Computer Networks Overview, Day 1

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EECS 325/425
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"Oh, oh come take my hand,
We're ridin' out tonight to case the promise land..."

Acknowledgments:
- Several slides and ideas in this slide set come from Seth Hall.

Our Scope

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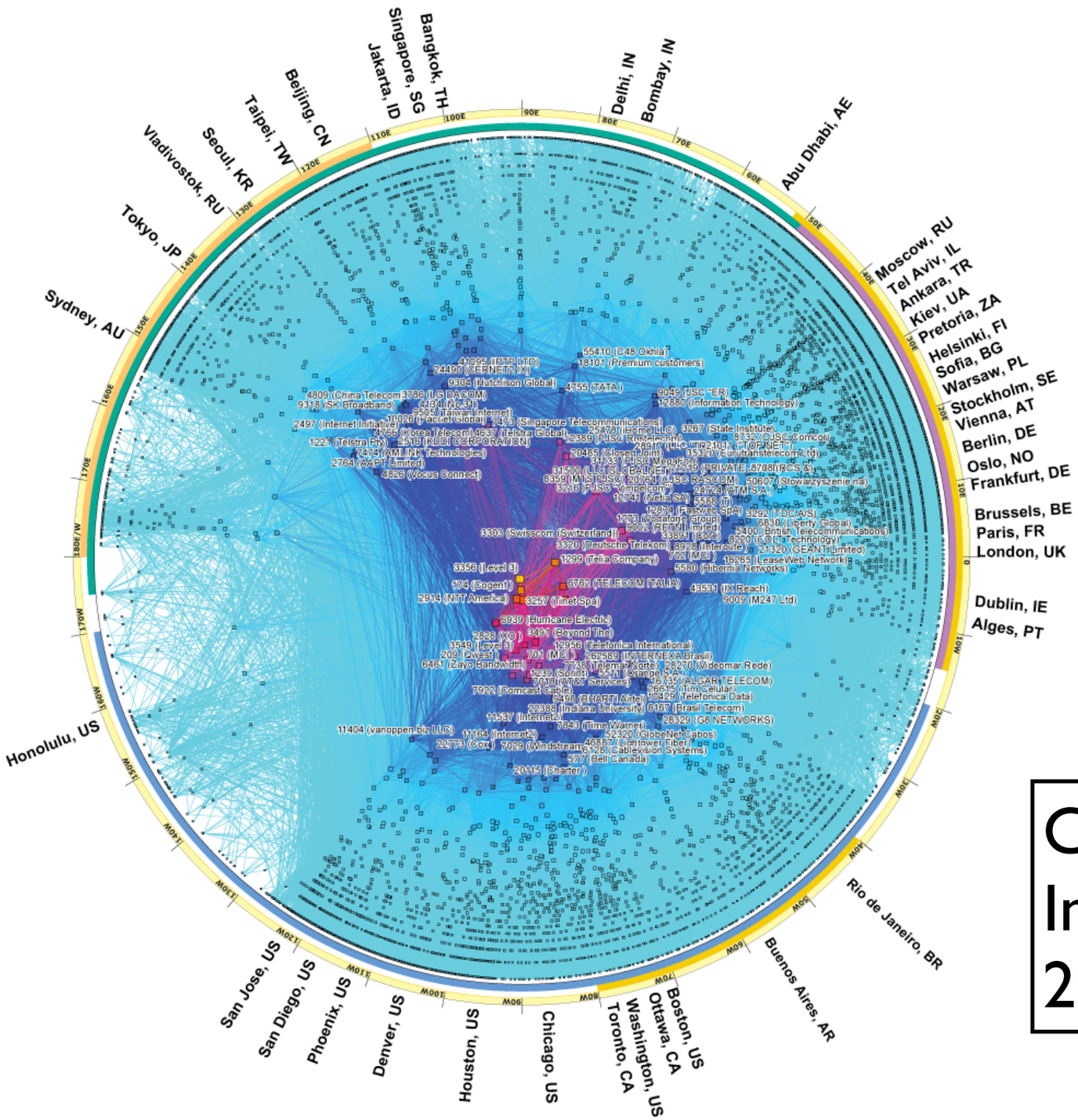
- We will mostly focus on *an artifact*: the Internet
- The Internet is not ....
  - .... the only network
  - .... the first network
  - .... some sort of perfect realization of networking theory
- The Internet is the most pervasive and successful network

What Is The Internet Anyway?!

What is the Internet?



CAIDA's IPv4 AS-level Internet Graph, February 2017

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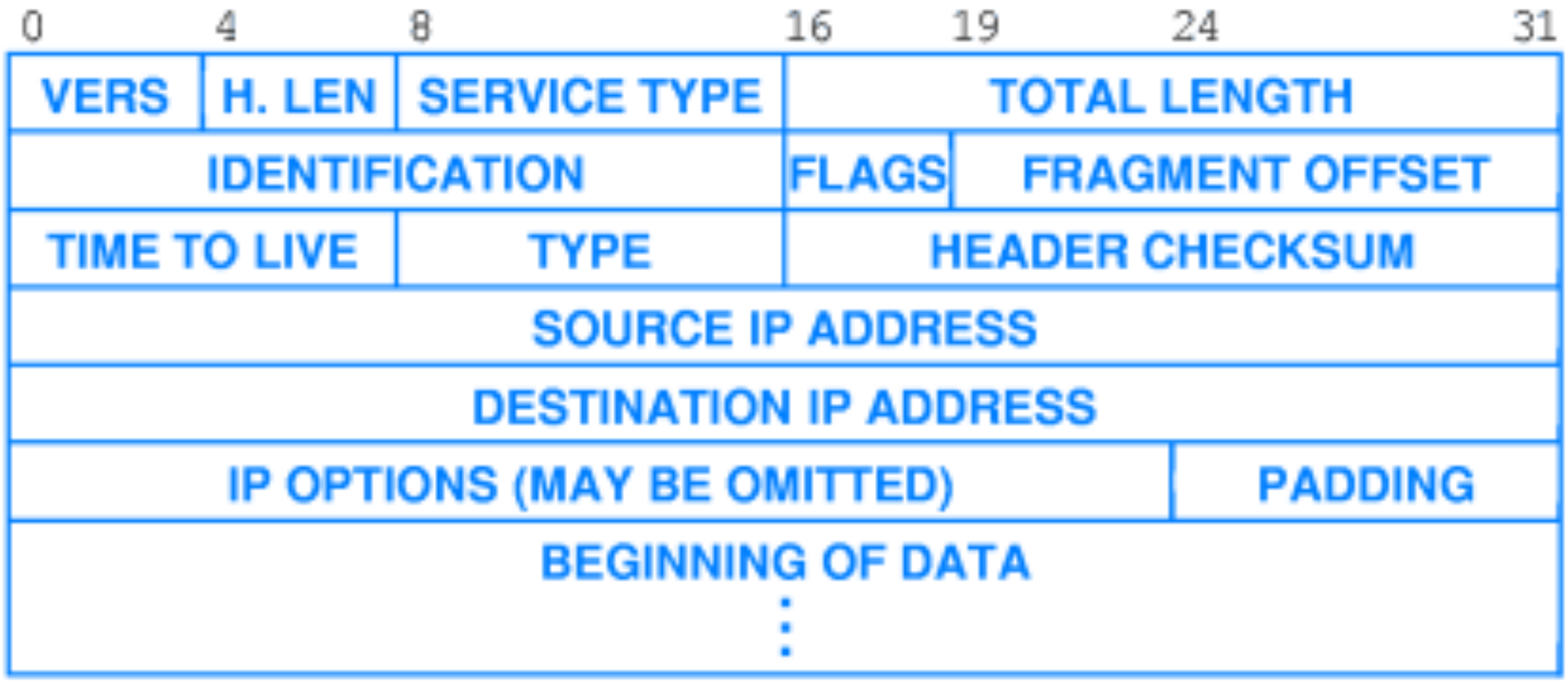

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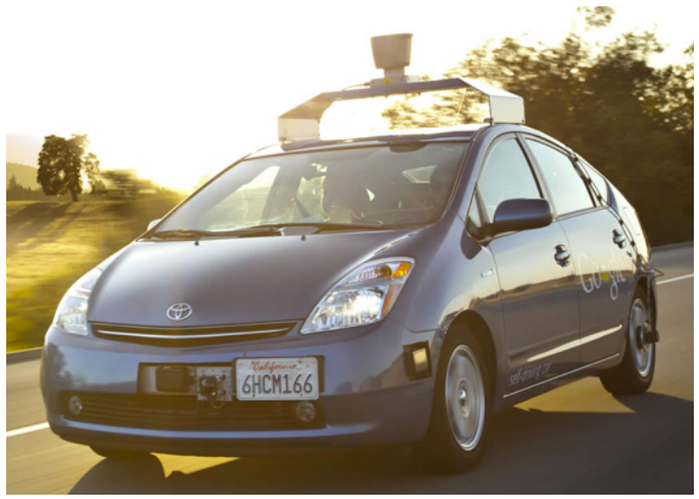

What is the Internet?

POWERDNS

APACHE

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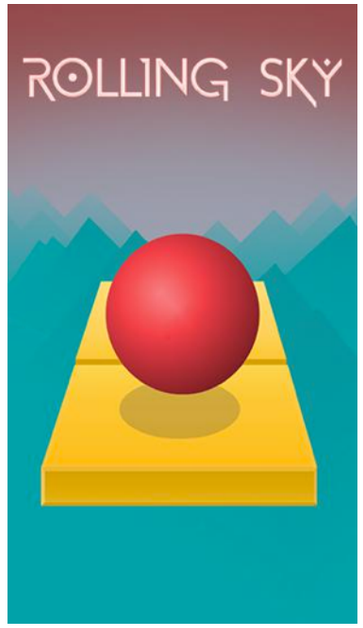

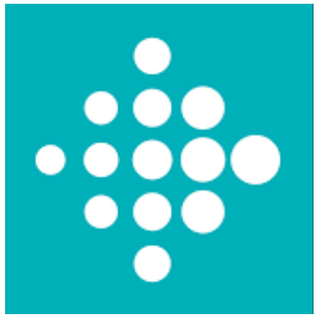

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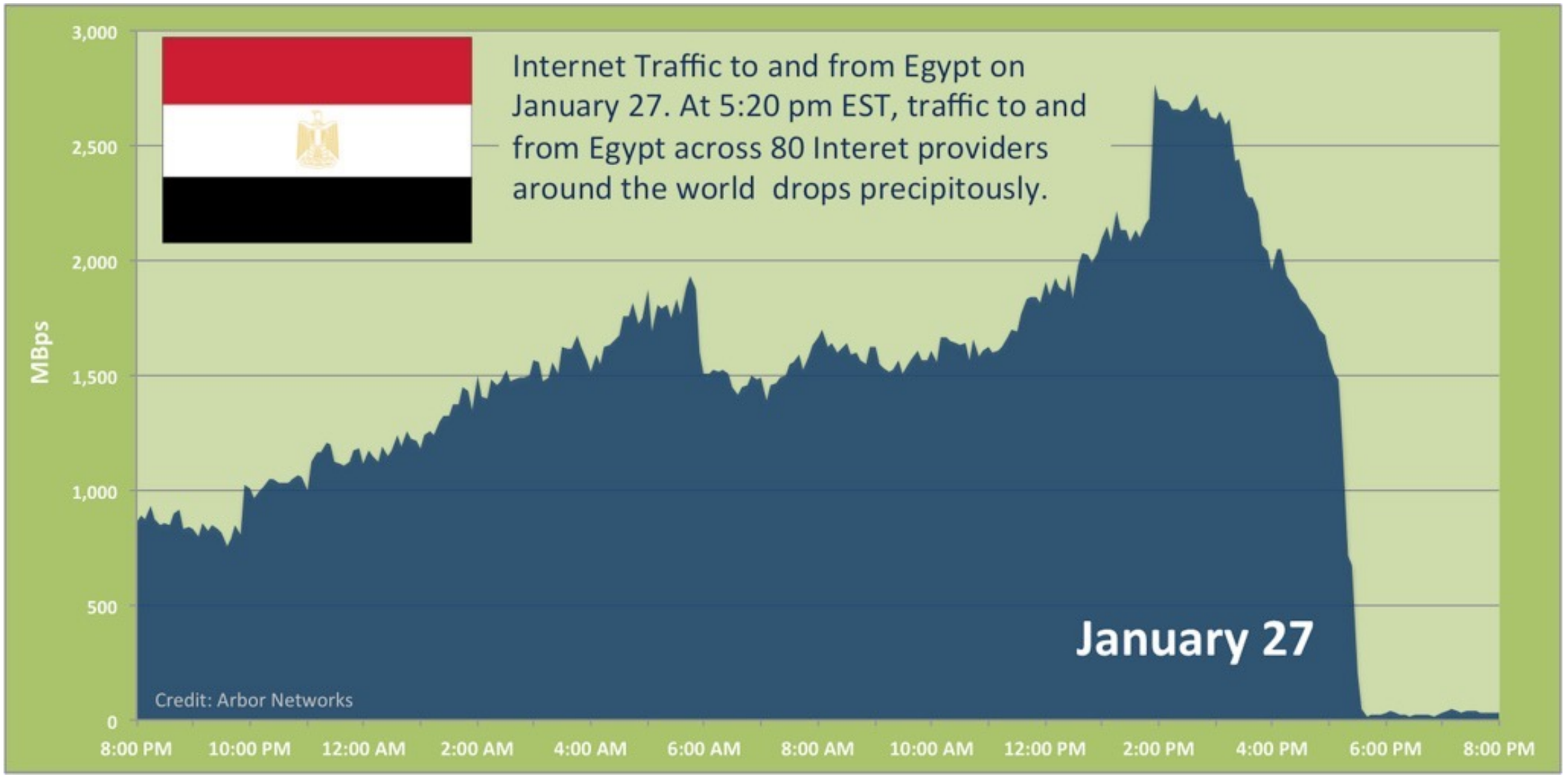

What is the Internet?

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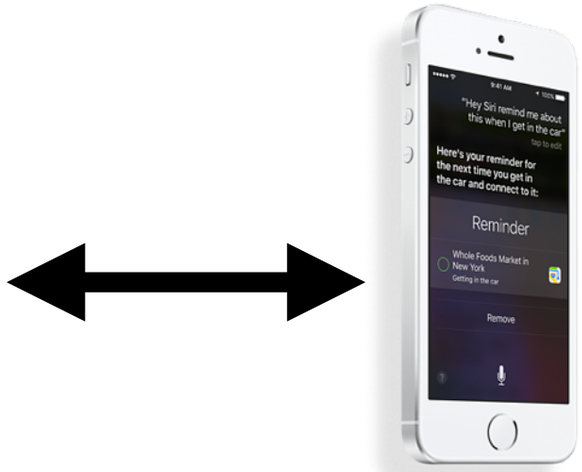

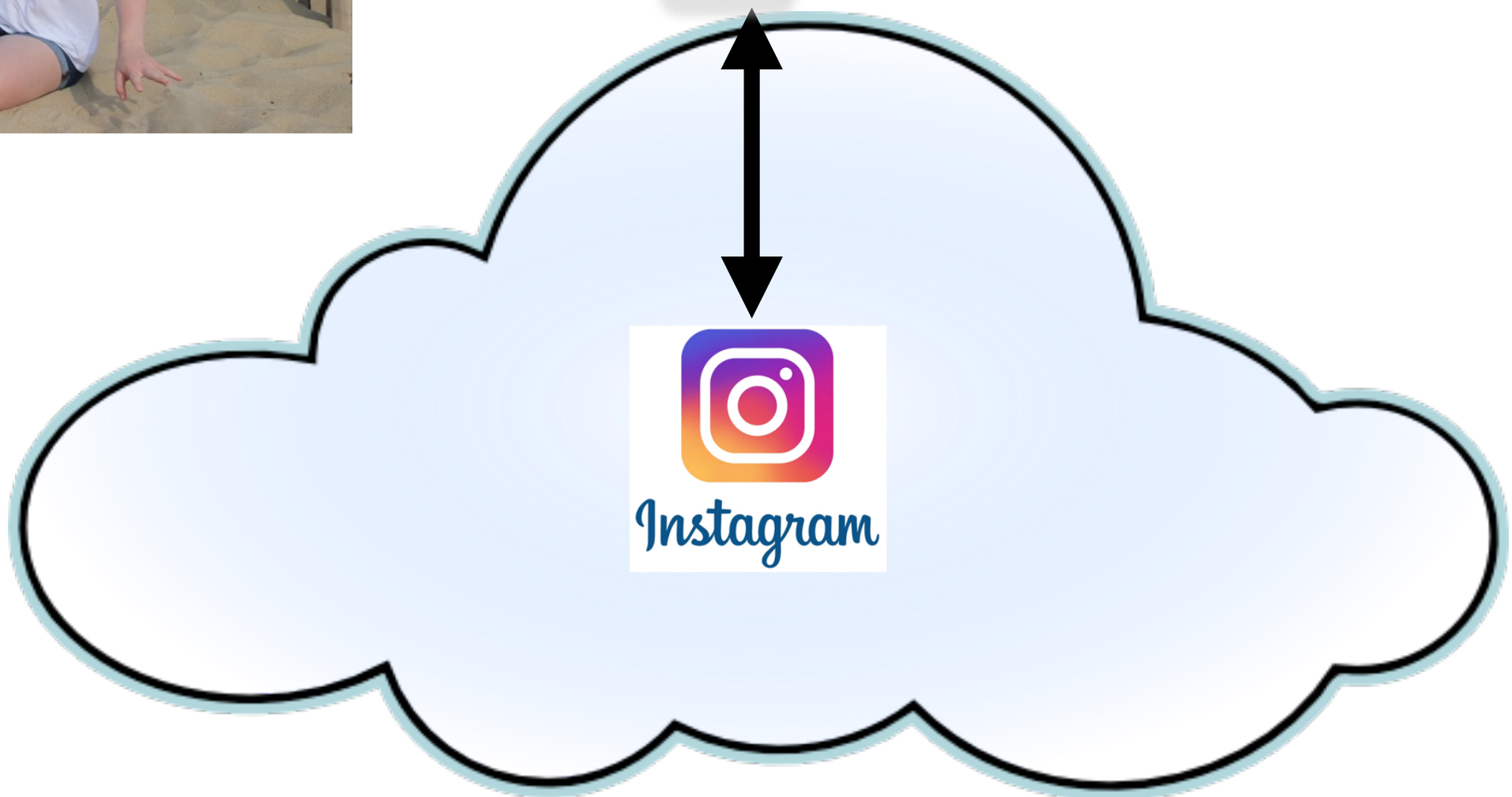

Scope Revisited

- The scope of *Internet use* is massive
- The scope of *Internet technologies* is massive
- We cannot study them all in one semester

- IP (v4 / v6)
- TCP
- DNS
- BitTorrent
- DHCP
- NAT
- End-to-end principle
- Fiber Optics
- HTTP
- Email
- UDP
- Late binding

Scope (cont.)

