
Computer Communication Networks

Introduction



UNIVERSITY
AT ALBANY
State University of New York

ICEN/ICSI 416 – Fall 2016

Prof. Dola Saha

Introductions

➤ Instructor

- Prof. Dola Saha, PhD University of Colorado Boulder
- <http://www.albany.edu/faculty/dsaha/>
- dsaha@albany.edu

➤ Students

- Upload pictures in blackboard

Information

➤ Course Website:

- http://www.albany.edu/faculty/dsaha/teach/2016Fall_CEN416/2016Fall_CEN416.html

➤ Blackboard:

Course Website	Blackboard
Lecture Slides	Homework Assignments
Class Calendar / Schedule	Homework Submission
Other Information	Homework Solutions
	Announcements
	Grades

Office Hours

- Where: BA 312

- When:
 - Tuesday 2:00-3:00PM
 - Thursday 3:00-4:00PM
 - By appointment.

Textbooks

➤ Required:

- "Computer Networks: A Systems Approach", Larry Peterson and Bruce Davie, Elsevier

➤ Reference:

- "Computer Networking: A Top Down Approach", James Kurose and Keith Ross, Pearson
- "Computer Networks", Andrew S. Tanenbaum, and David J. Wetherall, Pearson

Assignments & Grading

➤ Assignments

- No late assignments will be accepted.
- All assignments are due by 11:59PM on the due date.
- Re-grading requests will be considered up to 5 business days after posting the grades for the corresponding assignment.

➤ Grading

- Projects - 20%
- Homework - 20%
- Midterm - 25%
- Final Exam - 30%
- Attendance and class participation – 5%

Academic Integrity

- Undergraduate Academic Regulations
 - http://www.albany.edu/undergraduate_bulletin/regulations.html
- Academic Dishonesty
 - Plagiarism, Cheating on examinations, unauthorized collaboration, etc.
- Practicing Academic Integrity
 - Citation
- Penalties for Violation
 - Warning, lowering grade, failing grade

Cell Phone in classroom

- Keep your phone in vibrate mode
- Be attentive
- Respect other students

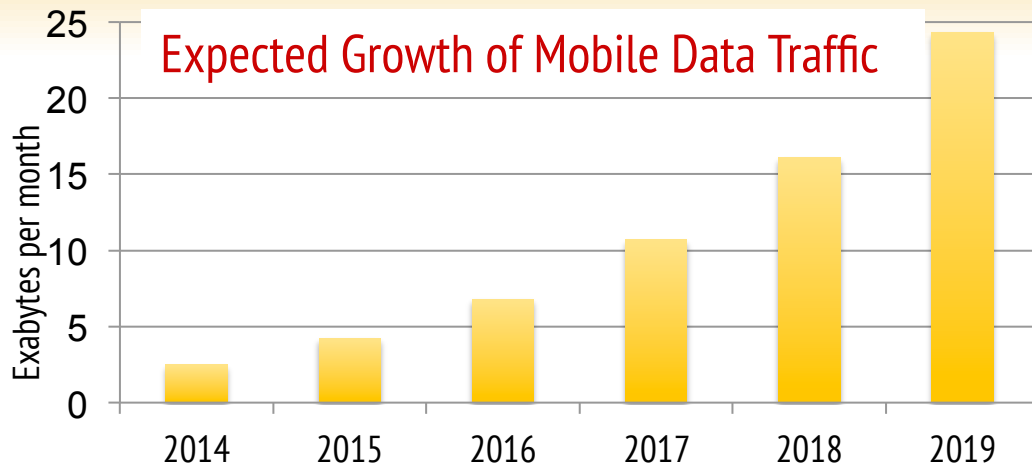
Why this course?



