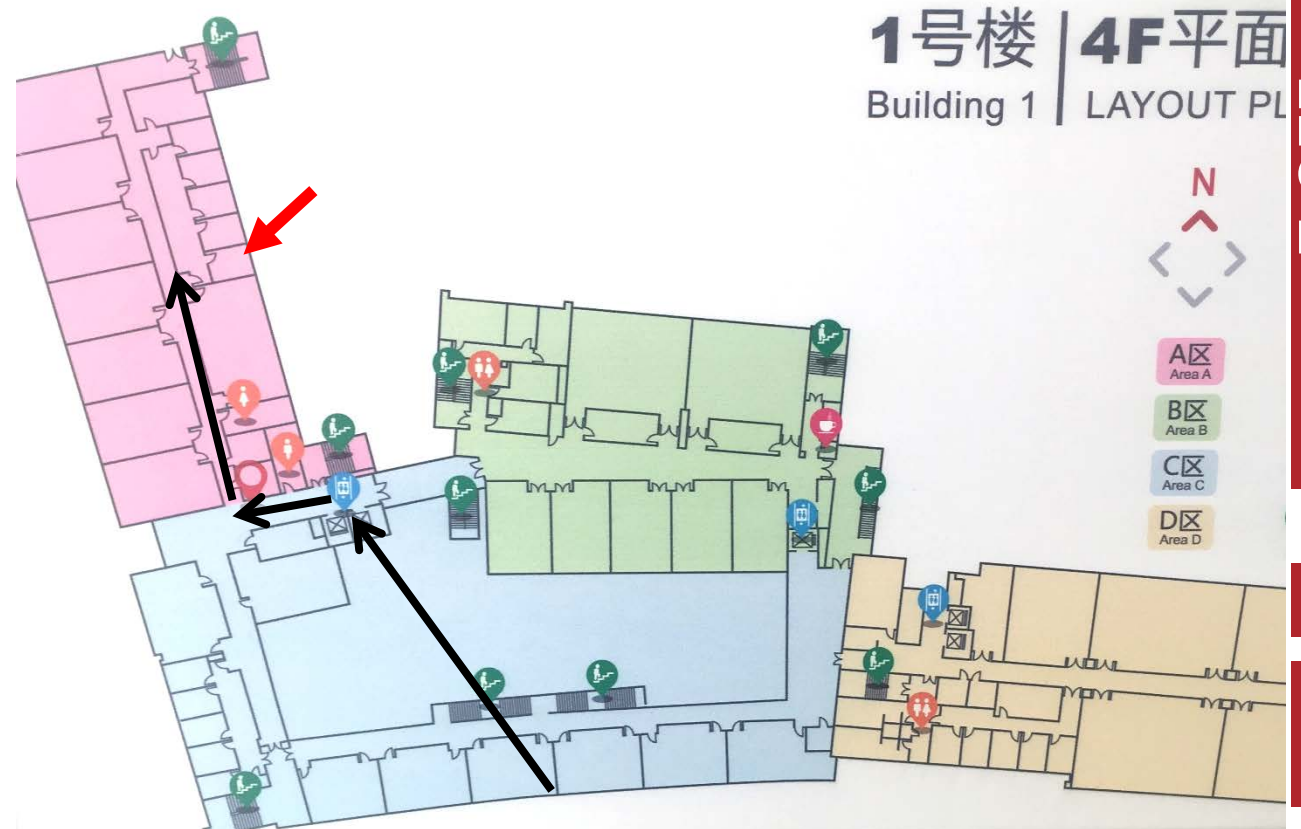# CS120: Computer Networks

Lecture 1. Course Introduction 1

Zhice Yang

General Information

- Instructor:
  - Zhice Yang (杨智策), www.yangzhice.com

  - Office hours:
    - Wednesday 2:30 p.m. – 4:30 p.m.
    - yangzhc@shanghaitech.edu.cn
    - 2068 5362
    - Office 1A-404E

1号楼 4F平面
Building 1 LAYOUT PL

General Information (cont.)

- TAs:
  - Ningzhi Zhu (祝宁之)
    - zhunzh@shanghaitech.edu.cn
    - Office Hours: Thursday 7:30 p.m. – 8:30 p.m.
  - Xin Li (李鑫)
    - lixin1@shanghaitech.edu.cn
    - Office Hours: Tuesday 7:30 p.m. – 8:30 p.m.
- Wechat
  - Q&A
  - Urgent Notifications
- Blackboard (互动教学平台)
  - Notifications
  - Course Materials
  - Homework Submission

Valid until 9/23 and will update upon joining gro...

General Information (cont.)

- Textbook
  - Computer Networks: A System Approach 5th
    - by Larry Peterson, Bruce Davie
    - http://product.dangdang.com/22722782.html (English Version)
- References
  - Computer Networking: A Top-Down Approach 6th
    - by James Kurose, Keith Ross
    - http://product.dangdang.com/23578344.html

Grading

- No Cheating !
  - Once confirmed. Fail the course

- 20% Homework
  - Four Homework Assignments (5% each)

- 30% Final Exam
  - No Midterm

- 50% Course Project
  - Group: <= 2 students
    - email TA (zhunzh@shanghaitech.edu.cn) your group members before Sep. 30
  - 40% for four subprojects (10% each)
    - Submit your project (code) through Blackboard
    - Ask TAs to check and grade your project before submitting your code
  - 10% if you finish all the four subprojects
    - "finish" means: obtain 60% points of the compulsory parts
  - Reference code of project 1 is provided after the due
  - Programming language: No restrictions (Java is suggested)
  - Estimated coding overhead (5000 lines)
  - You can use any open-source code (should be explicitly acknowledged with reference link)

- Up to 30% Bonus Score
  - For finishing optional parts of Course Project

- Delayed Submissions
  - -10 % * N, N is the delayed time in unit of day (N<=10)
  - -5% for the first 0 – 12 Hours
  - -10 % for the first 12 – 24 Hours

