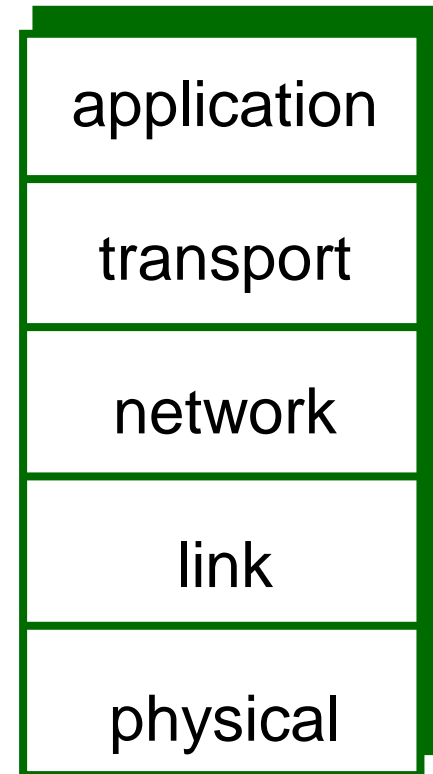


Exercise 1

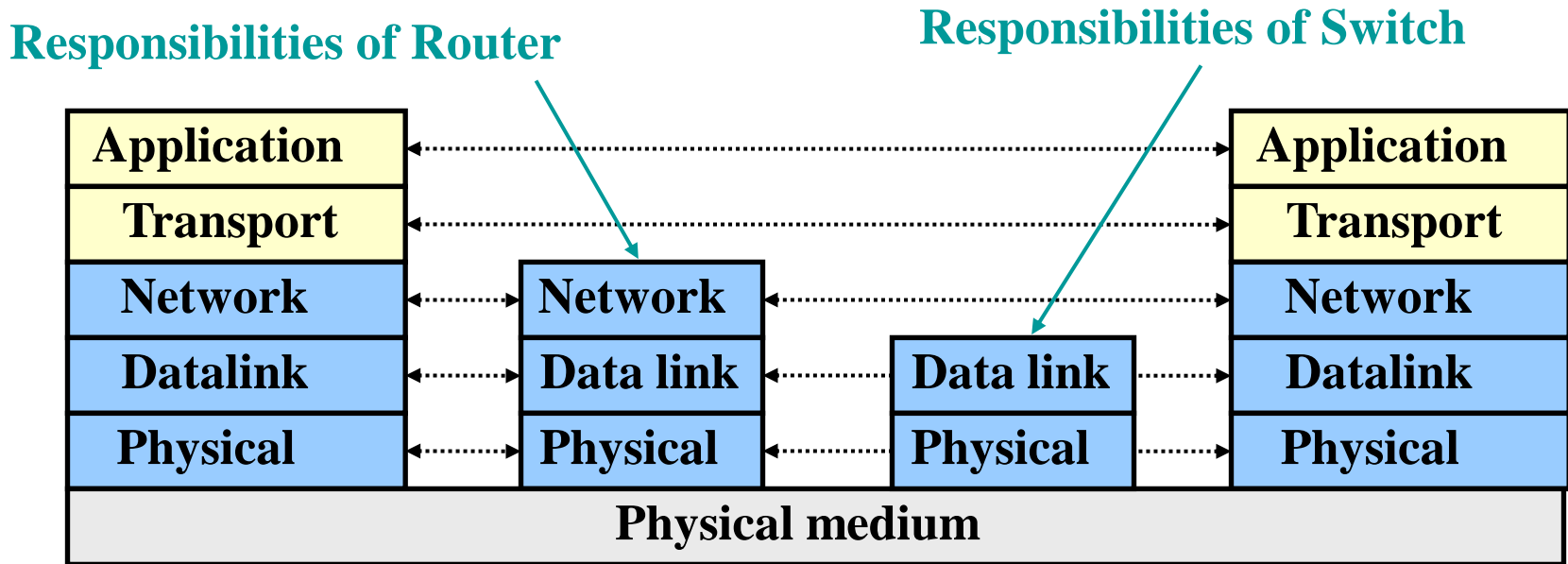
Florian Tegeler

1. The five layers

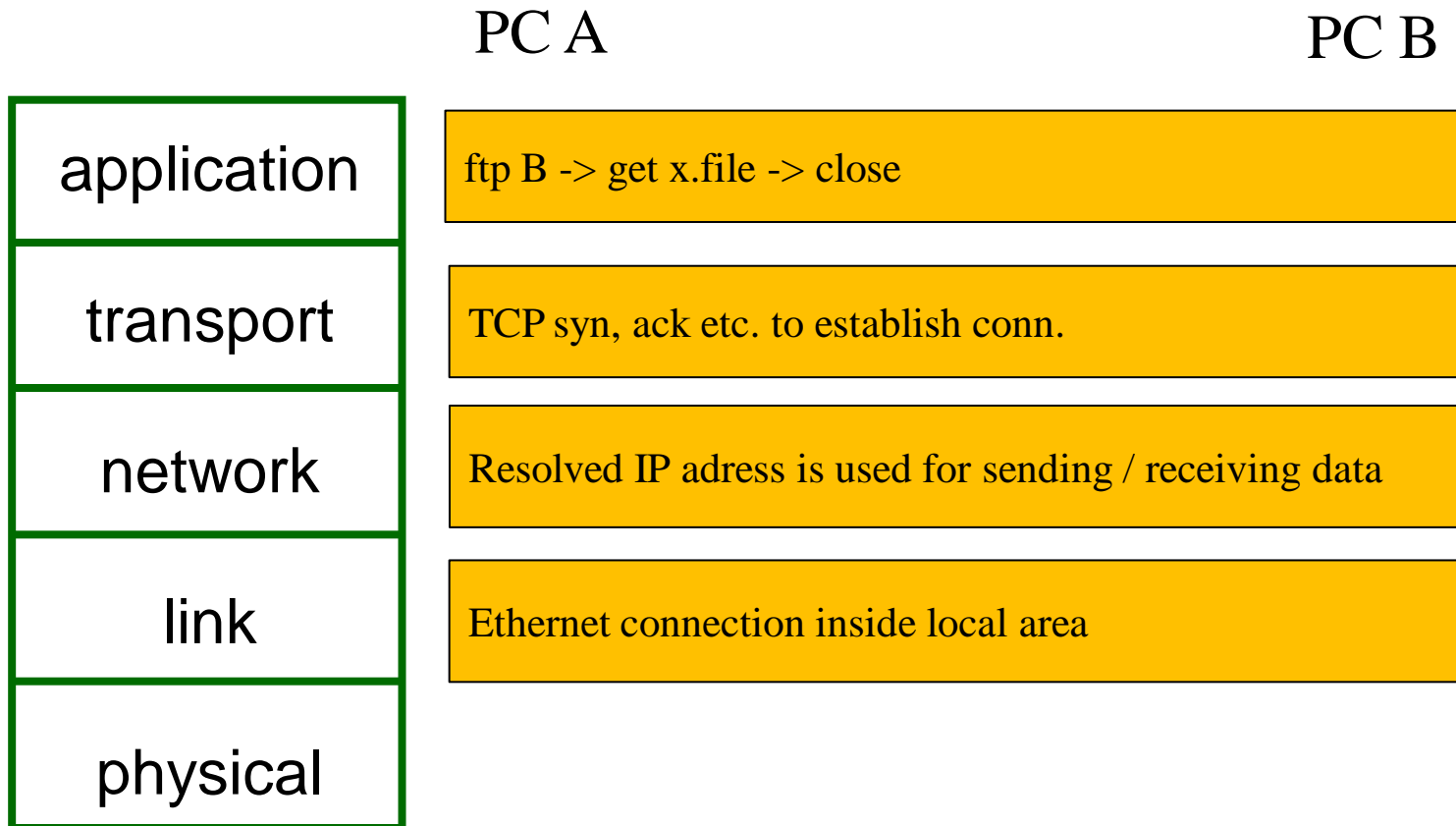
- A switch processes up to layer 2. It uses the physical and the link layer.
- Advantages: Isolation, transparent to changes in other layers
- Disadvantages: Isolation ;)



