun
    - The particulars of the place where someone lives or an organization is situated: they exchanged addresses and agreed to keep in touch

à If I know your address,  
I know 'where' you are.



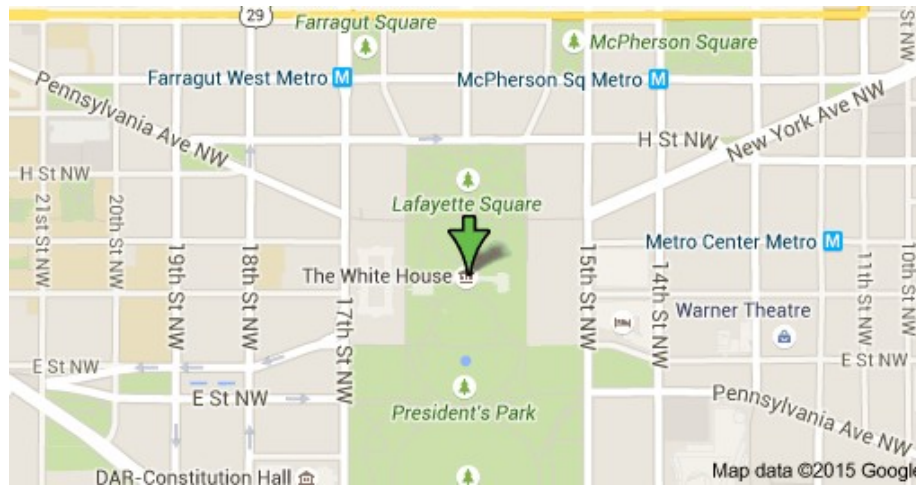
# Address Structures

- A little detour: **most famous address in DC**:  
1600 Pennsylvania Avenue NW, Washington,  
D.C. 20500-0003, USA
- Hierarchical structure:
  - USA
    - DC
      - NW
        - » Pennsylvania Avenue
          - 1600
- Not always geographically organized
  - 1-800 (toll free) telephone numbers
  - Cell phone numbers
  - **IP addresses**



# Addresses Have Scopes

- If you live in DC, all I need to tell you is:
  - 1600 Pennsylvania Avenue NW



- If you live in Europe, you know that Paris is most probably in France. If you live in the US, you have 29 cities to choose from...

# Address as a Handle

- Similar to names:
  - Addresses can be used directly
    - E.g., to send a postcard
  - Passed on to someone else as a reference

Here is the address of my dentist:  
125, Root Canal rd, DC



# An Address is Not Enough to Communicate

- You can send a postcard to 1600 Pennsylvania Avenue NW, Washington D.C. 20500 USA from anywhere in the world
- It would only arrive there because there is a postal system that will “route” the postcards through a number of mail hubs
- Now, How do I go to 125, Root Canal rd, DC?





# Routing

“How do I go to your dentist?”

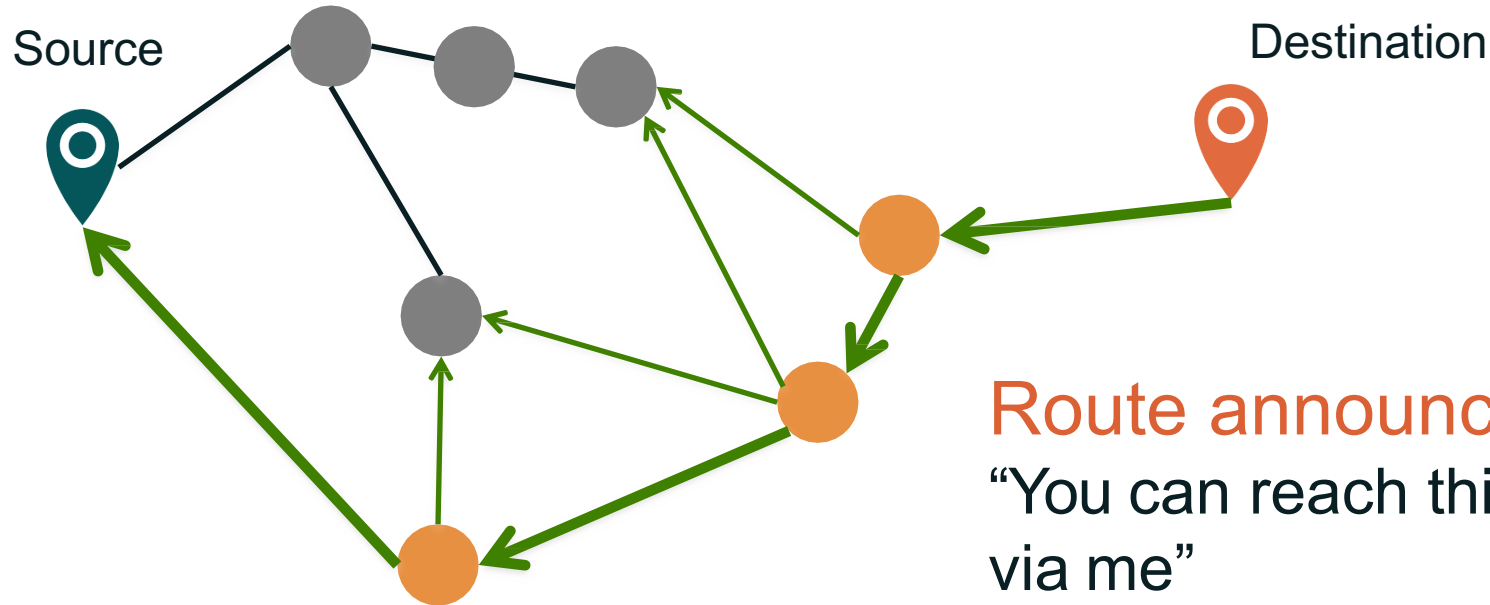
# What is a Route?

