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Wireshark Developer and User Conference

PA-17 TCP Performance Problem Analysis Through Multiple Network Segments

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Multipoint Analysis

- A single measure point is not sufficient for certain network analysis tasks
- Typical scenarios for multipoint analysis
  - Assumed packet loss between client and server
  - Determining Latency
  - Investigating packet manipulation when passing certain network devices
  - Asymmetric routing
  - Link Aggregation
  - Active/Passive and Active/Active High Redundancy Solutions

Multipoint Analysis: Best practice

- Extremely important: Document your traces as detailed as possible!
  - Especially when dealing with loads of trace files from multiple capture points
- Sync the time of your capture devices


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Comparing trace files

Comparing traces

- Comparing traces taken at multiple points at the same time is often necessary
- Major points of interest are:
  - Identify identical packets at each capture point
  - Isolate conversations and match them
  - Determine latency
  - Determine packet loss
- Can be quite time consuming unless done automatically (e.g. Pilot)

Identifying packet matches

- Find identical TCP/UDP conversations:
  - Determine client/server socket pairs
  - Create conversation filter, apply to all capture points
  - When using multiple files per location: batch job
- For other protocols, try
  - ARP: sender/target MAC and IP in the ARP header
  - ICMP: type, code, ping sequence, packet quote
  - DHCP, DNS: transaction ID
  - GenericIP: IP-ID, TTL

Isolating TCP conversations

- Filter on the conversation, e.g.
  - `(ip.addr==10.0.0.1 and tcp.port==1025) and (ip.addr==10.0.0.2 and tcp.port==80)`
- Save into separate file using “Export specified packets” -> “Selected displayed packets”
- If possible: isolate initial SYN packet
  - `tcp.flags==2`
- Best Practice: deactivate relative TCP sequence numbers!