START PROJECT EARLY

Week	Time		Time	
1	Sep. 17	Course Introduction 1	Sep. 19	Course Introduction 2
2	~~Sep. 24~~		Sep. 26	Physical Layer
3	~~Oct. 1~~		~~Oct. 3~~ Sep. 29	Framing & Error Detection
4	Oct. 8	Project Discussion 1	Oct. 10	Project Discussion 2
5	Oct. 15	Reliable Transmission	Oct. 17	Multiple Access 1
6	Oct. 22	Multiple Access 2	Oct. 24	Multiple Access 3
7	Oct. 29	Switching 1	Oct. 31	Switching 2
8	Nov. 5	Routing 1	Nov. 7	Routing 2
9	Nov. 12	Routing 3	Nov. 14	Multicast
10	Nov. 19	TCP & UDP 1	Nov. 21	TCP & UDP 2
11	Nov. 26	TCP & UDP 3	Nov. 28	RPC & RTP
12	Dec. 3	Queuing	Dec. 5	Congestion Control 1
13	Dec. 10	Congestion Control 2	Dec. 12	QoS
14	Dec. 17	Data Presentation & Compression 1	Dec. 19	Data Presentation & Compression 2
15	Dec. 24	DNS	Dec. 26	HTTP & SMTP
16	Dec. 31	FTP & P2P	Jan. 2	Network Security
18	Jan. 14		Jan. 16	

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proj1 release

proj1 due

proj2 release

proj2 due

proj3 release

proj3 due

proj4 release

proj4 due

Withdraw Policy

• According to University's Policies

What is a Computer Network

Internet

Information Sharing

Email

Device to Device Connections

Wireless Connections

The Purpose of This Course is

- NOT to teach how to
  - Write network apps
  - Configure network devices

The Purpose of This Course is

to Build a Computer Network

to understand how real computer networks work

Top-Down

Bottom-Up

Build a HTTP Service from Ground up ?

- A Real Network Like Internet is too Complicated to Build
  - Implement an http server (Apache, Nginx…)
  - Implement an http browser (Chrome, IE…)
  - Implement a TCP/IP stack (net/core, socket…)
  - Implement a link layer driver (ath9k, e1000…)
  - Implement a modem chip (ar9285, Intel i210…)

No one can do this in one semester…

About our Project

- Acoustic Toy Computer Network (ATNet)

FTP Client 1

FTP Server

Acoustic Channel

Acoustic Channel

Acoustic Channel

FTP Client 2

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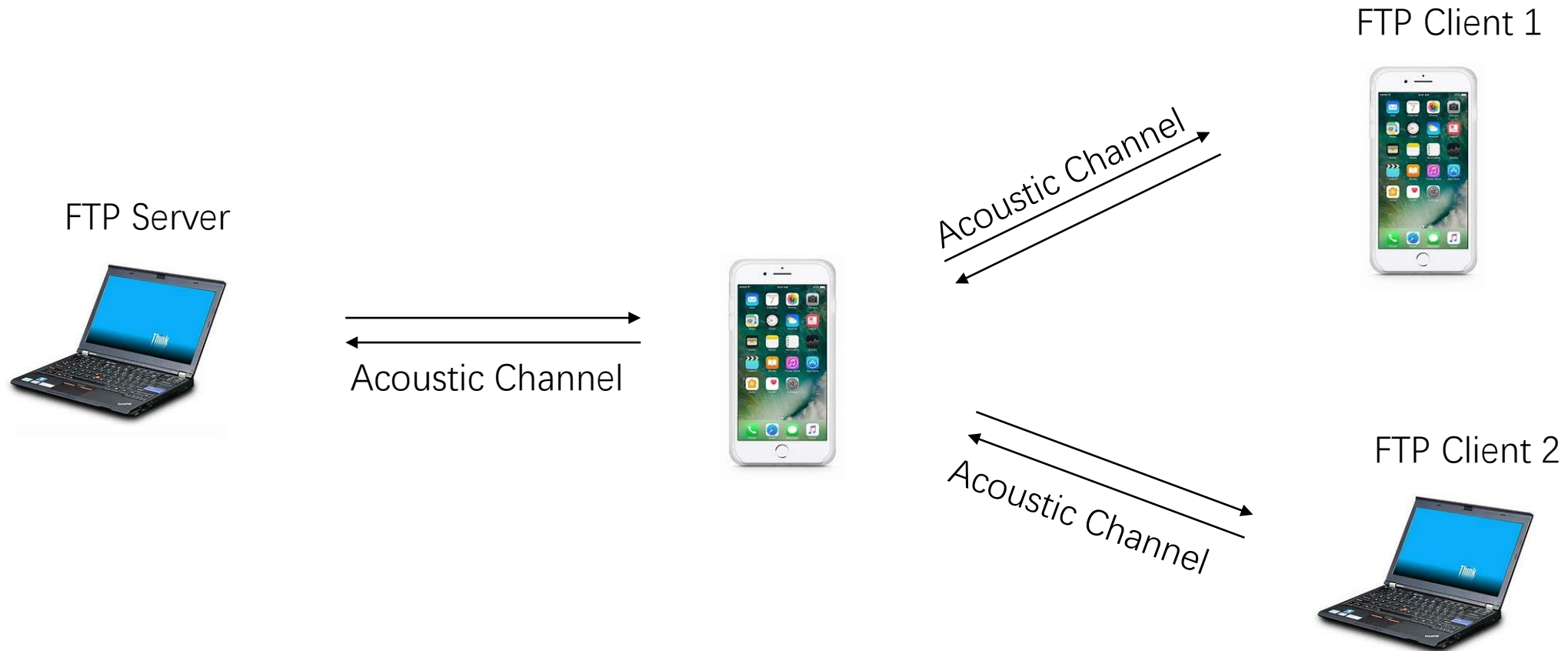
Subproject 1

- Acoustic Connection
  - Node to node connection through speakers and microphones