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    - engineering tradeoffs

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- Since we cannot cover everything we will focus on two areas.
  - *Fundamentals*:
    - key abstractions
    - design criteria
    - engineering tradeoffs
  - *Exemplars*:
    - particular (common & crucial) protocols and services
    - e.g., IP, TCP, DNS, HTTP, etc.

Scope (cont.)

- We *will not* be studying the nitty gritty of putting together of networks
  - we *will not* learn to setup a cable modem
  - we *will not* learn to configure a Cisco router
  - we *will not* learn to assign static IP addresses to your Windows box
  - we *will not* learn how to properly position your wireless access point
  - we *will not* write web apps

Scope (cont.)

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- You will end up with a *rough* understanding about how the Internet works

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  - *nobody* really understands the entire system
  - it is the most complex system mankind has ever engineered

Scope (cont.)

- You will end up with a *rough* understanding about how the Internet works
  - *nobody* really understands the entire system
    - it is the most complex system mankind has ever engineered
  - expect me to say *"I don't know"* on occasion
  - or, even on *many occasions*!

Comm. History

Comm. History

Comm. History (cont.)

Comm. History (cont.)

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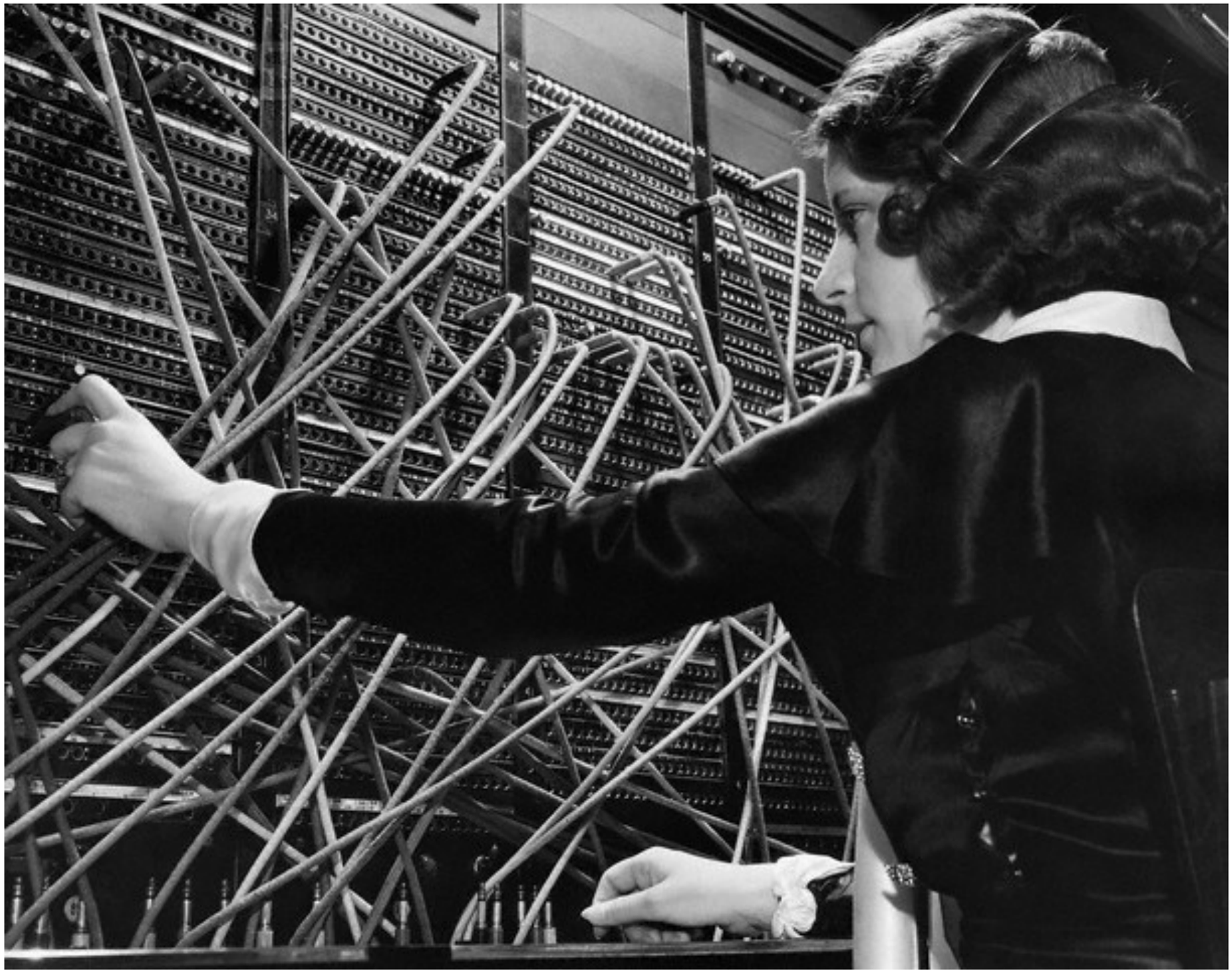
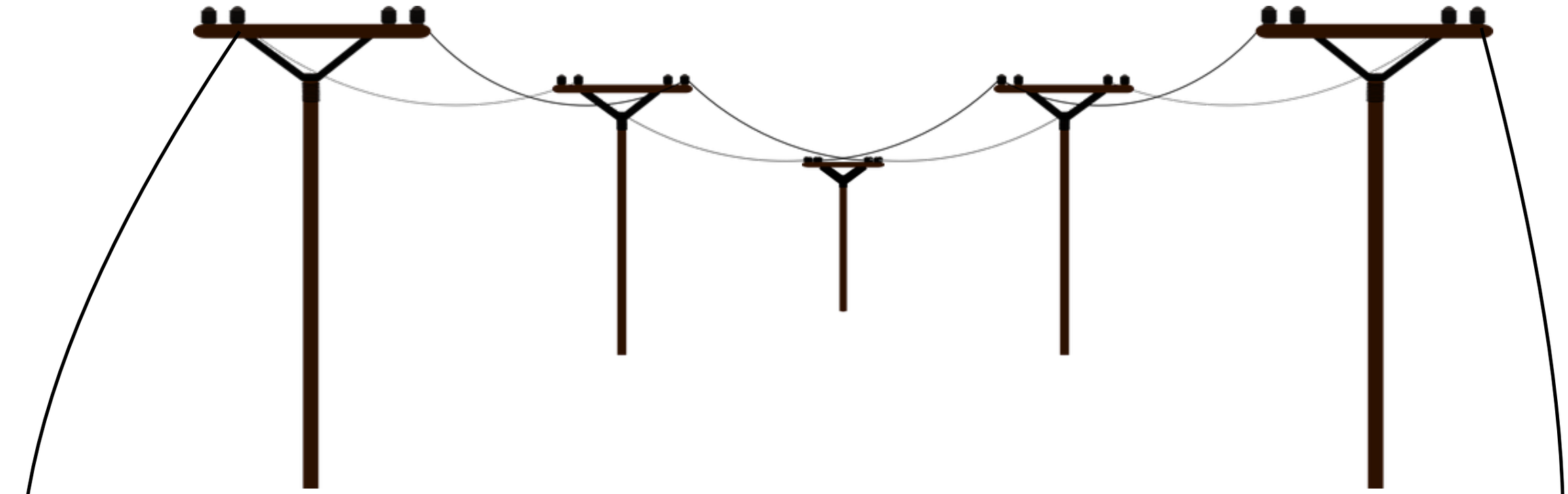


Circuit Switching



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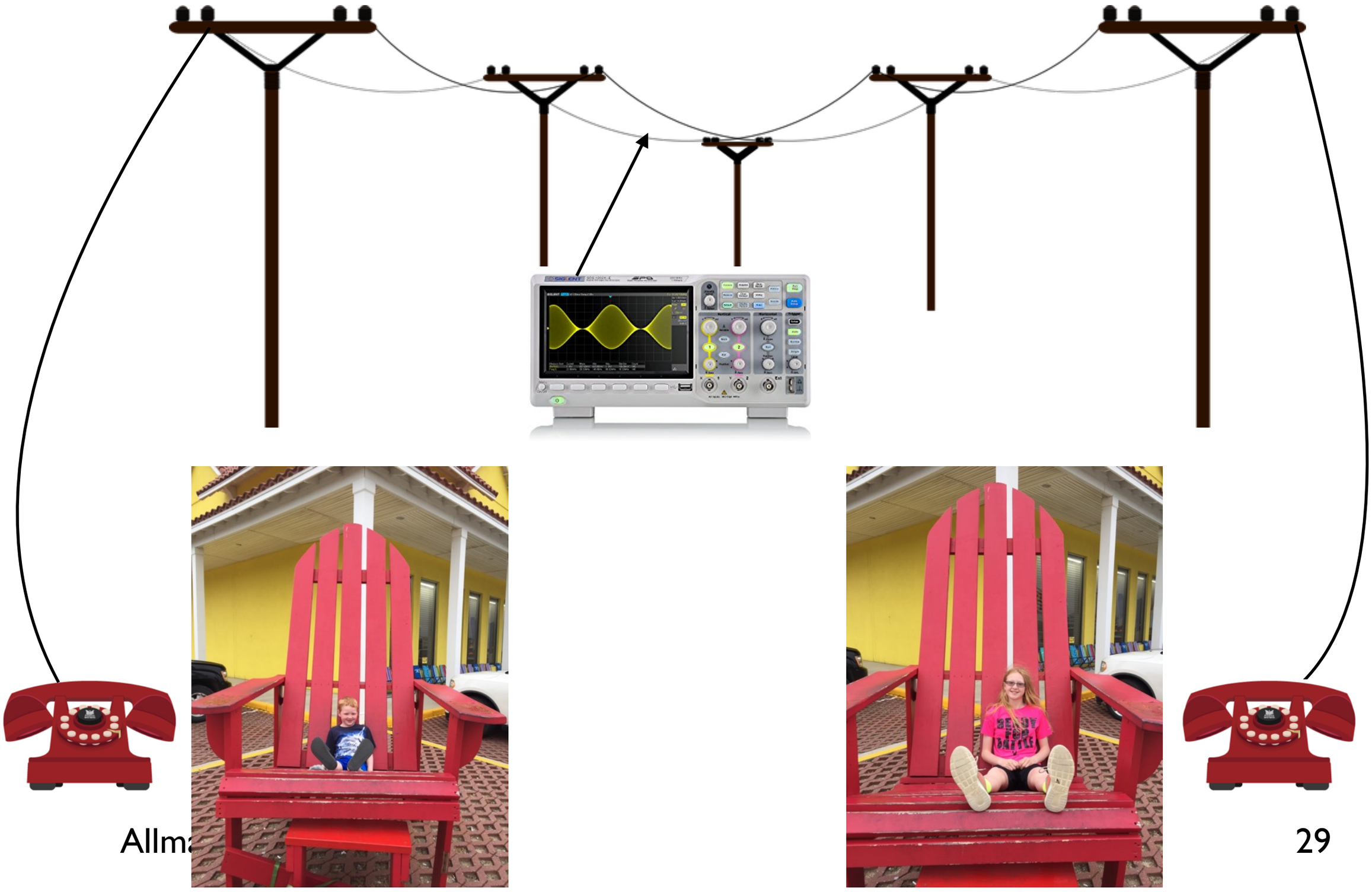

Circuit Switching

Circuits (cont.)

Paul Baran

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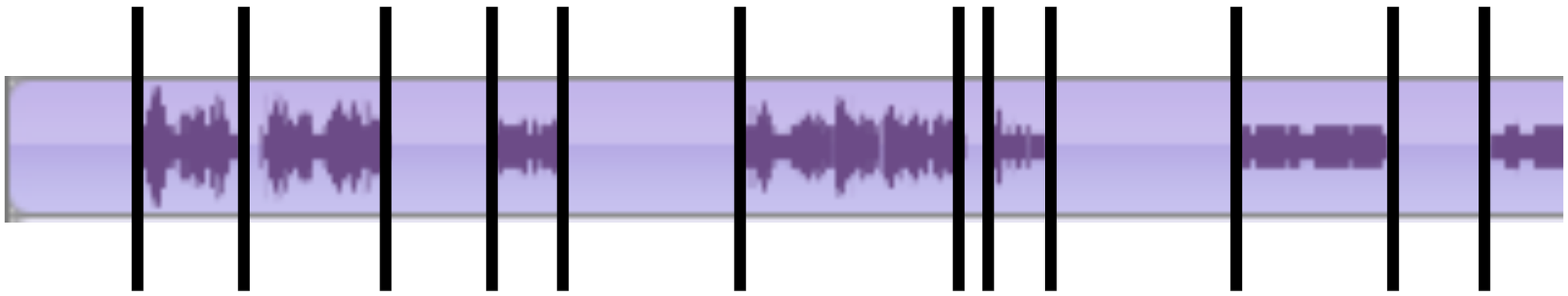

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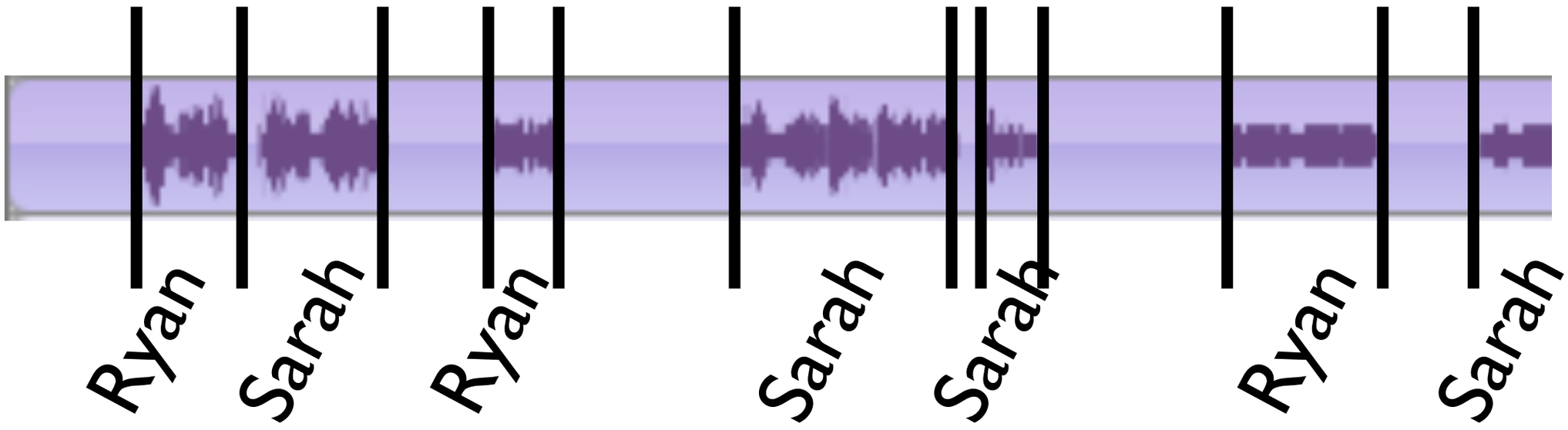

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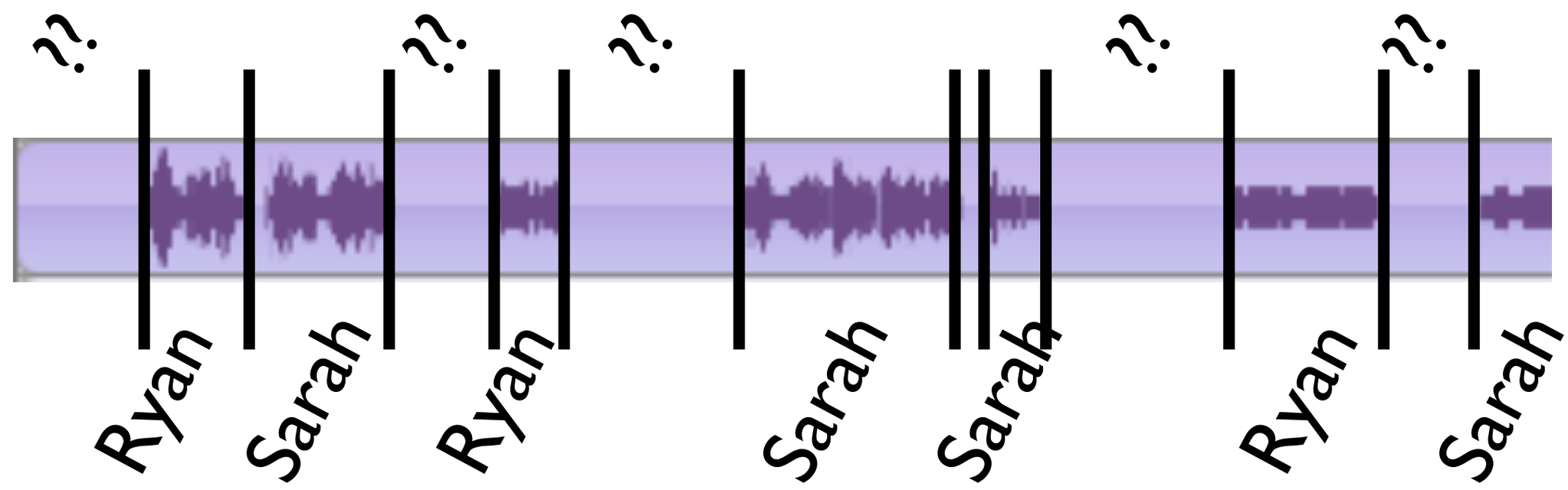
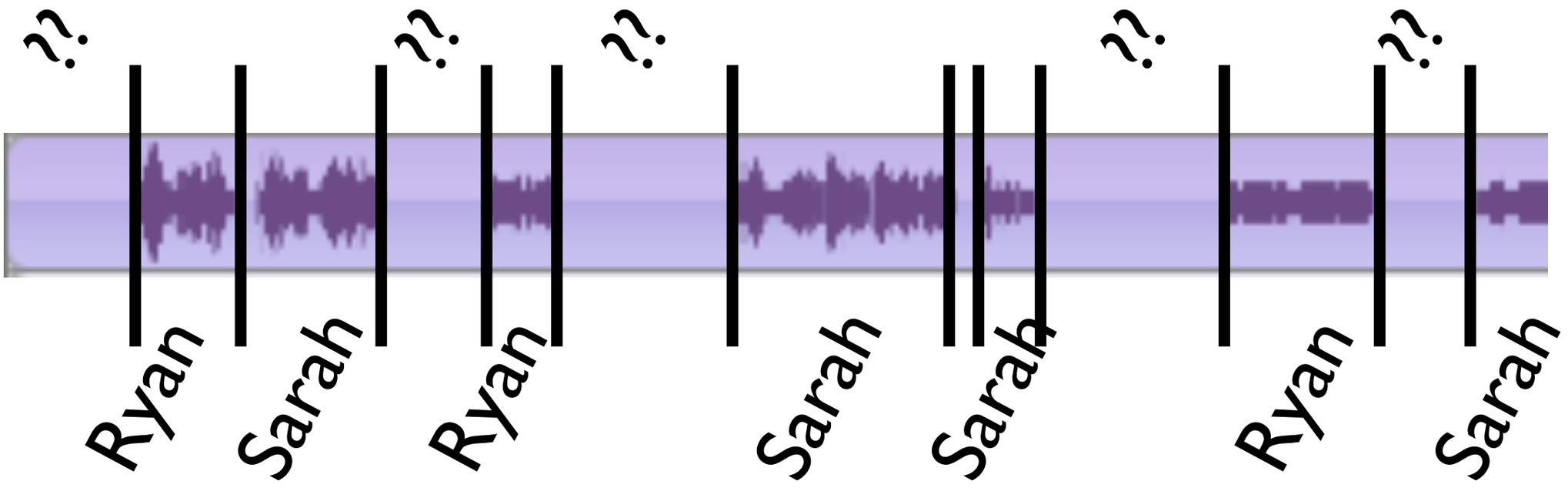