1. The five layers



2. Protocol exchange



3. Circuit vs. Packet switching

- If sources are bursty they do use the bandwidth only for short timeslots. The burst-process is randomly
 - Randomness: Hard to deal with in circuit switching but easy to do with packet switching
 - Circuit switching has lots of wasted bandwidth with bursty sources, packet switching scales better
- Even if the sources are bursty, QoS reason can make it indispensable to use circuit switching

4. Transmission time

- Quite easy:

$$\begin{aligned} D &= \frac{L}{R} + \frac{d}{P} = \frac{2048\text{Byte}}{1\frac{\text{MBit}}{s}} + \frac{2000\text{km}}{2,5 \cdot 10^8 \frac{m}{s}} \\ &= \frac{2048 \cdot 8\text{Bit}}{1.000.000 \frac{\text{Bit}}{s}} + \frac{0,02 \cdot 10^8 \frac{m}{s}}{2,5 \cdot 10^8 \frac{m}{s}} \\ &\approx 0,016s + 0,008s \approx 24ms \end{aligned}$$

No.	Time	Source	Destination	Protocol	Info
101	12.602603	10.10.2.37	195.71.11.67	HTTP	GET / HTTP/1.1
118	12.670704	10.10.2.37	195.71.11.67	HTTP	GET /layout/js/http/javascript-v200910-2_2_6-1.js HTTP/1.1
285	12.807366	195.71.11.67	10.10.2.37	HTTP	HTTP/1.0 200 OK (text/javascript)
287	12.811083	10.10.2.37	195.71.11.67	HTTP	GET /layout/js/http/netmind-v200910-2_2_6-1.js HTTP/1.1
310	12.828743	195.71.11.67	10.10.2.37	HTTP	HTTP/1.0 200 OK (text/html)
335	12.856712	195.71.11.67	10.10.2.37	HTTP	HTTP/1.0 200 OK (text/javascript)
344	12.857716	10.10.2.37	195.71.11.67	HTTP	GET /layout/css/http/style-v200910-2_2_6-1.css HTTP/1.1
345	12.857815	10.10.2.37	195.71.11.67	HTTP	GET /favicon.ico HTTP/1.1
352	12.880827	10.10.2.37	195.71.11.67	HTTP	GET /static/sys/pixel.gif HTTP/1.1
363	12.882397	195.71.11.67	10.10.2.37	HTTP	HTTP/1.0 200 OK (image/x-icon)
389	12.893049	10.10.2.37	194.64.250.200	HTTP	GET /RealMedia/ads/adstream_mjx.ads/www.spiegel.de/homepage/center/1? HTTP/1.1
391	12.903365	195.71.11.67	10.10.2.37	HTTP	HTTP/1.0 200 OK (GIF89a)
533	12.997923	195.71.11.67	10.10.2.37	HTTP	HTTP/1.0 200 OK (text/css)
568	13.126931	194.64.250.200	10.10.2.37	HTTP	HTTP/1.1 200 OK (application/x-javascript)
573	13.168215	10.10.2.37	194.64.250.200	HTTP	GET /images/activex_mn2.js HTTP/1.1
578	13.202834	194.64.250.200	10.10.2.37	HTTP	HTTP/1.1 200 OK (application/javascript)
582	13.285069	10.10.2.37	195.71.11.67	HTTP	GET /static/sys/v9/bg/bg_wrapper.jpg HTTP/1.1
583	13.285192	10.10.2.37	195.71.11.67	HTTP	GET /static/sys/v9/bg/bg_header_homepage.jpg HTTP/1.1

```

# Frame 101 (524 bytes on wire, 524 bytes captured)
# Ethernet II, Src: Asiarock_89:62:77 (00:19:66:89:62:77), Dst: Asustekc_55:17:59 (00:0e:a6:55:17:59)
# Internet Protocol, Src: 10.10.2.37 (10.10.2.37), Dst: 195.71.11.67 (195.71.11.67)
# Transmission Control Protocol, Src Port: 54256 (54256), Dst Port: http (80), Seq: 1, Ack: 1, Len: 470
# Hypertext Transfer Protocol
  # GET / HTTP/1.1\r\n
    User-Agent: Opera/9.80 (windows NT 6.1; U; en) Presto/2.2.15 Version/10.00\r\n
    Host: www.spiegel.de\r\n
    Accept: text/html,application/xml;q=0.9,application/xhtml+xml,image/png,image/jpeg,image/gif,image/x-xbitmap,*/*;q=0.1\r\n
    Accept-Language: de-DE,de;q=0.9,en;q=0.8\r\n
    Accept-Charset: iso-8859-1,utf-8,utf-16,*;q=0.1\r\n
    Accept-Encoding: deflate,gzip,x-gzip,identity,*;q=0\r\n
    Connection: Keep-Alive,TE\r\n
    TE: deflate,gzip,chunked,identity,trailers\r\n
  \r\n

