Computer Networking

谢 逸

中山大学 • 数据科学与计算机学院

2018. Spring

个人简介

2016-现在：中山大学数据科学与计算机学院
2009-2015: 中山大学信息科学与技术学院电子系
2004-2008: 中山大学信息科学与技术学院电子系(博士)
2014-2015: Deakin U, Melbourne, Australia. (访问学者)
2007-2008: Georg Mason U, Fairfax, USA. (访问学者)

- 教学授课: 计算机网络

- 研究兴趣:
  - 计算机网络与通信：**SDN, NV/NFV, DCN, SN, FI, ...**
  - 网络与系统安全：**Attack, Defense, Detection, Confrontation, ...**
  - 行为分析与建模：**Network/Application/User Behavior Analysis, Modeling Algorithm, Prediction, ...**

- 欢迎计划在计算机网络及网络安全方向读研的同学加入。

广州大学城外环东路132号中山大学数据科学与计算机学院

数据科学与计算机学院528-C

http://sdcs.sysu.edu.cn/node/2462

+8613710287197

: xieyi5@mail.sysu.edu.cn

xieyi-cn

- **Textbook:**
  - **James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach, 6th Ed.**
- **References:**
  - 谢希仁，计算机网络，第6版，电子工业出版社
  - **Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, 5th Ed. Pearson**

    中文版：严伟，潘爱民，李晓明 译，计算机网络，第5版，清华大学出版社
  - **W.Richard Stevens，TCP/IP Illustrated Volume I: -III.**
  - **Larry L.Peterson, Bruce S.Davie, Computer Networks:A Systems Approach, 5th Ed.**

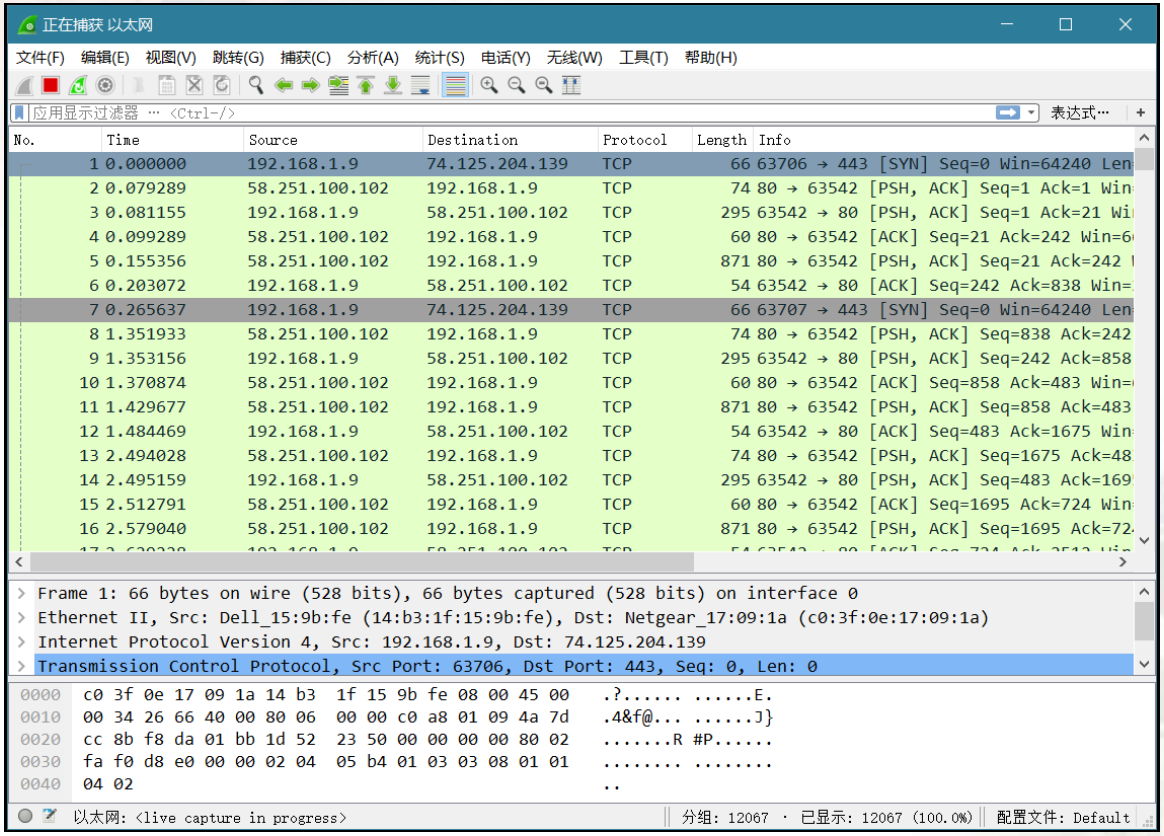
- **Prerequisite Courses**
  - **Operating System (not necessary)**
  - **Probability and Statistics (not necessary)**

