

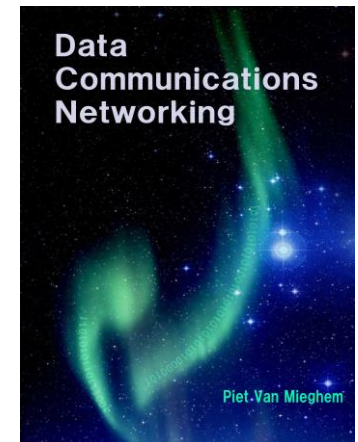
Telecommunications Networking

Part of EE2T21

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&
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Network Architectures and Services (NAS)

- 2 out of 4 ECTS (2/2 for EE8001)
- All announcements via FeedbackFruits
 - <https://secure.feedbackfruits.com/#groups/81105>
- Discussion forum, direct questions here
- Book:
 - Data Communications Networking;
ISBN 978-94-91075-01-8
 - Chapters 1-7.5: EE2T21
(Telecommunications Networking)
 - Chapters 7.5-13: CS4055
(High Performance Data Networking)



Mininet lab & Tour

- Mininet homework lab: Learn to configure network switches and routers, use Wireshark
 - 5 exercises, 0.2 bonus per exercise
 - 100 % 1st exams
 - 50 % Retake
 - 0 % otherwise
-
- Perhaps we will organize a tour of the TUDelft datacenter... To be confirmed.



- Homework is optional, though recommended
- Hand in **before** class x @ 13:30
 - Make and hand-in assignment using Google Forms @ FeedbackFruits page
 - Late assignments are not graded (no matter the excuse)
 - Suggestions for better hand-in tools are appreciated
- Start class with explanation of due assignment
- Finish remaining time working on exercise

- **Goal of the course:** understanding of different network concepts
- What do I expect from you?
 - Able to explain concepts: what? why? relation with others?
- Examination: what?
 - Only chapters 1 up to, and including, 7.5. No Appendices, no footnote-sized text, no homework nor lab material.
- Examination: how?
 - Written and *closed* book

- When:
 - 25/05: Partial exam chapter 1, 2 and 4 (possibly also chapter 3)
 - 29/06: Partial exam chapter (3,) 5, 6 and 7-7.5
 - 25/07: Re-exam chapter 1-7.5

- My ideal course:
 - You read the material in advance
 - I give a brief summary
 - We discuss the material and your questions
 - We put theory to practice (instead of only theory)
- What's your ideal?

Tentative schedule

Before class read:

- 21/04: Chapter 1
- 28/04: Chapter 2
- 12/05: Chapter 4
- 19/05: Chapter 3
- 26/05: Chapter 5
- 02/06: Chapter 6
- 09/06: Chapter 7
- T.B.A.: Q&A Session

and complete:

Install Mininet

Exercise 1

Exercise 2

Exercise 3

No exercise

Exercise 4

Exercise 5

1. Introduction

2. Local Area Networking

3. Error Control and Retransmission Protocols

4. Architectural Principles of the Internet

5. Flow Control in Internet: TCP

6. Routing Algorithms

7. Routing Protocols

8. The principles of ATM

9. Traffic Management in ATM

10. Scheduling

11. Quality of Service

12. Quality of Service routing

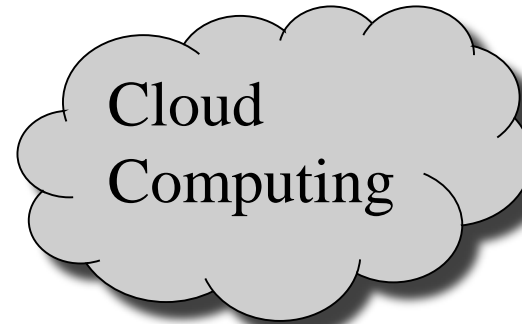
13. Peer-to-peer networks

Communication applications

Google™



You **Tube**




twitter

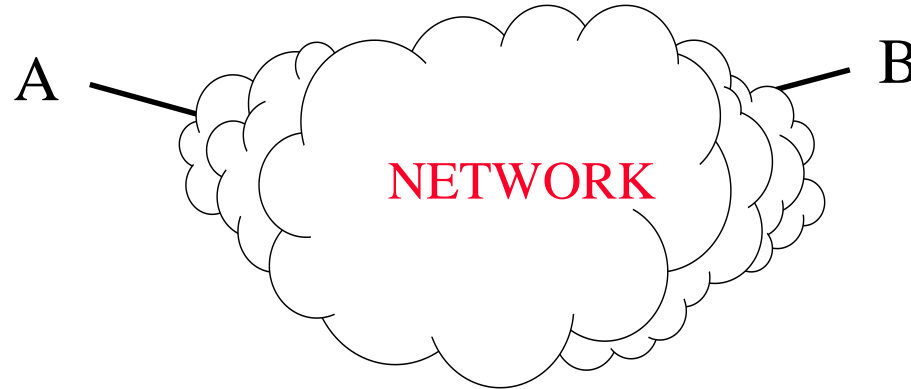


facebook®





*How to
communicate
with post-its
in a classroom?*



- Purpose: Transfer information from A \leftrightarrow B
- Basic Needs and Network Functionality

- topology, network infrastructure
- reachability, scope
- description of info
- finding path from A to B
- installing/reserving network resources
- forwarding and scheduling