Circuits-vs.-Packets



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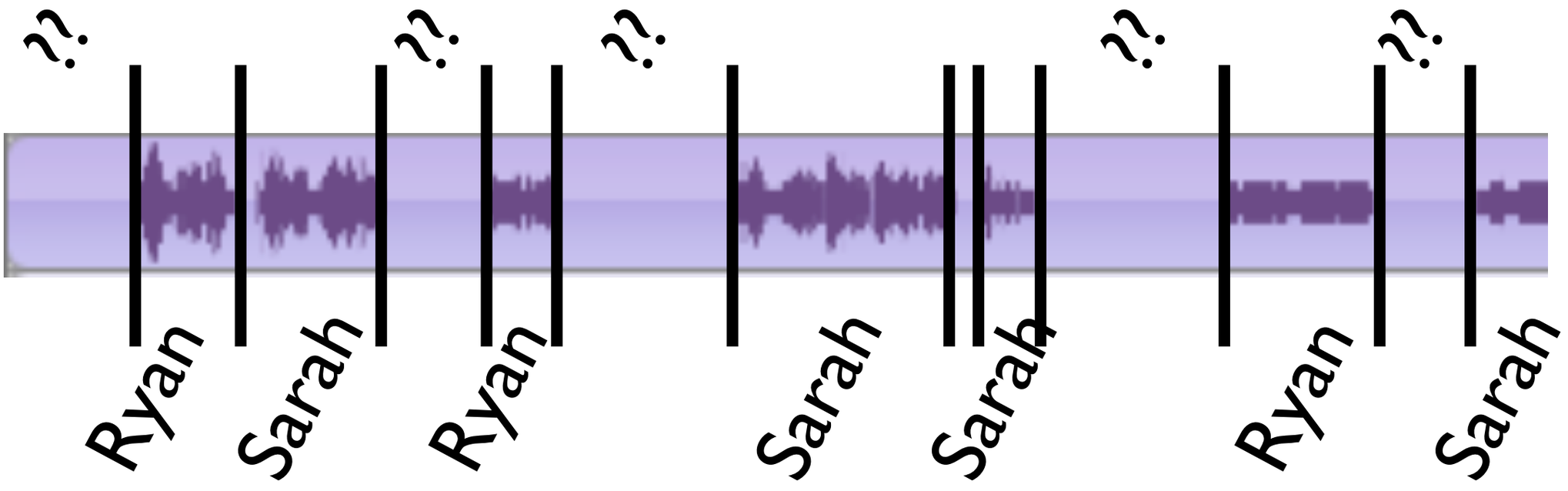

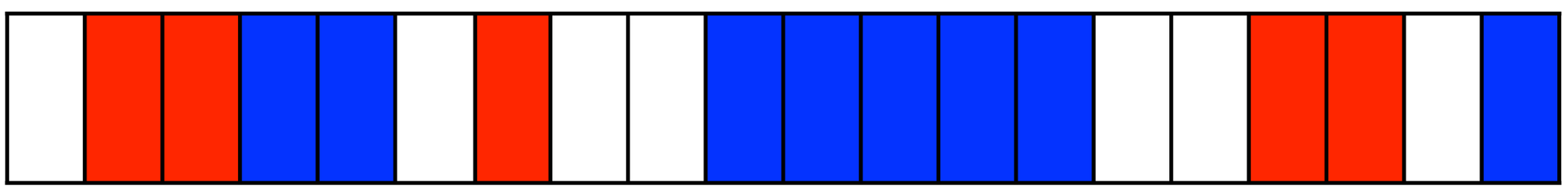

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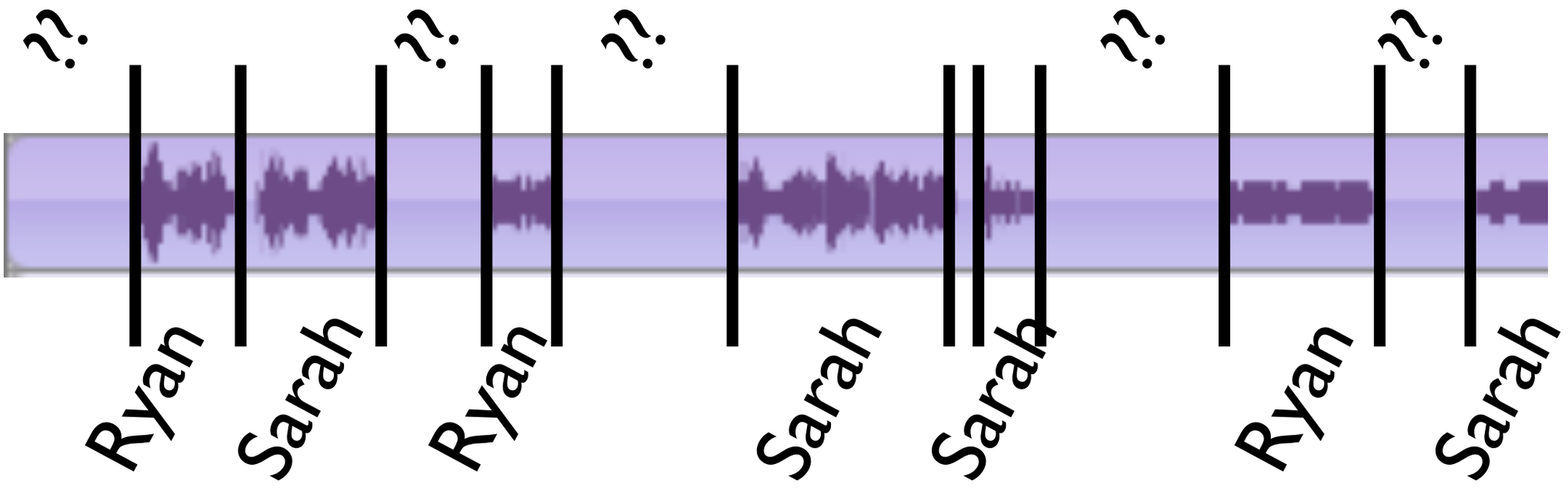

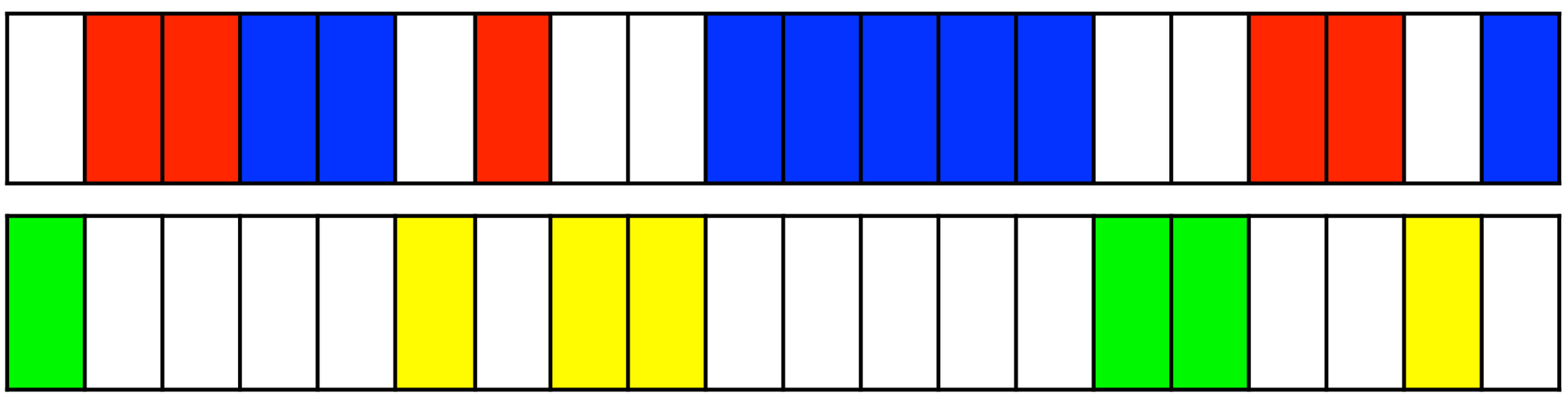

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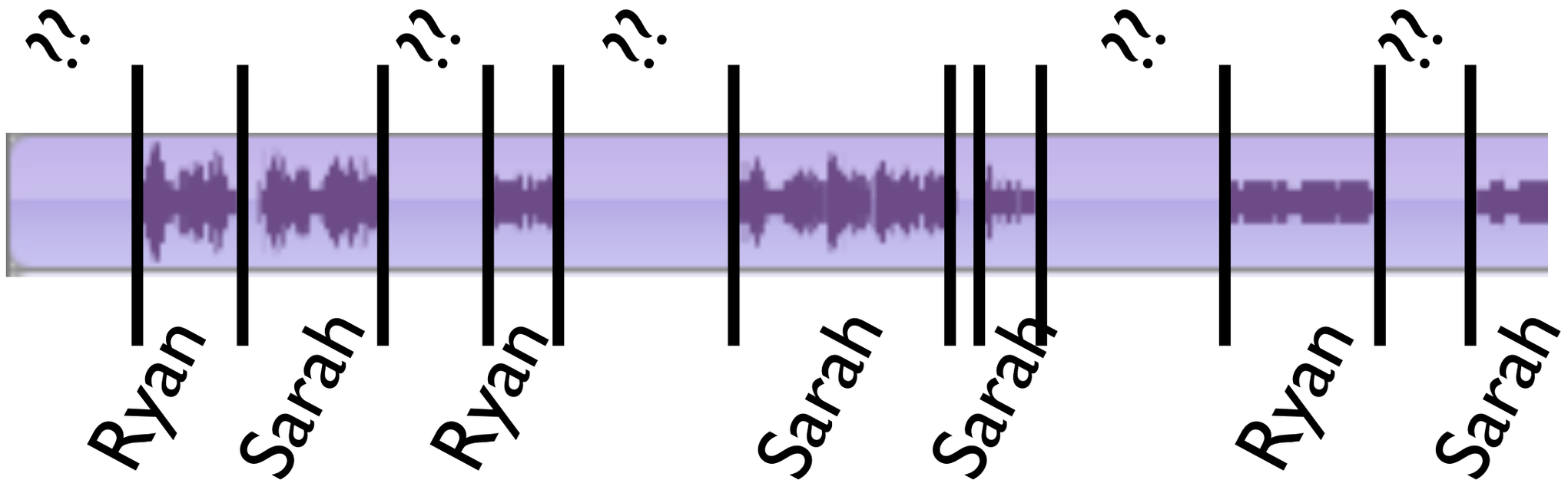

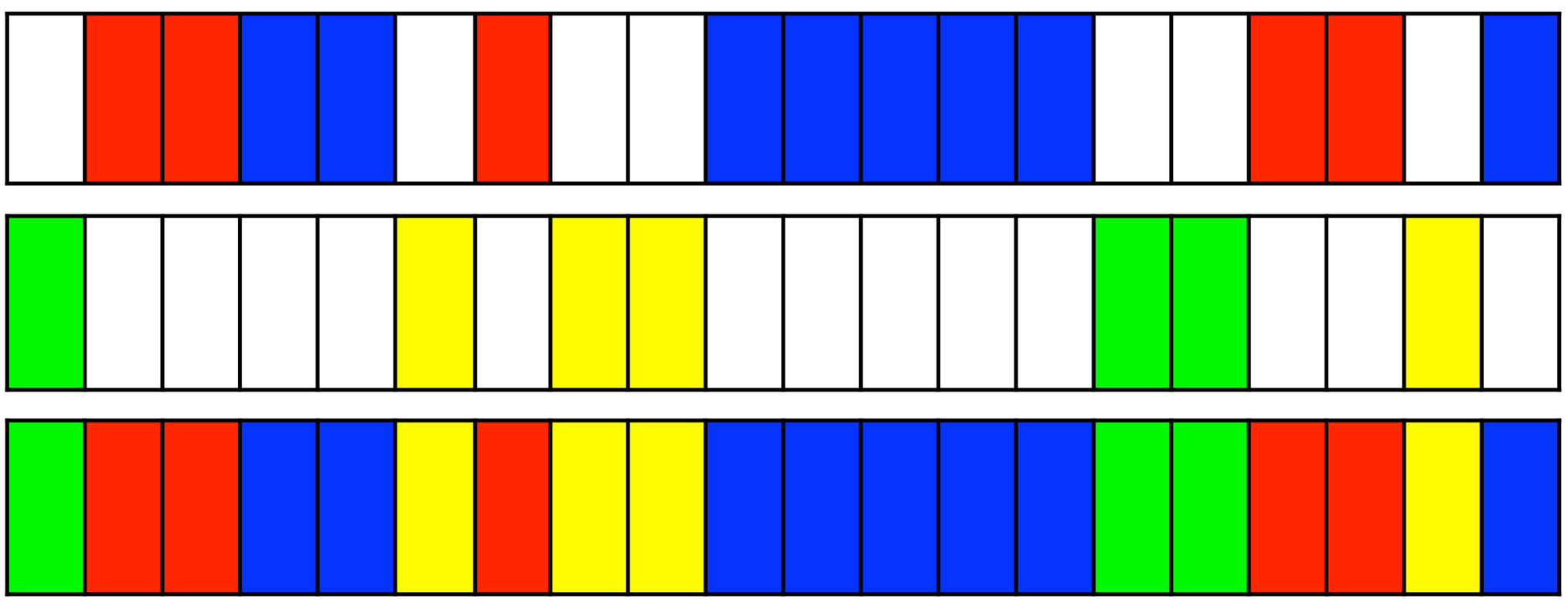

Layering

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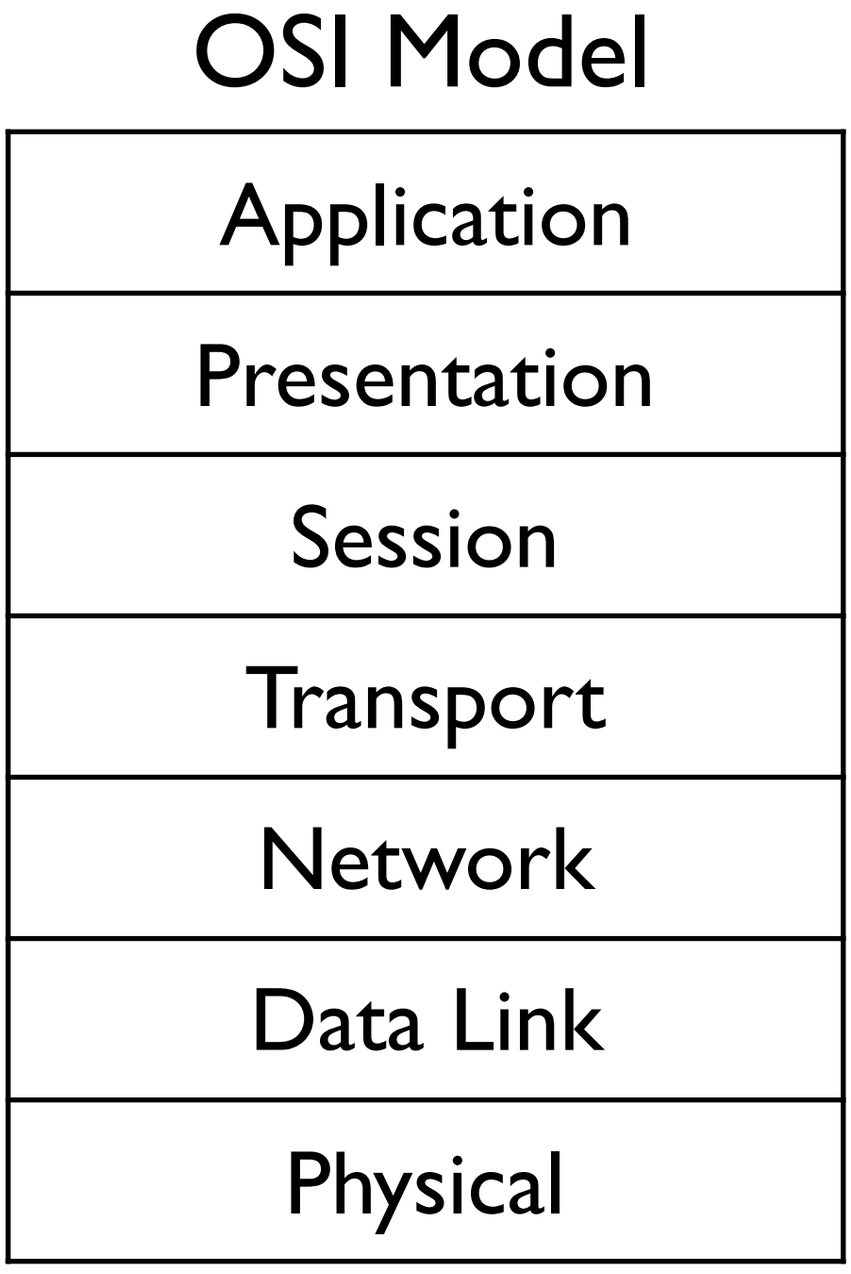
OSI Model
Application
Presentation
Session
Transport
Network
Data Link
Physical

Layering

OSI Model

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Internet Model

Application
Transport
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Physical

Layering (cont.)