- **Successive Courses**
  - **Computer Network II**
  - **Network Attack and Protection**
  - **Protocol Analysis for Computer Network**
  - **Network measurement, modeling and analysis**
  - **…**

Contents

Chapter No.	Content
Chapter 1:	Computer Networks and the Internet
Chapter 2:	Application Layer
Chapter 3:	Transport Layer
Chapter 4:	The Network Layer
Chapter 5:	The Link Layer: Links, Access Networks, and LANs
Chapter 6:	Wireless and Mobile Networks
Chapter 7:	Multimedia Networking
Chapter 8:	Security in Computer Networks

- **Experimental tool: Wireshark**
  - **Wireshark is a free and open source packet analyzer. It is used for network troubleshooting, analysis, software and communications protocol development, and education.**
  - **https://www.wireshark.org/**



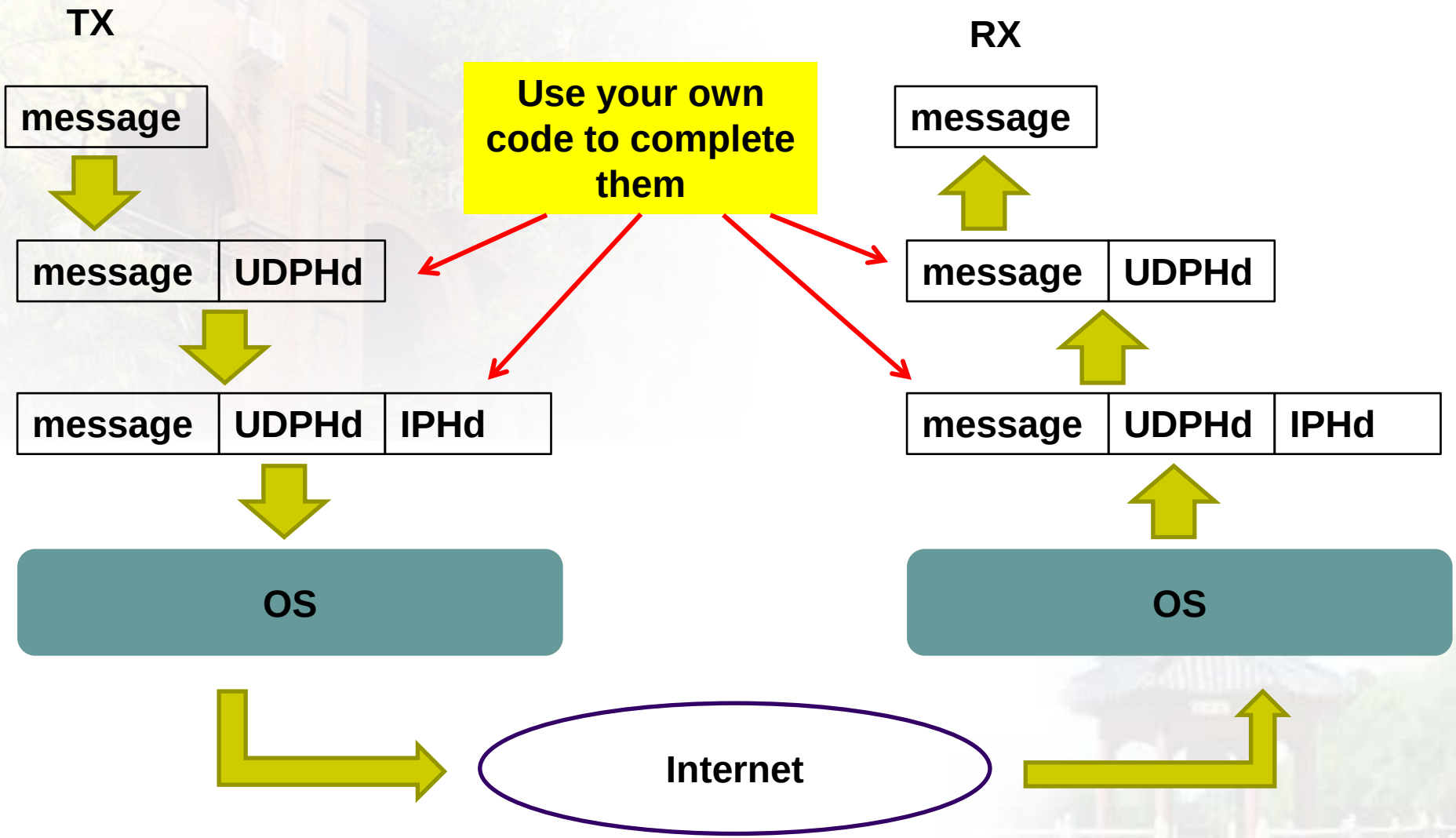
- **Recommended video:**
  - **BBC: “Virtual Revolution”**
  - **BBC: “Google and the World Brain”**
  - **“The Internet’s own boy”**
  - **“The Social Network”**
  - **“维基解密的抗争”**
  - **CCTV: “互联网时代”**

