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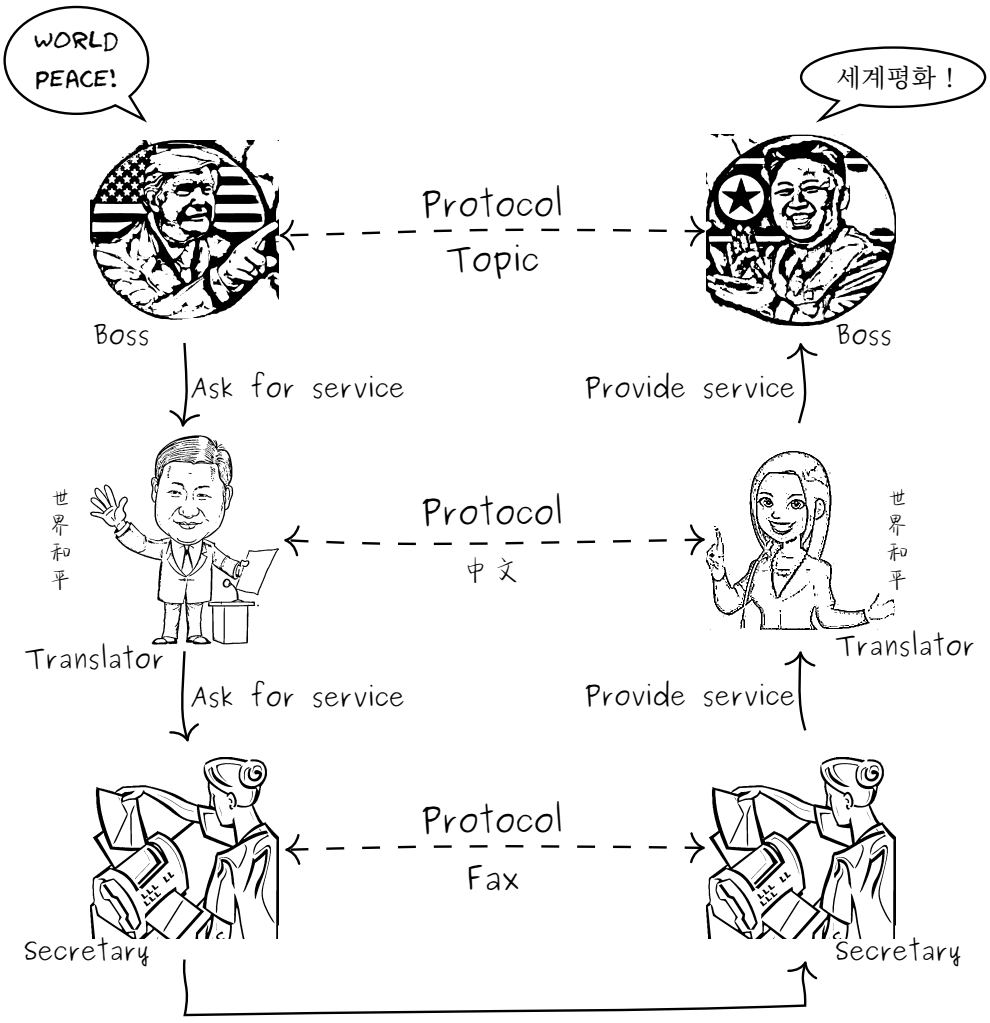