Acoustic Channel

Subproject 2

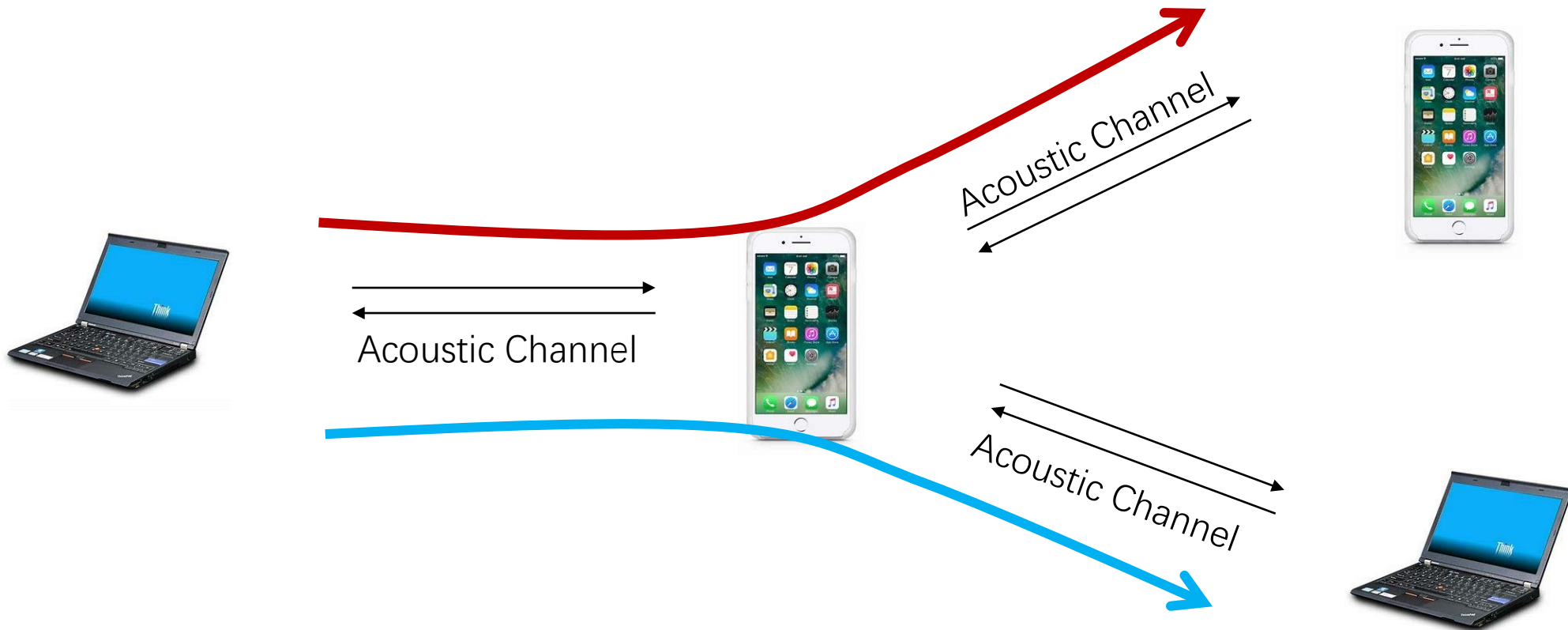- Multiple Access
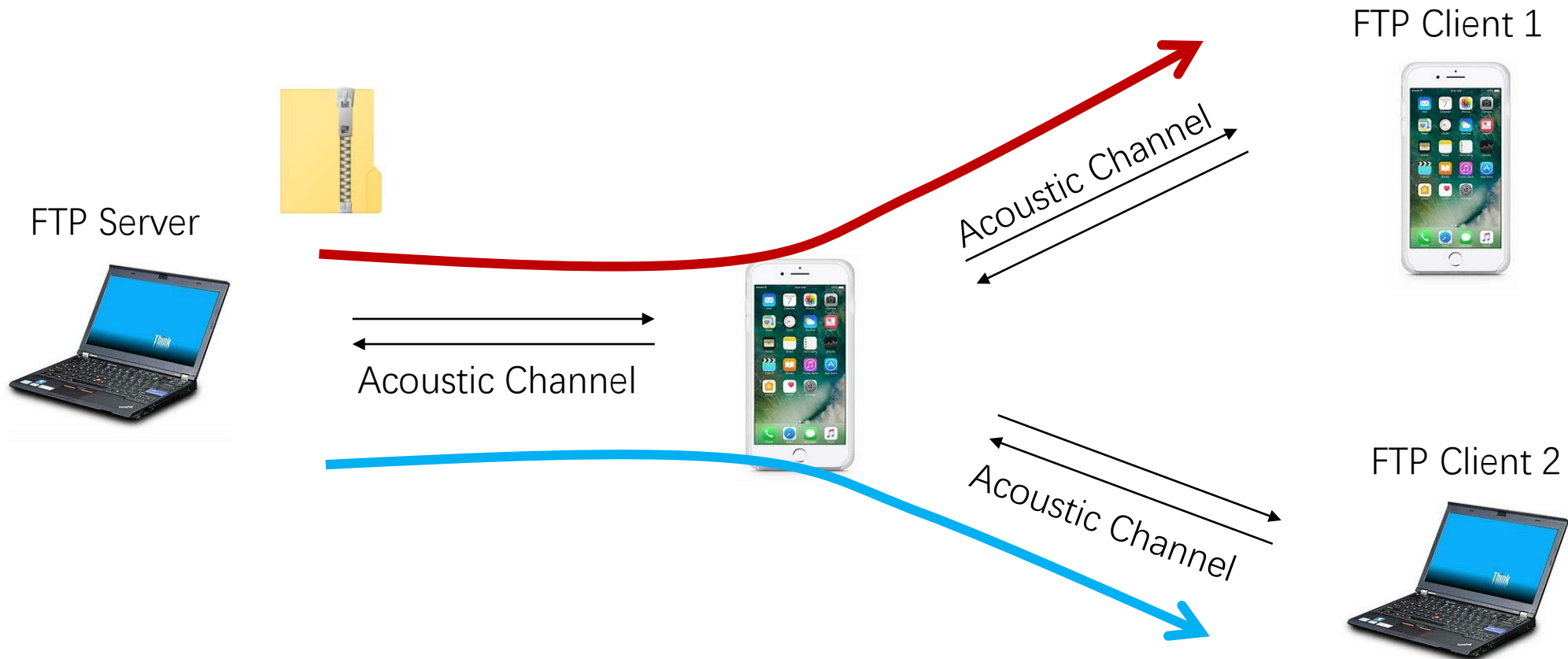 - Efficiently handle the access of multiple nodes

