VSR://edu/2017/evs/

07 – Advanced Concepts

//// Design of Distributed Systems
//

Dipl.-Inf. Michael Krug

VSR.Informatik.TU-Chemnitz.*de*

1

Cookie secrets

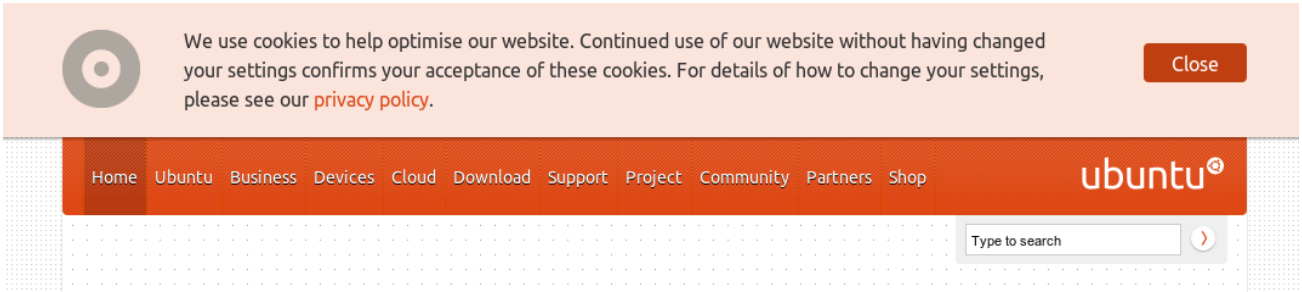
HTTP Cookies can also be set via JavaScript

http://www.w3schools.com/js/js_cookies.asp

Pay attention to the HttpOnly property

Are HTTP Cookies dangerous?

- Cookies are only available for the domain they belong to
- If the Cookie domain equals the current web address
  → **First-party cookie**
- If the user visits a website and a Cookie is set by a resource from a different domain
  → **Third-party cookie**



A word on Cookie Policies

2

HTML5

HTML5 supports a lot of cool, new features

- Better semantic markup (section, header, footer, nav, …)
- New multimedia tags (audio, video, canvas, …)
- Web Sockets
- Web Storage + App Cache
- Web Worker

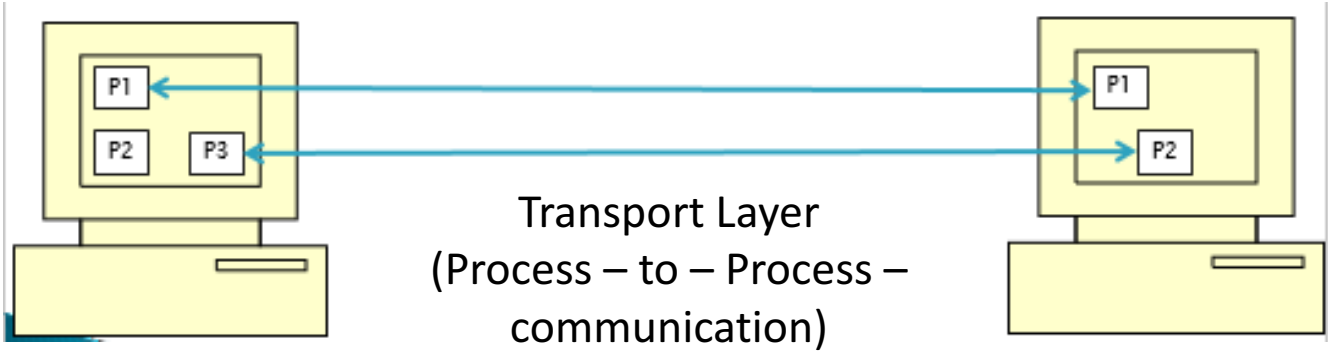
WebSockets

How does a web client and a server application exchange messages?