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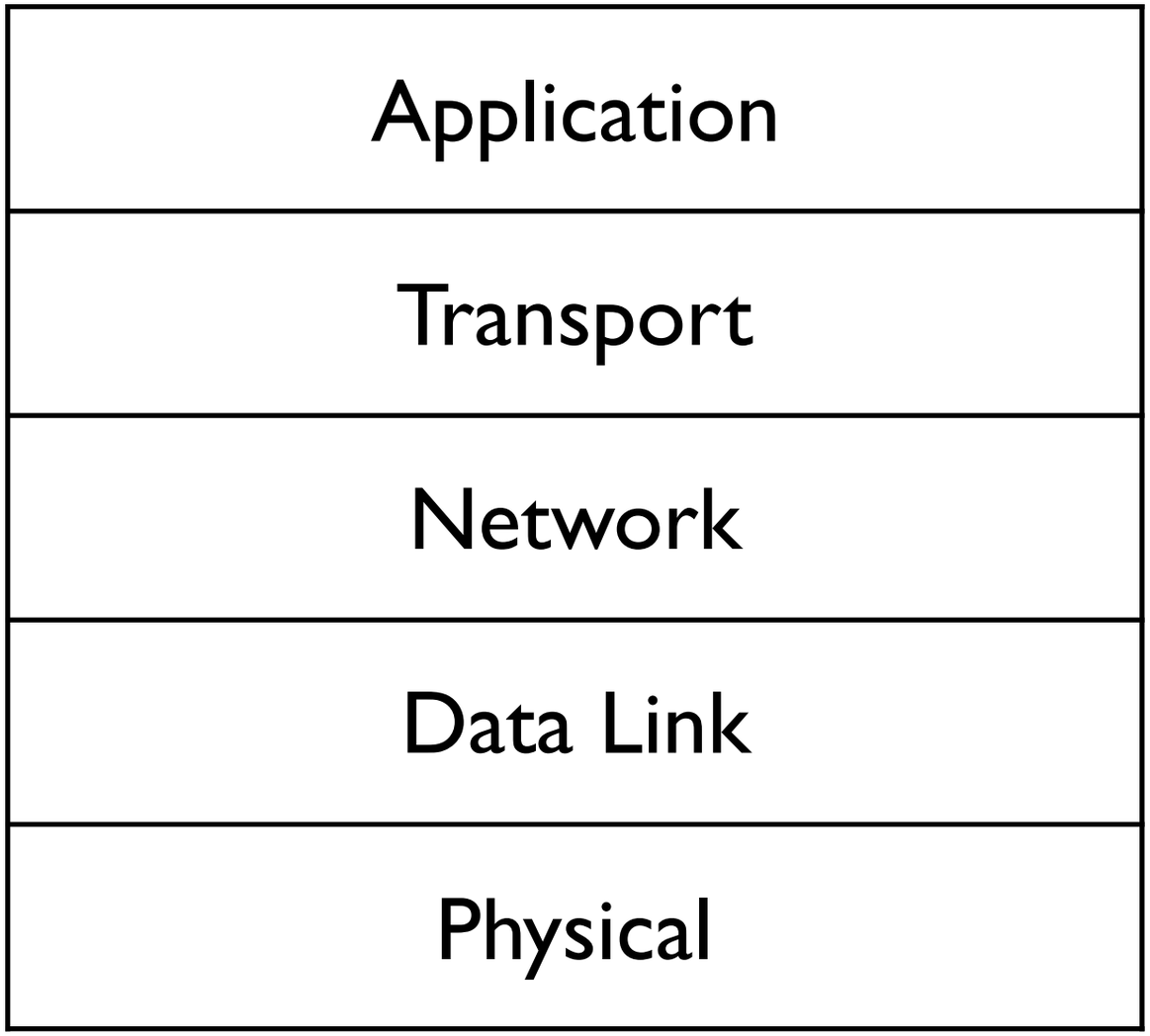

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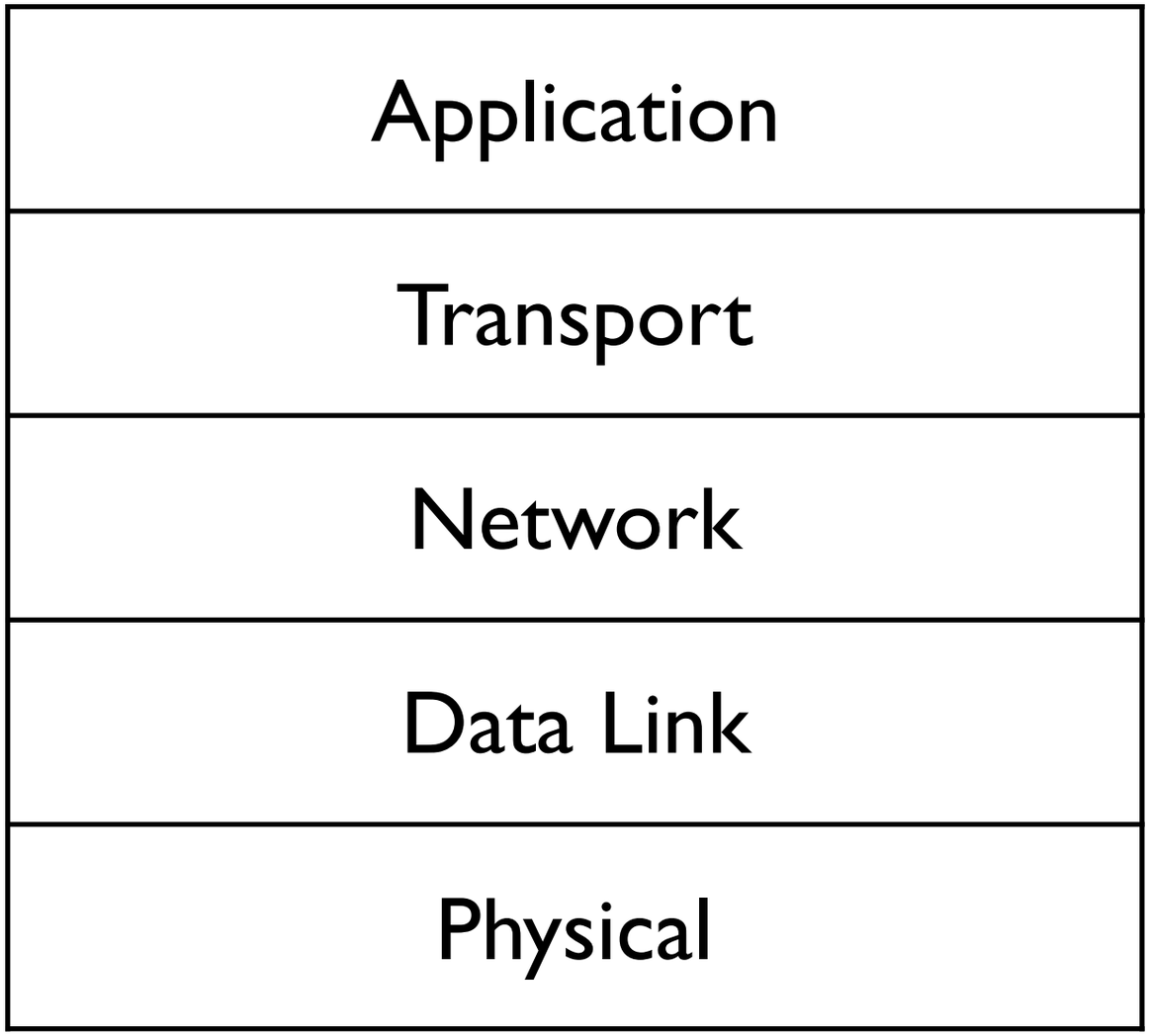

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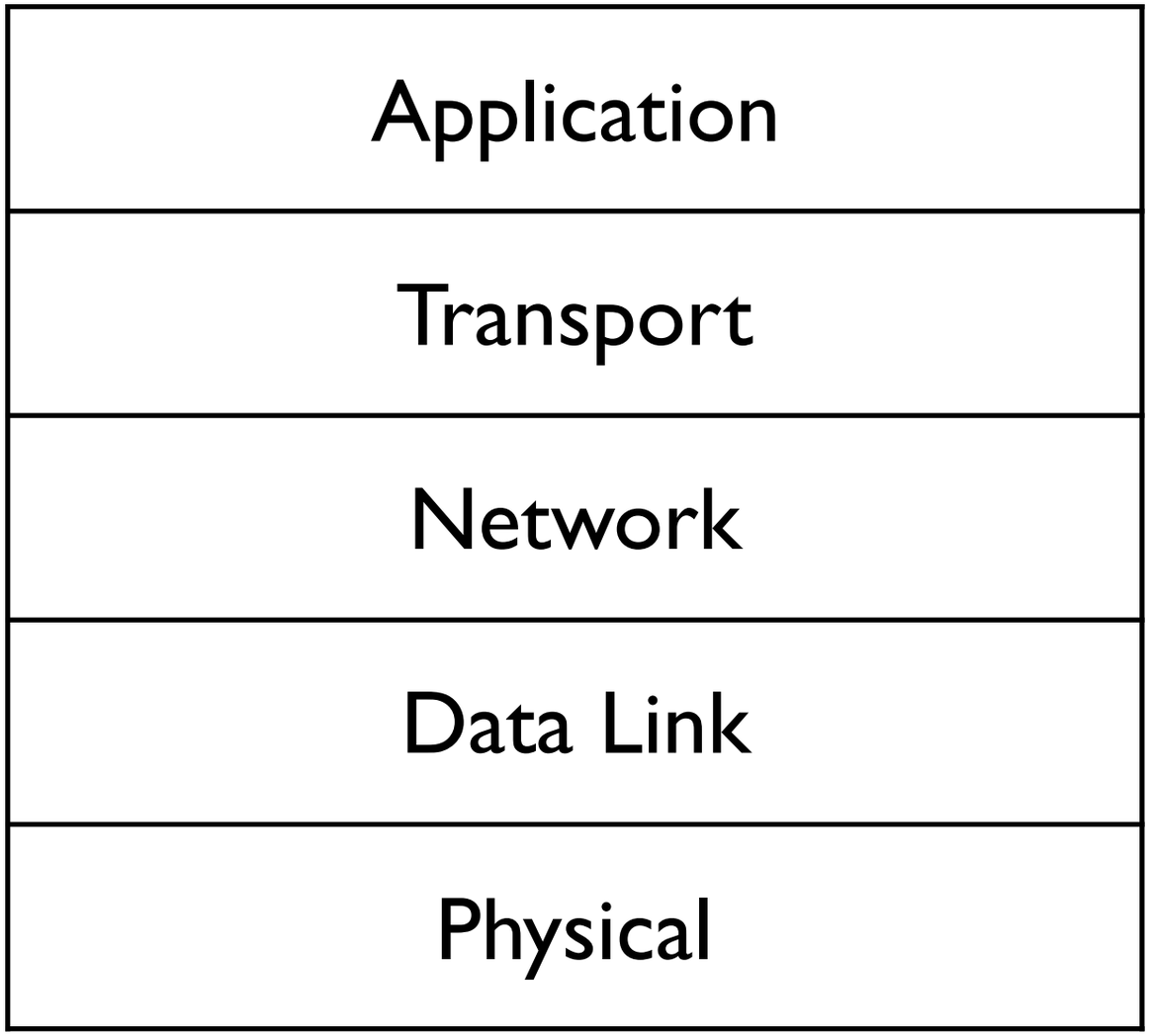

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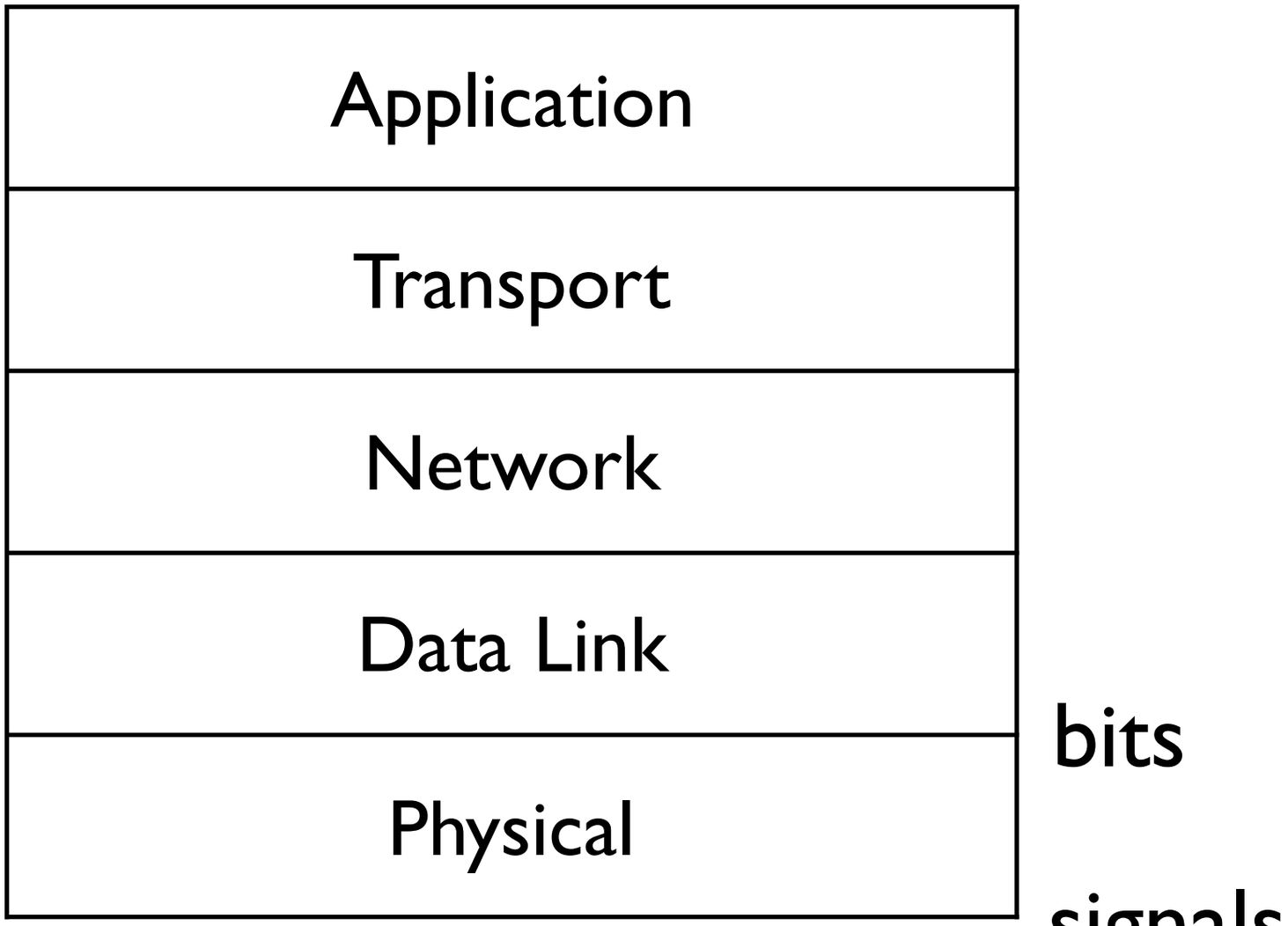

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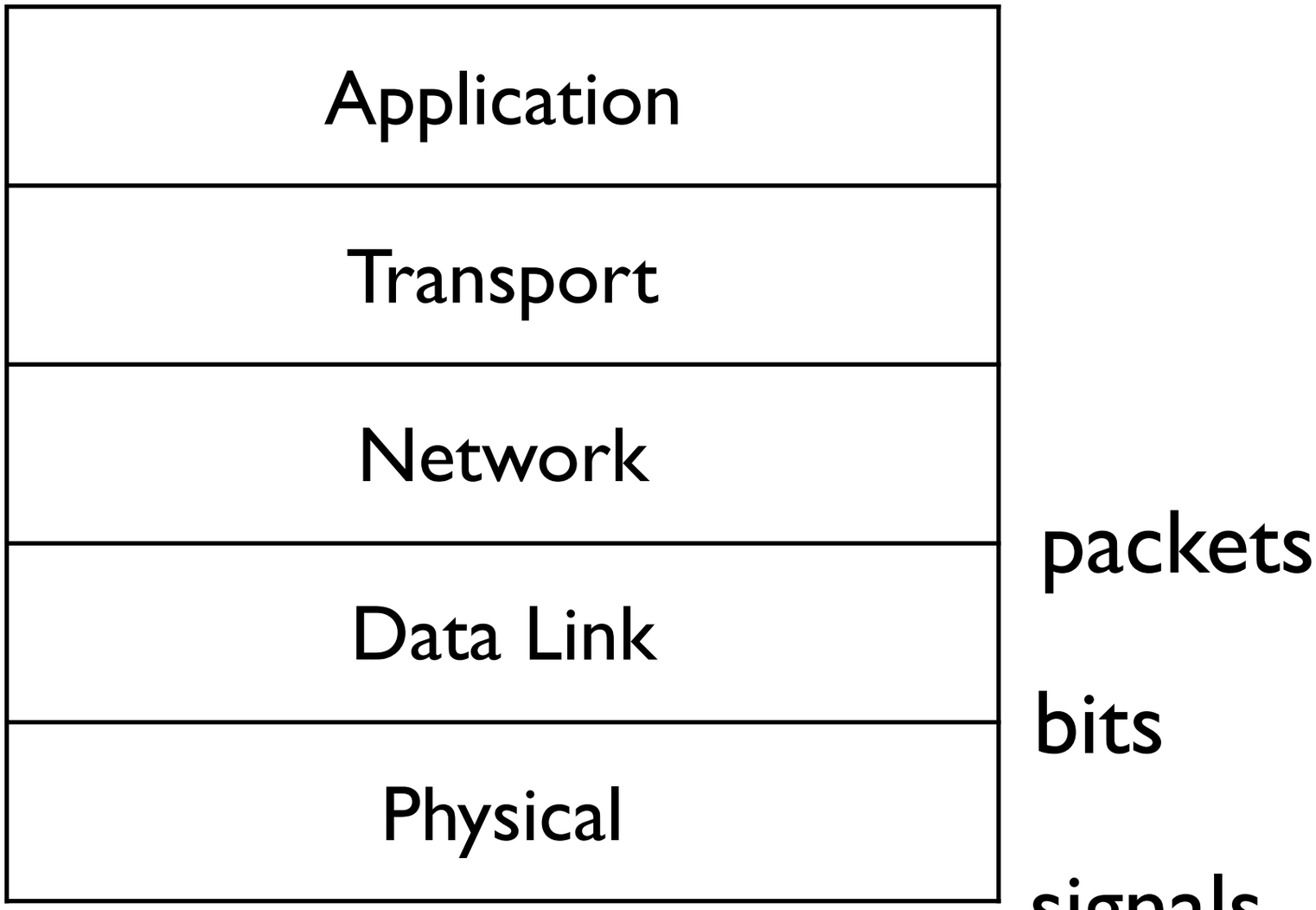