- route |rōot, rout|
  - Noun
  - A way or course taken in getting from a starting point to a destination: the most direct route is via Los Angeles

à I f I h a v e a  
route for you, I know  
where to go.

# Building Routes Before the Traffic Flows

Route announcements flow in the reverse direction from the future traffic:

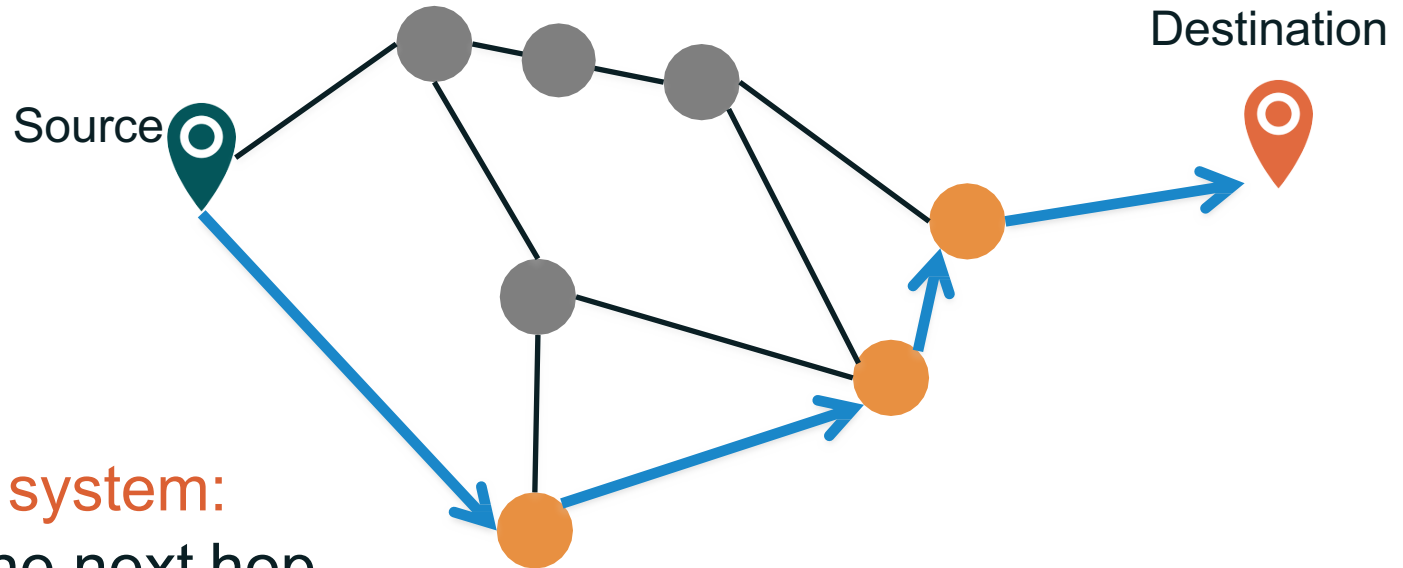


Cooperative system:  
Previous hops re-announce routes

# Sending Traffic Hop-by-Hop

Forwarding traffic happens hop-by-hop

à If I have a route for your destination, I know the “next hop” to which I can deliver the packet.



Cooperative system:

We rely on the next hop to do the “right thing”

# Conclusion

“You have arrived...”

# You Have Arrived!





# Engage with ICANN

## Thank You and Questions

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