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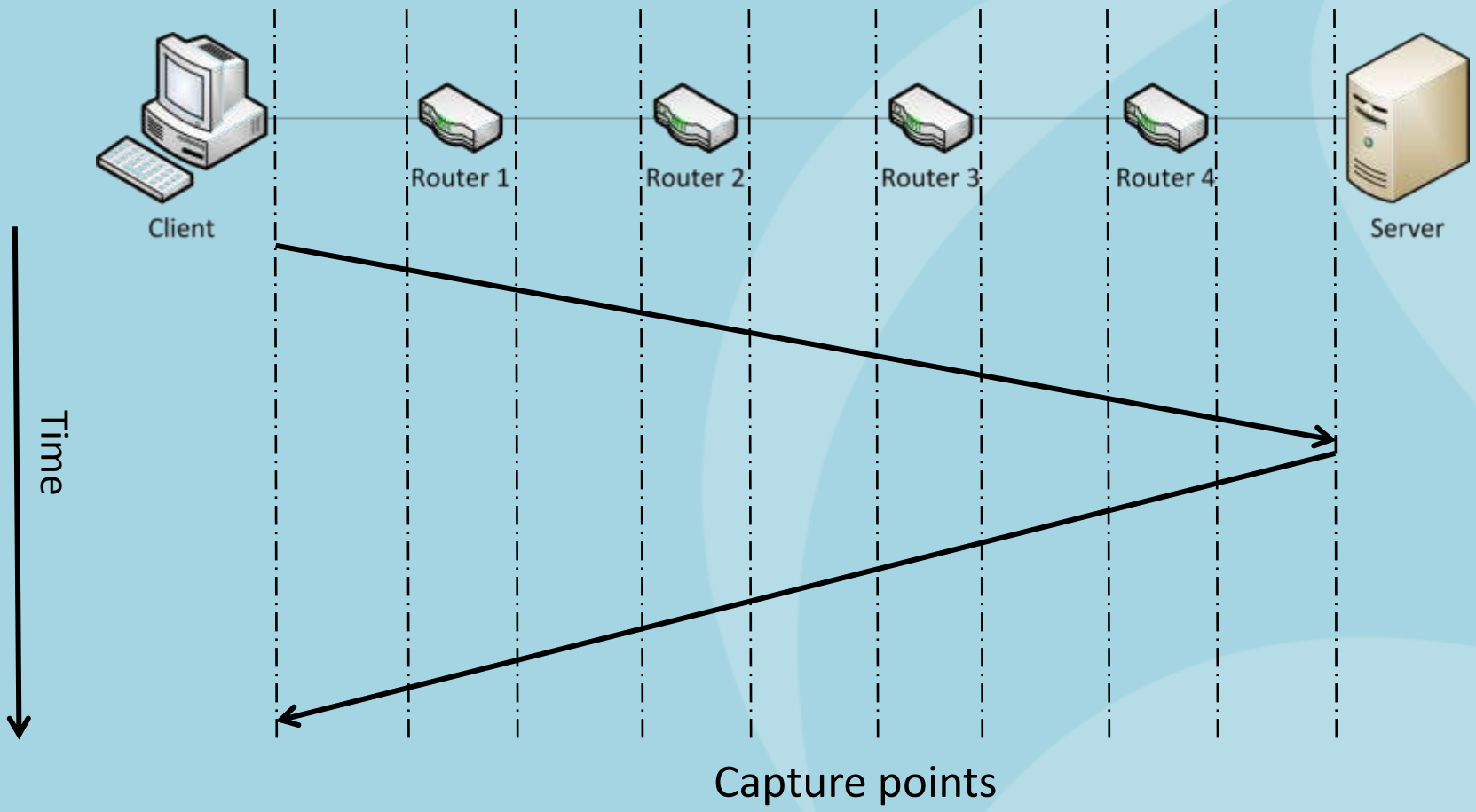
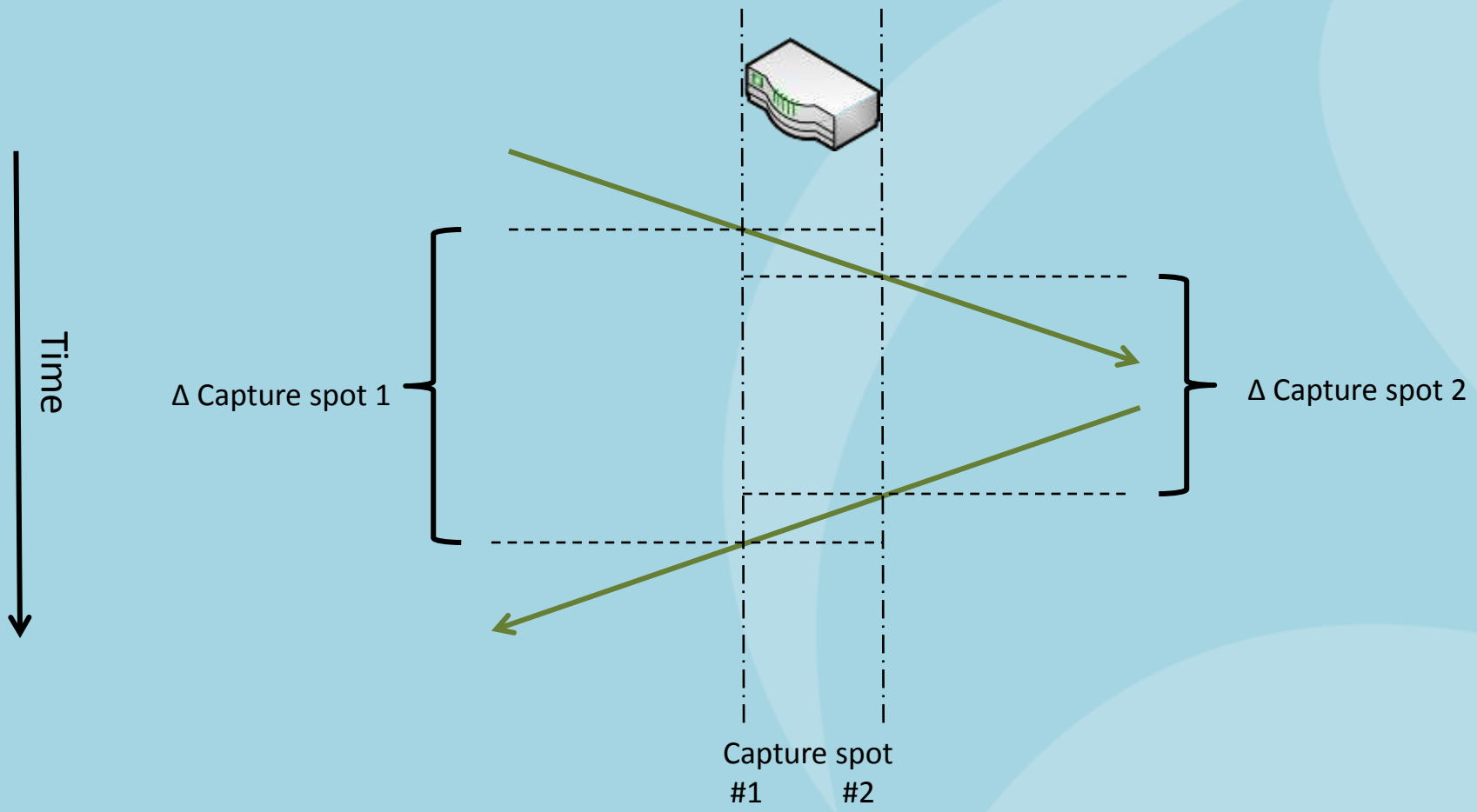
Determining latency