Network design

Addressing structure

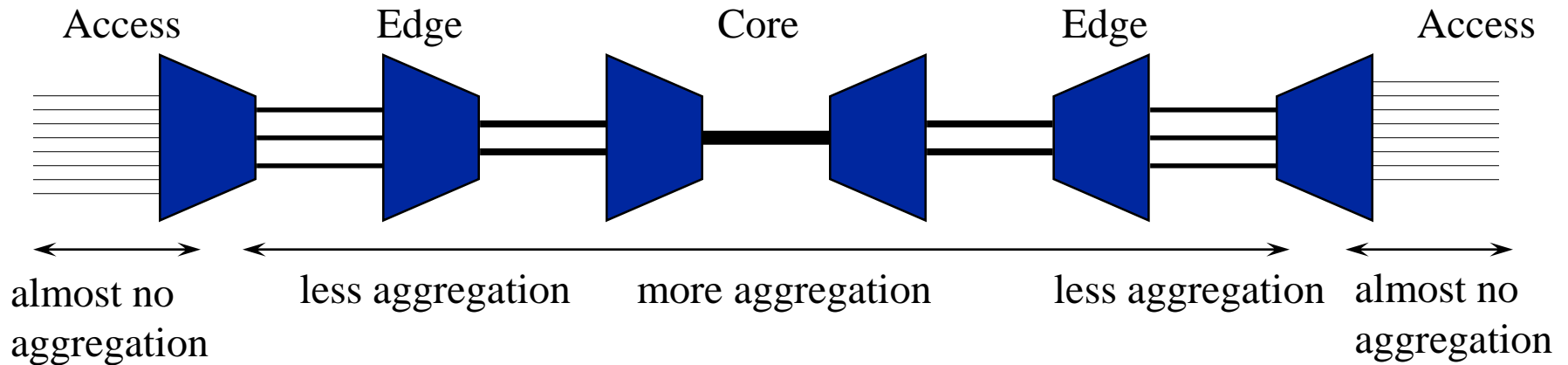
Traffic profile

Routing

Signaling

Switching

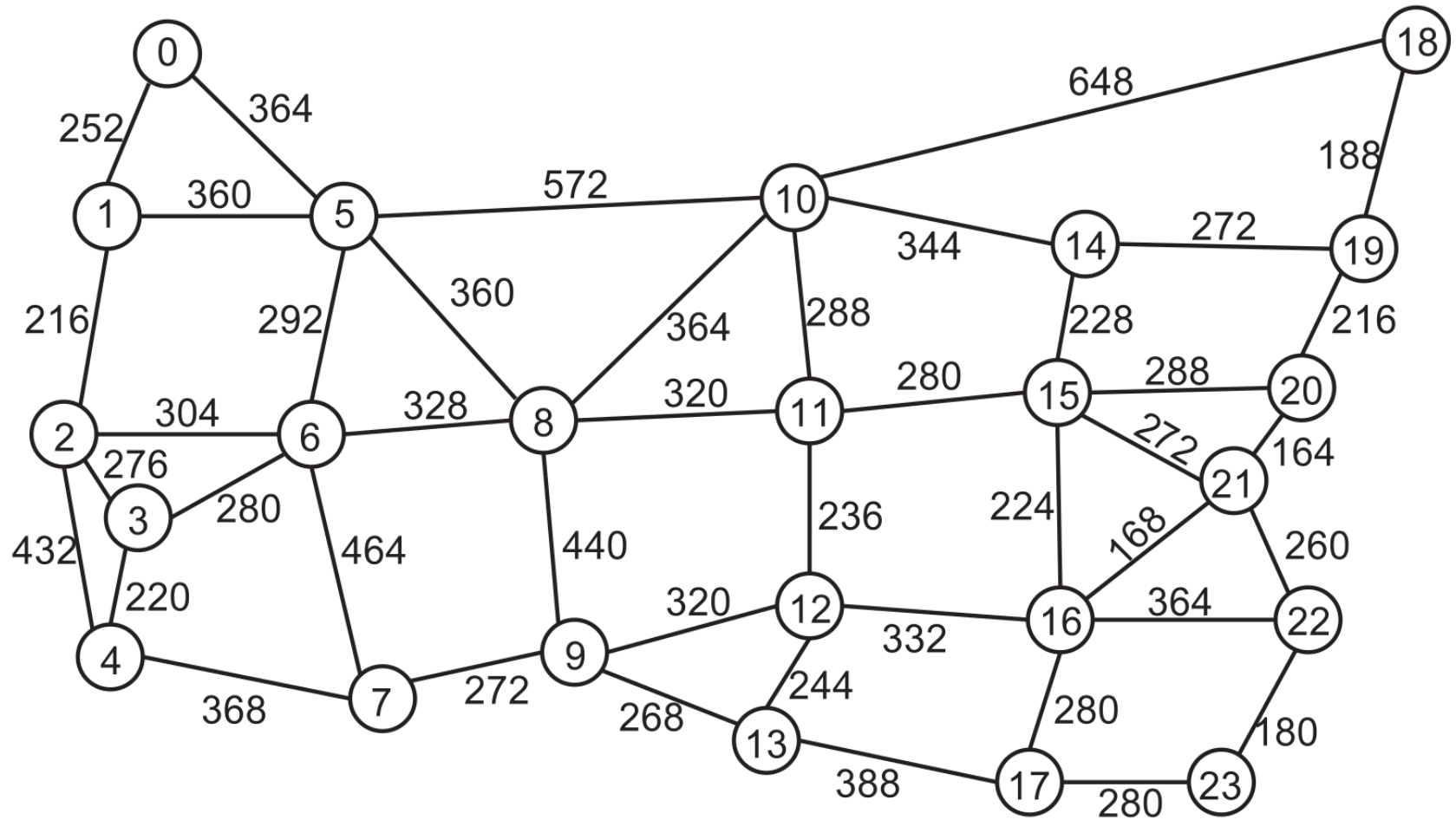
Hierarchy in Networking



Access: e.g. ADSL network or mobile GSM network

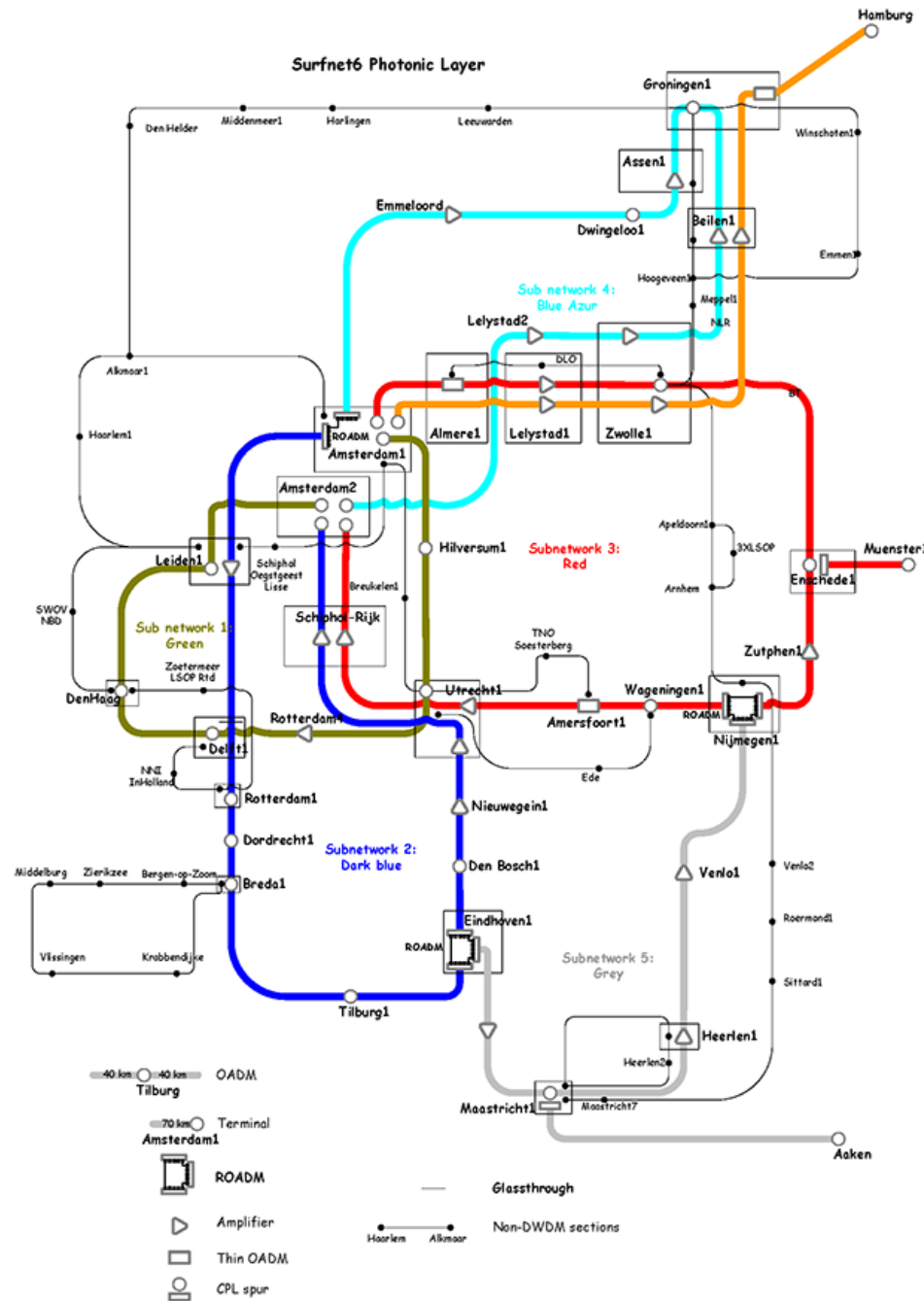
Core: Optical backbone network

Topology: USnet



Topological: SURFnet