Acoustic Channel
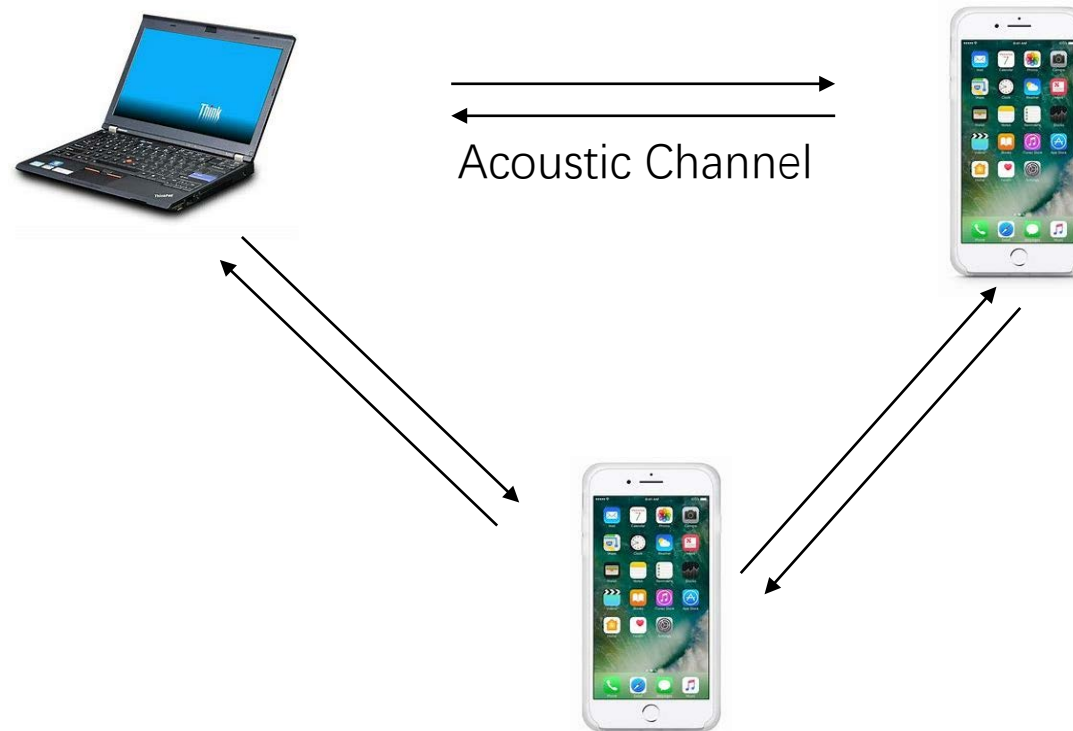
Subproject 3

- NAT/Routing
  - Implement a network gateway

Acoustic Channel

Acoustic Channel

Acoustic Channel

Acoustic Channel

Subproject 4

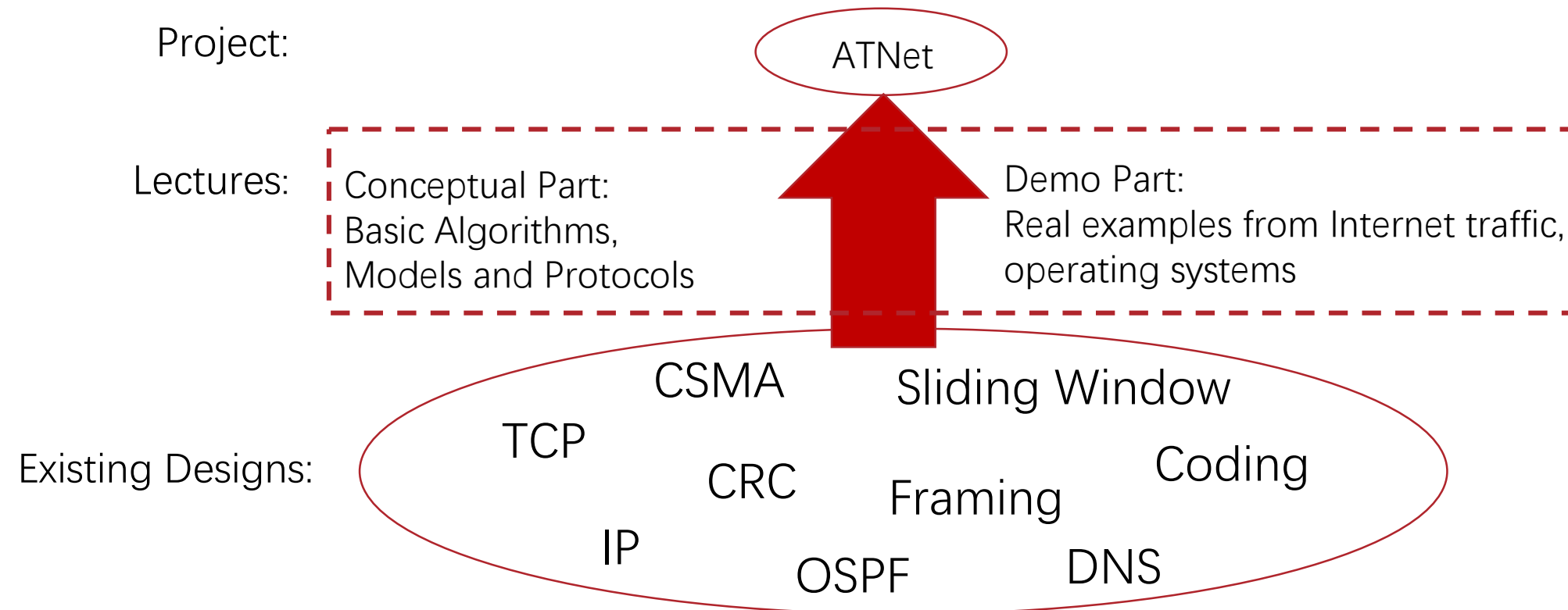- Reliable Delivery and Network Application
  - eg: FTP

