移动网络性能优化

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性能优化的目的是什么?

- 更可靠
- 更快速

这段代码执行的时候发生了什么?

```
let defaultSession = URLSession(configuration: .default)
if let url = URL(string: "https://httpbin.org/get") {
  let dataTask = defaultSession.dataTask(with: url) { data, response, error in

  }
  dataTask?.resume()
}
```

IP 直连

1. 启动时下发所有可用的 IP 列表

2. 客户端找出当前连接最快的 IP

3. 后续的网络请求中将域名替换为 IP

域名收敛

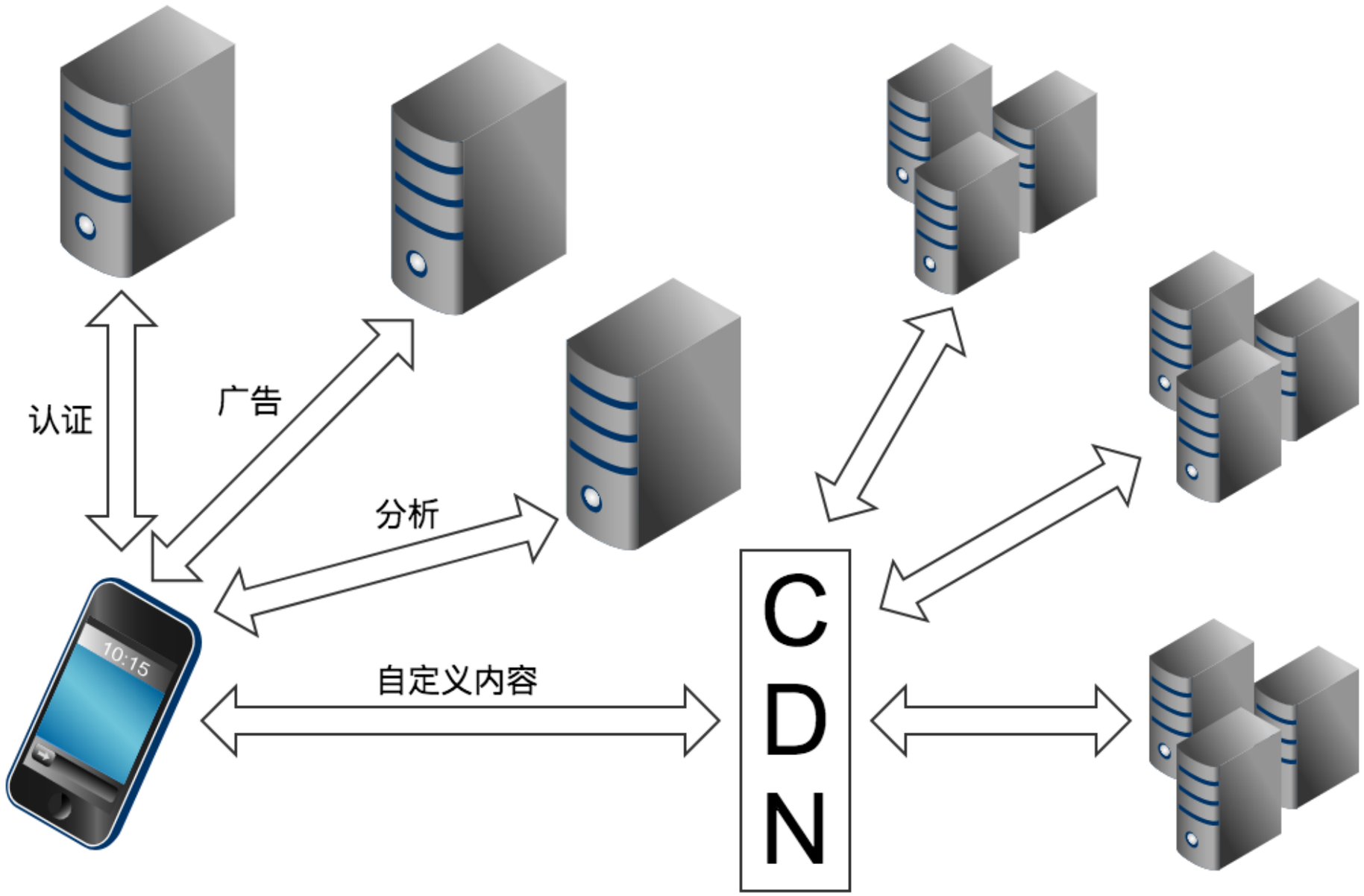
- a.api.example.com
- b.api.example.com
- c.api.example.com
- .....