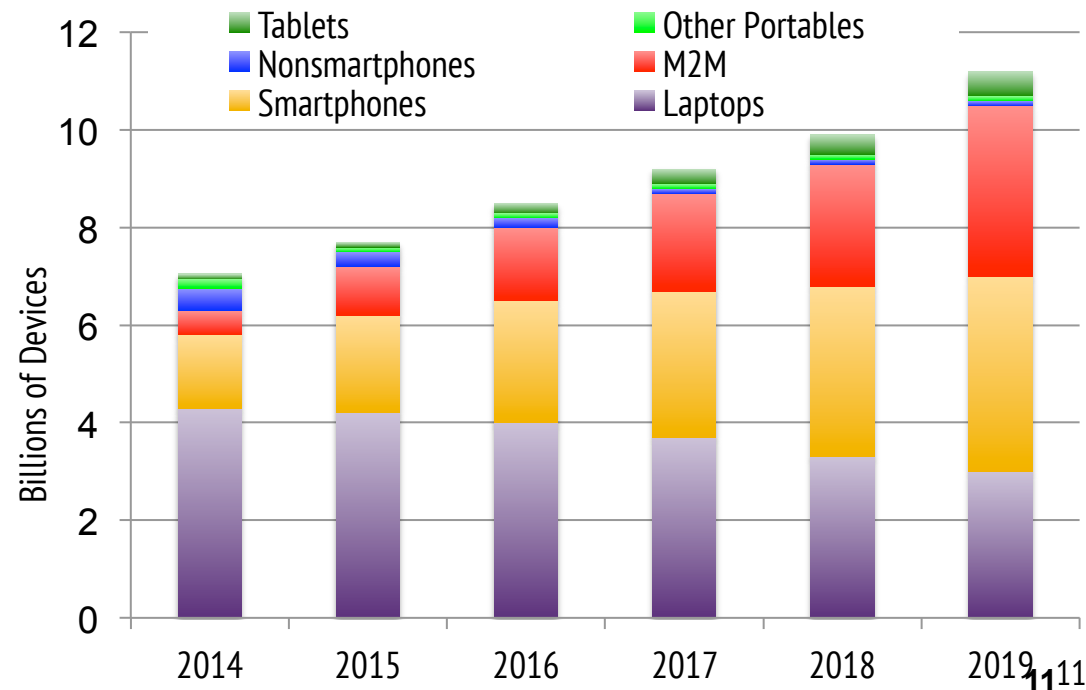
Syllabus

- Internet Architecture
- Application, Transport, Network, MAC and Physical Layers
- Network Security
- Congestion Control
- Resource Allocation
- Modern Applications

Challenges Ahead



Expected Growth of Mobile Devices



- High bandwidth
- Low latency
- High Reliability
- Number of devices
- Diversity in traffic