Fig. 1: Layered design

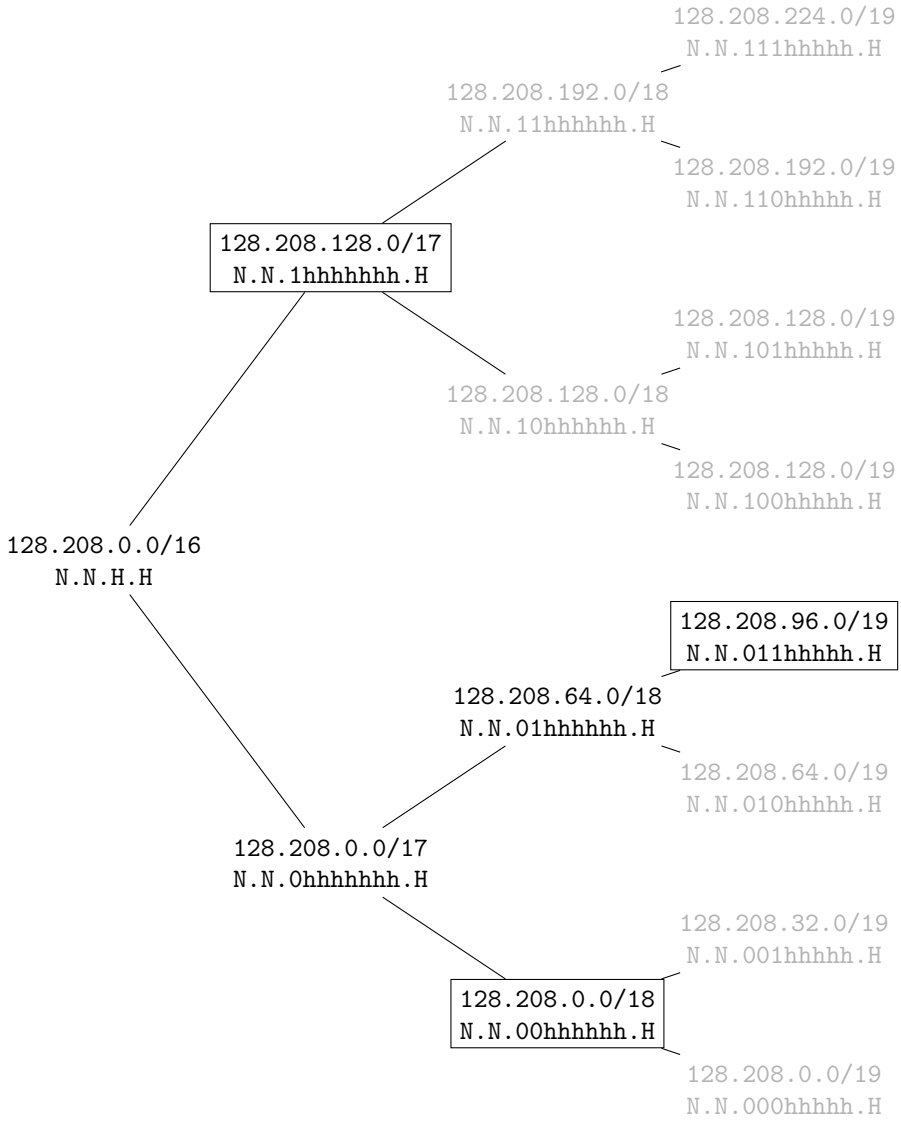

Fig. 2: Subnet hierarchy

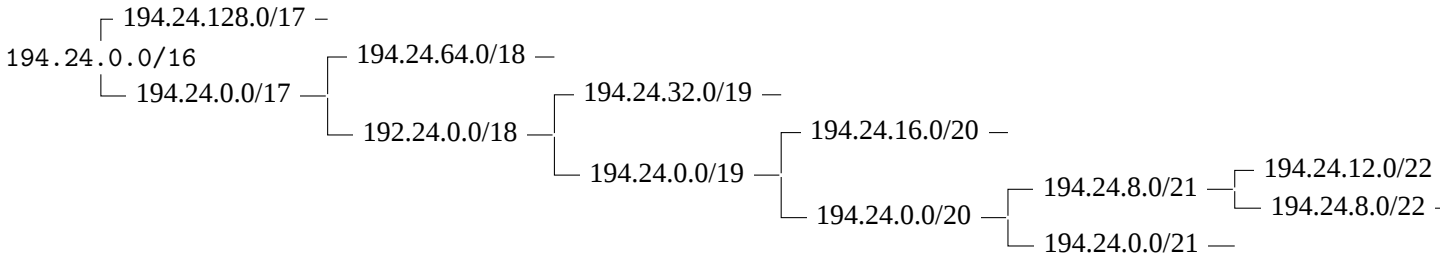

Fig. 3: Subnetting example - 194.24.0.0/16

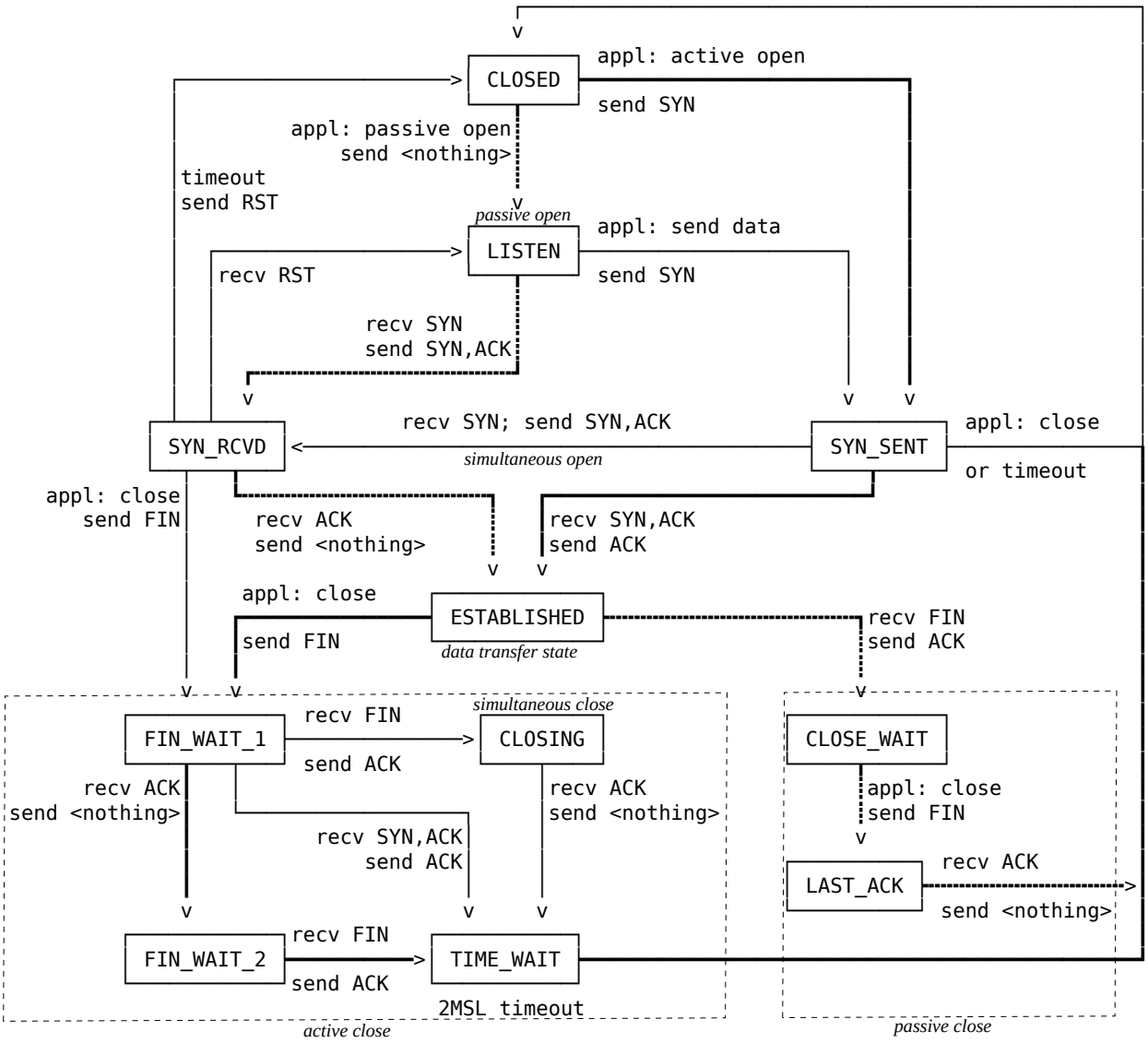

Fig. 4: TCP state transition diagram

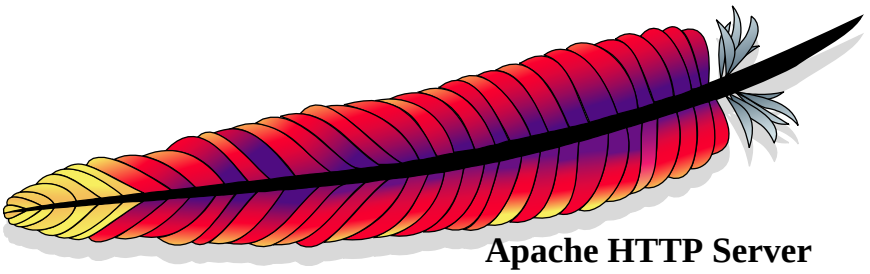

Fig. 5: Apache HTTP Server