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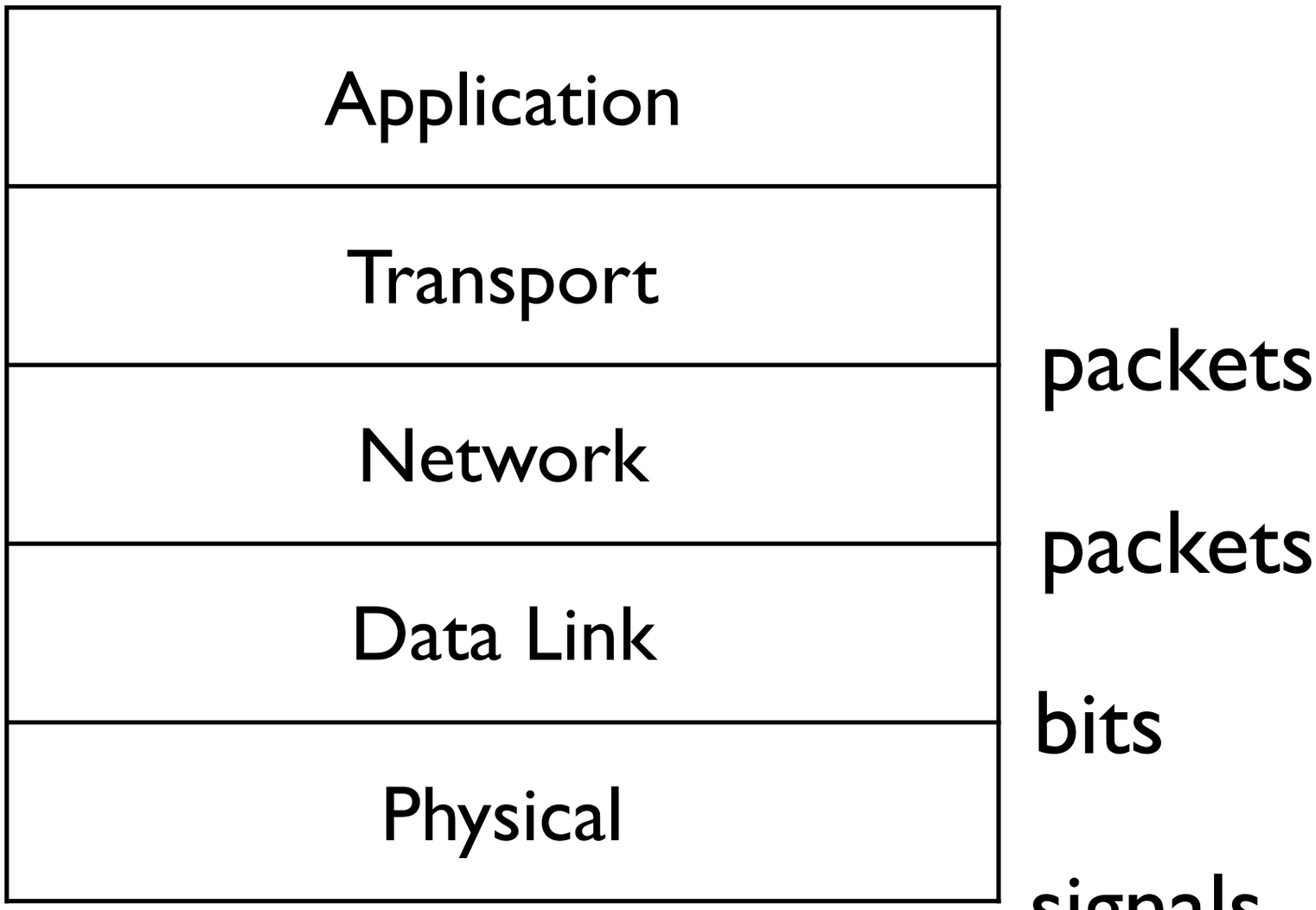

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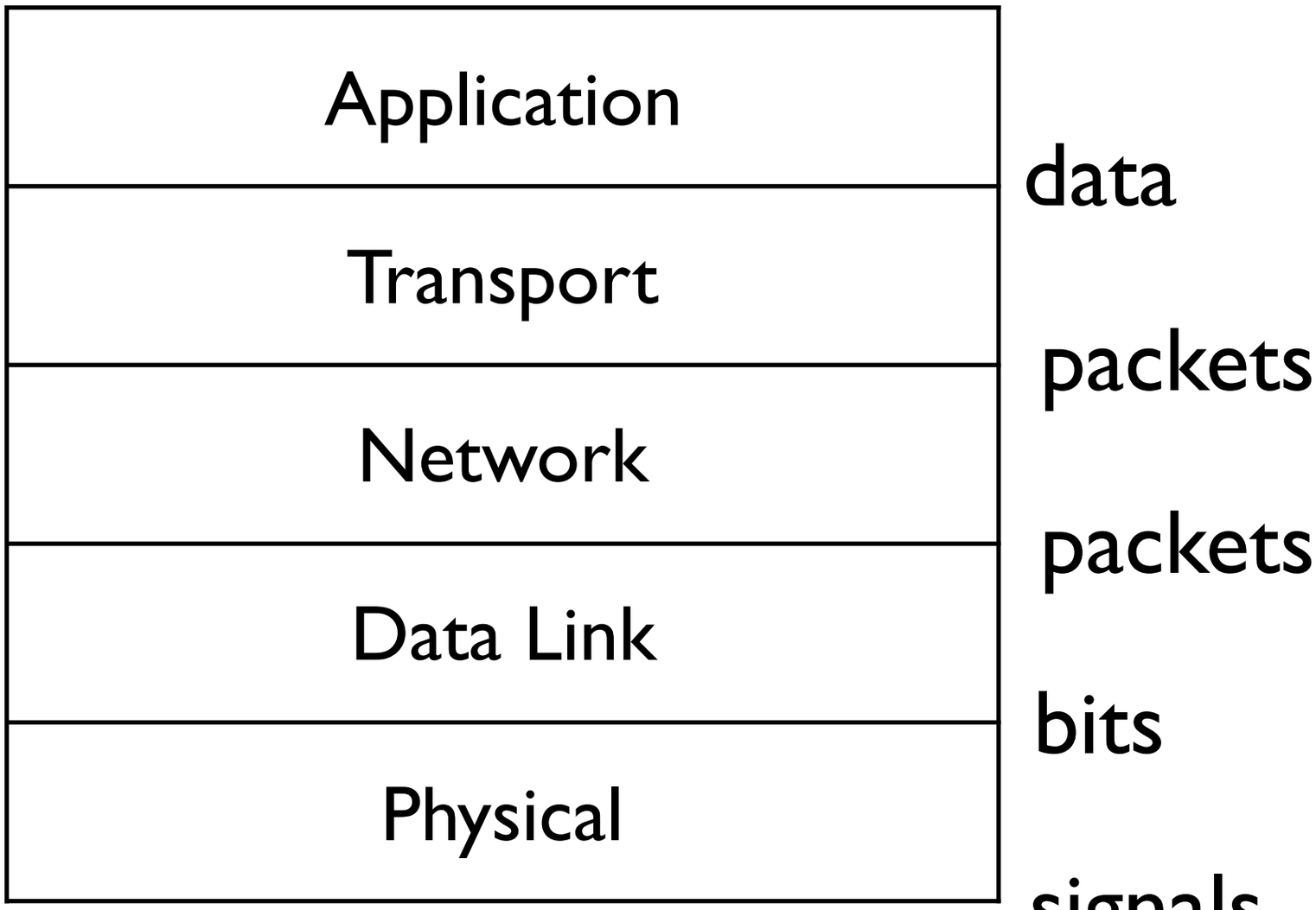

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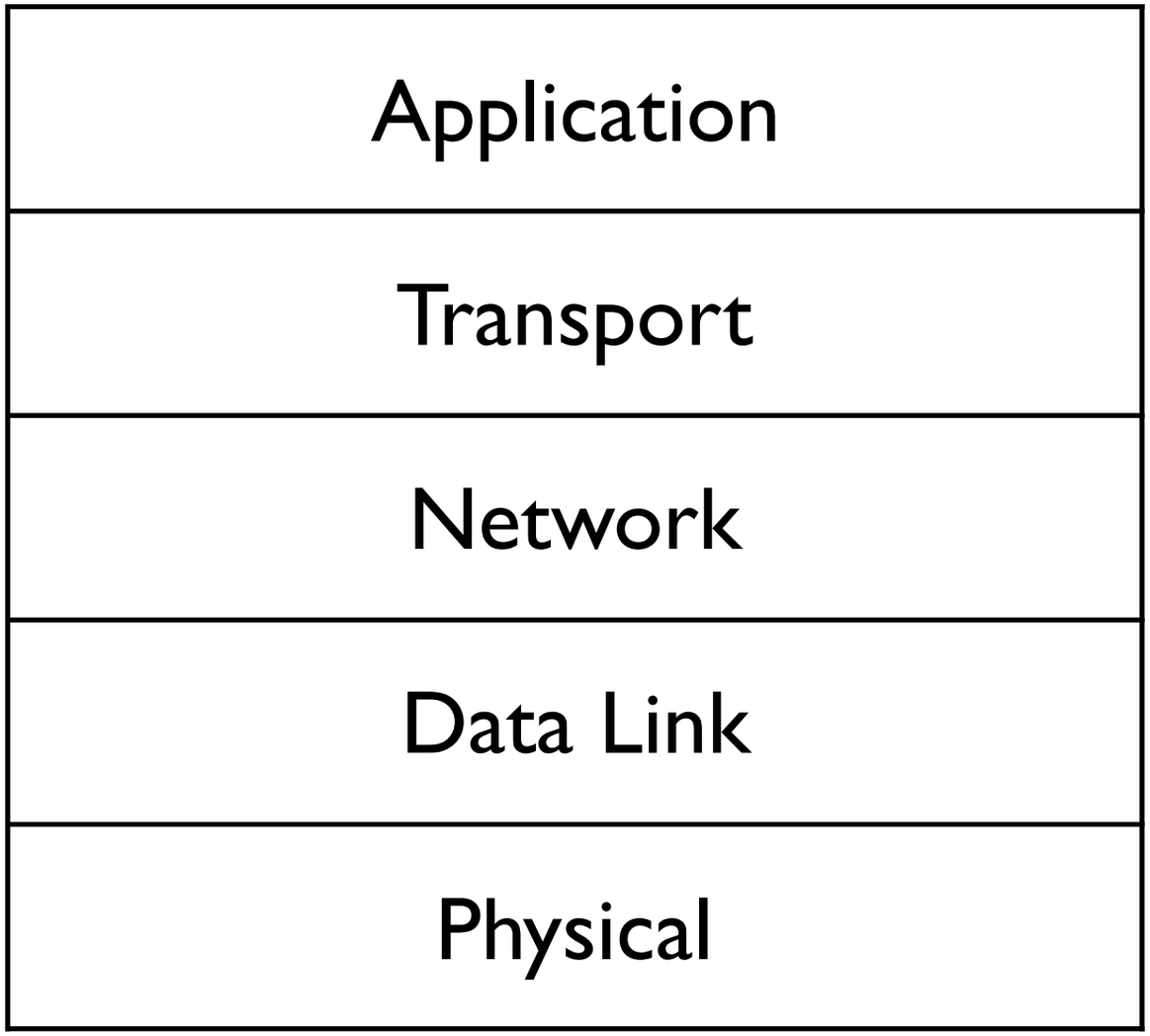

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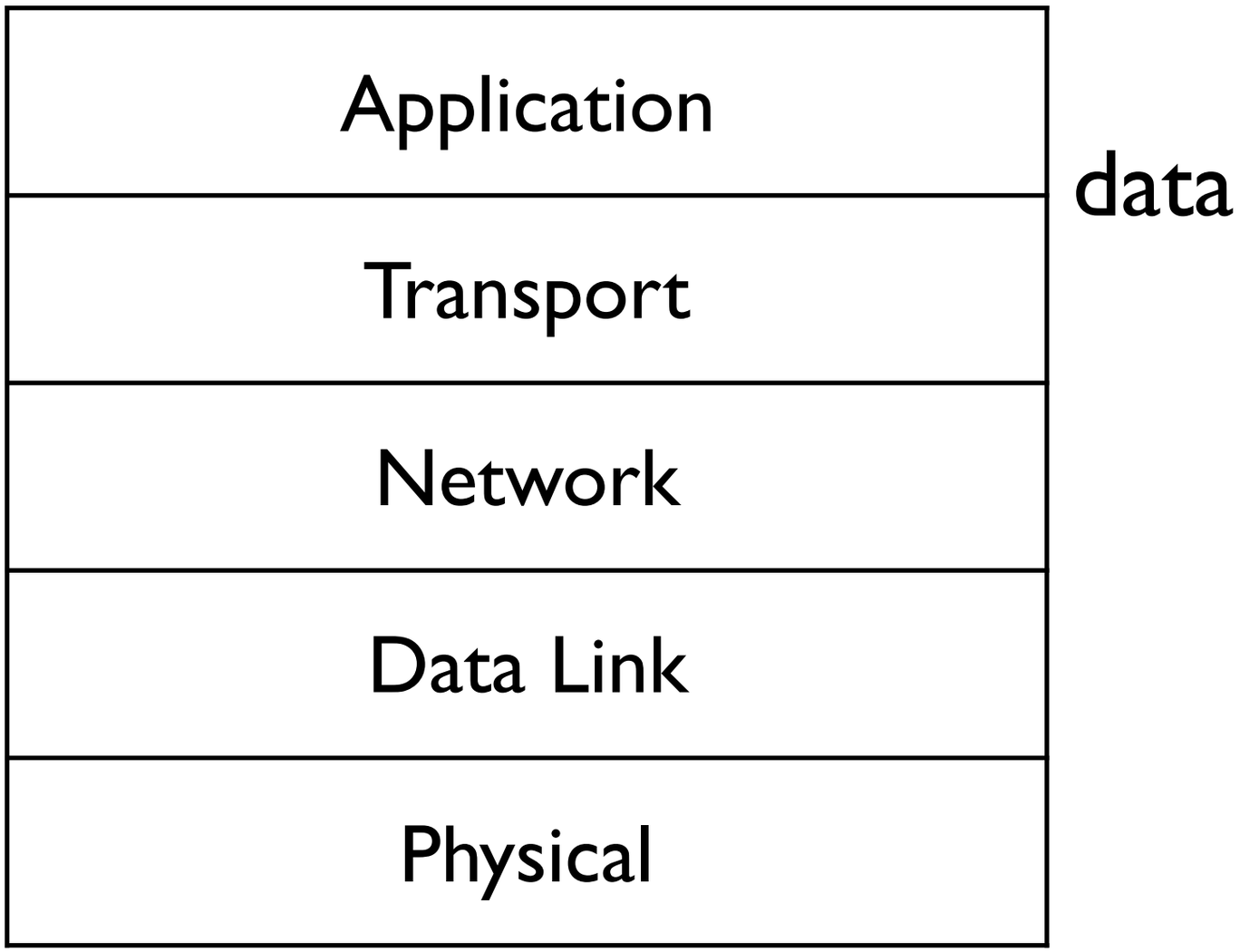