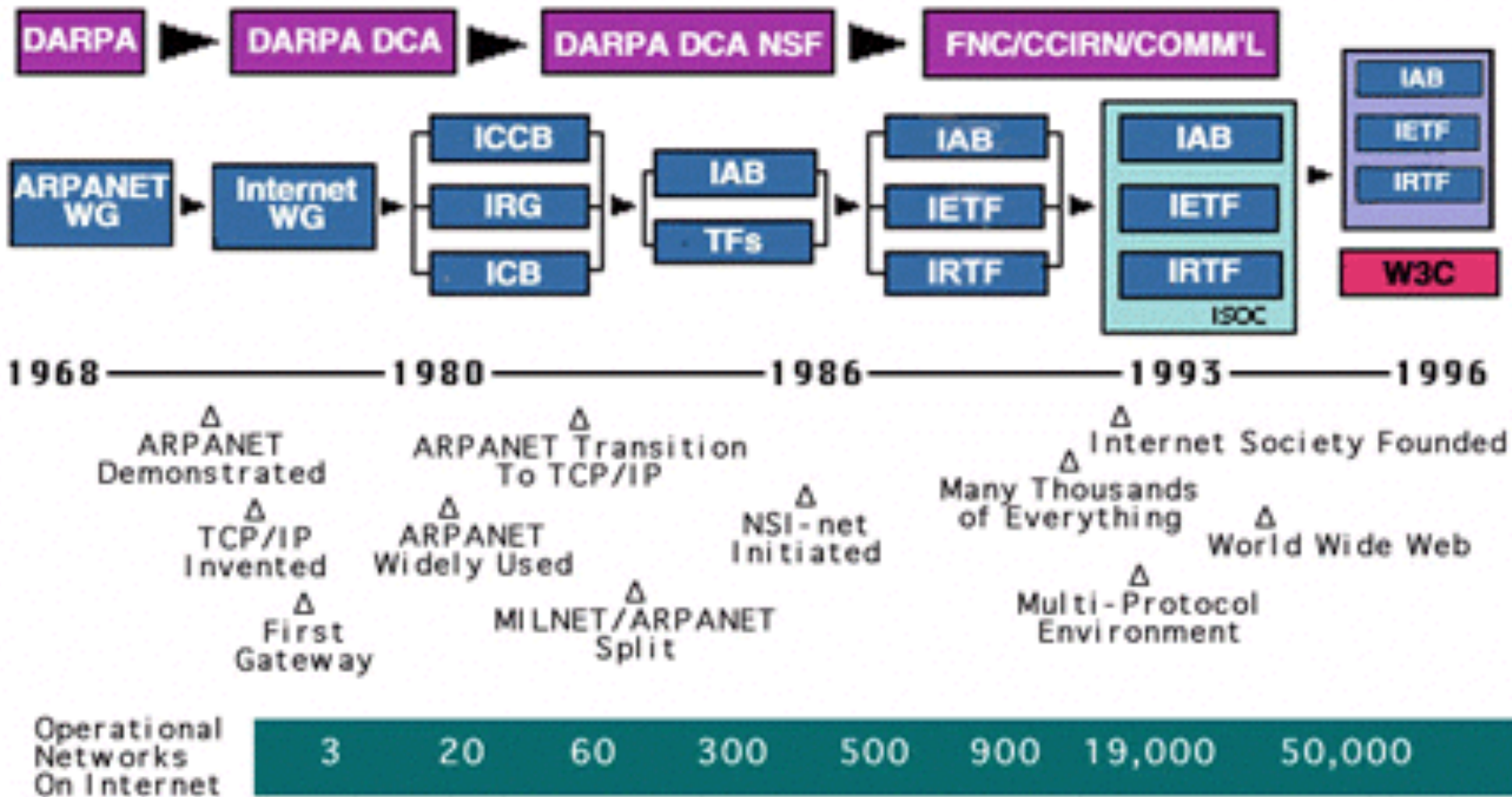
Source: Cisco Visual Networking Index Mobile, 2015