Multipoint captures: latency



Determining latency – single device

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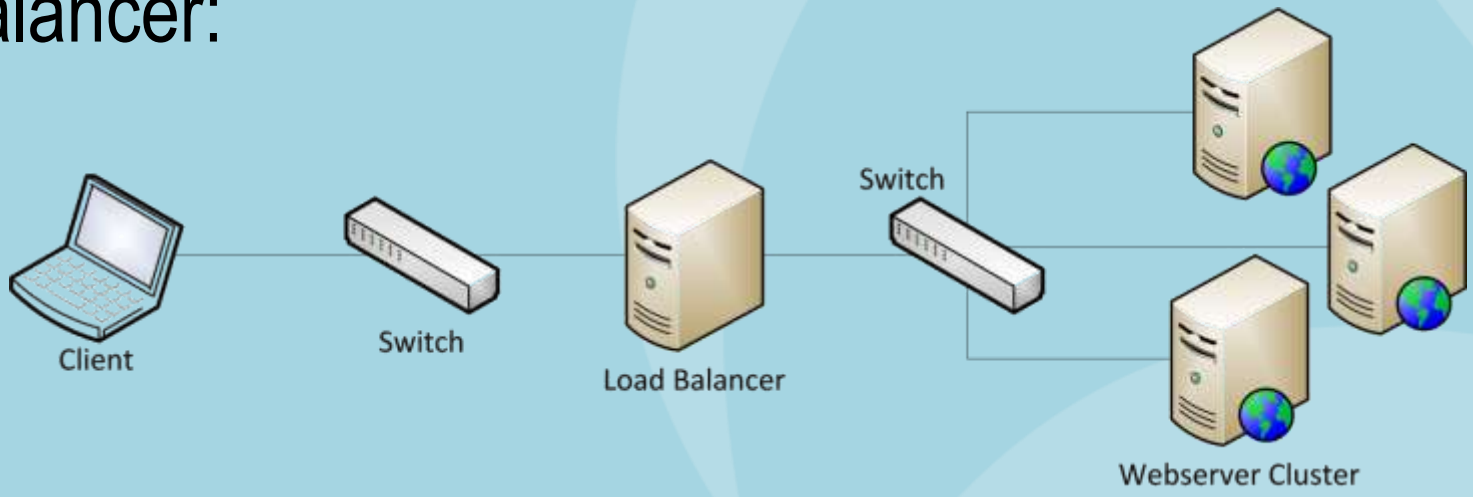
NAT, Proxy, Loadbalancer
Your troubles start here...

Troublemakers: Load balancers

- Load balancers distribute connections to multiple identical servers
- Allows scaling the available capacity
- Example with multi-tiered servers behind the load balancer:

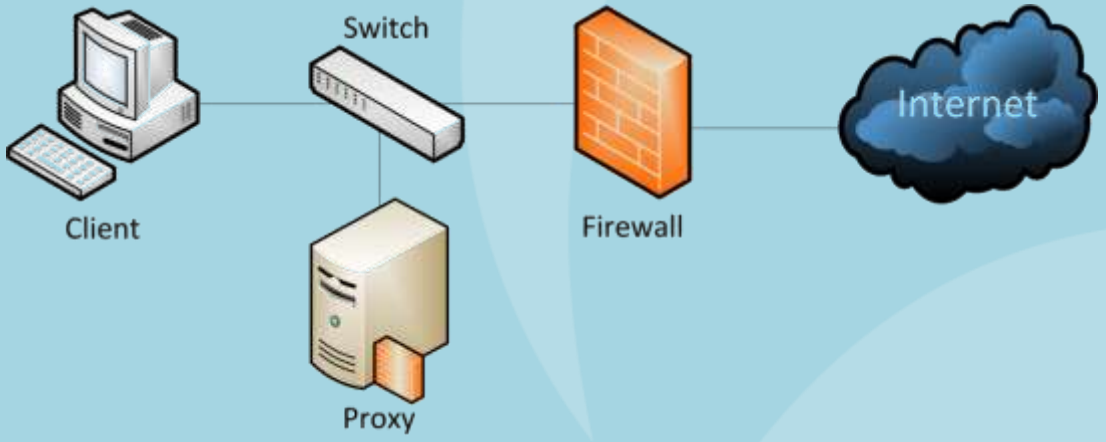


NAT gateways

- NAT = Network Address Translation
  - Basically replaces network addresses found in packets back and forth
  - Usually relevant to layer 3, which means routers
- Typical NAT activity
  - Source NAT
  - Destination NAT