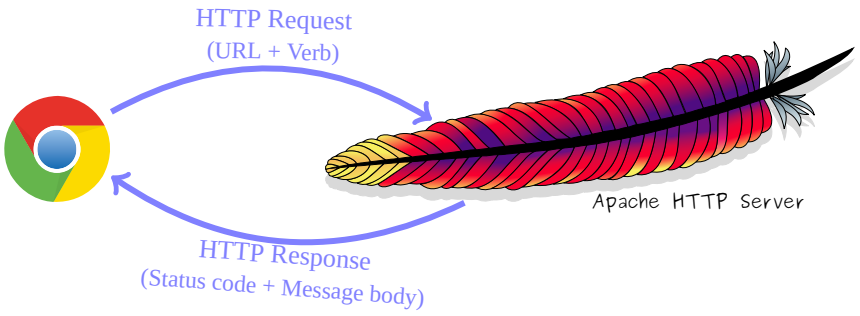

Fig. 6: HTTP client/server interaction

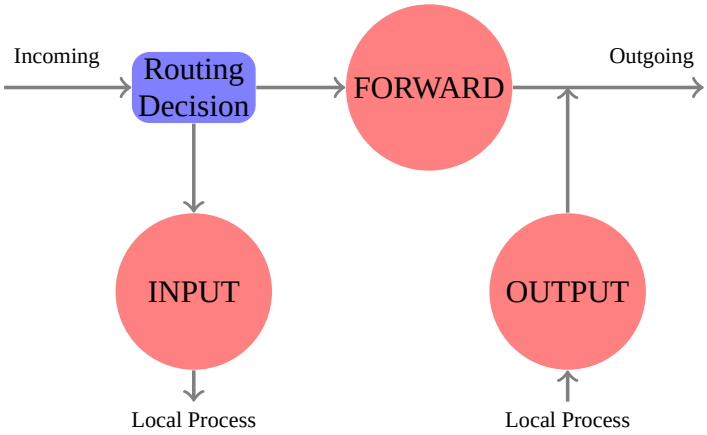

Fig. 7: iptables chains

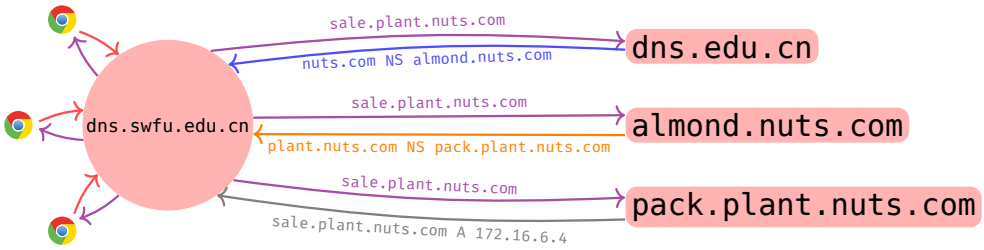

Fig. 8: DNS non-recursive transaction

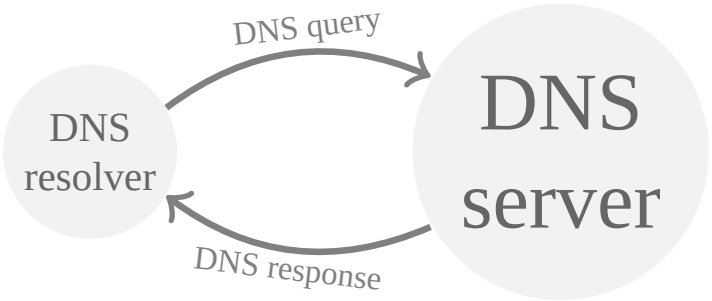

Fig. 9: DNS overview

```
~$ curl -v cs2.swfu.edu.cn/index.html
* Connected to cs2.swfu.edu.cn port 80
> GET /index.html HTTP/1.1
> User-Agent: curl/7.38.0
> Host: cs2.swfu.edu.cn
> Accept: */*
>
```

Request line

Header lines

Empty line

Fig. 10: HTTP request

```
< HTTP/1.1 200 OK
< Date: Thu, 15 Jan 2015 08:18:50 GMT
< Server: Apache/2.4.10 (Debian)
< Last-Modified: Tue, 02 Sep 2014 03:49:24 GMT
< ETag: "1fd-5020d015e5e4a"
< Accept-Ranges: bytes
< Content-Length: 509
< Vary: Accept-Encoding
< Content-Type: text/html
<
<html>
<head>
<title>Hello, world!</title>
</head>
<body>
<h1>Hello, world!</h1>
</body>
</html>
* Connection #0 to host cs2.swfu.edu.cn left intact
```