Rotary Phone

- Used by telephony system

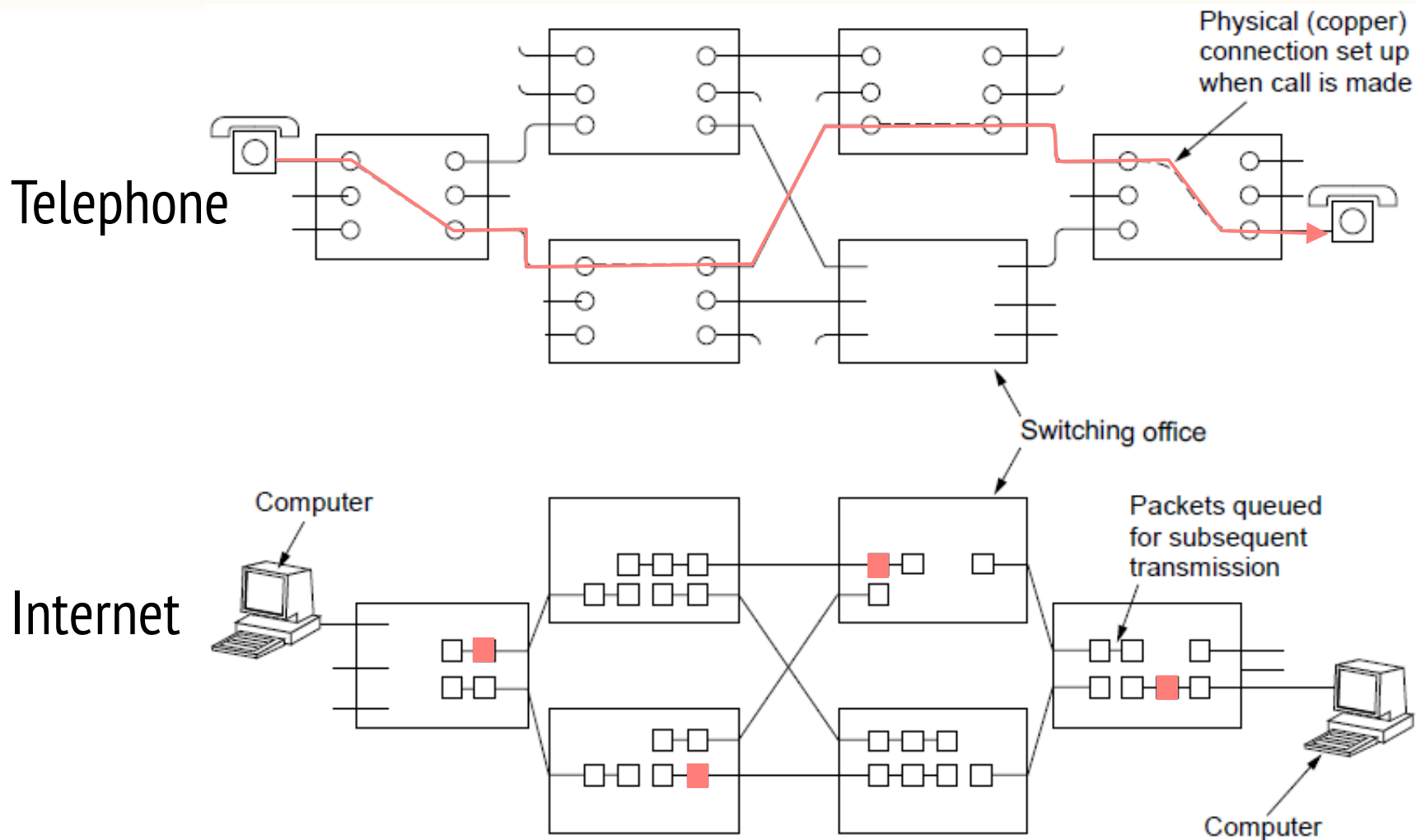


History of the Internet