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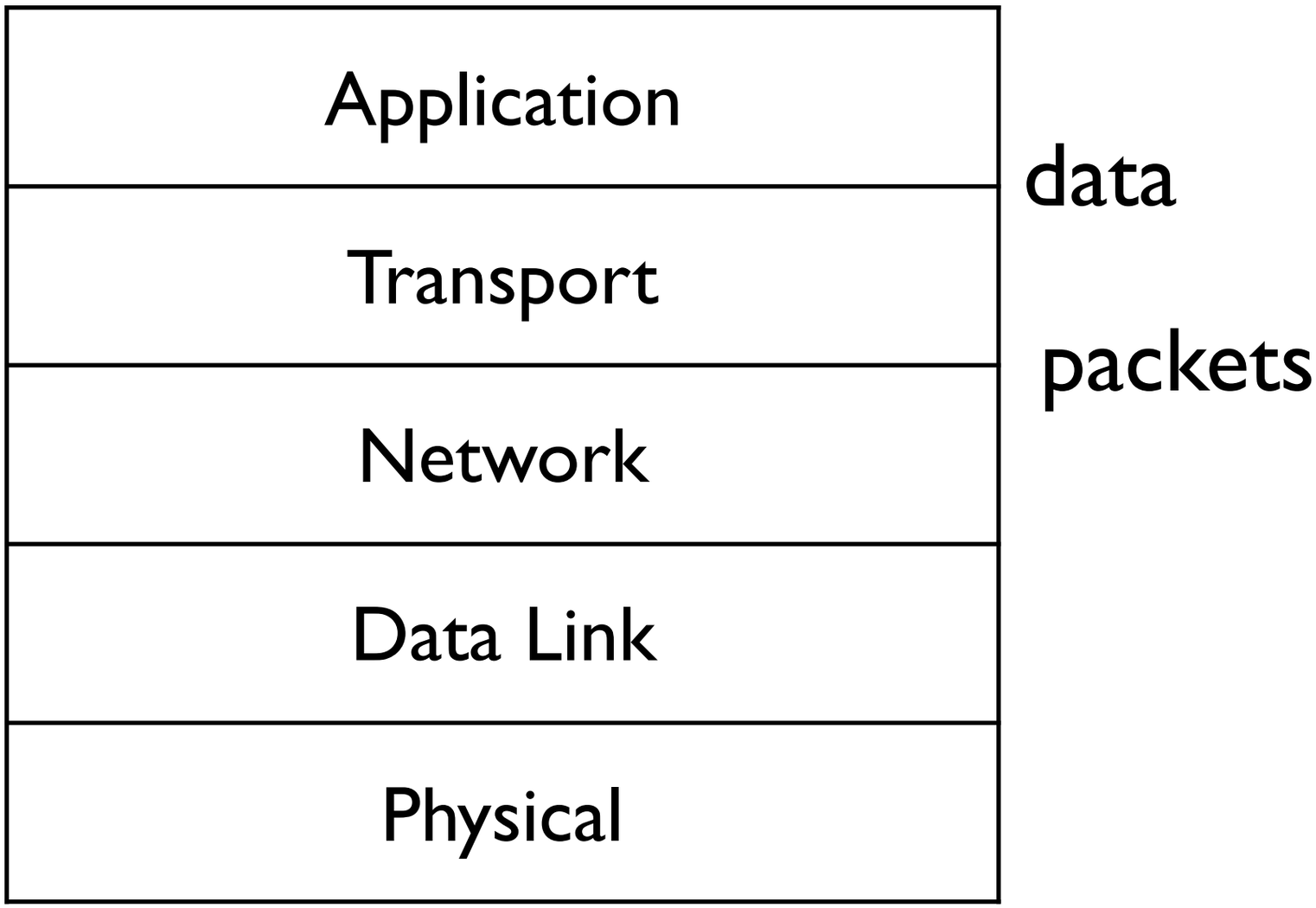

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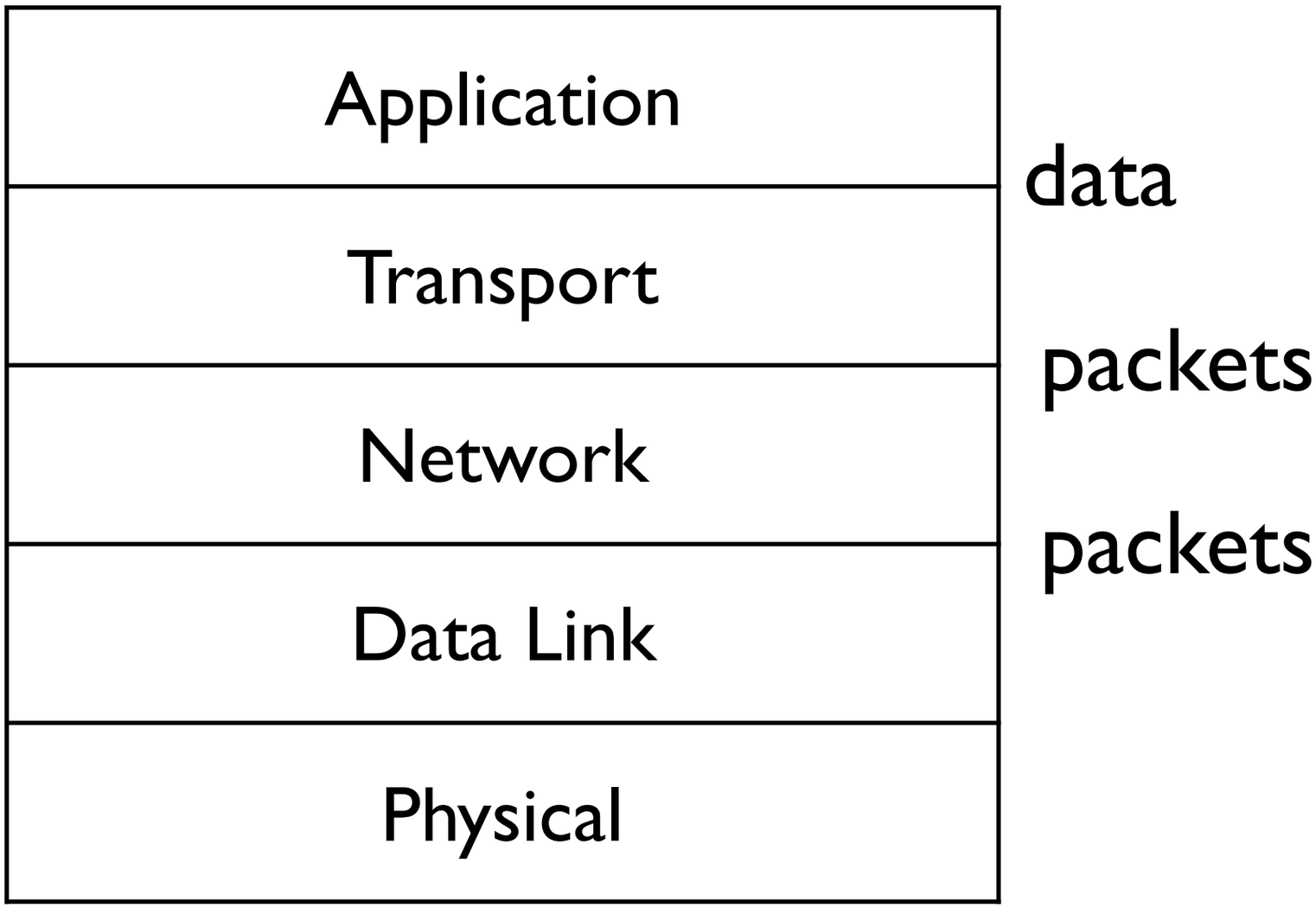

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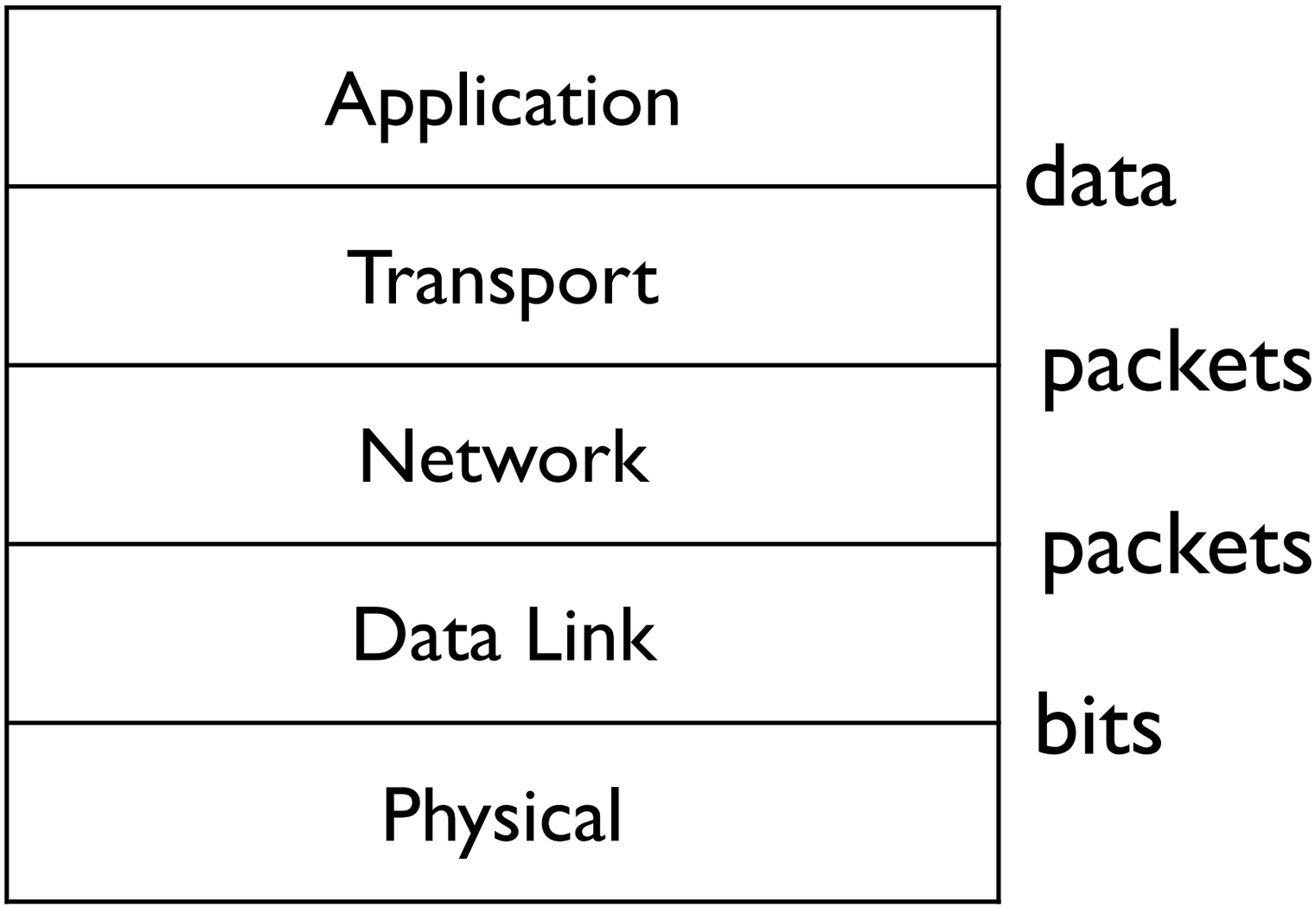

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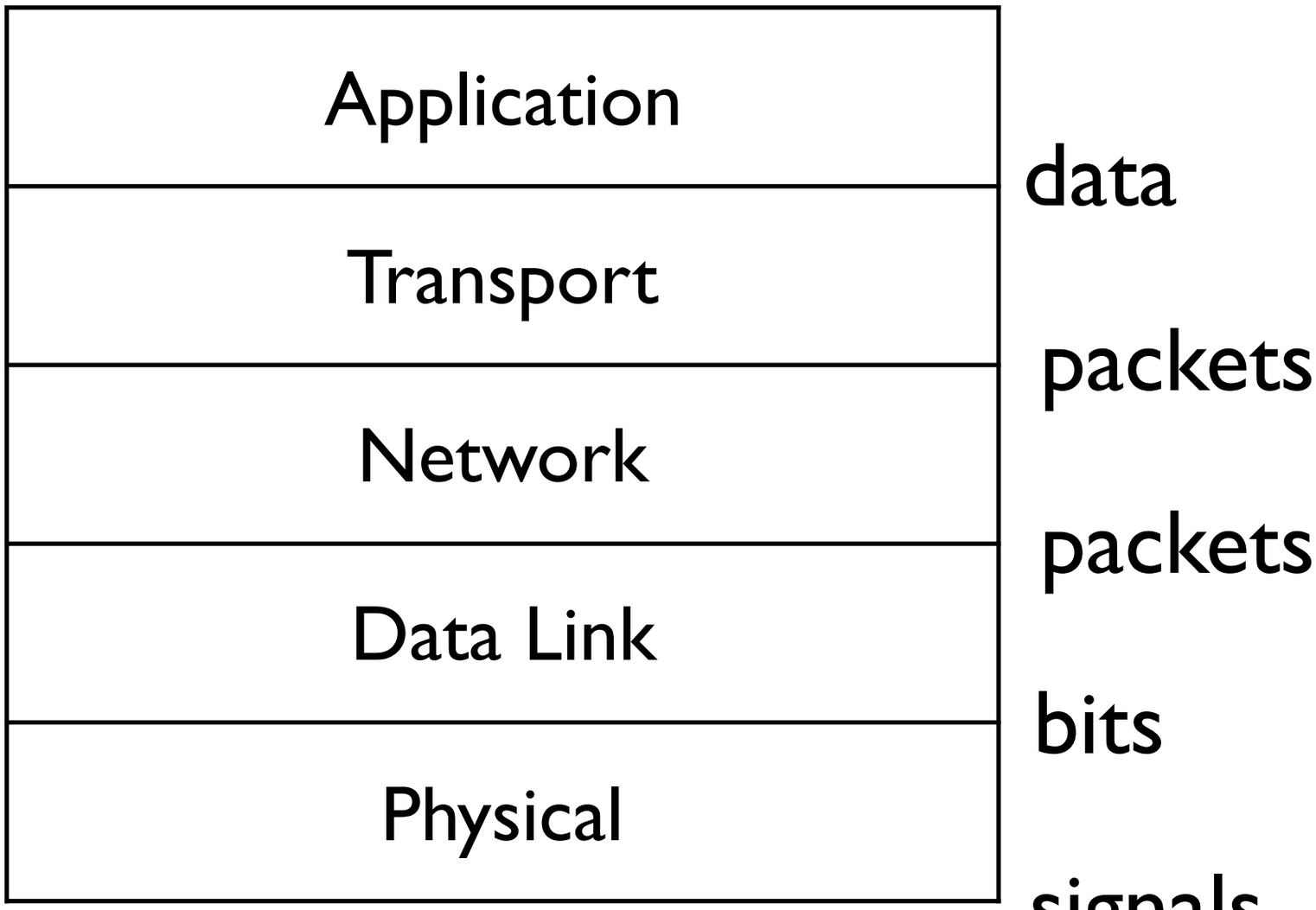

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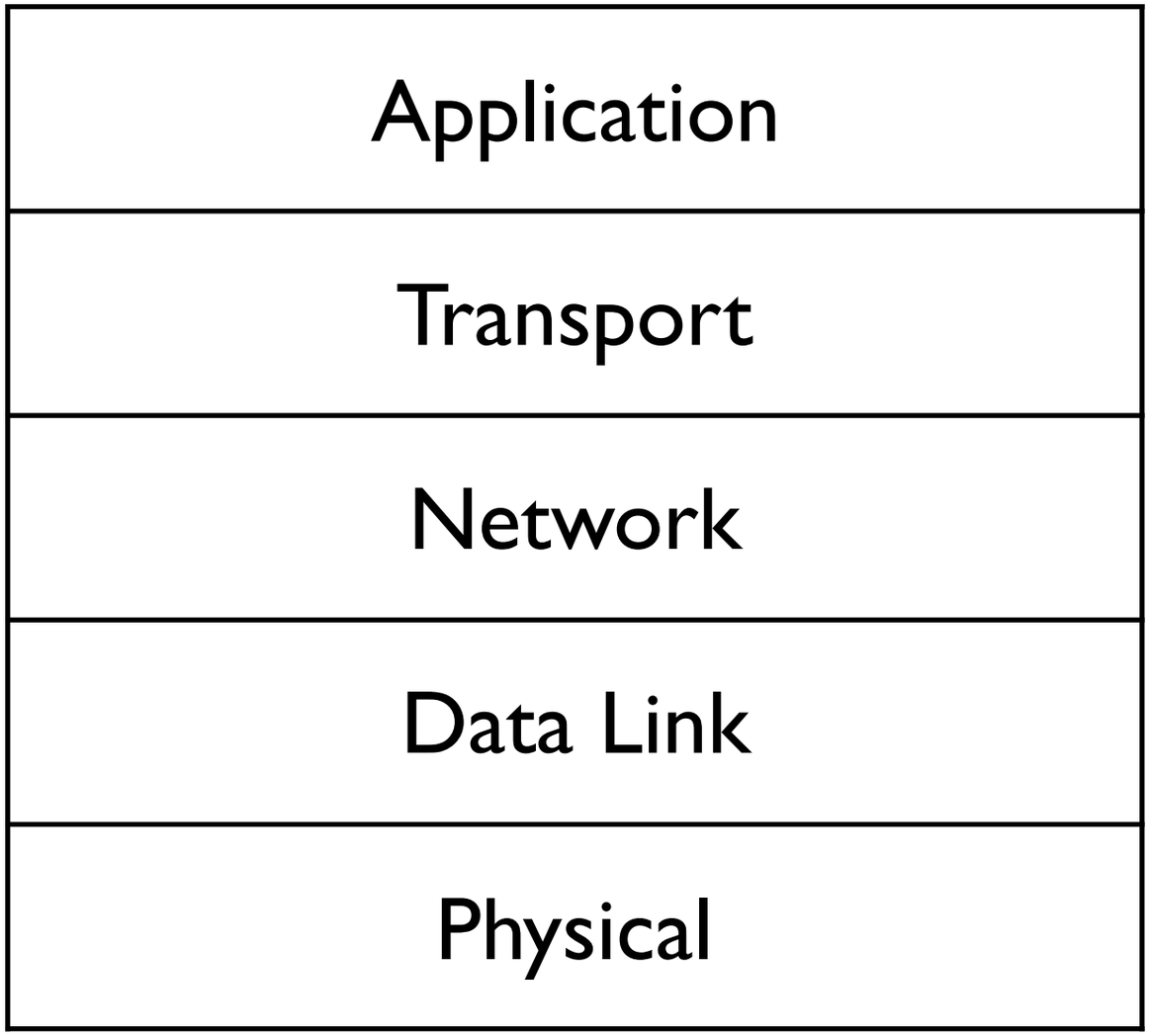