3.1 Sockets

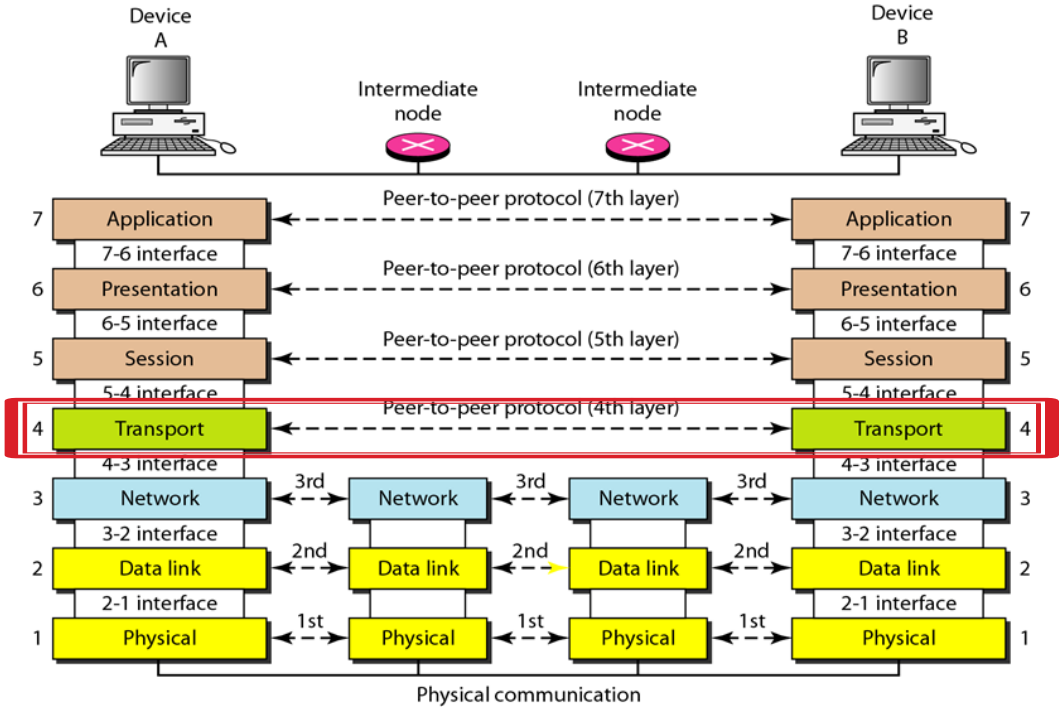
Network Layer vs. Transport Layer

Network Layer (Net – to – Net – communication)



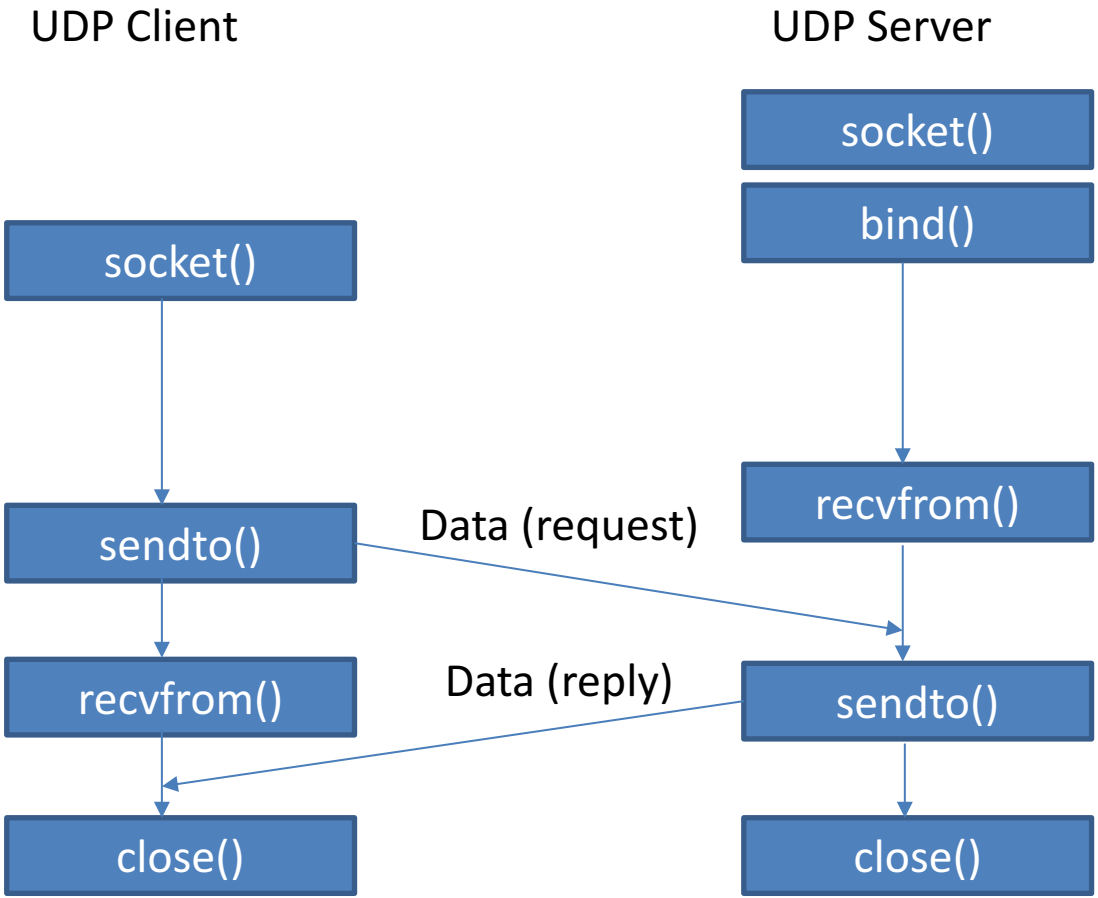
Transport Layer
(Process – to – Process – communication)