Contain complexity

- Many have tried to visualize or contain the complete Internet
- AT&T Labs Internet Map
(already from 2007...)
- Clear need to contain complexity

Basic Address Types

It all starts with identifiers

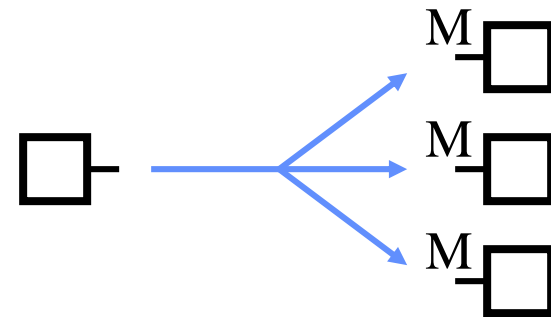
unicast:

for one-to-one
communication



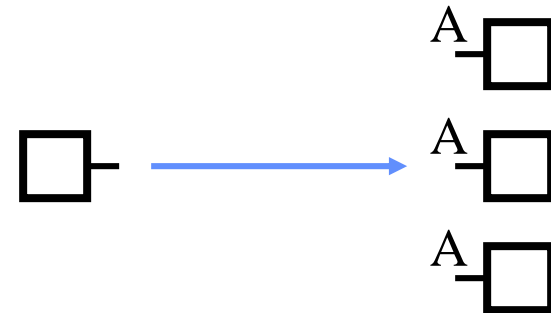
Multicast (*broadcast):