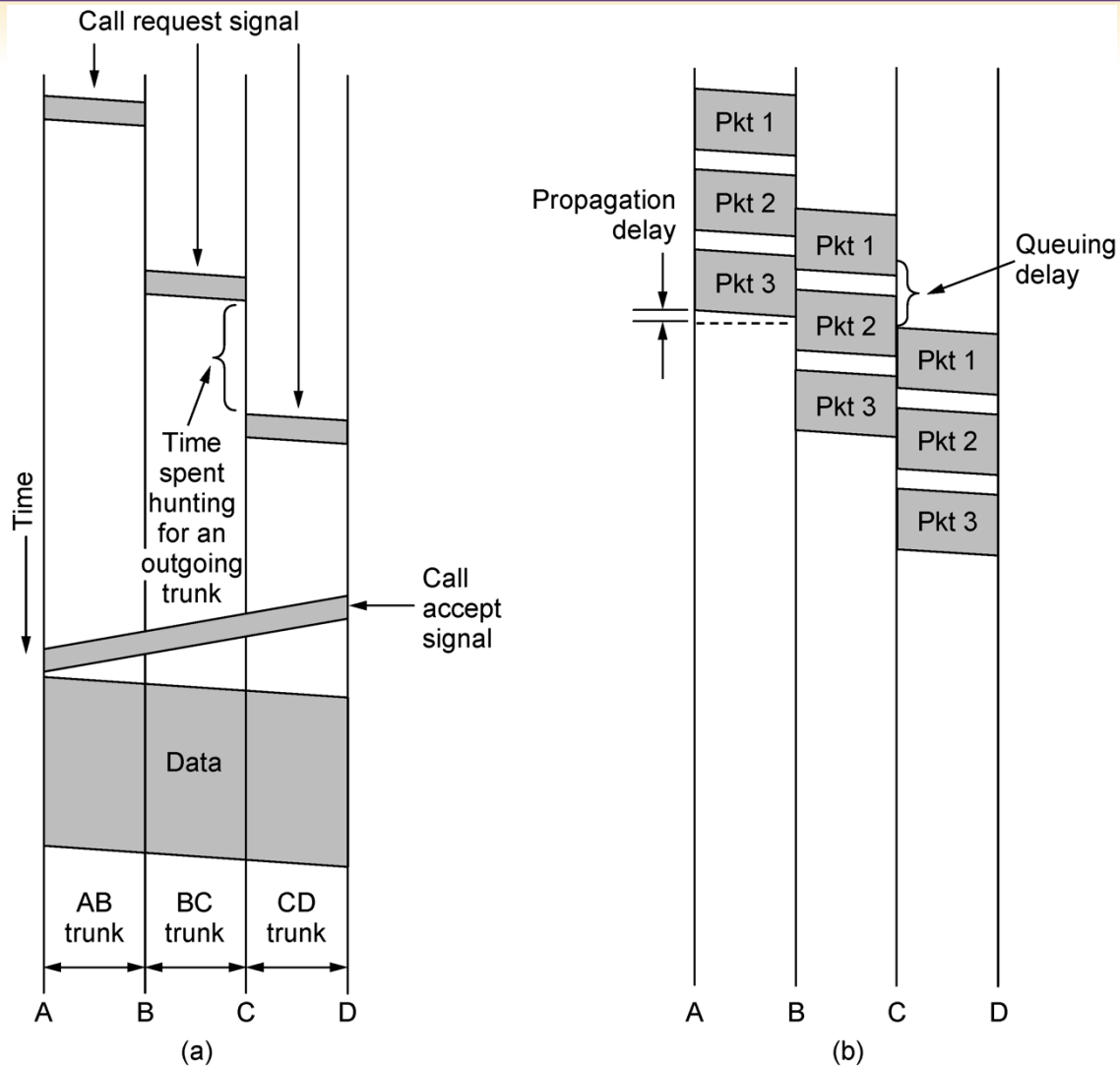


<http://www.internetsociety.org/internet/what-internet/history-internet/brief-history-internet>