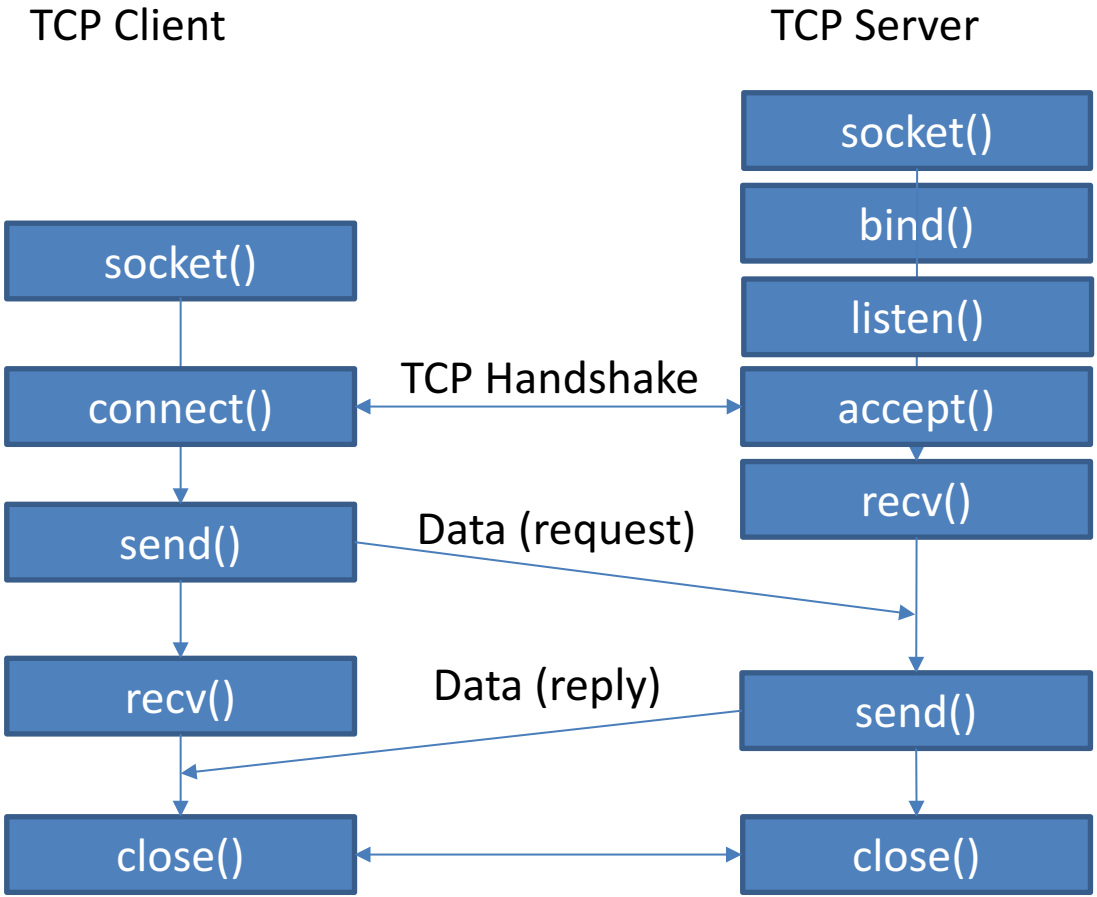
Repetition: Protocol Stack



Repetition: What is a Socket?

- A socket is a communication endpoint in a computer network represented by a handle that allows the usage of the network service implementation of the Operating System (Socket API)
- Socket = <IP address, port> + transport protocol type
- Datagram Sockets (UDP) vs Stream Sockets (TCP)


UDP Client
UDP Server
socket()
bind()
socket()
recvfrom()
sendto()
Data (request)
recvfrom()
Data (reply)
sendto()
close()
close()


TCP Client
TCP Server
socket()
bind()
listen()
socket()
connect()
TCP Handshake
accept()
recv()
send()
Data (request)
recv()
Data (reply)
send()
close()
close()

How can a server application actively send messages to a client?