for one-to-many
communication

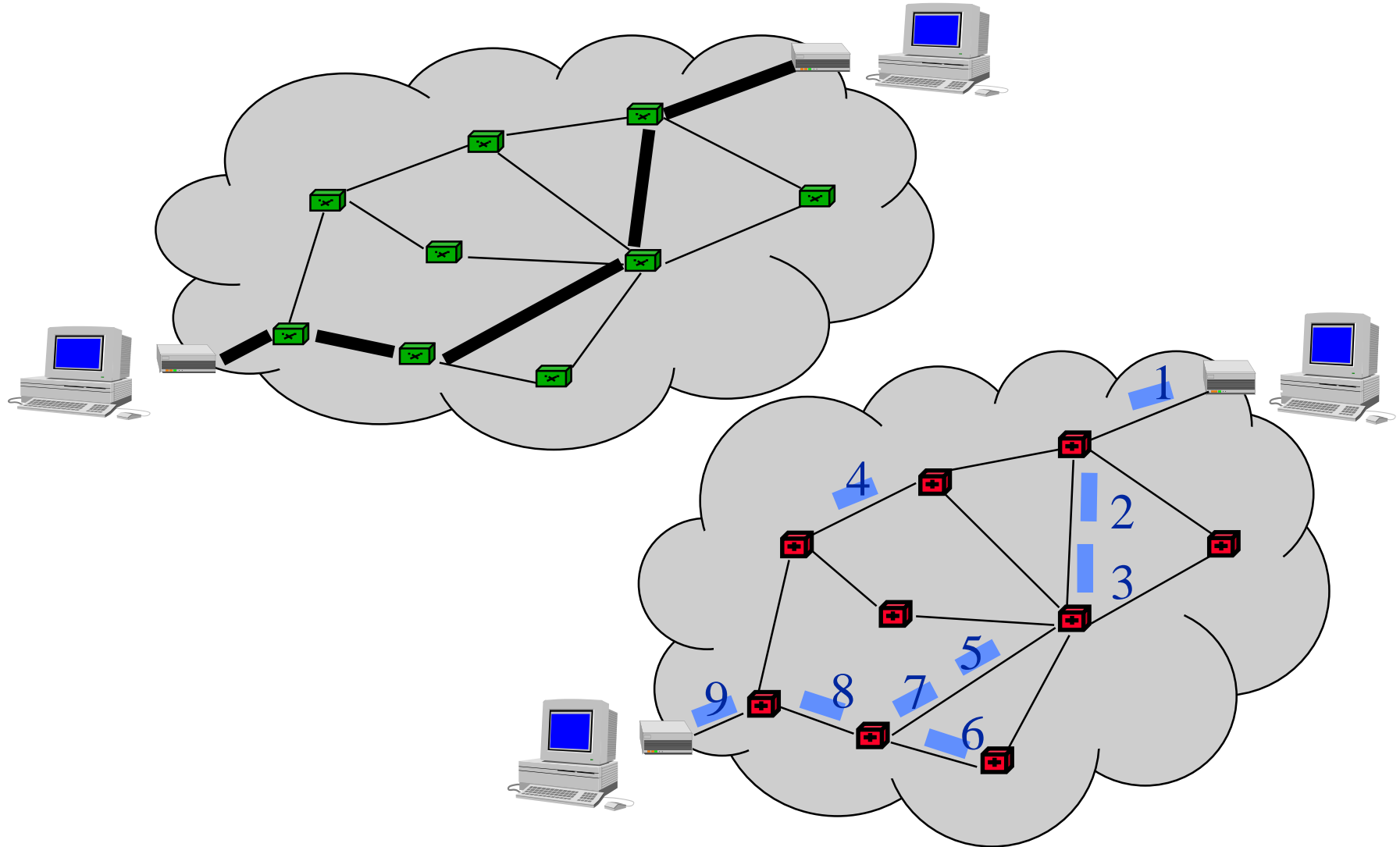


anycast:

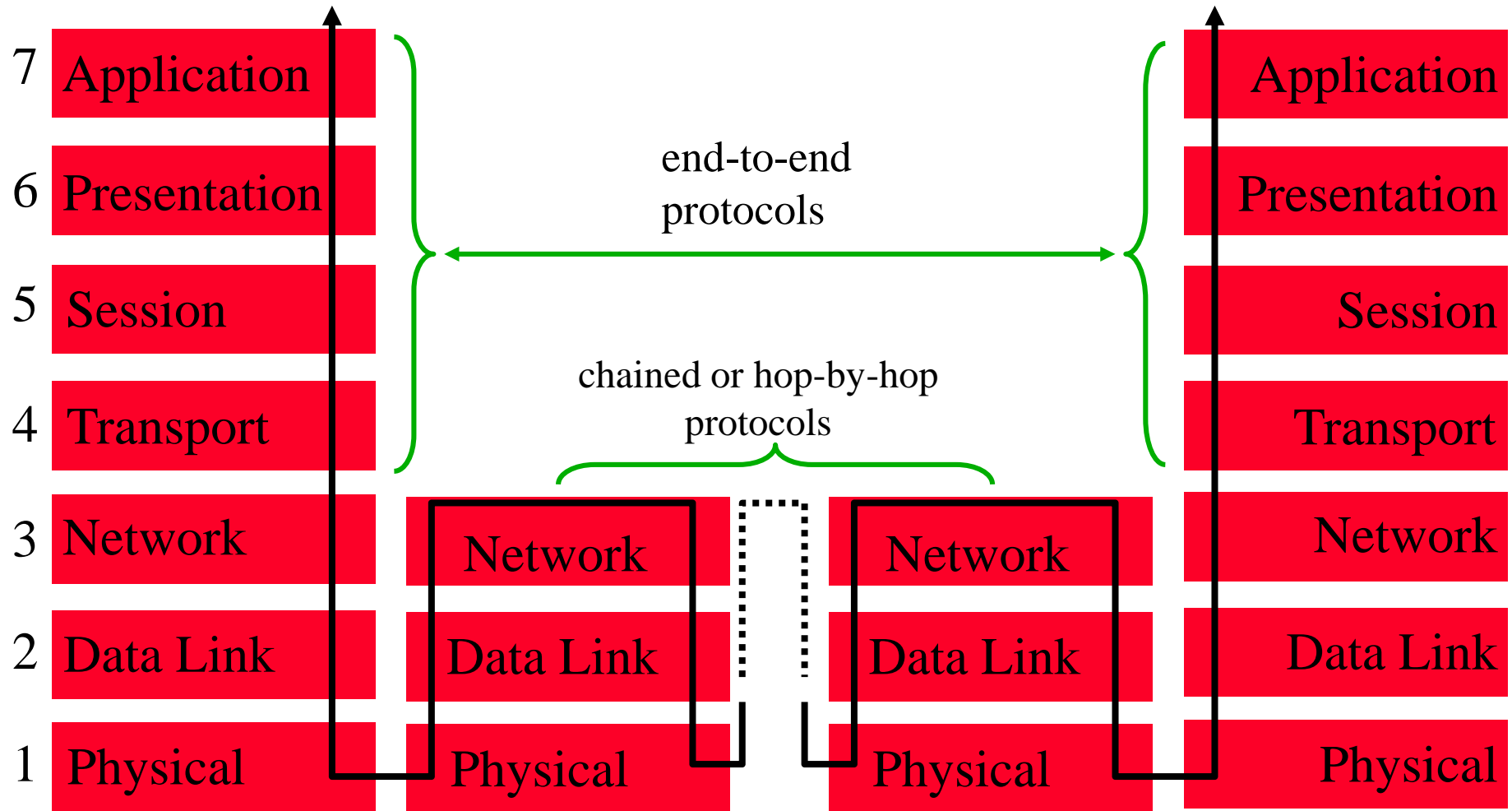
for one-to-nearest
communication



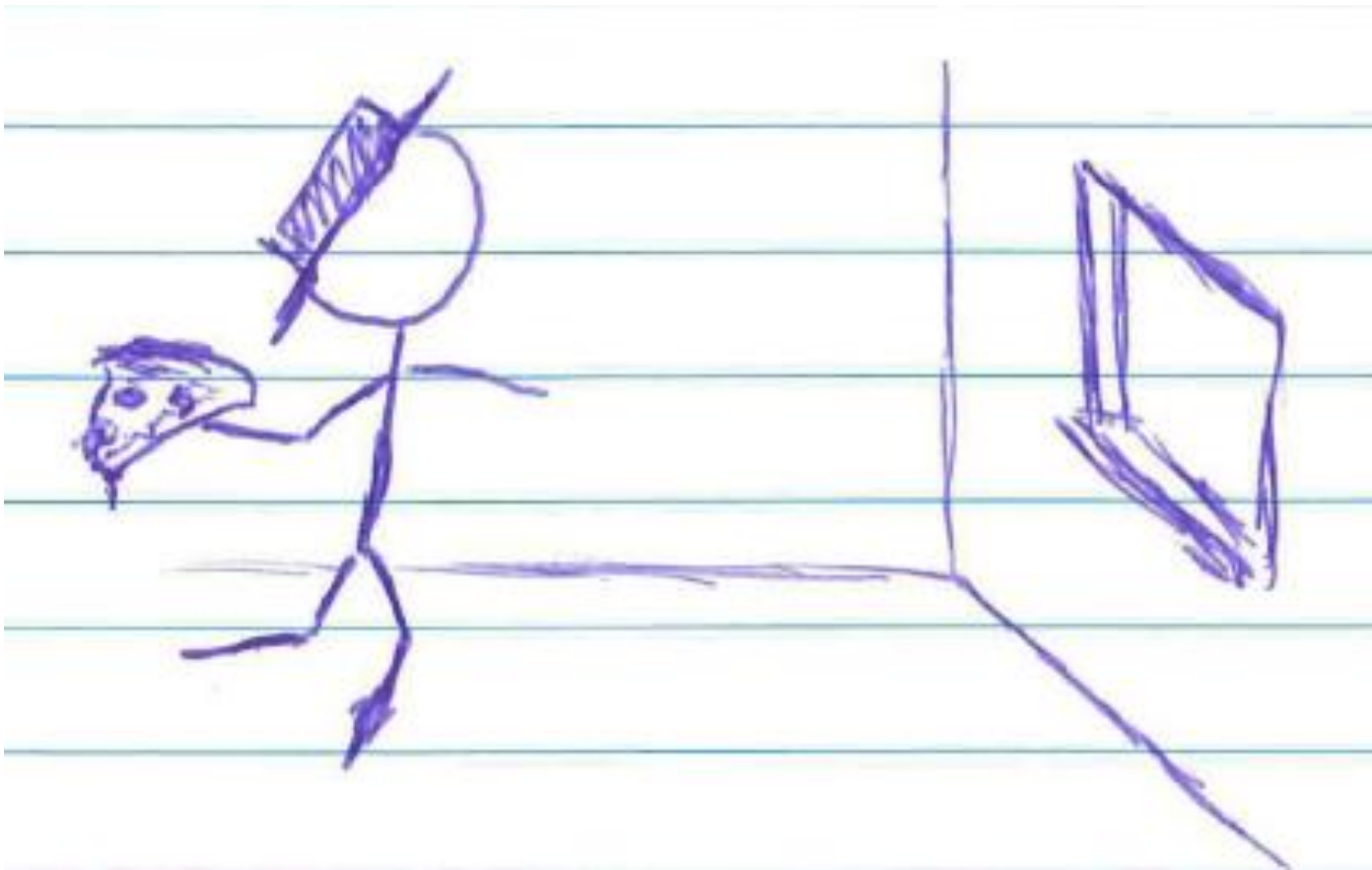
Connection Oriented and Connectionless



Open System Interconnect (OSI)



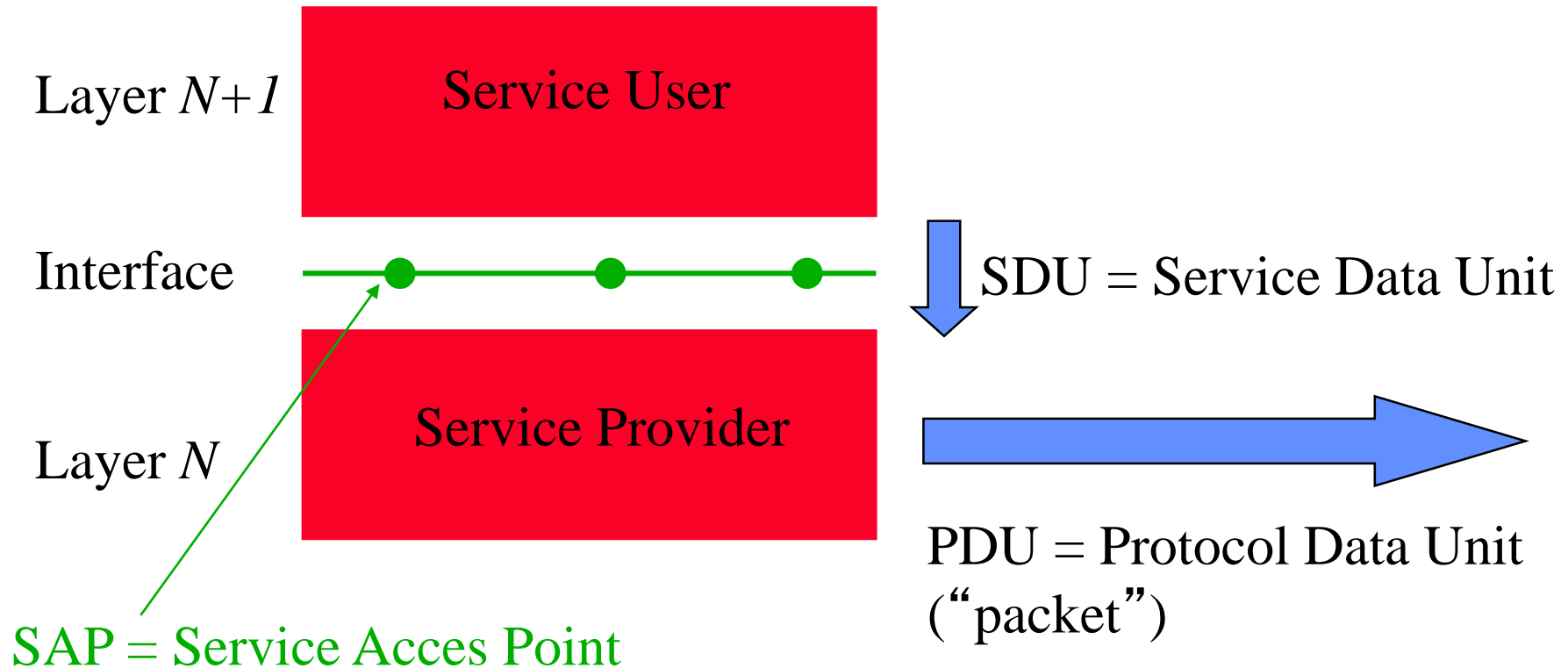
Physical	Data	Network	Transport	Service	Presentation	Application
Please	Do	Not	Throw	Salami	Pizza	Away