Circuit Switching vs Packet Switching

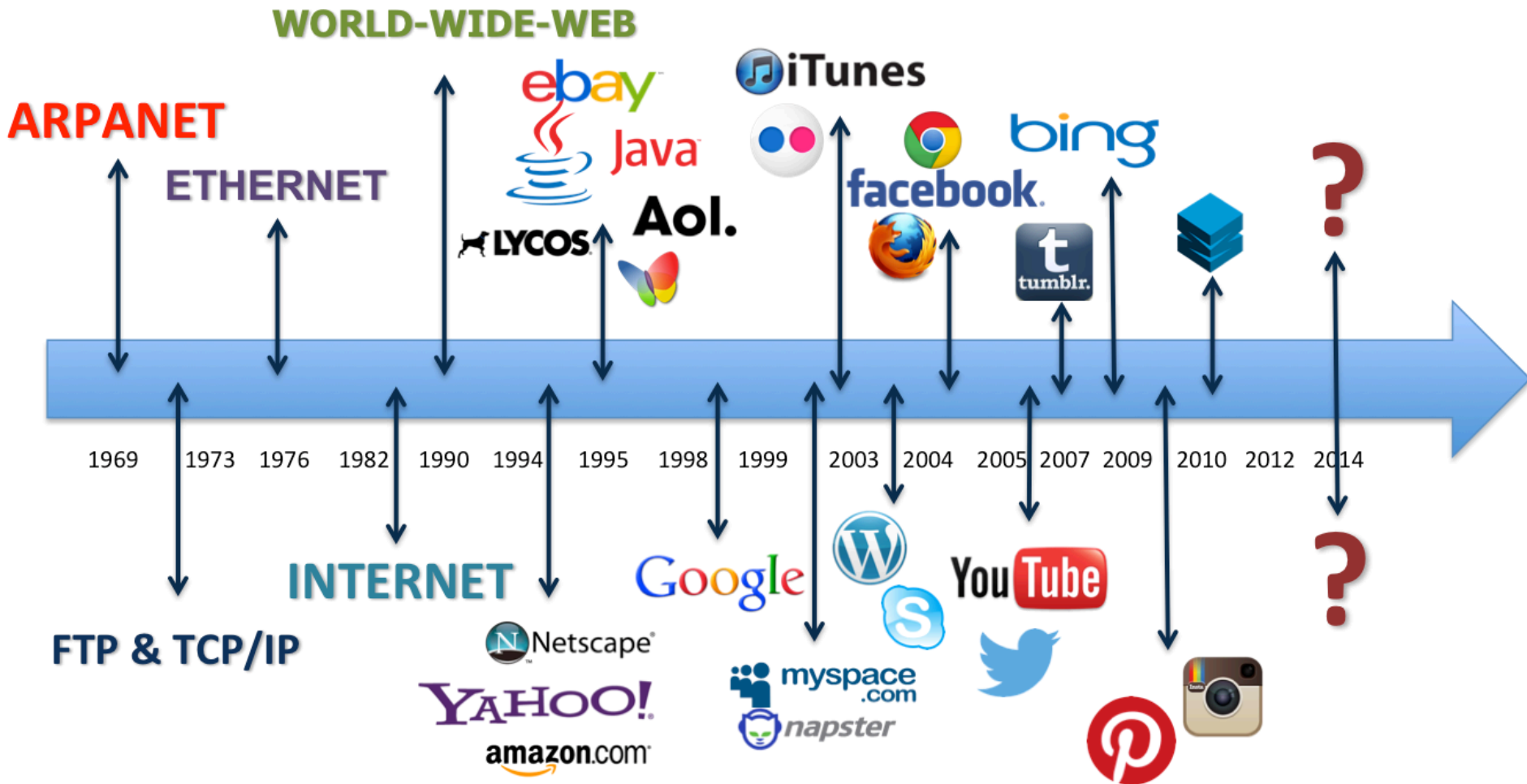


Circuit Switching vs Packet Switching



Timing of events in (a) circuit switching, (b) packet switching.

Evolving Internet



<http://malonemediagroup.com/history-of-the-internet-timeline-an-ever-evolving-digital-world/>

Proverb

- Tell me and I forget.
- Show me and I remember.
- Involve me and I understand.

Homework is a way to get involved!!!!

Wireshark

- <https://www.wireshark.org>
- Get Acquainted → Download stable release

The screenshot displays the Wireshark interface with a packet capture of a DNS response. The packet list pane shows a DNS response (frame 349) from 192.168.0.1 to 192.168.0.21. The packet details pane shows the response for the query of cdn-0.nflximg.com, including the transaction ID 0x2188 and the answer for the authoritative nameservers.