About the Project

- Requirements of the Acoustic Toy Computer Network (ATNet)
    - Basic Communication
    - Reliability
    - Resource Sharing
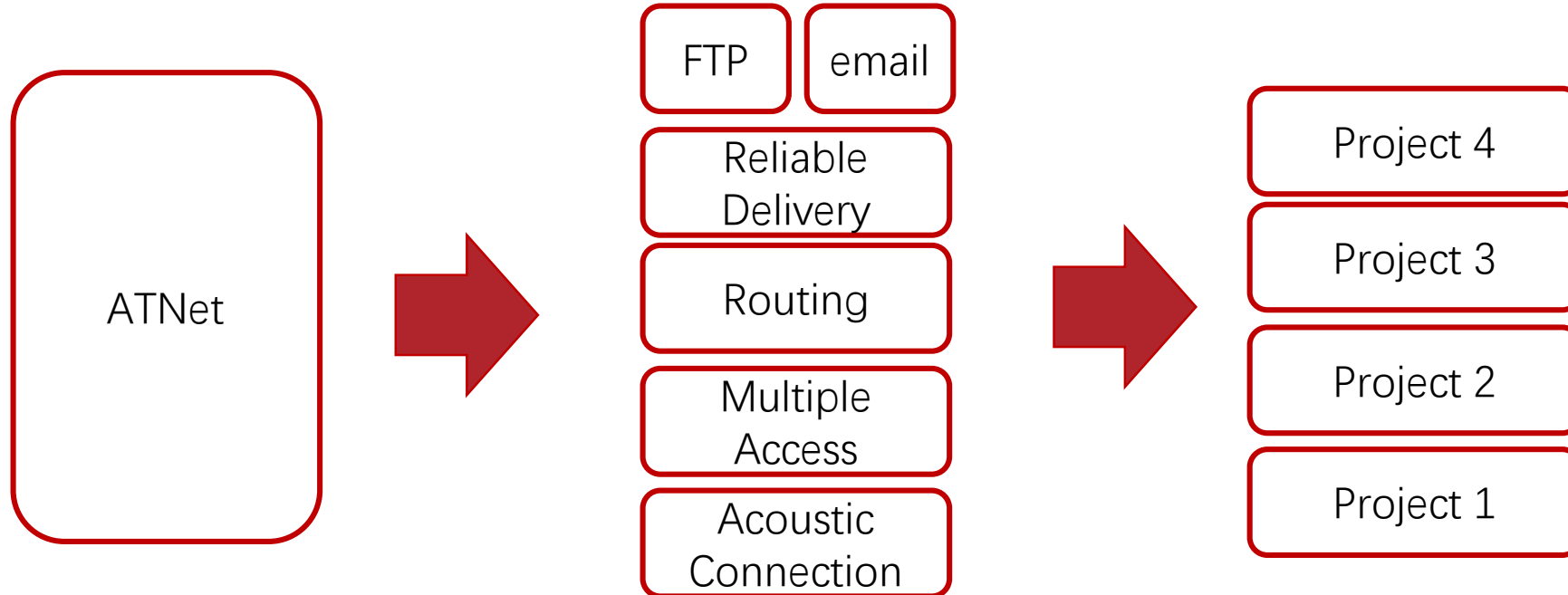   - Scalability
    - etc…

Still Very Challenging …

Shoulders of Giants

- We introduce and borrow existing designs from state-of-the-art network technologies (especially the Internet)

Project:

ATNet

Lectures:

Conceptual Part:
Basic Algorithms,
Models and Protocols

Demo Part:
Real examples from Internet traffic,
operating systems

Existing Designs:

CSMA

Sliding Window

TCP

CRC

Framing

Coding

IP

OSPF

DNS

Layering

- Benefit
  - Divide and Conquer
  - Modular Design

ATNet → FTP | email | Reliable Delivery | Routing | Multiple Access | Acoustic Connection → Project 4 | Project 3 | Project 2 | Project 1