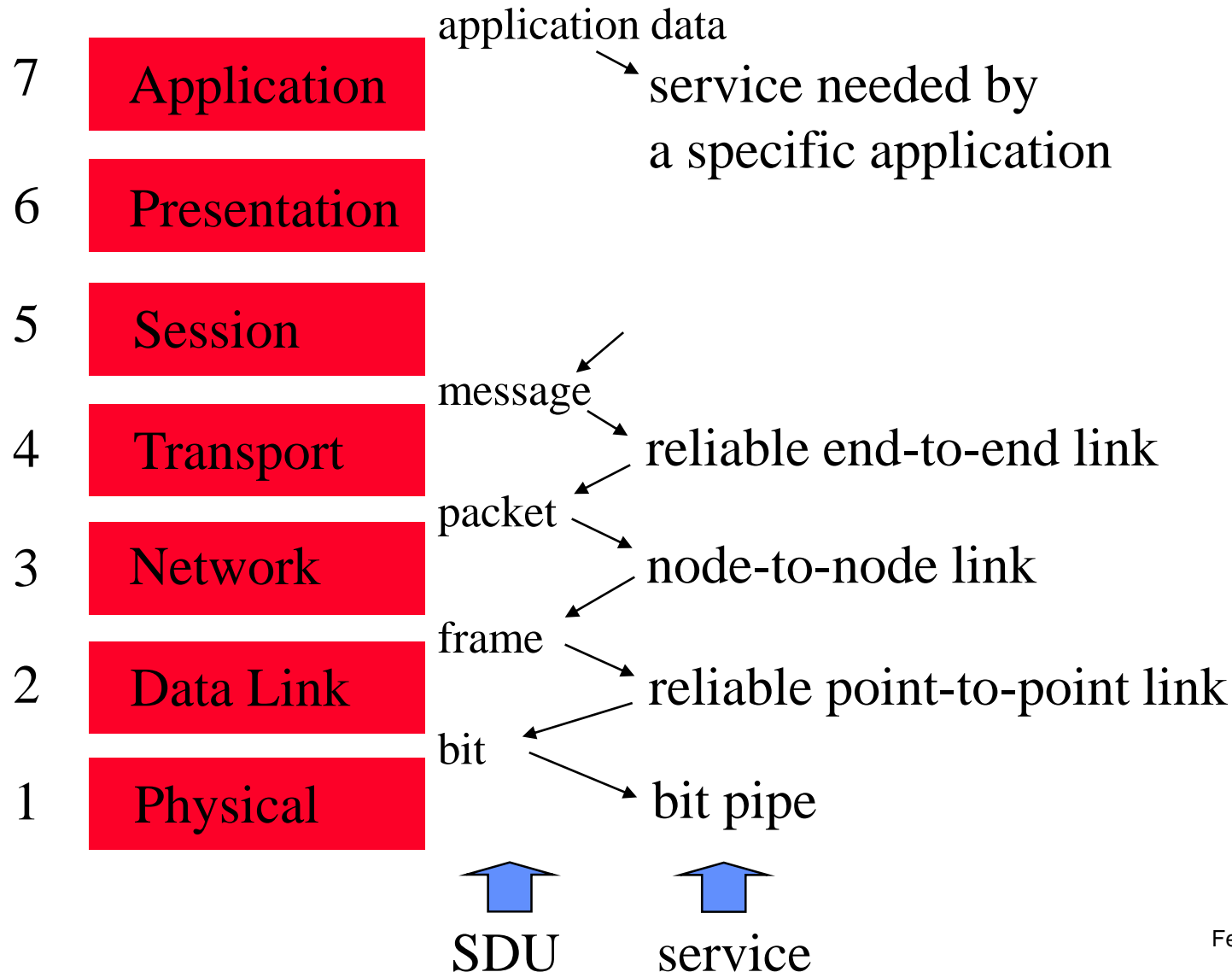


Three Basic OSI concepts

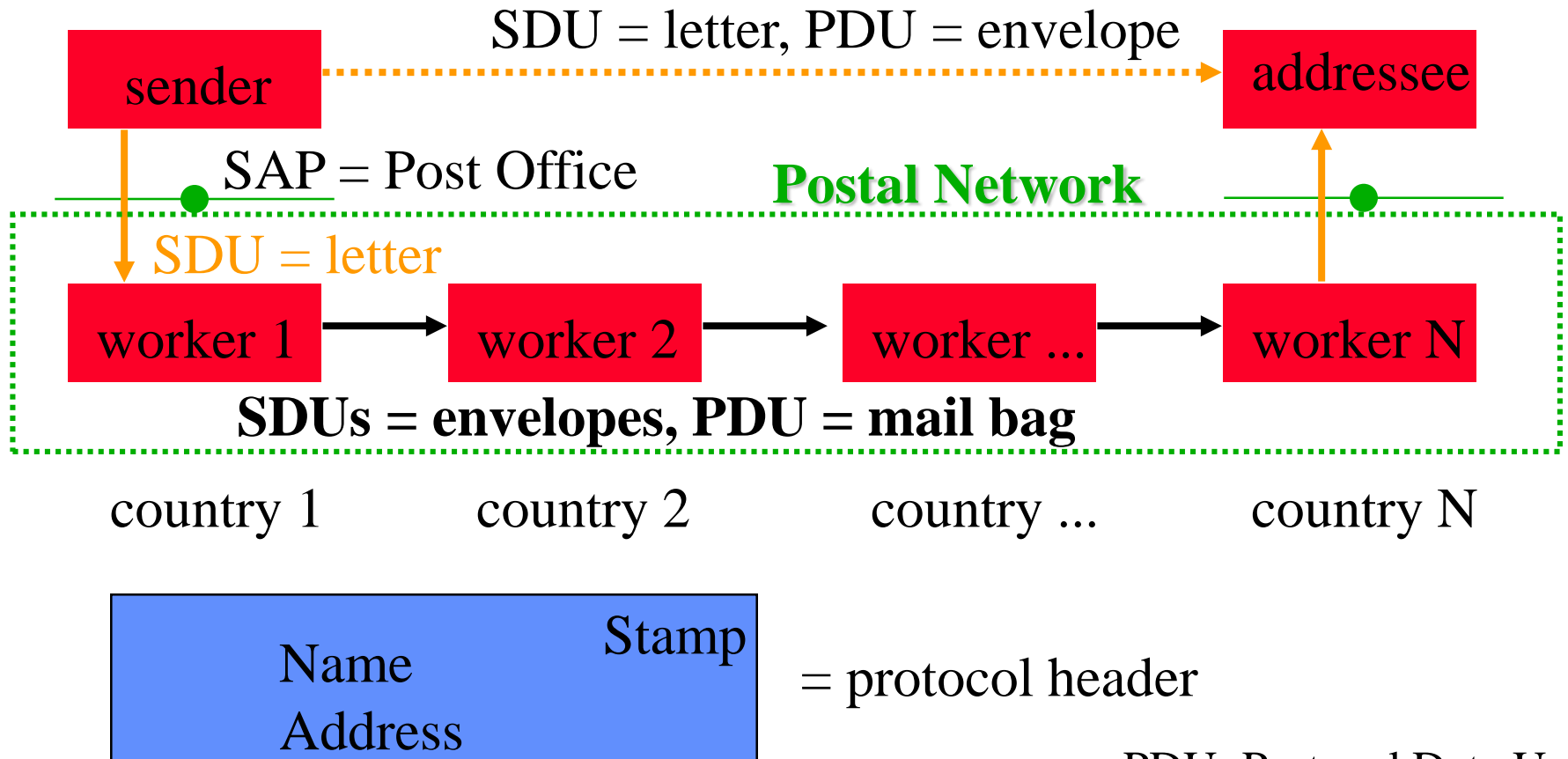
- Service
 - defines what the layer does
- Interface
 - tells the processes above it how to access the service
 - parameter specification
- Protocol
 - set of rules for communication between peers
 - the layer can use any protocol to provide its service