域名收敛

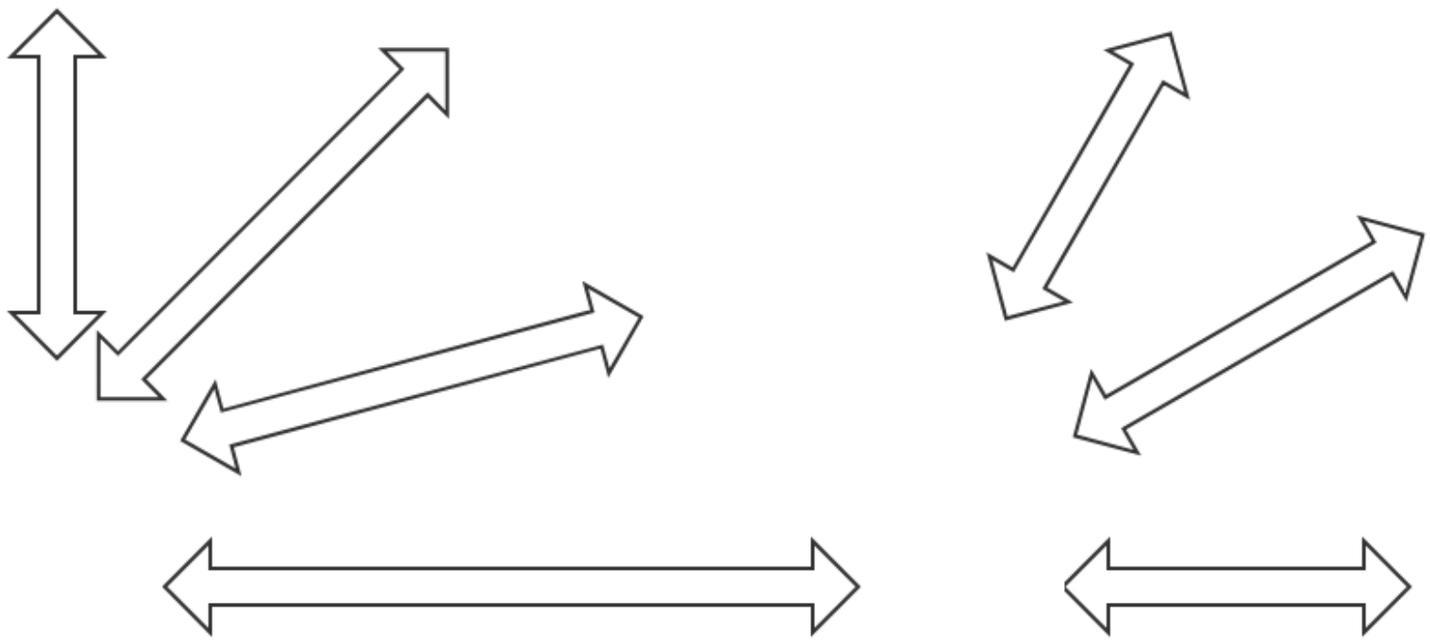
- api.example.com/a
- api.example.com/b
- api.example.com/c
- .....