No.	Time	Source	Destination	Protocol	Length	Info
343	65.142415	192.168.0.21	174.129.249.228	TCP	66	40555 → 80 [ACK] Seq=1 Ack=1 Win=5888 Len=0 TSval=491519346 TSecr=551811827
344	65.142715	192.168.0.21	174.129.249.228	HTTP	253	GET /clients/netflix/flash/application.swf?flash_version=flash_lite_2.1&v=1.5&n...
345	65.230738	174.129.249.228	192.168.0.21	TCP	66	80 → 40555 [ACK] Seq=1 Ack=188 Win=6864 Len=0 TSval=551811850 TSecr=491519347
346	65.240742	174.129.249.228	192.168.0.21	HTTP	828	HTTP/1.1 302 Moved Temporarily
347	65.241592	192.168.0.21	174.129.249.228	TCP	66	40555 → 80 [ACK] Seq=188 Ack=763 Win=7424 Len=0 TSval=491519446 TSecr=551811852
348	65.242532	192.168.0.21	192.168.0.1	DNS	77	Standard query 0x2188 A cdn-0.nflximg.com
349	65.276870	192.168.0.1	192.168.0.21	DNS	489	Standard query response 0x2188 A cdn-0.nflximg.com CNAME images.netflix.com.edge...
350	65.277992	192.168.0.21	63.80.242.48	TCP	74	37063 → 80 [SYN] Seq=0 Win=5840 Len=0 MSS=1460 SACK_PERM=1 TSval=491519482 TSecr=...
351	65.297757	63.80.242.48	192.168.0.21	TCP	74	80 → 37063 [SYN, ACK] Seq=0 Ack=1 Win=5792 Len=0 MSS=1460 SACK_PERM=1 TSval=3295...
352	65.298396	192.168.0.21	63.80.242.48	TCP	66	37063 → 80 [ACK] Seq=1 Ack=1 Win=5888 Len=0 TSval=491519502 TSecr=3295534130
353	65.298687	192.168.0.21	63.80.242.48	HTTP	153	GET /us/nrd/clients/flash/814540.bun HTTP/1.1
354	65.318730	63.80.242.48	192.168.0.21	TCP	66	80 → 37063 [ACK] Seq=1 Ack=88 Win=5792 Len=0 TSval=3295534151 TSecr=491519503
355	65.321733	63.80.242.48	192.168.0.21	TCP	1514	[TCP segment of a reassembled PDU]

Frame 349: 489 bytes on wire (3912 bits), 489 bytes captured (3912 bits)
> Ethernet II, Src: Globalsec_00:3b:0a (f0:ad:4e:00:3b:0a), Dst: Vizio_14:8a:e1 (00:19:9d:14:8a:e1)
> Internet Protocol Version 4, Src: 192.168.0.1, Dst: 192.168.0.21
> User Datagram Protocol, Src Port: 53 (53), Dst Port: 34036 (34036)
▼ Domain Name System (response)
 [Request In: 348]
 [Time: 0.034338000 seconds]
 Transaction ID: 0x2188
 > Flags: 0x8180 Standard query response, No error
 Questions: 1
 Answer RRs: 4
 Authority RRs: 9
 Additional RRs: 9
 ▼ Queries
 > cdn-0.nflximg.com: type A, class IN
 > Answers
 > Authoritative nameservers

```
0020  00 15 00 35 84 f4 01 c7 83 3f 21 88 81 80 00 01  ...5.... .?!....
0030  00 04 00 09 00 09 05 63 64 6e 2d 30 07 6e 66 6c  .....c dn-0.nfl
0040  78 69 6d 67 03 63 6f 6d 00 00 01 00 01 c0 0c 00  .....ximg.com .....
0050  05 00 01 00 00 05 29 00 22 06 69 6d 61 67 65 73  .....). ".images
0060  07 6e 65 74 66 6c 69 78 03 63 6f 6d 09 65 64 67  .netflix .com.edge
0070  65 73 75 69 74 65 03 6e 65 74 00 c0 2f 00 05 00  esuite.n et./...
```

Python

- Download Python
 - <https://www.python.org/downloads/>
 - Check your OS
 - Version – 3.5.2