Status line

Header lines

Empty line

Data

Fig. 11: HTTP Response

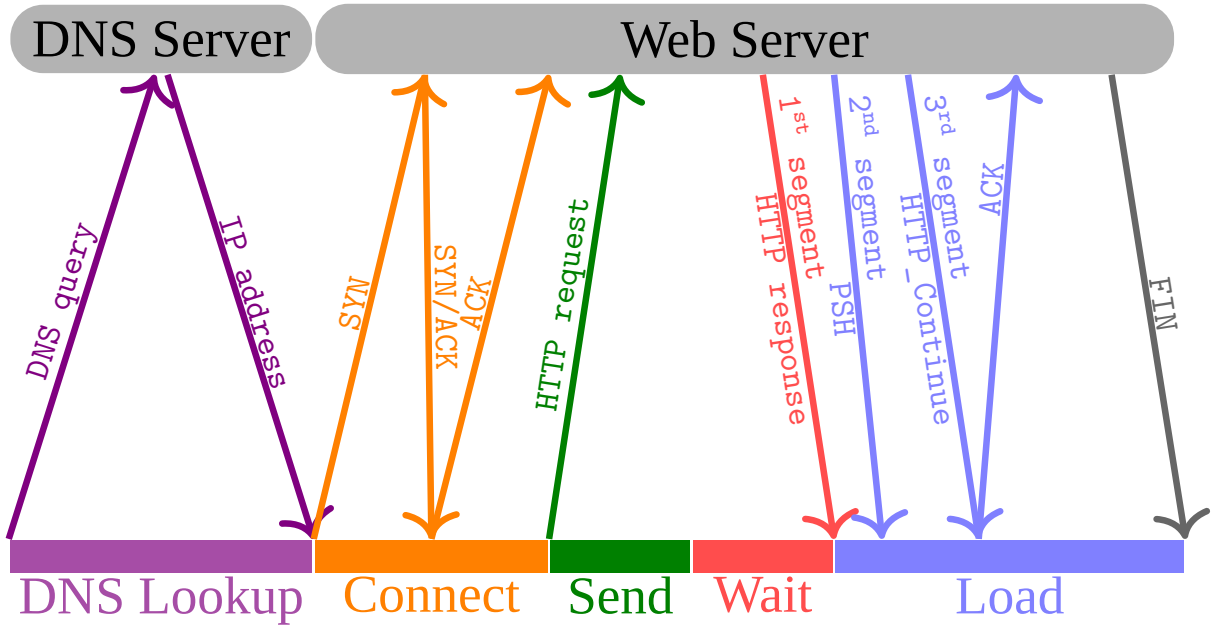

Fig. 12: HTTP transaction

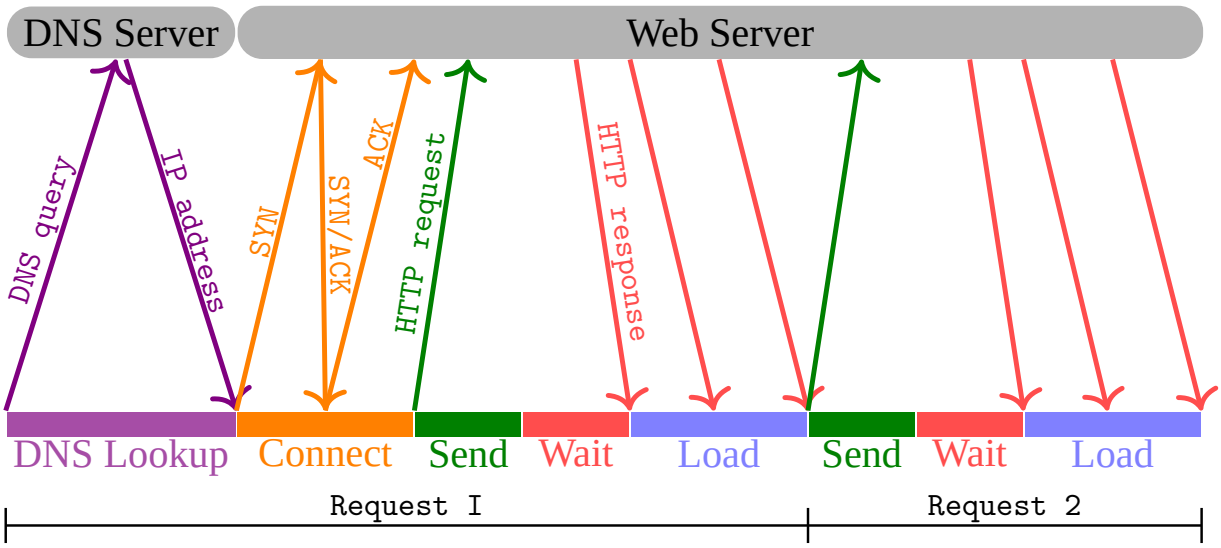

Fig. 13: HTTP persistent transaction

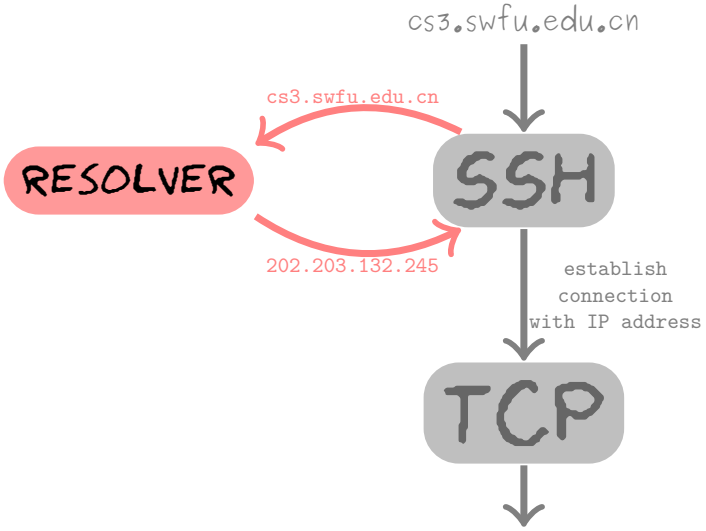

Fig. 14: DNS resolver

```
wx672@cs3:~$ netstat -at | grep http | grep ESTAB
tcp   0   0 cs3.swfu.edu.cn:http    220.163.96.3:47179    ESTABLISHED
```