理想中的网络请求

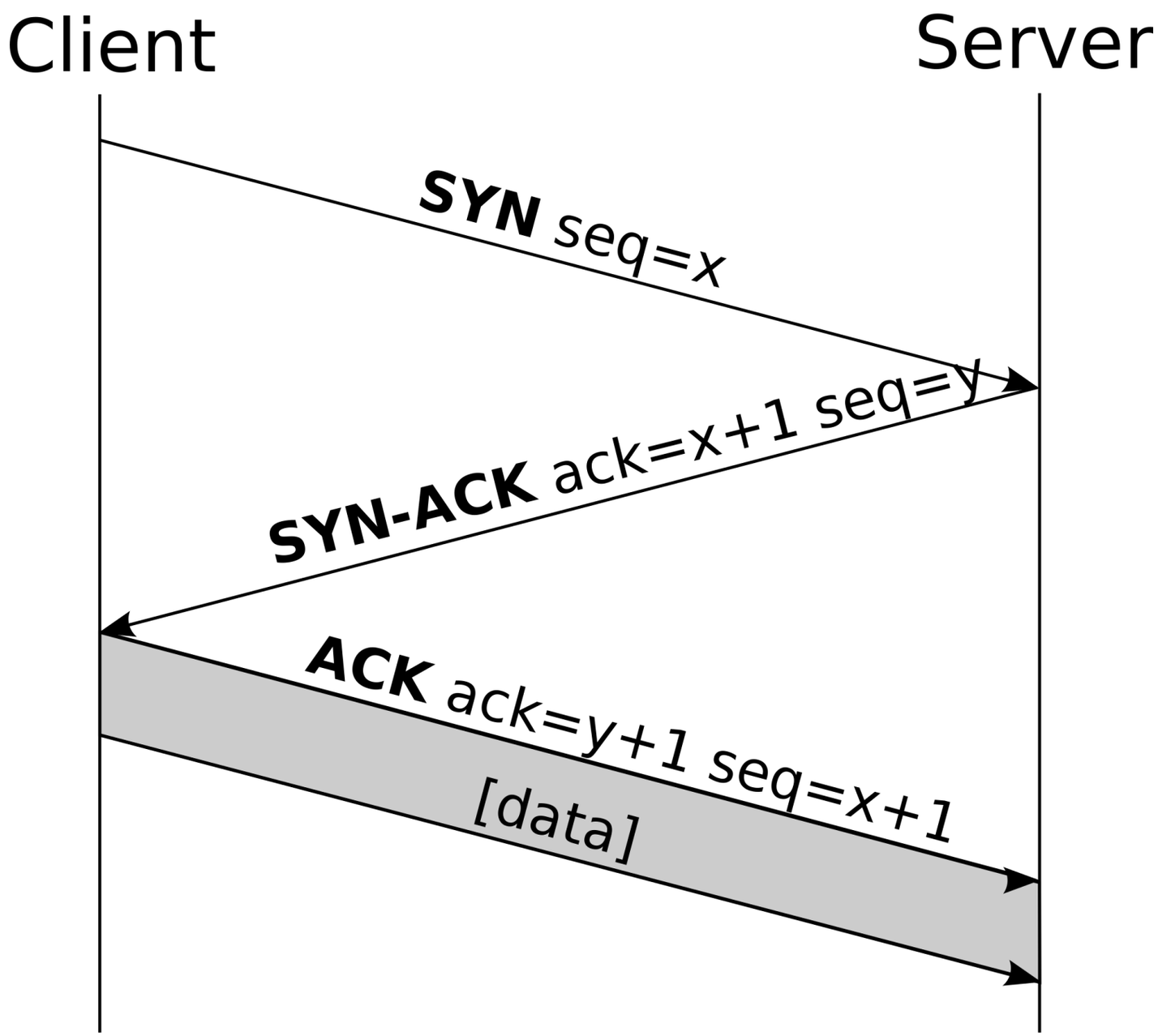
实际上的网络请求



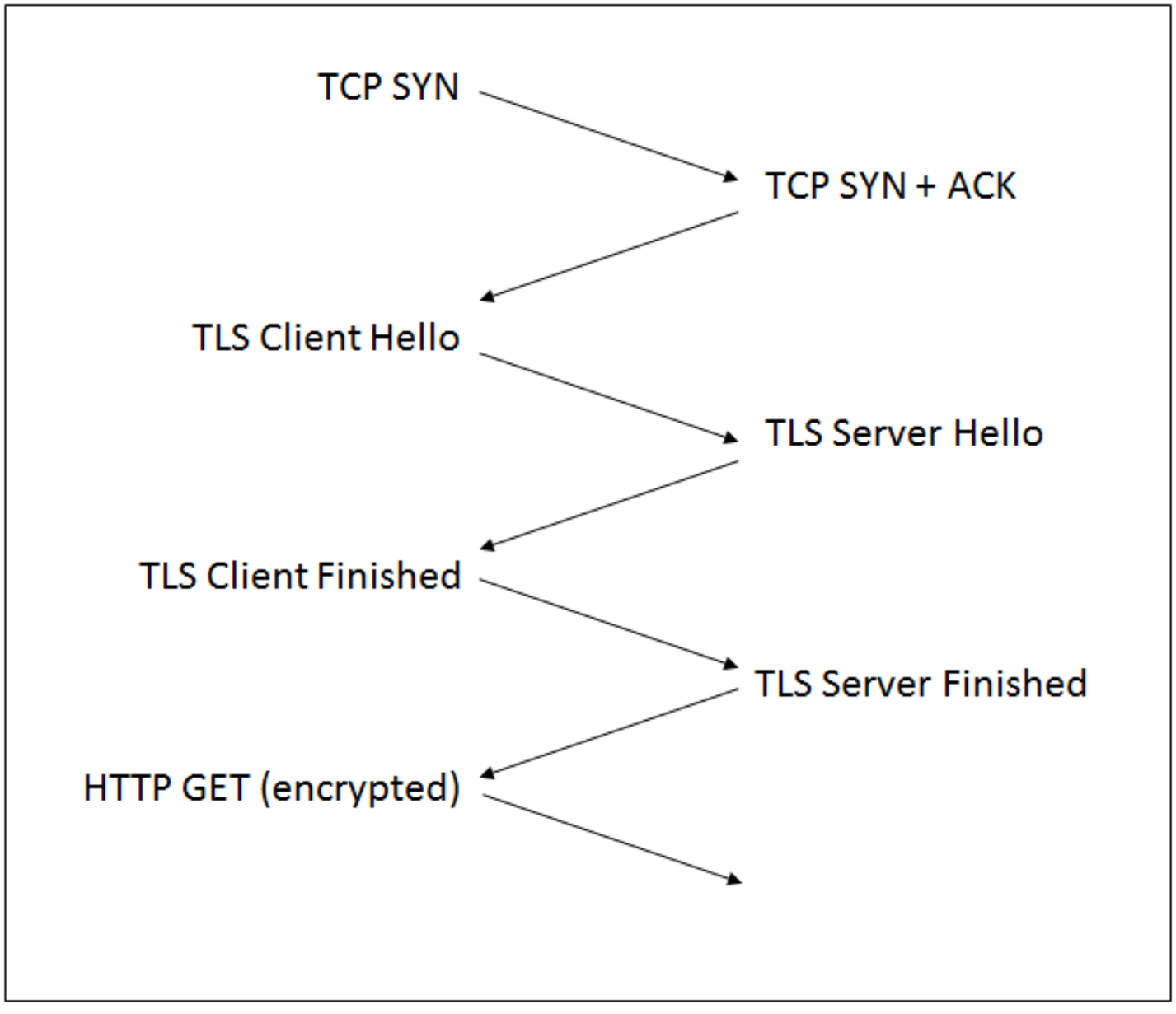
网络延迟的产生