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Layering

Example
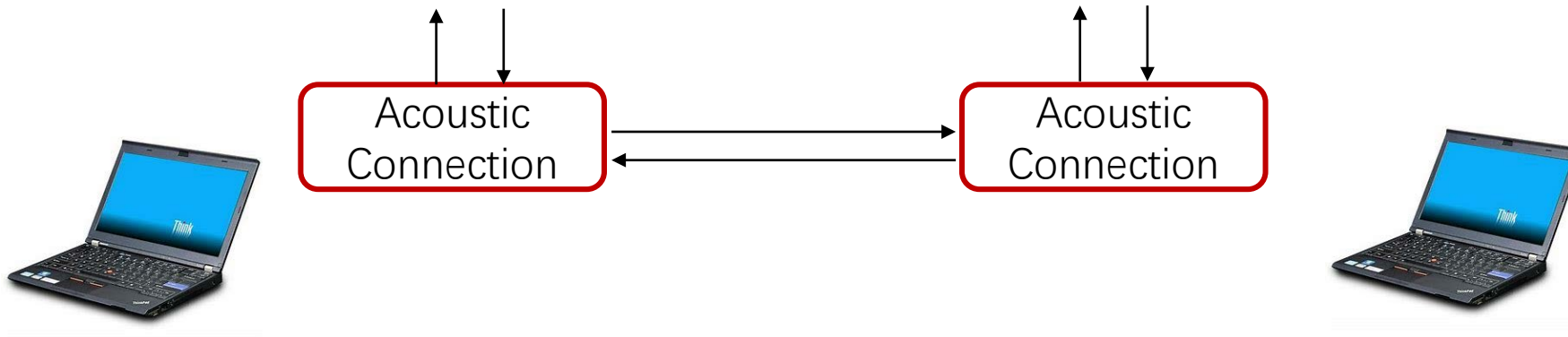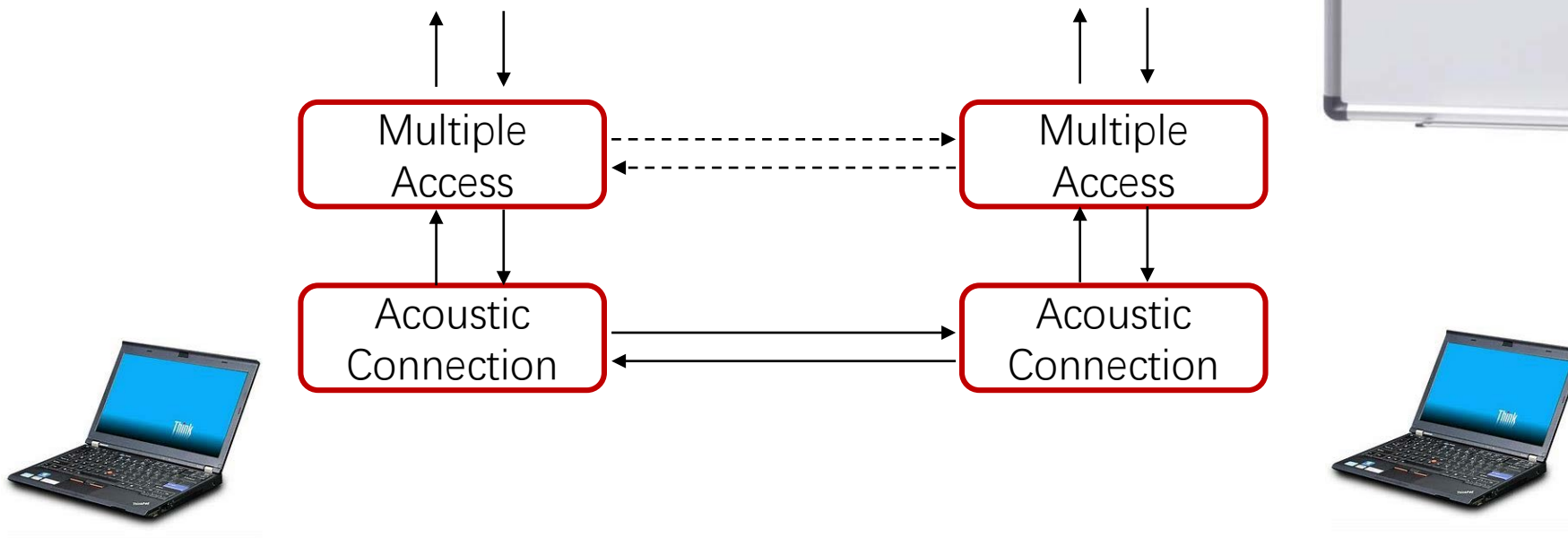
How Laying Works ?