address port — address port

socket — socket

a pair of sockets form a TCP connection

Fig. 15: TCP socket pair

```
http://en.wikipedia.org/w/index.php?title=Hello&oldid=636846770
```

protocol — host — resource path — query

Fig. 16: URL

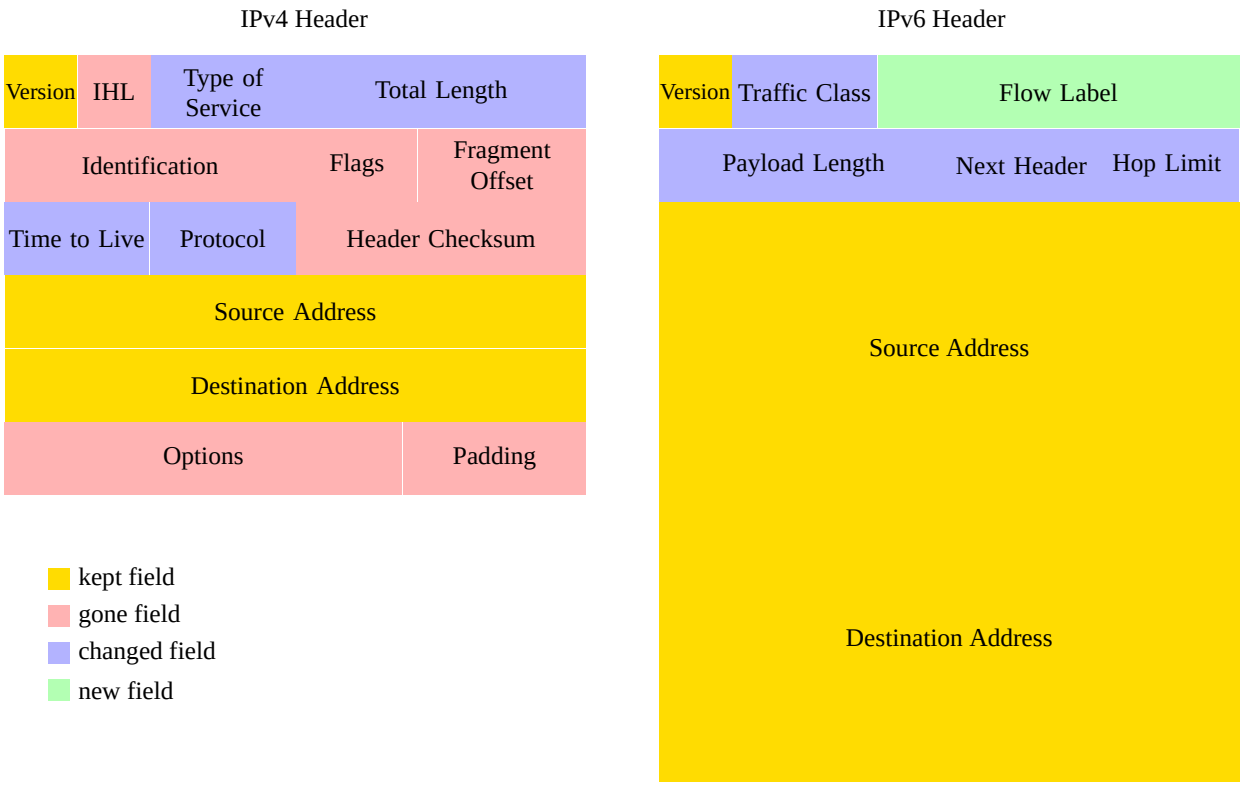

Fig. 17: IPv4 header vs. IPv6 header