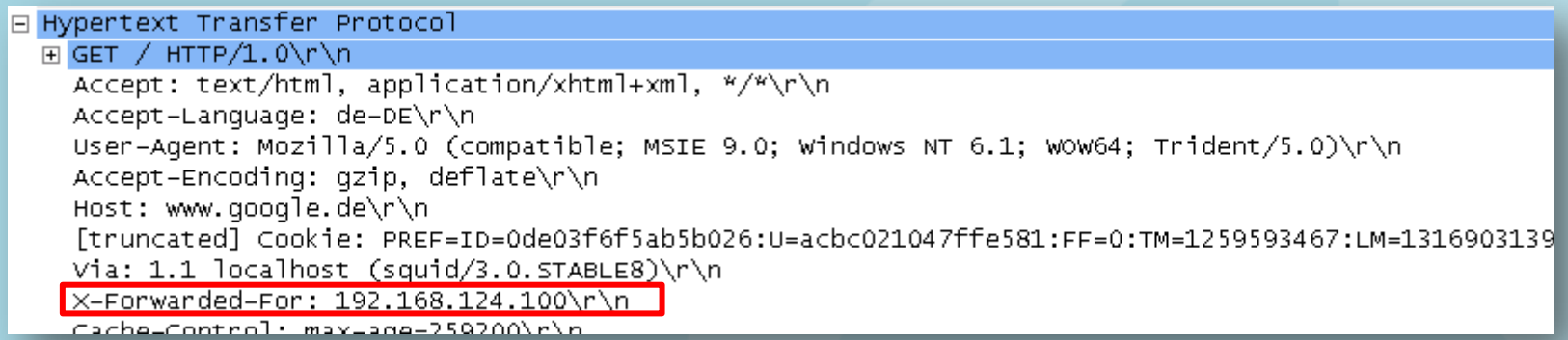
Proxy servers

- Proxy servers separate different network and security zones
- Client requests are sent to the proxy
- The proxy fetches the requested content and delivers it to the client



Proxy Server: Forwarded-For

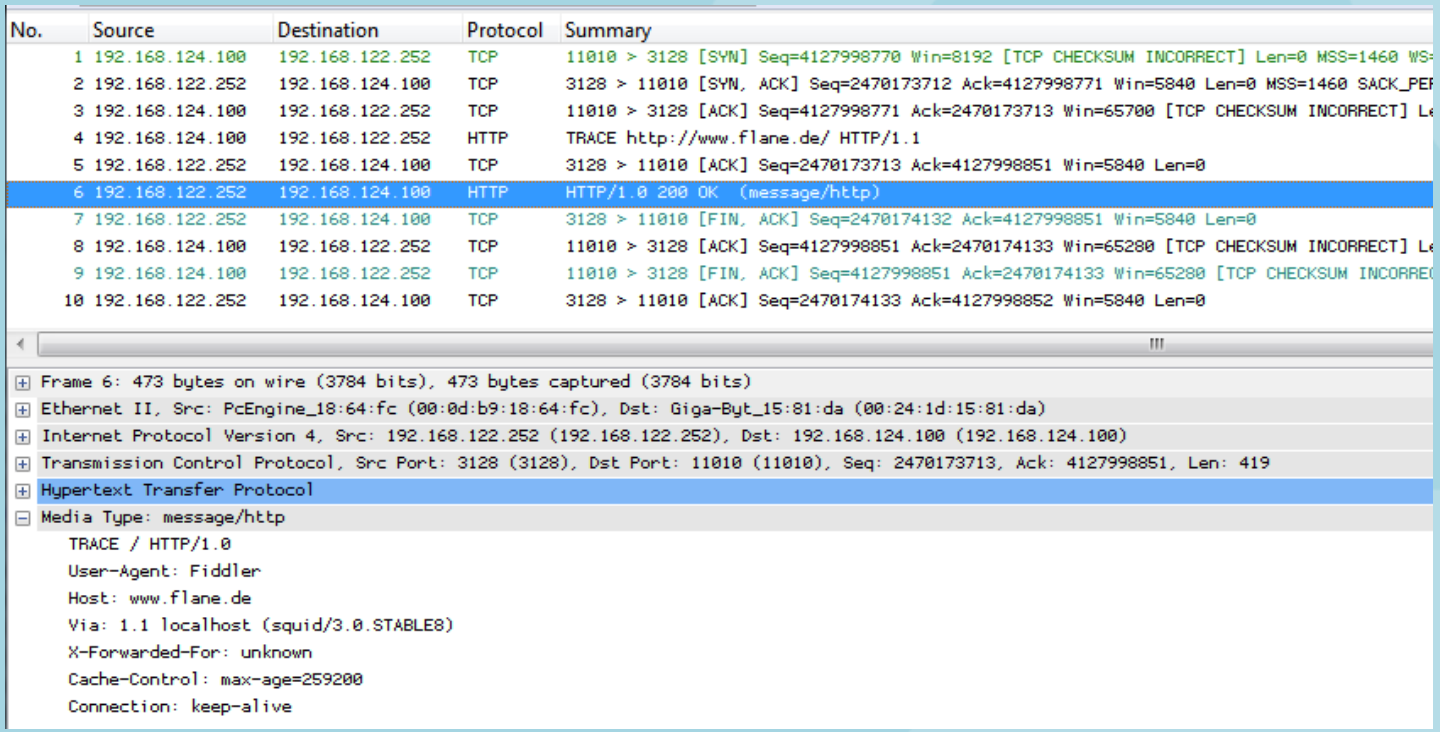
- Some proxies insert the address of the client into the request headers:



- Best Practice:disable “X-Forwarded-For” for security reasons
  - X-Forwarded-For will show something like „unknown“
  - Turn back on for temporary troubleshooting tasks

Transparent Proxies

- Intercept client communication without the need to configure the client to use the proxy
  - Using the “trace” method can reveal those proxies



No.	Source	Destination	Protocol	Summary
1	192.168.124.100	192.168.122.252	TCP	11010 > 3128 [SYN] Seq=4127998770 Win=8192 [TCP CHECKSUM INCORRECT] Len=0 MSS=1460 WS=
2	192.168.122.252	192.168.124.100	TCP	3128 > 11010 [SYN, ACK] Seq=2470173712 Ack=4127998771 Win=5840 Len=0 MSS=1460 SACK_PE
3	192.168.124.100	192.168.122.252	TCP	11010 > 3128 [ACK] Seq=4127998771 Ack=2470173713 Win=65700 [TCP CHECKSUM INCORRECT] Le
4	192.168.124.100	192.168.122.252	HTTP	TRACE http://www.flane.de/ HTTP/1.1
5	192.168.122.252	192.168.124.100	TCP	3128 > 11010 [ACK] Seq=2470173713 Ack=4127998851 Win=5840 Len=0
6	192.168.122.252	192.168.124.100	HTTP	HTTP/1.0 200 OK (message/http)
7	192.168.122.252	192.168.124.100	TCP	3128 > 11010 [FIN, ACK] Seq=2470174132 Ack=4127998851 Win=5840 Len=0
8	192.168.124.100	192.168.122.252	TCP	11010 > 3128 [ACK] Seq=4127998851 Ack=2470174133 Win=65280 [TCP CHECKSUM INCORRECT] Le
9	192.168.124.100	192.168.122.252	TCP	11010 > 3128 [FIN, ACK] Seq=4127998851 Ack=2470174133 Win=65280 [TCP CHECKSUM INCORRE
10	192.168.122.252	192.168.124.100	TCP	3128 > 11010 [ACK] Seq=2470174133 Ack=4127998852 Win=5840 Len=0

```
⊞ Frame 6: 473 bytes on wire (3784 bits), 473 bytes captured (3784 bits)
⊞ Ethernet II, Src: PcEngine_18:64:fc (00:0d:b9:18:64:fc), Dst: Giga-Byt_15:81:da (00:24:1d:15:81:da)
⊞ Internet Protocol Version 4, Src: 192.168.122.252 (192.168.122.252), Dst: 192.168.124.100 (192.168.124.100)
⊞ Transmission Control Protocol, Src Port: 3128 (3128), Dst Port: 11010 (11010), Seq: 2470173713, Ack: 4127998851, Len: 419
⊞ Hypertext Transfer Protocol
⊟ Media Type: message/http
    TRACE / HTTP/1.0
    User-Agent: Fiddler
    Host: www.flane.de
    Via: 1.1 localhost (squid/3.0.STABLE8)
    X-Forwarded-For: unknown
    Cache-Control: max-age=259200
    Connection: keep-alive
```

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It's trace file clobberin' time!