- **Cyberwar season 1**
- **Cyberwar threat**
- **…**

Group Project

- Grouping: 3 students per group
- Task-1: Information exchange
  - basic requirements
    - Build a server (S) and several clients (C);
    - Each C can connect to S and other clients;
    - Each C can obtain the information on others clients via S, e.g., who is online, what IP used, …
    - S supports group chat room, i.e., each C is able to chat with other client through S's group chat room. (send and receive text message)
    - P2P chat: C selects from online user(s), and connect to it(them), send/receive messages

Please adopt UDP & IP instead of Socket.



- **Optional work**
  - **Support Image transfer.**
  - **Audio, Video chat.**
  - **Provide web server, for browser supported information query, or chat? (Chapter 2)**
  - **Support offline mail system (Chapter 2)**
  - **UDP Pinger (Chapter 2)**
  - **proxy Cache (Chapter 2)**
  - **Pass through LAN**
  - **Implementing a Reliable Transport Protocol (Chapter 3)**
  - **Implementing a Distributed, Asynchronous Distance Vector Routing Algorithm (Chapter 4)**
  - **Streaming Video with RTSP and RTP (Chapter 7)**
  - **…**

- **Task-2: virtual routing**

  (Application-layer routing)

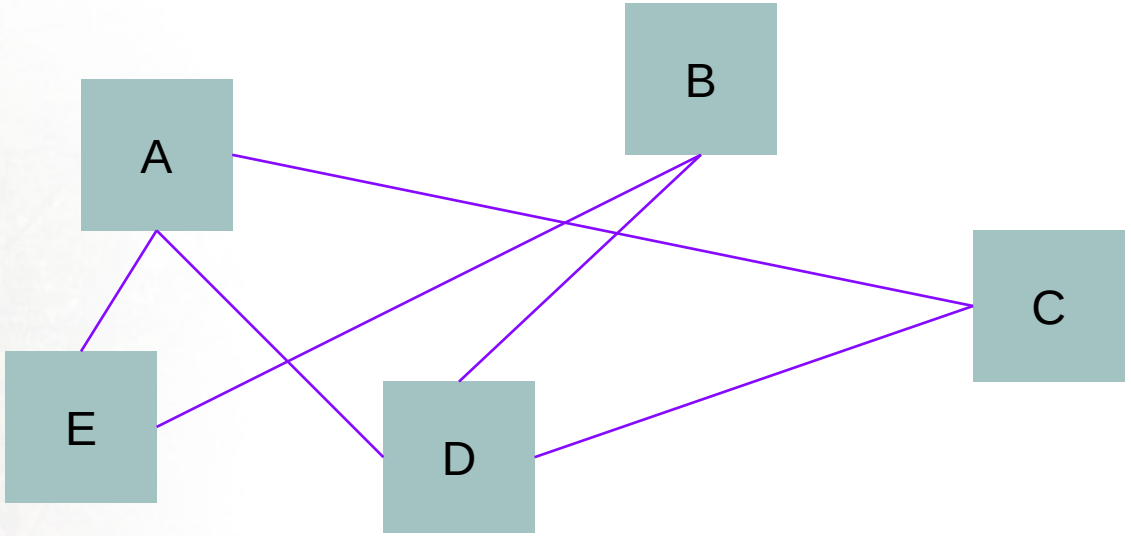
  - **self-organized routing**
    - **Select a virtual topo for members' computers**
    - **Build virtual connection between computers according to the virtual topo;**
    - **Each computer acts as both client and router.**
    - **Each computer exchanges and updates routing table periodically.**
    - **A computer can send message to other computers,**