```

Offset	Raw Data	ASCII
0000	00 0e a6 55 17 59 00 19 66 89 62 77 08 00 45 00	...U.Y..f.bw..E.
0010	01 fe 7b 80 40 00 80 06 00 00 0a 0a 02 25 c3 47	..{.@... ..%.G
0020	0b 43 d3 f0 00 50 4e 2b 9d 56 e8 2c 7f 4e 50 18	.C...PN+ .V...NP.
0030	40 29 dc a9 00 00 47 45 54 20 2f 20 48 54 54 50	@)....GE T / HTTP
0040	2f 31 2e 31 0d 0a 55 73 65 72 2d 41 67 65 6e 74	/1.1.us er-Agent
0050	3a 20 4f 70 65 72 61 2f 39 2e 38 30 20 28 57 69	: opera/ 9.80 (wi
0060	6e 64 6f 77 73 20 4e 54 20 36 2e 31 3b 20 55 3b	ndows NT 6.1; U;
0070	20 65 6e 29 20 50 72 65 73 74 6f 2f 32 2e 32 2e	en) Pre sto/2.2.
0080	31 35 20 56 65 72 73 69 6f 6e 2f 31 30 2e 30 30	15 Versi on/10.00
0090	0d 0a 48 6f 73 74 3a 20 77 77 77 2e 73 70 69 65	..Host: www.spie
00a0	67 65 6c 2e 64 65 0d 0a 41 63 63 65 70 74 3a 20	gel.de.. Accept:
00b0	74 65 78 74 2f 68 74 6d 6c 2c 20 61 70 70 6c 69	text/htm l, appli
00c0	63 61 74 69 6f 6e 2f 78 6d 6c 3b 71 3d 30 2e 39	cation/x ml;q=0.9
00d0	2c 20 61 70 70 6c 69 63 61 74 69 6f 6e 2f 78 68	, applic ation/xh
00e0	74 6d 6c 2b 78 6d 6c 2c 20 69 6d 61 67 65 2f 70	tml+xml, imag e/p
00f0	6e 67 2c 20 69 6d 61 67 65 2f 6a 70 65 67 2c 20	ng, imag e/jpeg,
0100	6f 6d 61 67 65 2f 67 69 66 2c 20 69 6d 61 67 65	image/gi f, image
0110	2f 78 2d 78 62 69 74 6d 61 70 2c 20 2a 2f 2a 3b	/x-xbitm ap, /*;
0120	71 3d 30 2e 31 0d 0a 41 63 63 65 70 74 2d 4c 61	q=0.1..A ccept-La
0130	6e 67 75 61 67 65 3a 20 64 65 2d 44 45 2c 64 65	nguage: de-DE,de