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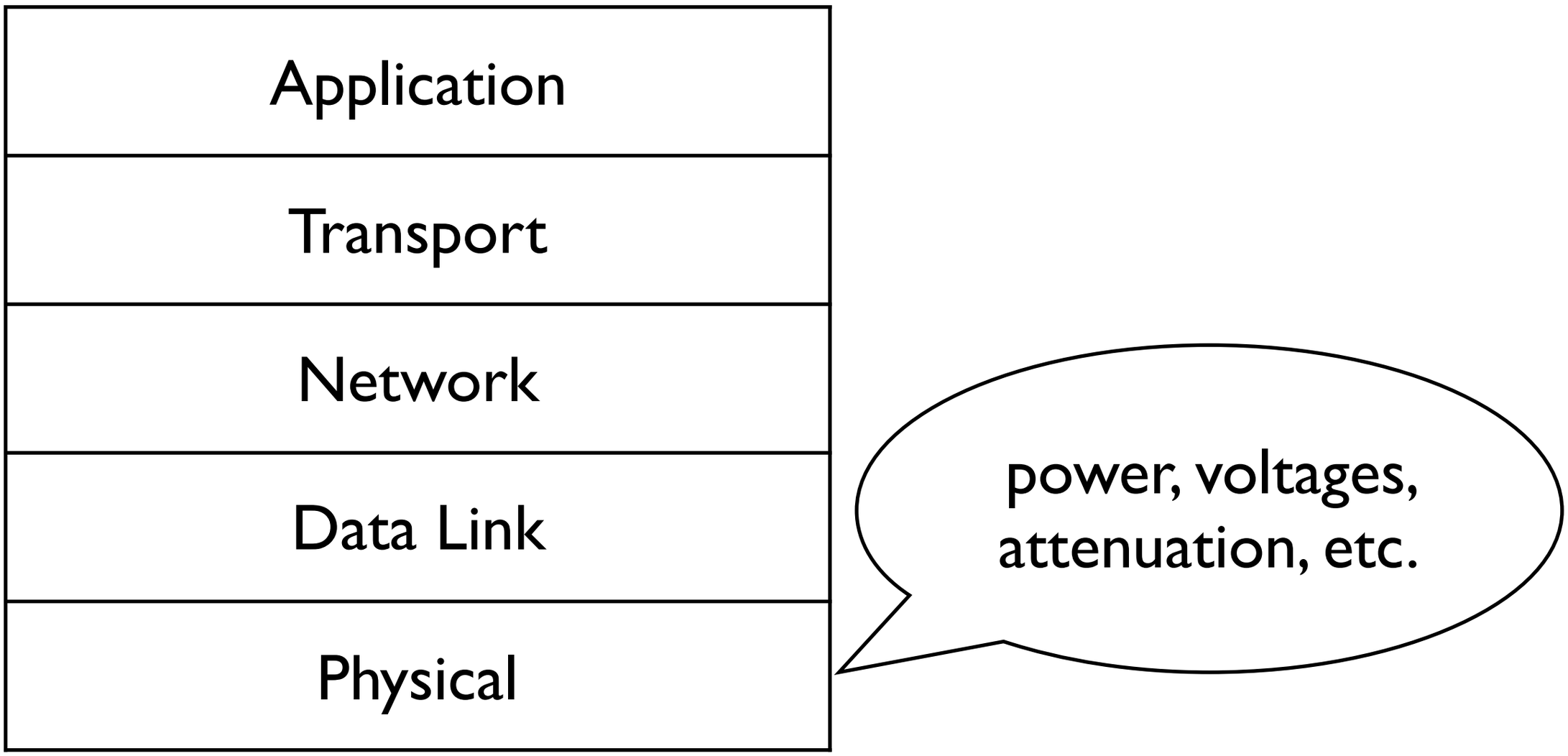

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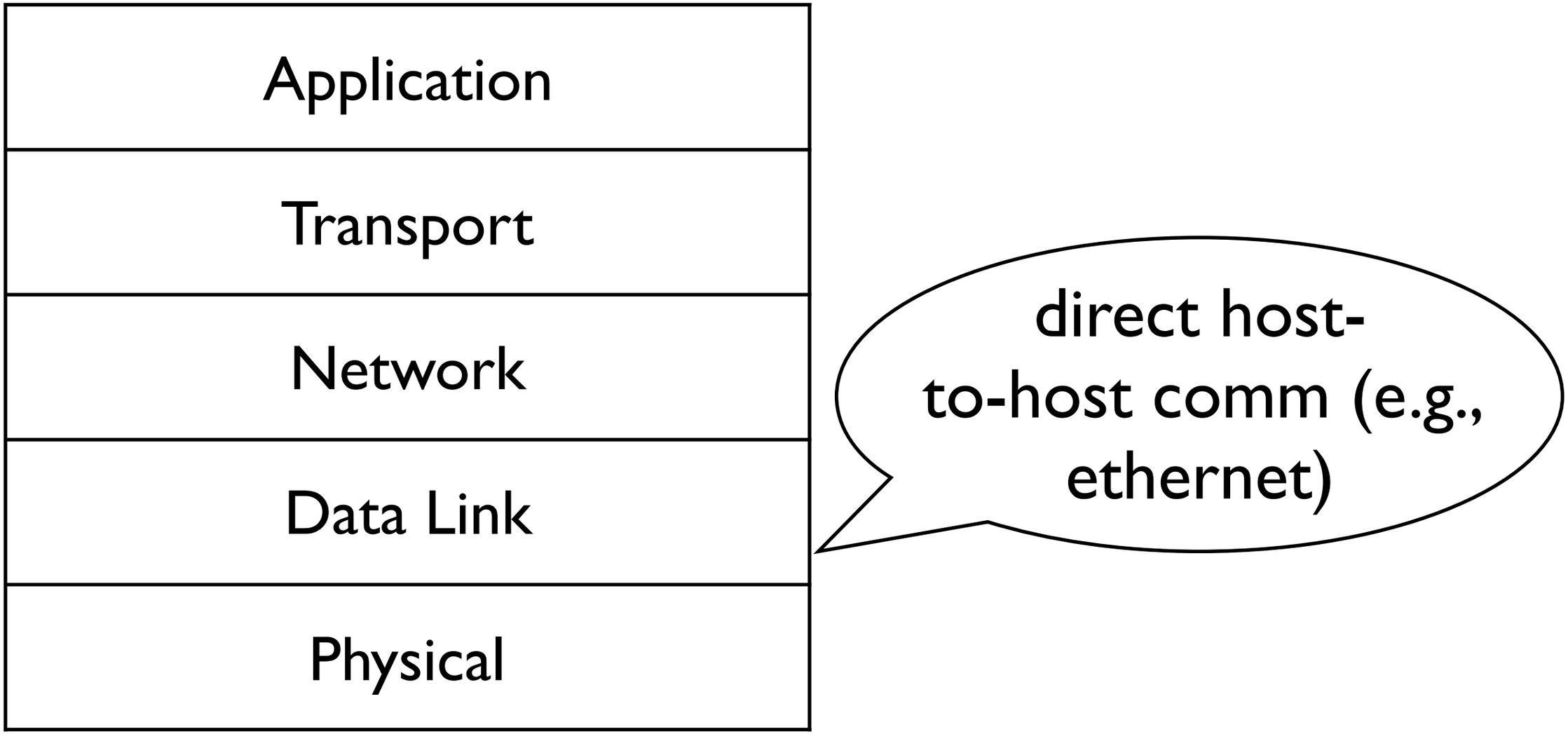

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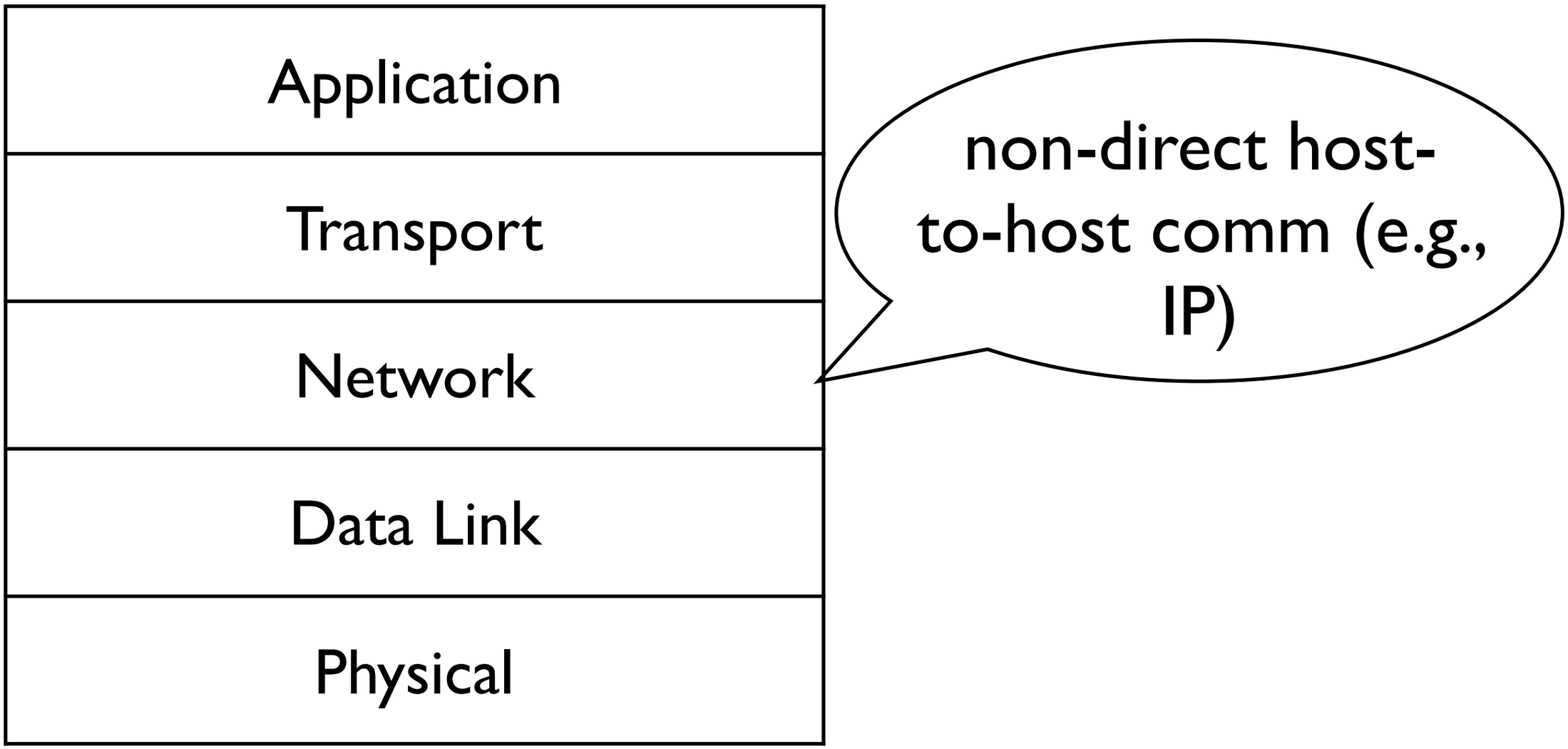

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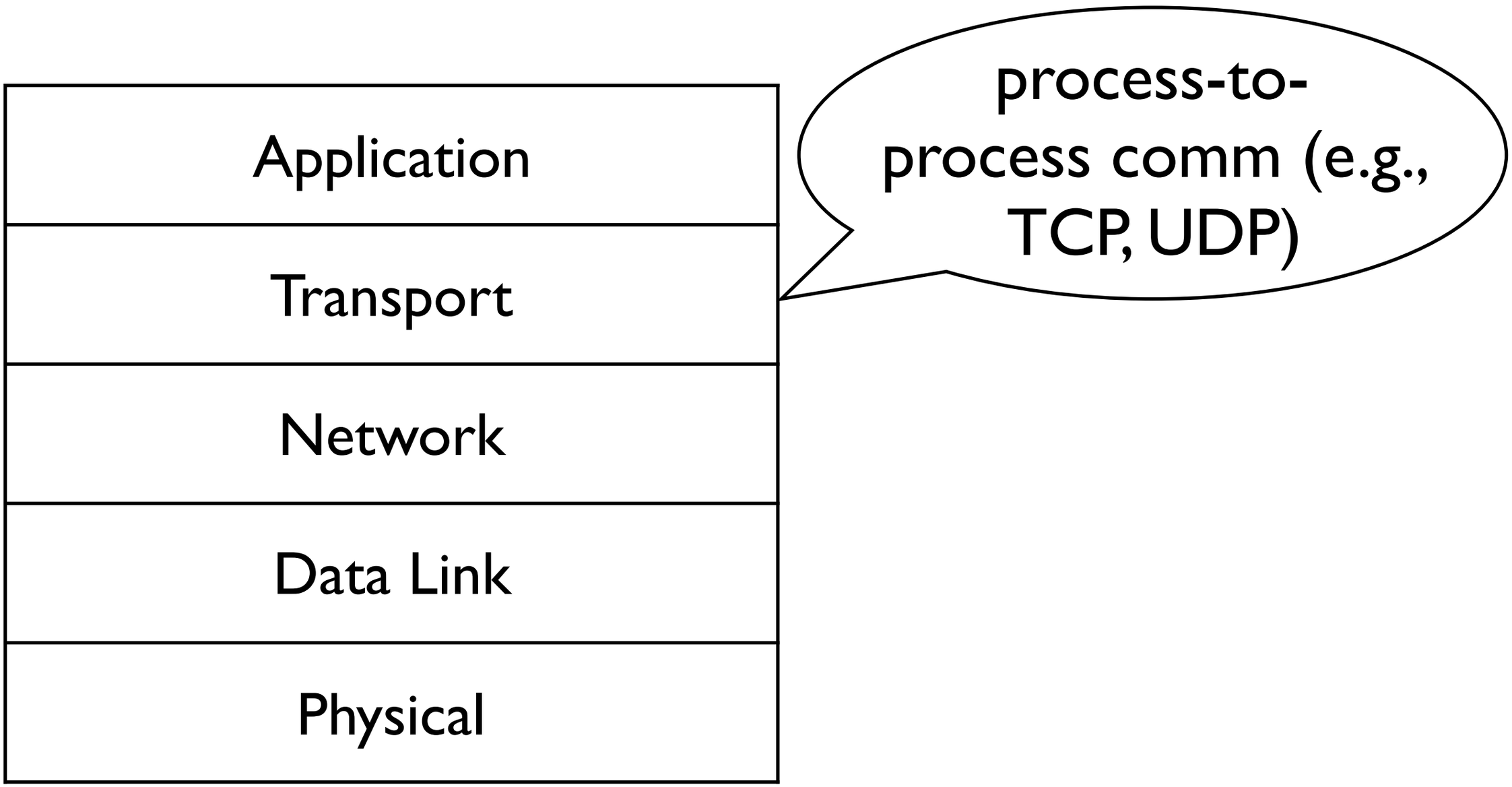

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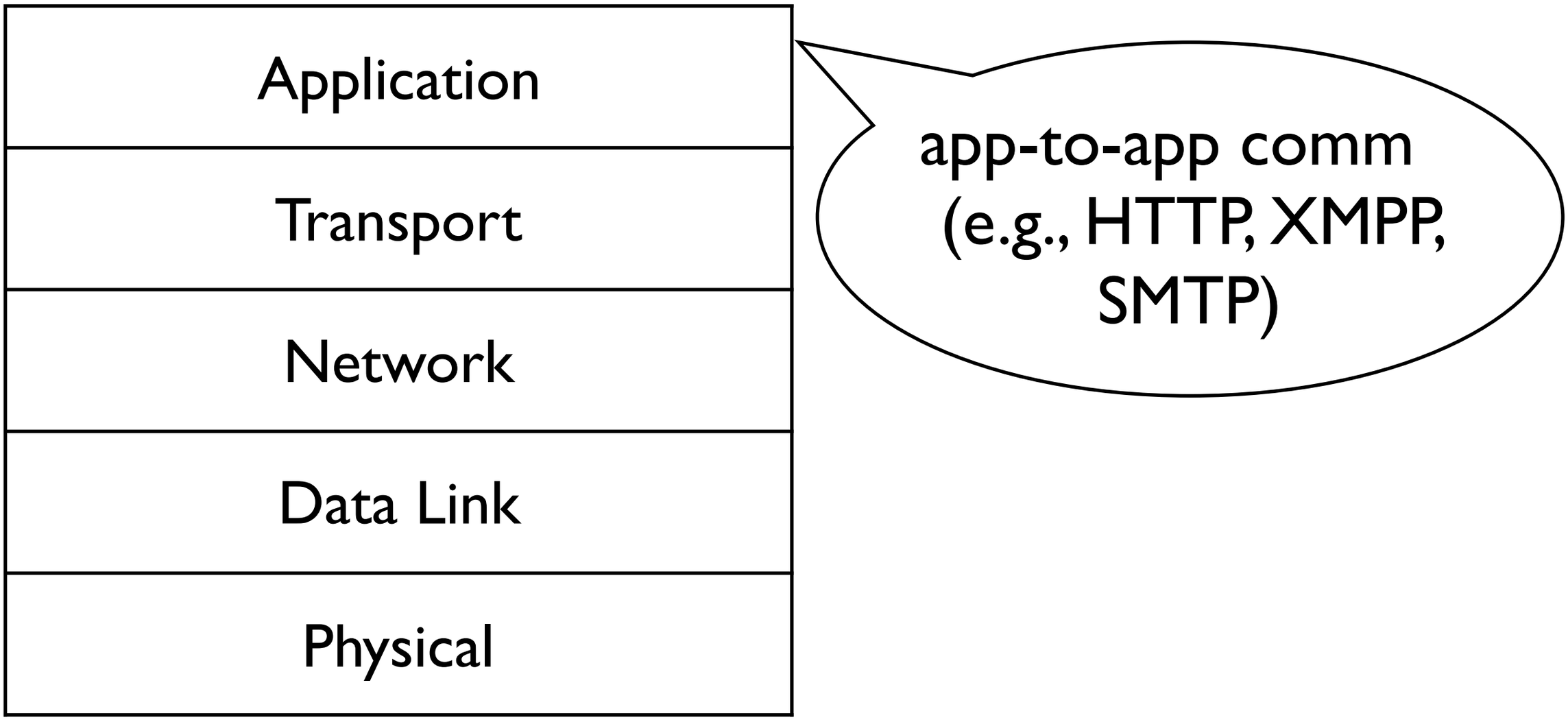