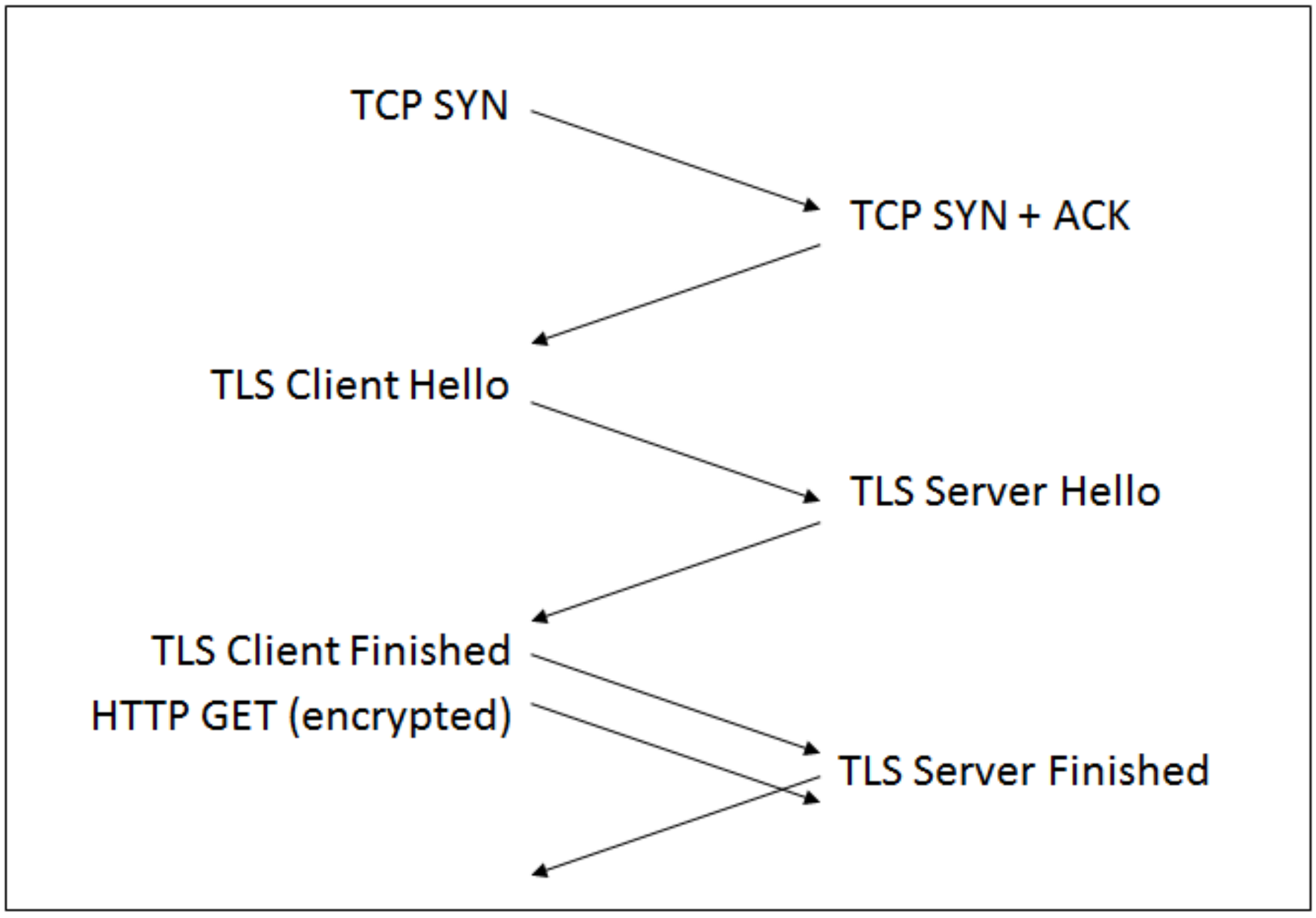
TCP 三次握手


Client
Server
SYN seq=x
SYN-ACK ack=x+1 seq=y
ACK ack=y+1 seq=x+1
[data]