Hint:

- **IP-in-IP (IP-layer virtual routing) or**
- **use sock directly (Application-layer routing)**

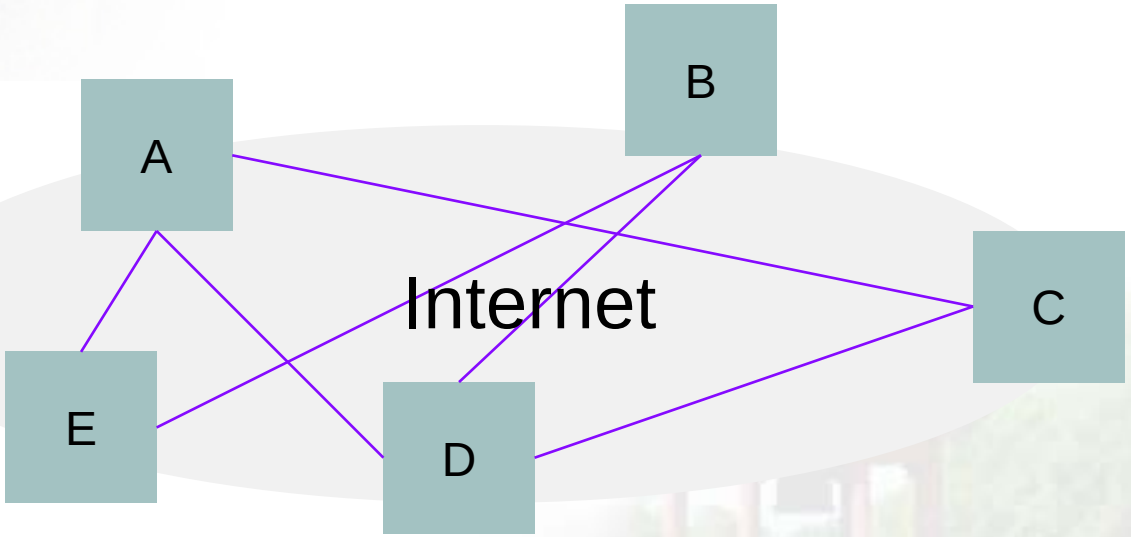
Step 1:

Design the virtual topo (link cost)



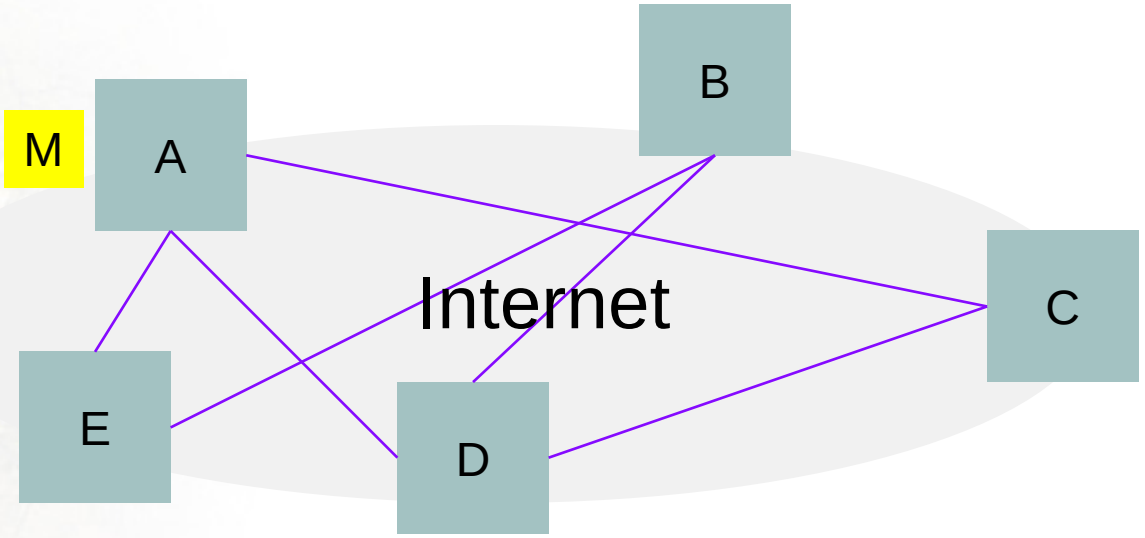
Step 2:

Build the virtual Topo over Internet & exchange the routing information periodically



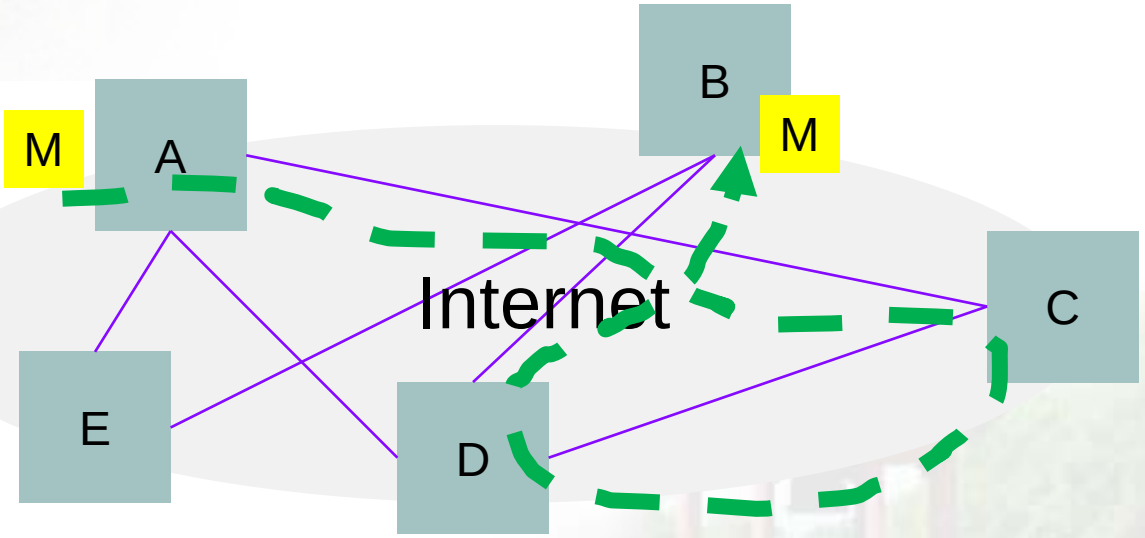
Step 3:

Simulate the routing and forwarding. For example, A sends M to B. Which path is better?
A →E → B? or
A →D → B?
A → C → D → B?



Step 4:

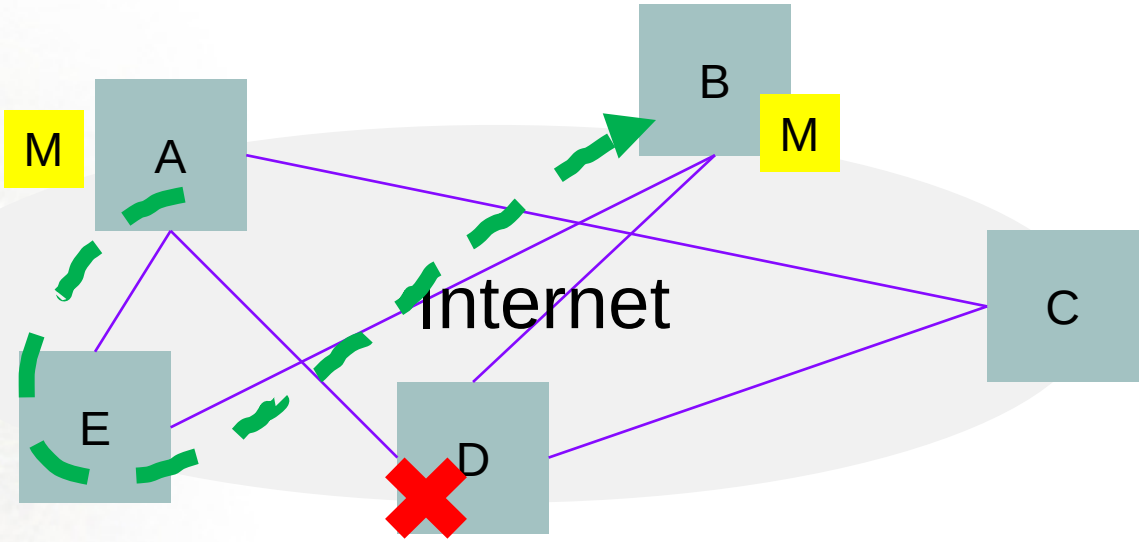
Transmit data M via the best path, e.g.,
A → C → D → B



Please try different topos and different routing algorithms (LS & DV).