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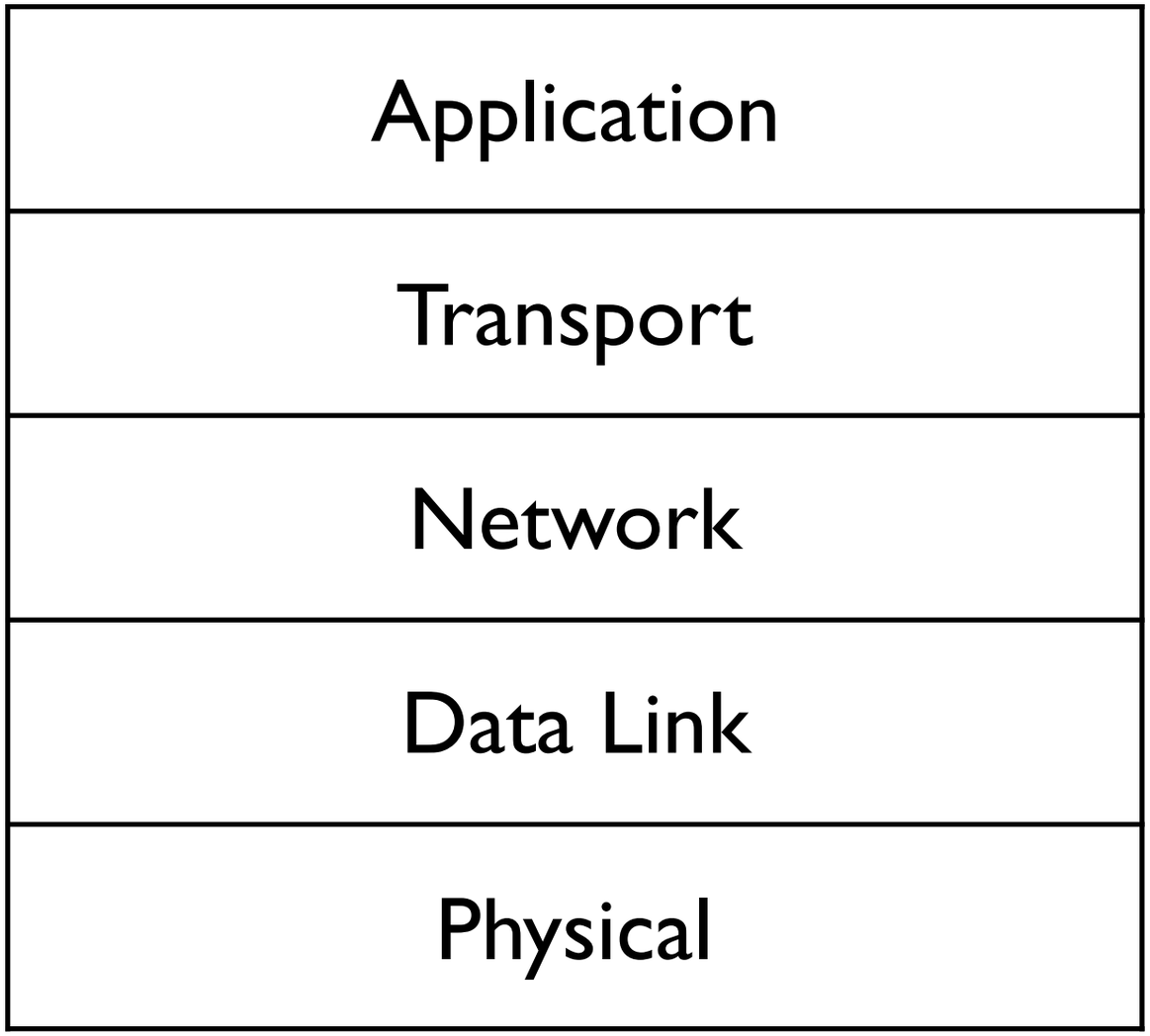

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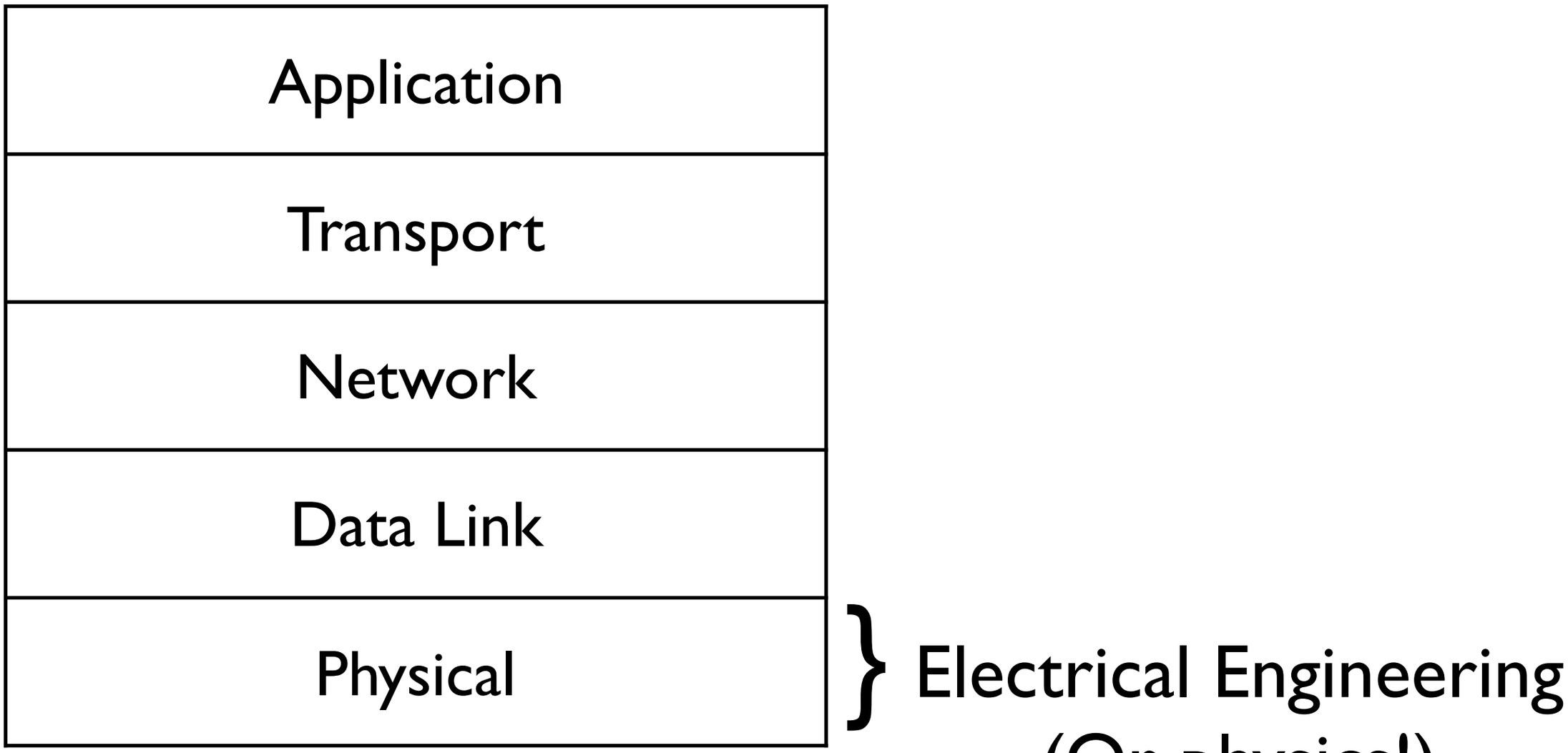

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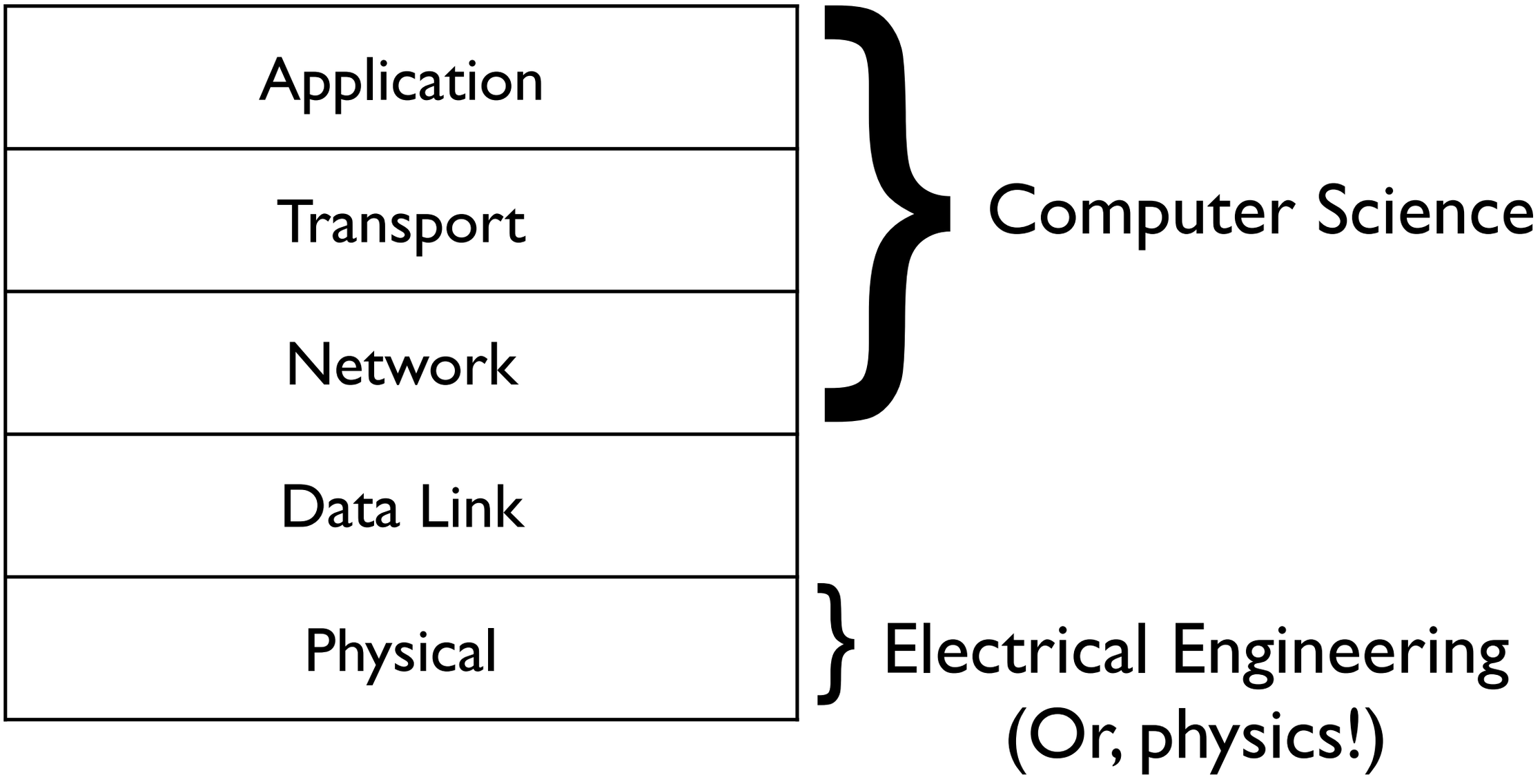

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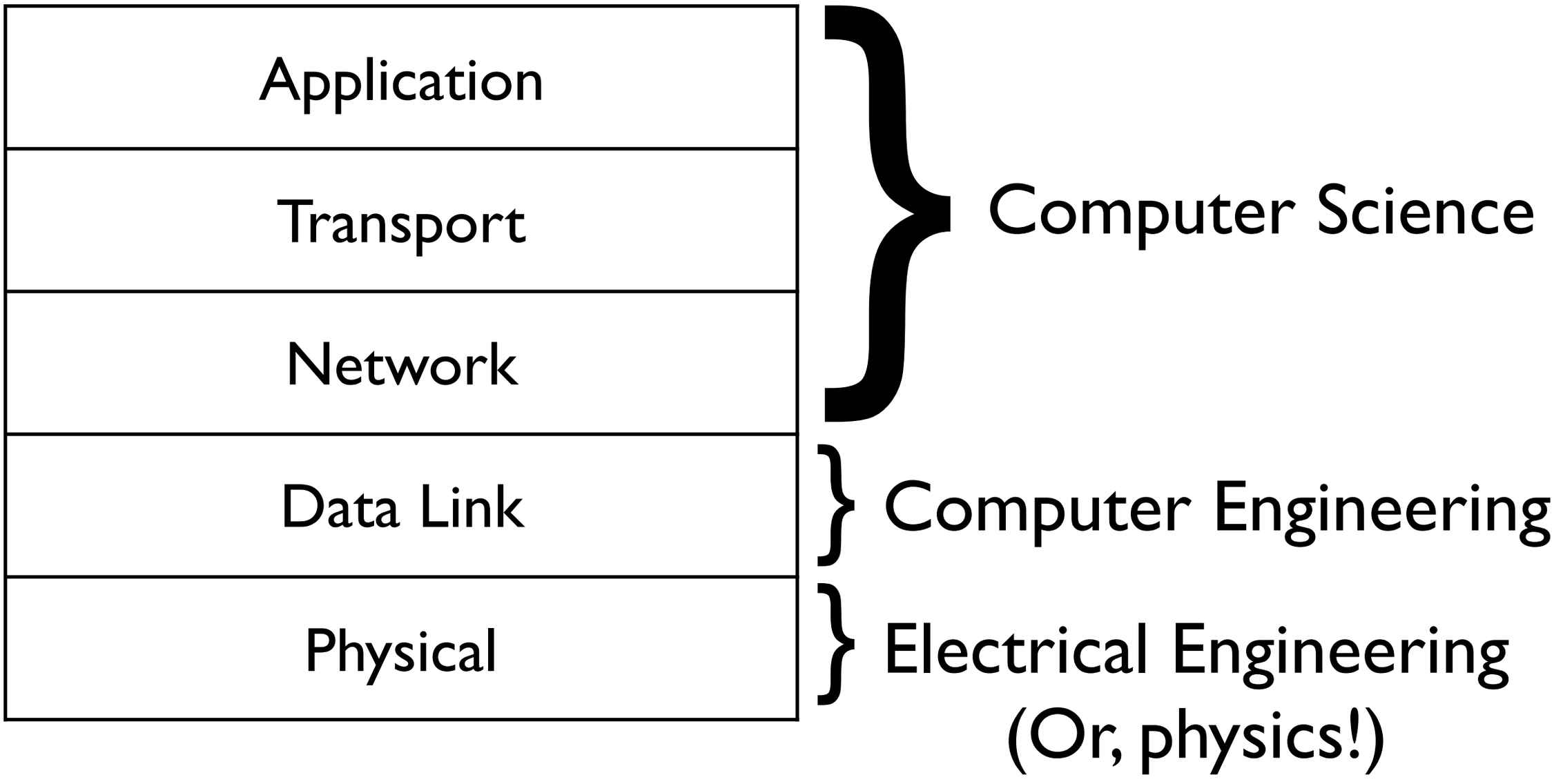

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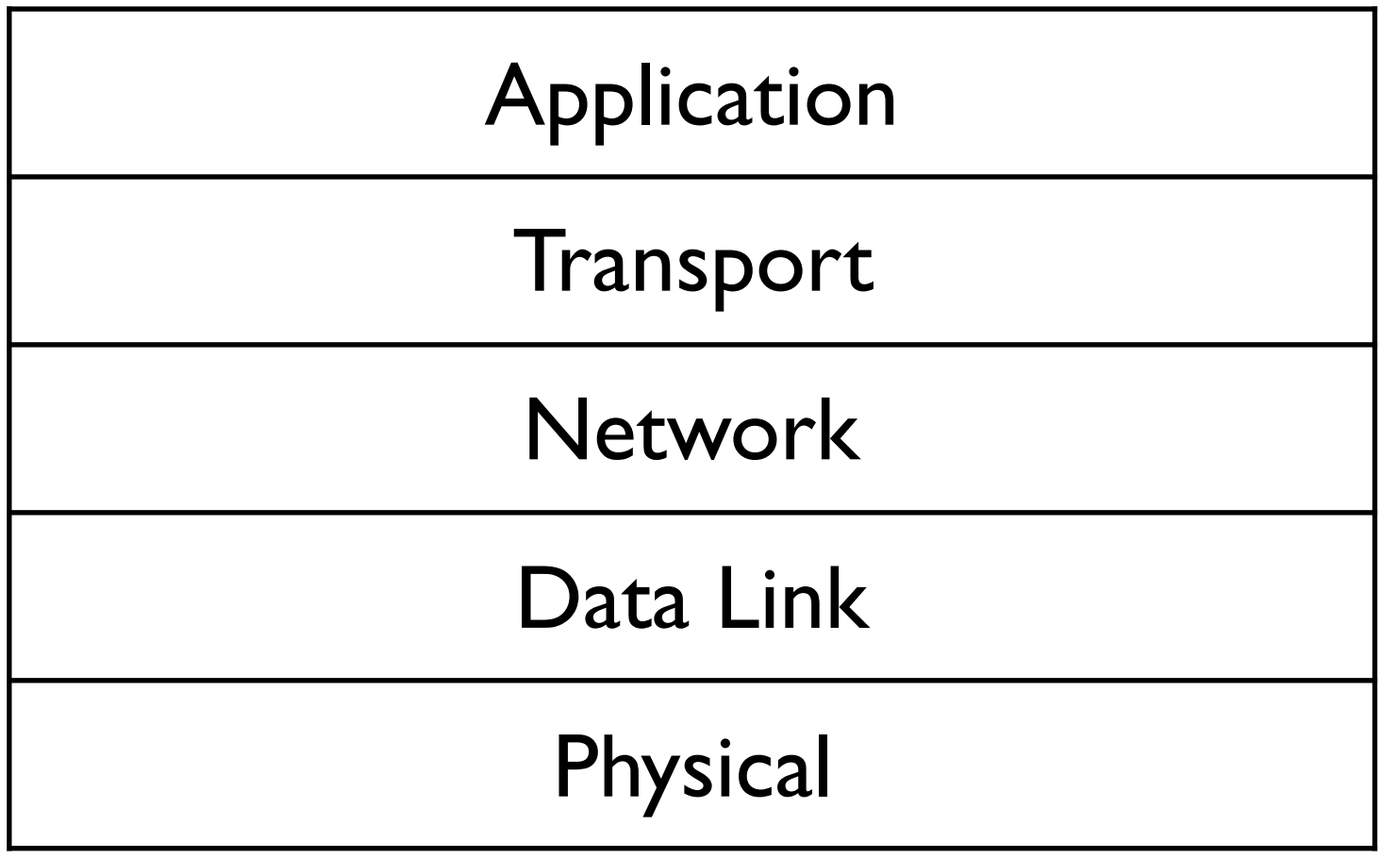

Layering (cont.)

Religion
Politics
Money
Application
Transport
Network
Data Link
Physical