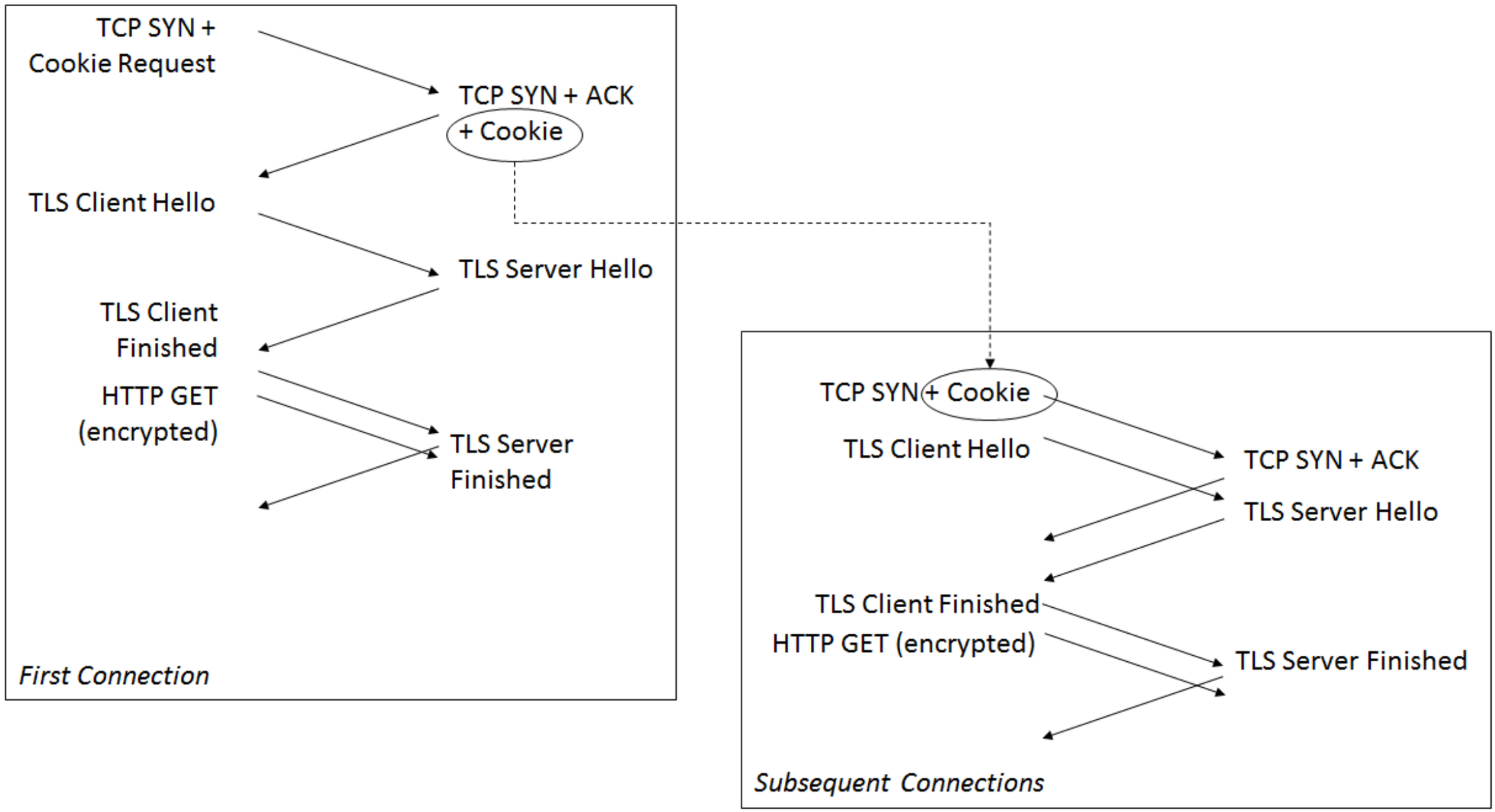
有 TLS 情况下的 三次握手



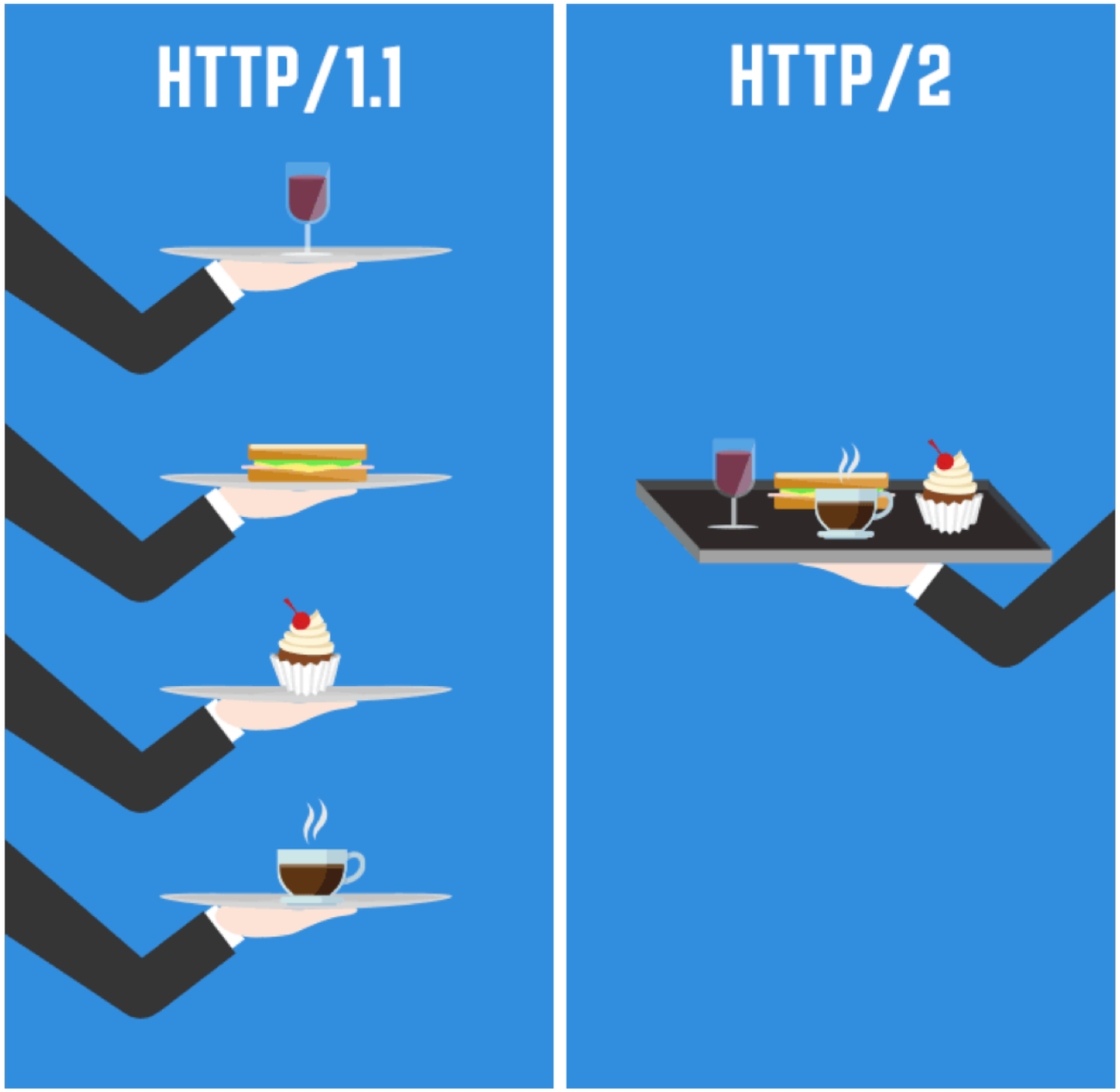
TLS False Start



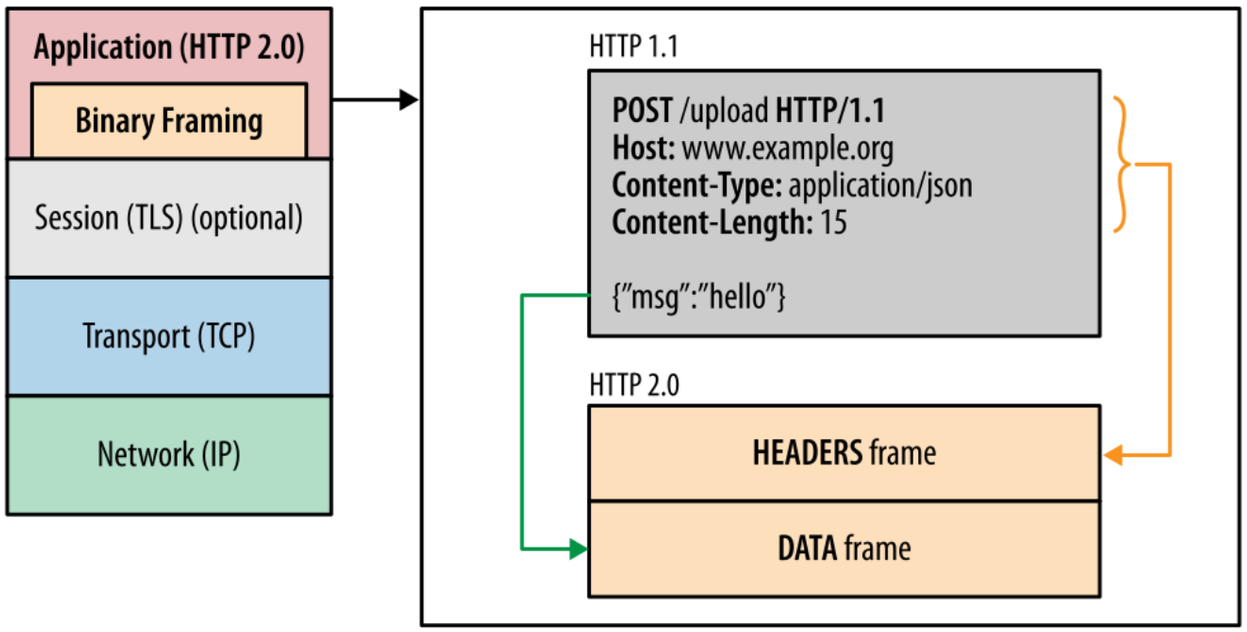
TCP Fast Open