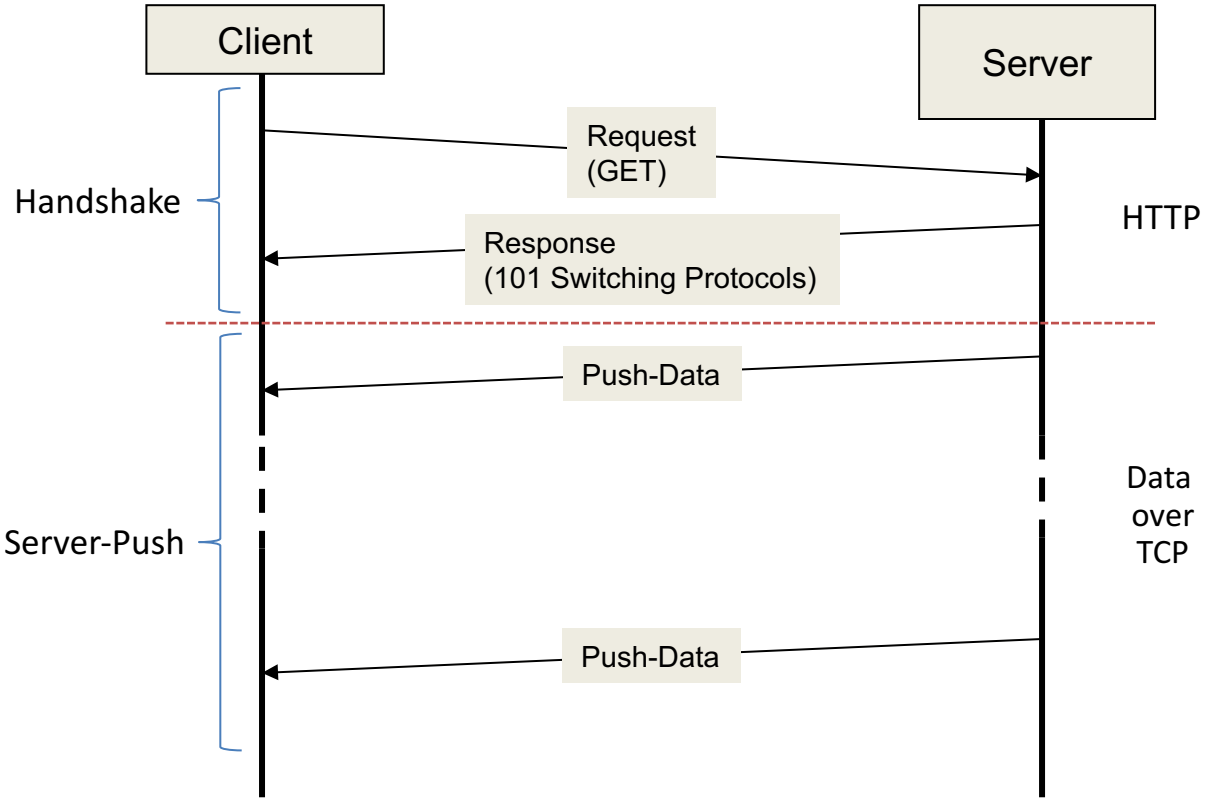
3.2 WebSockets

WebSocket Idea

- How can the Server send messages to the Client (Server-Push)?
- HTTP: Each action of the Server requires a prior Client request
- Solved by HTTP: Polling by the Client
- Disadvantage: Message delivery delay

- Solution: WebSockets
  → Leave an open TCP connection between Client and Server

WebSocket Principle



Handshake (Client)

```
GET /news HTTP/1.1