- Through Protocols
  - One or more protocols implement the functionality of a certain layer
  - A protocol defines a communication service
    - Service Interface
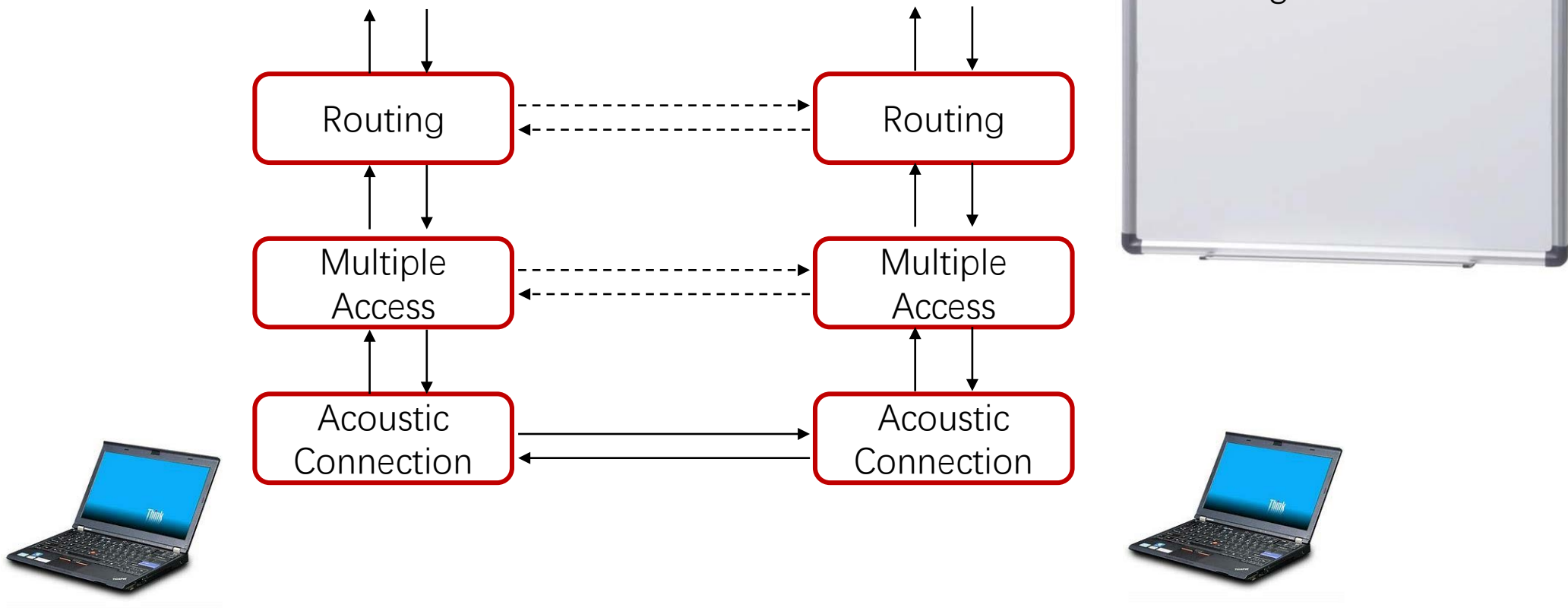   - Peer to peer Interface
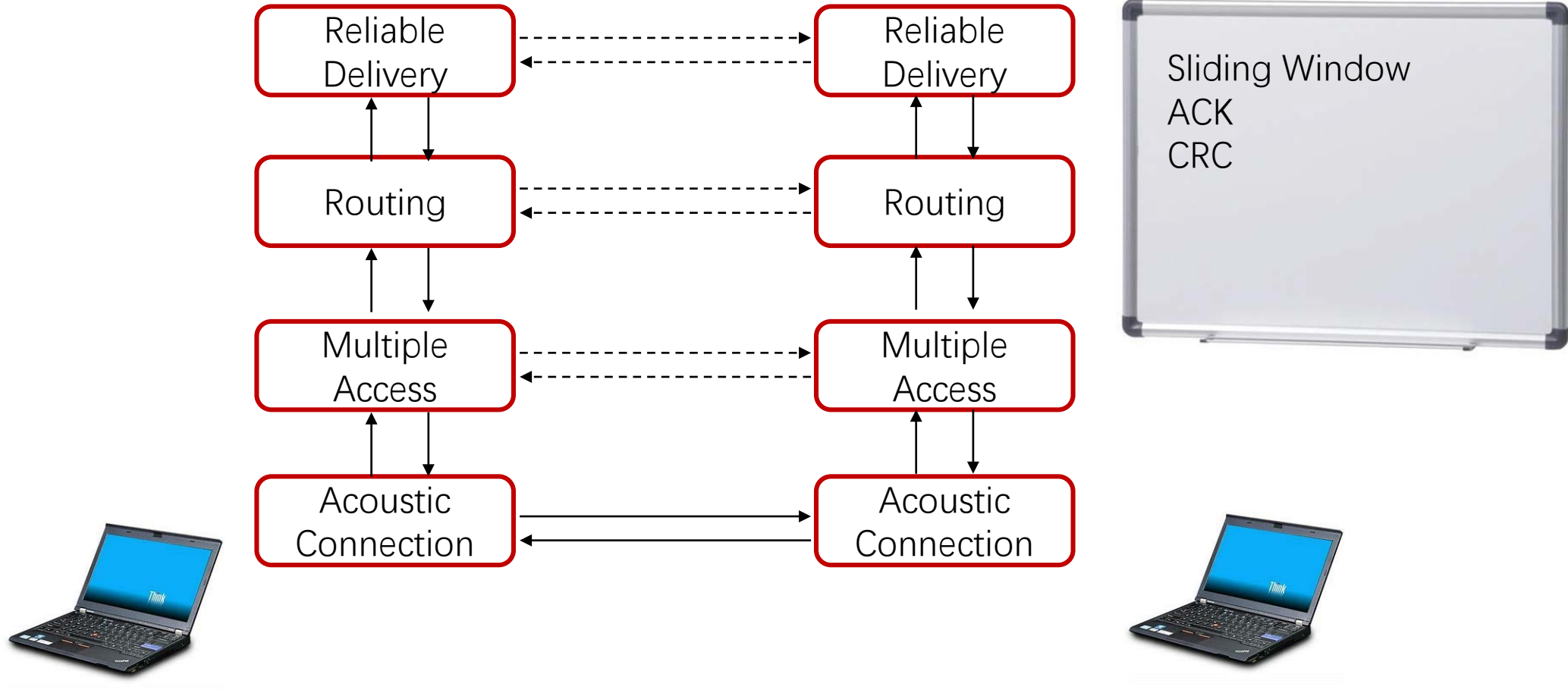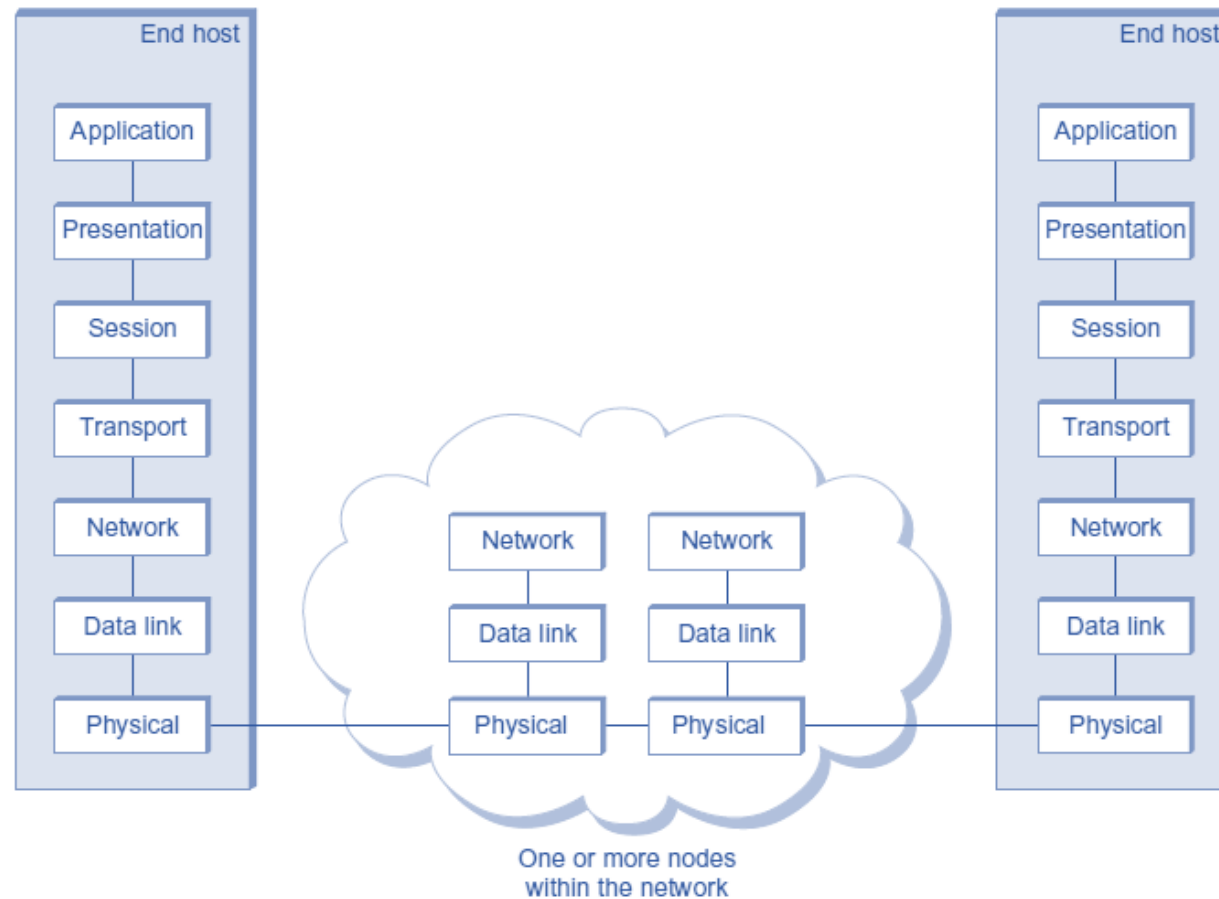
How Laying Works ?