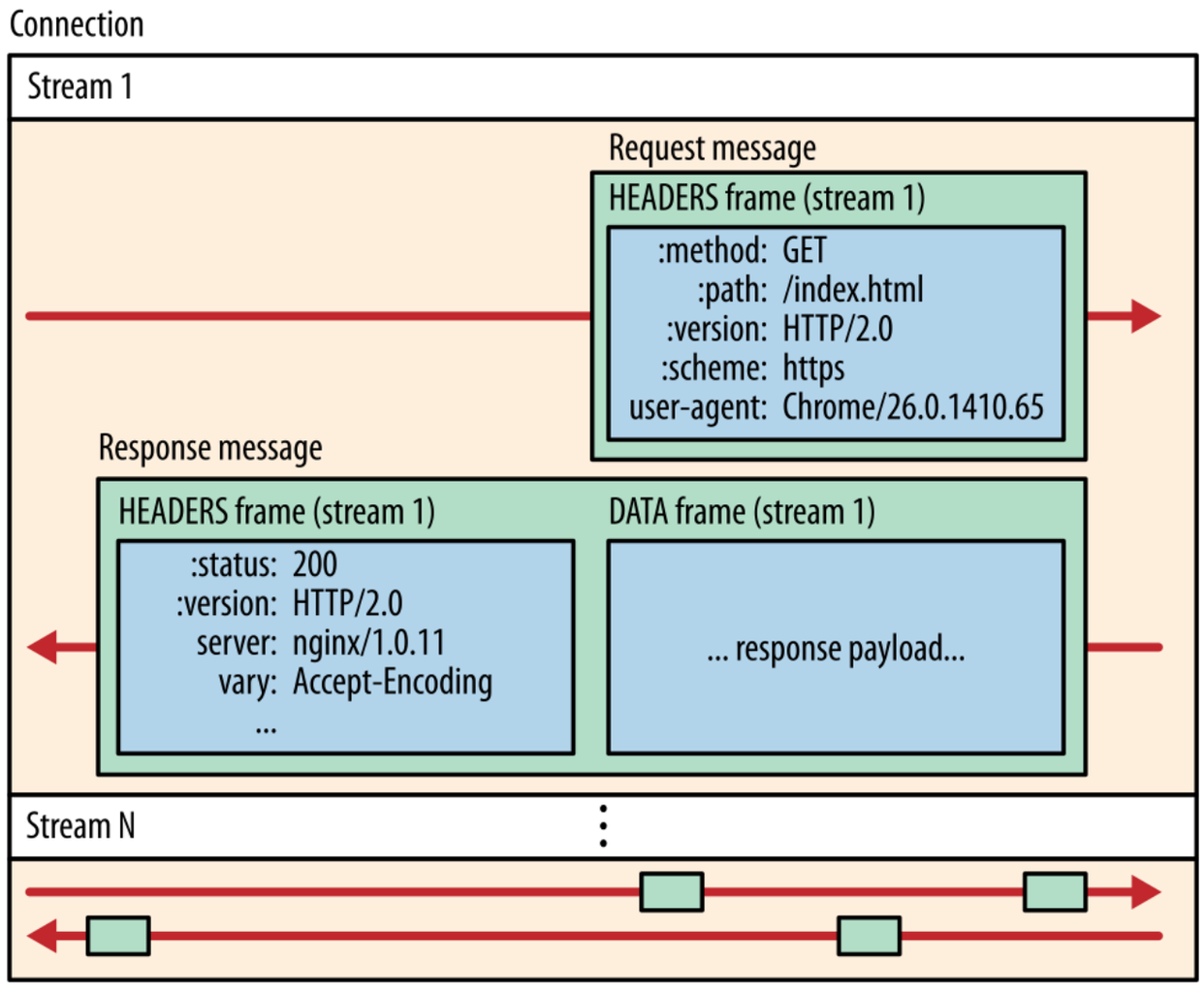
HTTP/2



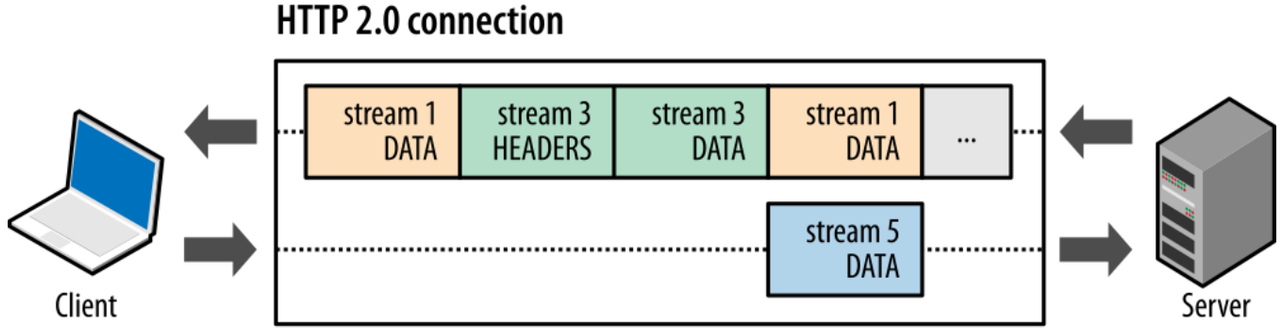
二进制分帧层


Application (HTTP 2.0)
Binary Framing
Session (TLS) (optional)
Transport (TCP)
Network (IP)
HTTP 1.1
POST /upload HTTP/1.1
Host: www.example.org
Content-Type: application/json
Content-Length: 15
{"msg":"hello"}
HTTP 2.0
HEADERS frame
DATA frame