Layers and Interfaces



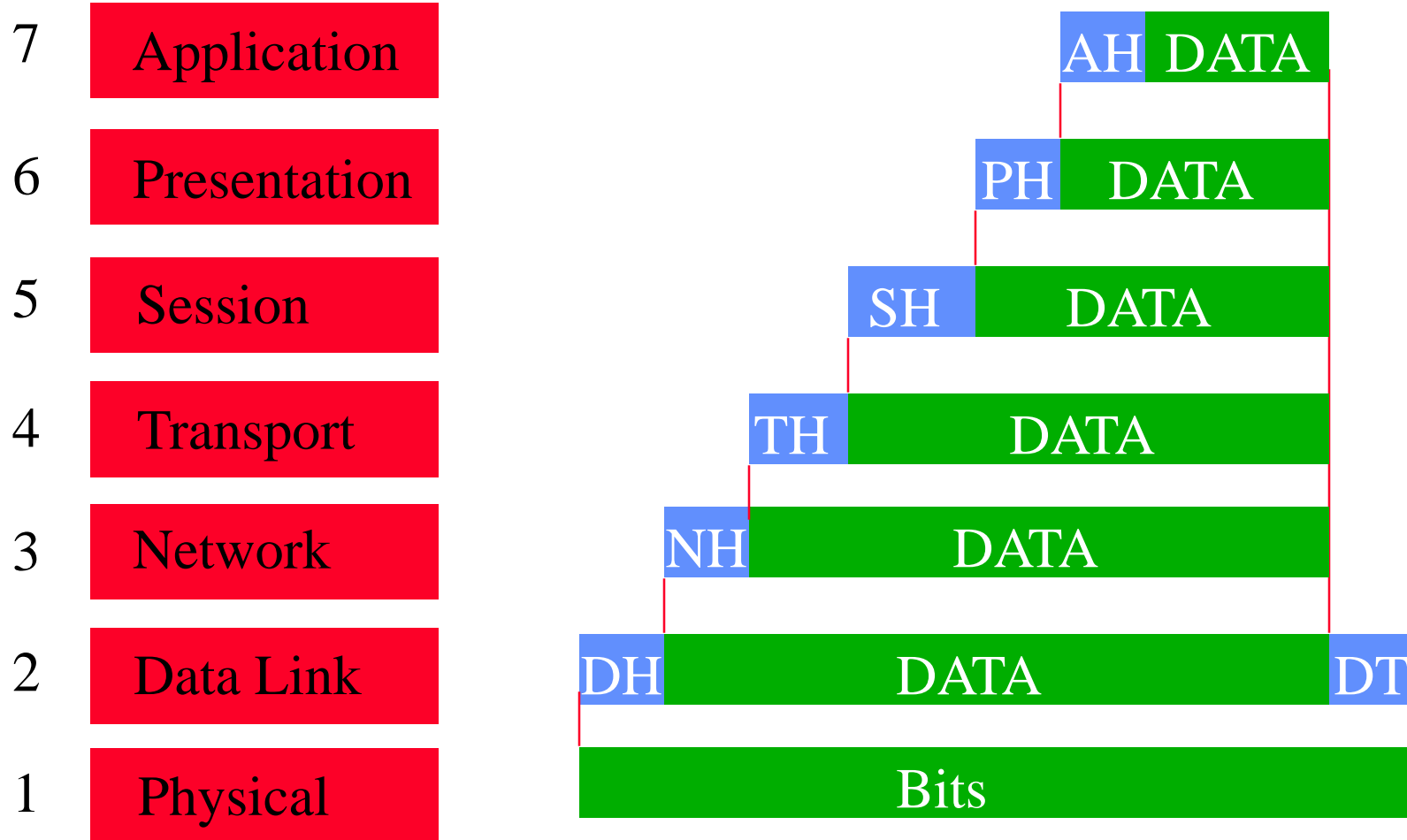


Postal Service Example



PDU: Protocol Data Unit
SDU: Service Data Unit
SAP: Service Access Point

Header overhead

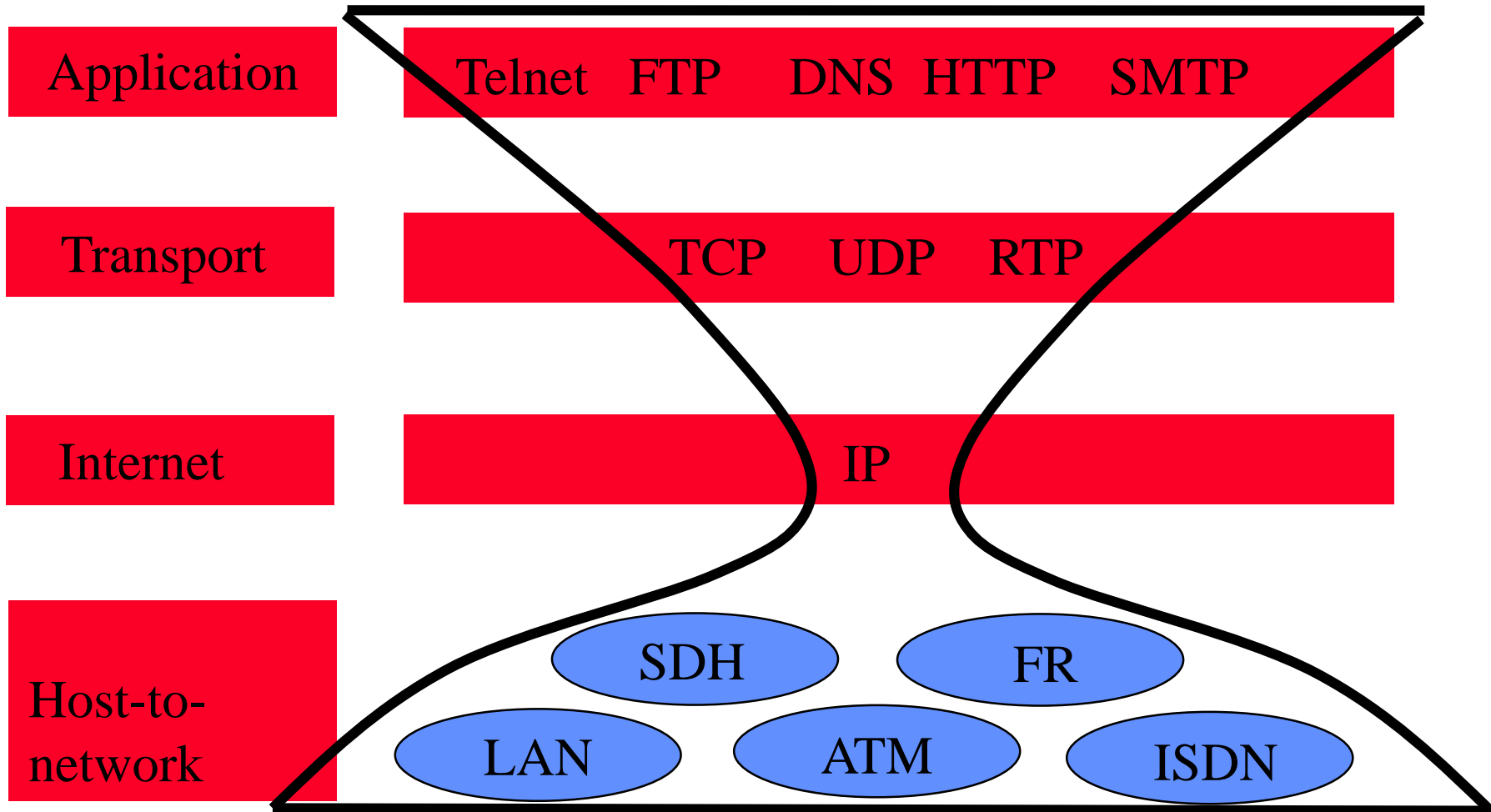


PRO: simplify design

- divide complex problem into smaller, more manageable pieces (independent & parallel execution)
- hiding implementation details from other layers: easy to upgrade a part of the system
- re-use of functionality: many upper layers can share services of lower layers