Host: www.example.org
Connection: Upgrade
Upgrade: websocket
Sec-WebSocket-Key: dGhlIHNhbXBsZSBub25jZQ==
Sec-WebSocket-Origin: http://test.com
Sec-WebSocket-Protocol: example.news
Sec-WebSocket-Version: 8
```

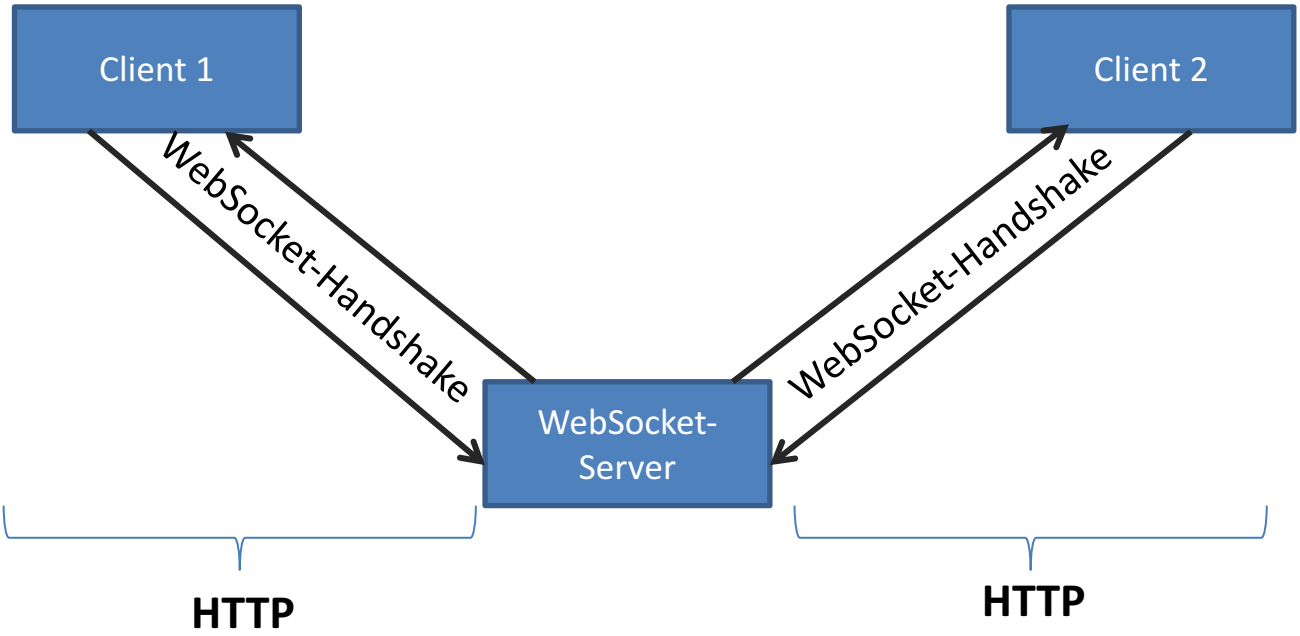
- Sec-WebSocket-Key: randomly generated key (processed by the server)
- Sec-WebSocket-Protocol: Protocol on which Websocket connection is build up

Handshake (Server)