Step 5:

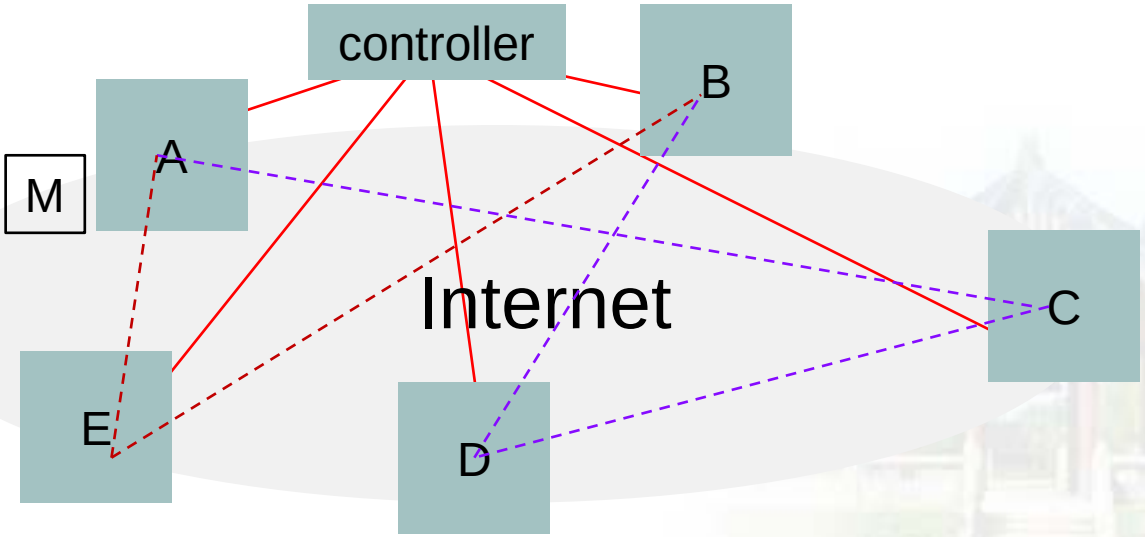
A node is down.
e.g., D



Please try different topos and different routing algorithms (LS & DV).

- **Task-2: virtual routing**
  - **centralized routing**
    - **Like the above self-organized routing**
    - **Controller determines and distributes routing policy (routing table) to each member**

Example: A sends M to B. Which path is better? A →E → B? or A → C → D → B?



- **Submit**
  - **PPTs + demo video**
  - **Source code (and the compiled executable files)**
  - **The project report documents (including introduction, design, setup and deploy, and result, project management records)**
  - **The individual report of each team members (your contributions, and anything else you want to talk about)**
  - **votes of the top 5 teams (based on their presentations and your observations, give comments of 2-3 sentences)**
  - **A list that shows each member's contribution and grade.**

- **Put all file into a package and name it as:**

  A_B_C.rar,

  A: the student ID of group leader;

  B: the name of group leader;

  C: task1 or task2

  example: 1500001_张三_task1.rar

- **Group leader submit it to the given FTP server.**

- **Basic points**
  - **Protocol design. (10 points)**
  - **Finish basic function correctly (error). (60 points)**
  - **On time (WEEK 15). (10 points)**
  - **Documents, codes, presentation. (20 points)**
  - **votes**
  - **in-group assessment**

Evaluation and Grading Policy

Class Participation	**5%**
Weekly Written Assignments	**10%**
Midterm Examination	**10%**
Final Examination	**60%**
Group Project	**15%**

Miscellaneous

- **Schedule:**

  18 Weeks vs. 500 PPTs ~~ 50 pages/week

- **Teaching pattern:**
  - **in class: I will talk less and only focus on key points. However, I encourage students to question and discuss some interesting topics.**
  - **after class: Students have to read, think and prepare the issues for class discussion.**
  - **If you don't read and think, it is very difficult for you to pass the tests.**
  - **My advice: Please show your questions in the class, and please do NOT rely on your memory!**

Miscellaneous

- **Teaching Assistant:**
  - **费星瑞 (feixr@mail2.sysu.edu.cn)**

- **FTP://202.116.70.254**
  - **Usr/pwd: ComNet/ComNet**

Thanks

Q & A

Email: xieyi5@mail.sysu.edu.cn
http://sdcs.sysu.edu.cn/node/2462