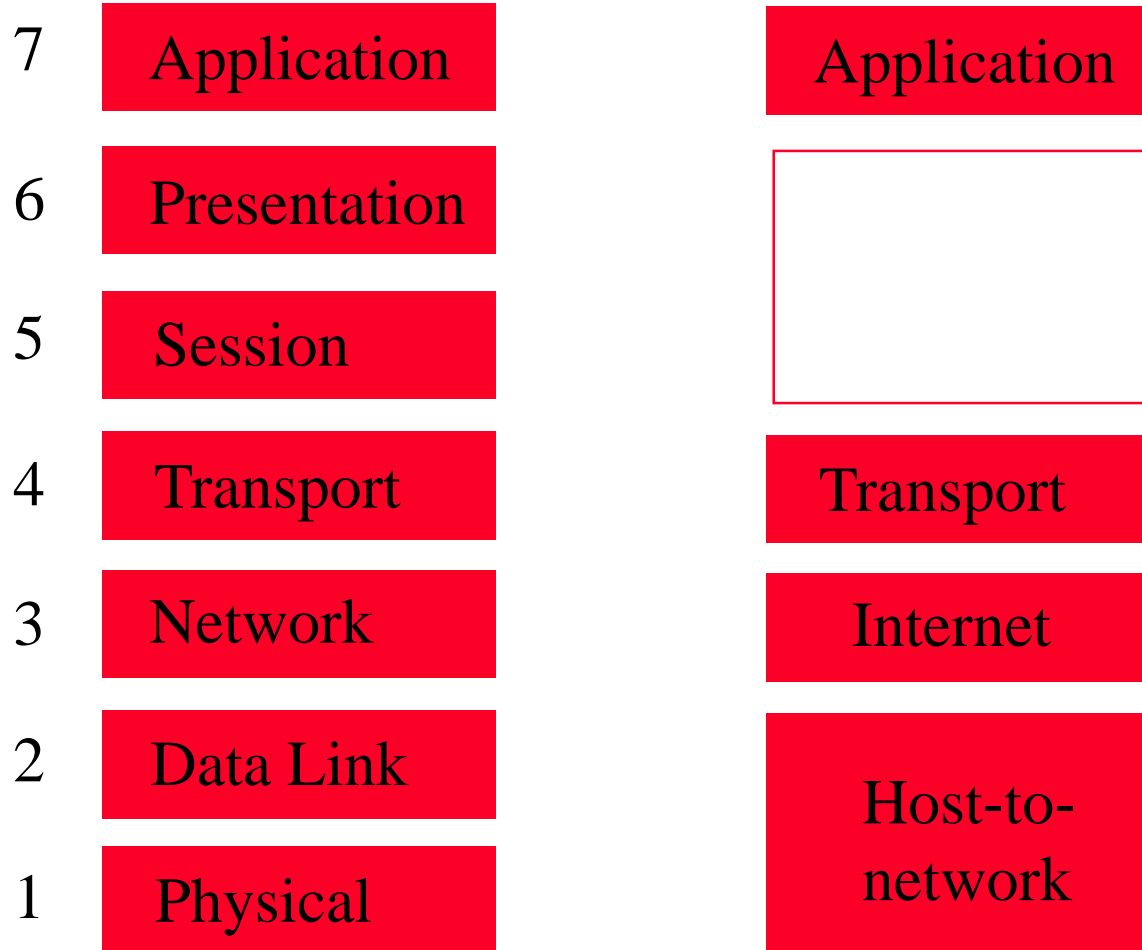
CON: poor performance

- limited info exchange between layers



“Hourglass” design

OSI versus TCP/IP



- Explain what connection oriented (CO) forwarding is and explain what connectionless (CL) forwarding is.
- Present the 7 OSI layers in the correct order and explain the purpose of layers 1,2,3,4,7.
- Explain the four communication modes: unicast, multicast, broadcast and anycast.

Mininet

An Instant Virtual Network on your Laptop (or other PC)