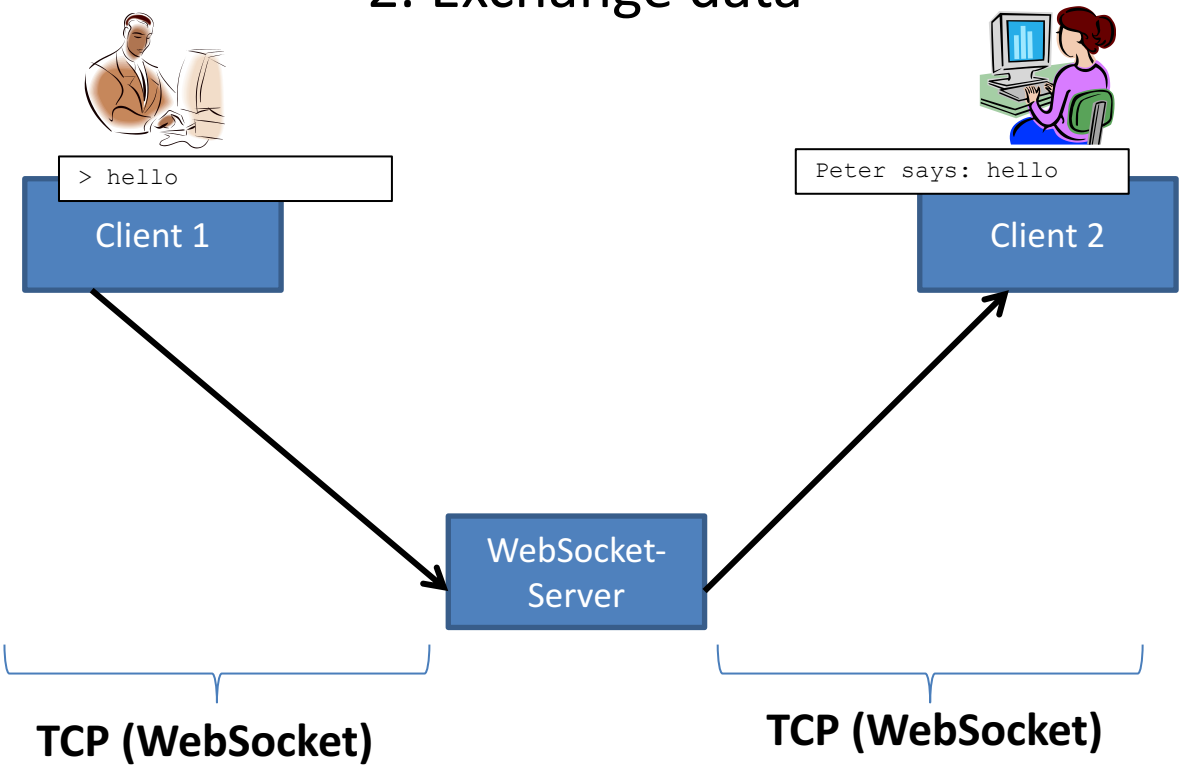
```
HTTP/1.1 101 Switching Protocols
Connection: Upgrade
Upgrade: websocket
Sec-WebSocket-Accept: s3pPLMBiTxaQ9kYGzzhZRbK+xOo=
Sec-WebSocket-Protocol: example.news
```

- Sec-WebSocket-Accept: Sever processes the key received from the Client (Sec-WebSocket-Key) and, thereby, confirms that he has read and understood Client's request.
- Calculation procedure:
  a = Sec-WebSocket-Key + '258EAFA5-E914-47DA-95CA-C5AB0DC85B11'
  b = calculate_hash_sha1(a)
  Sec-WebSocket-Accept = encode_base64(b)

1. Establish WebSocket connection



2. Exchange data



Advantages

- Server can actively use the connection
- No HTTP overhead
- No delay due to polling
- Supported by many Web browser
  Example: Google Chrome (JavaScript):

- ```
  //Socket öffnen und Daten empfangen
  var s = new WebSocket(host);
  s.onmessage = function (e) {…};
  …
  //Daten senden
  var xxx = inputBox.value;
  s.send(xxx);
  ```
  ```

VSR

Thank You!

Michael.Krug@informatik.tu-chemnitz.de

VSR.*Informatik*.TU-Chemnitz.*de*