How Laying Works ?

Framing
CSMA
Packet Header

Multiple
Access

Multiple
Access

Acoustic
Connection

Acoustic
Connection

How Laying Works ?

How Laying Works ?

```
Reliable          Reliable
Delivery   <----> Delivery

Routing    <----> Routing

Multiple          Multiple
Access     <----> Access

Acoustic          Acoustic
Connection <----> Connection
```
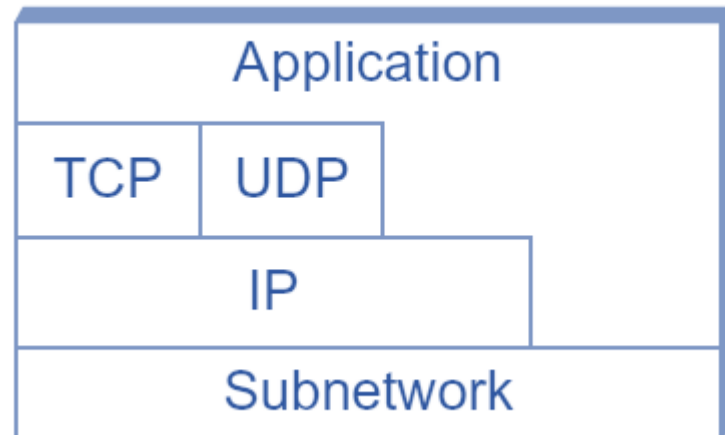
Sliding Window
ACK
CRC

Shoulders of Giants
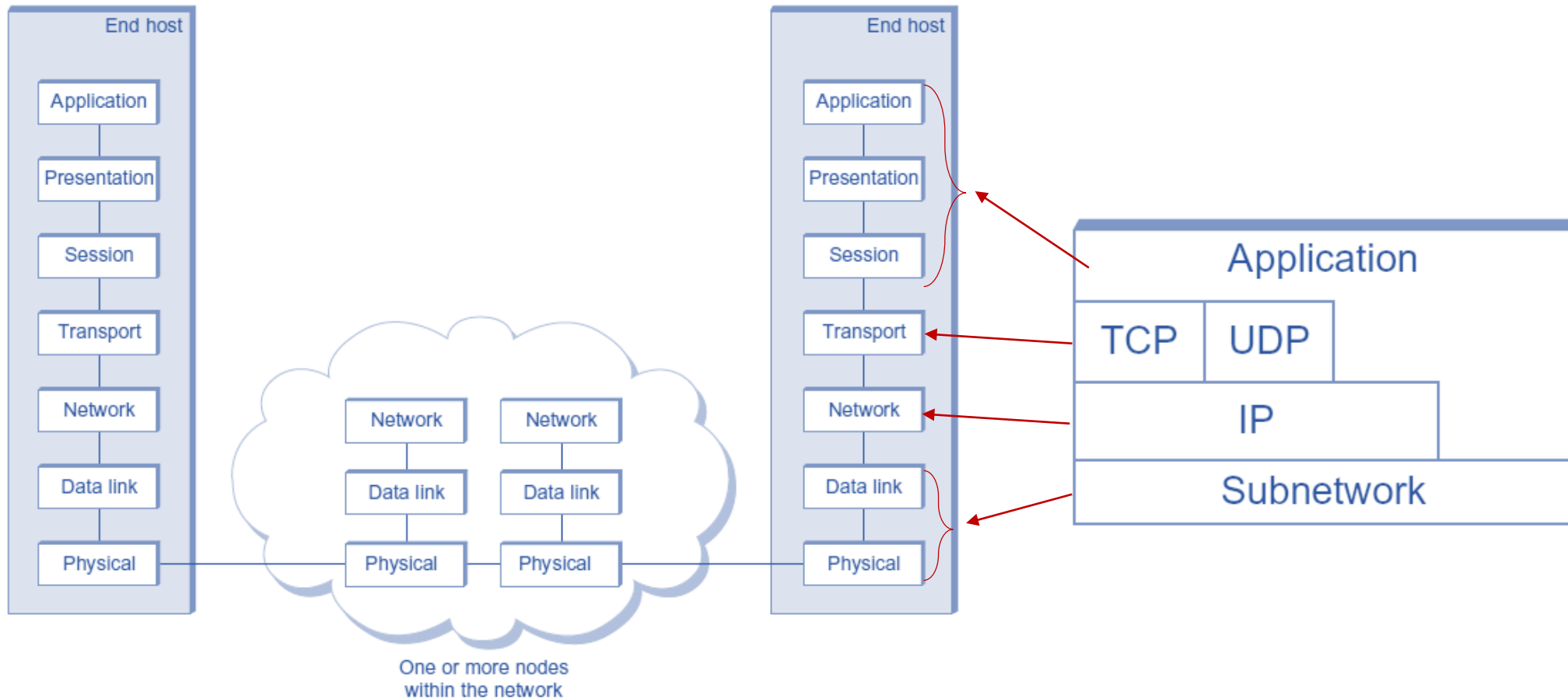
- Layering and Protocols (OSI 7 Layer Model)

Shoulders of Giants

- Layering of the Internet

Layerist

Layerist