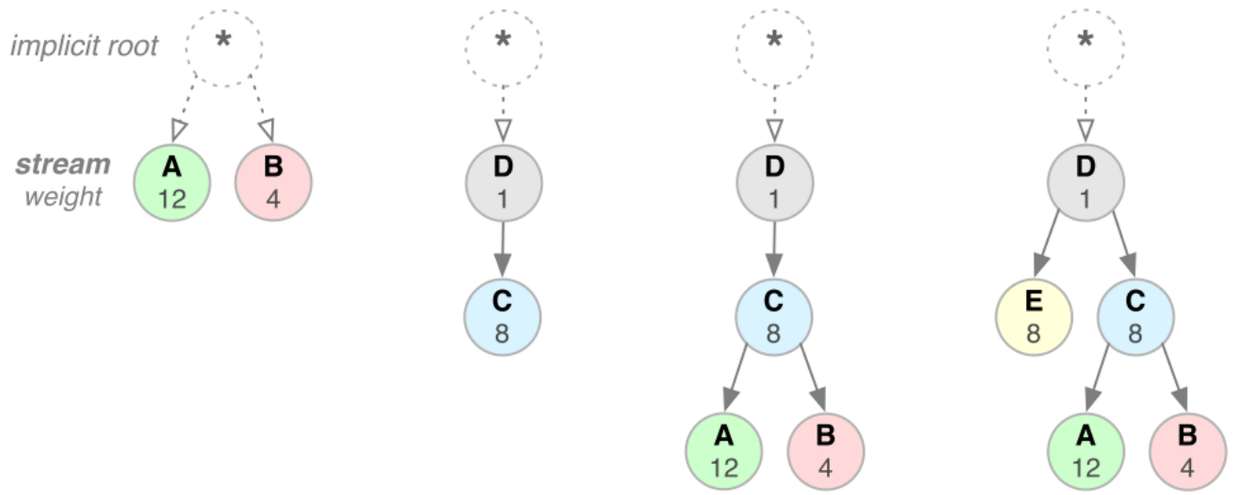
数据流、消息和帧


Connection
Stream 1
Request message
HEADERS frame (stream 1)
:method: GET
:path: /index.html
:version: HTTP/2.0
:scheme: https
user-agent: Chrome/26.0.1410.65
Response message
HEADERS frame (stream 1)
:status: 200
:version: HTTP/2.0
server: nginx/1.0.11
vary: Accept-Encoding
...
DATA frame (stream 1)
... response payload...
Stream N

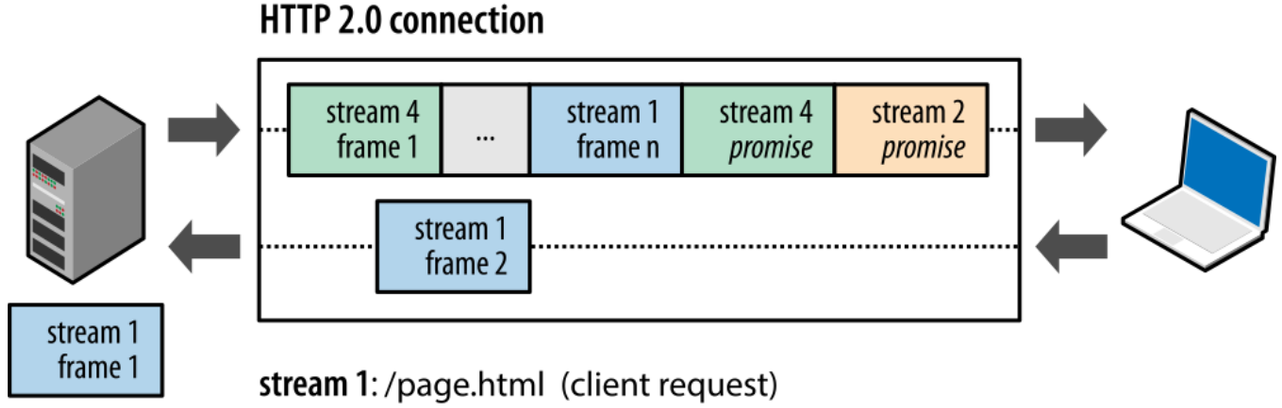
请求与响应复用


HTTP 2.0 connection
stream 1 DATA
stream 3 HEADERS
stream 3 DATA
stream 1 DATA
...
stream 5 DATA
Client
Server

数据流优先级

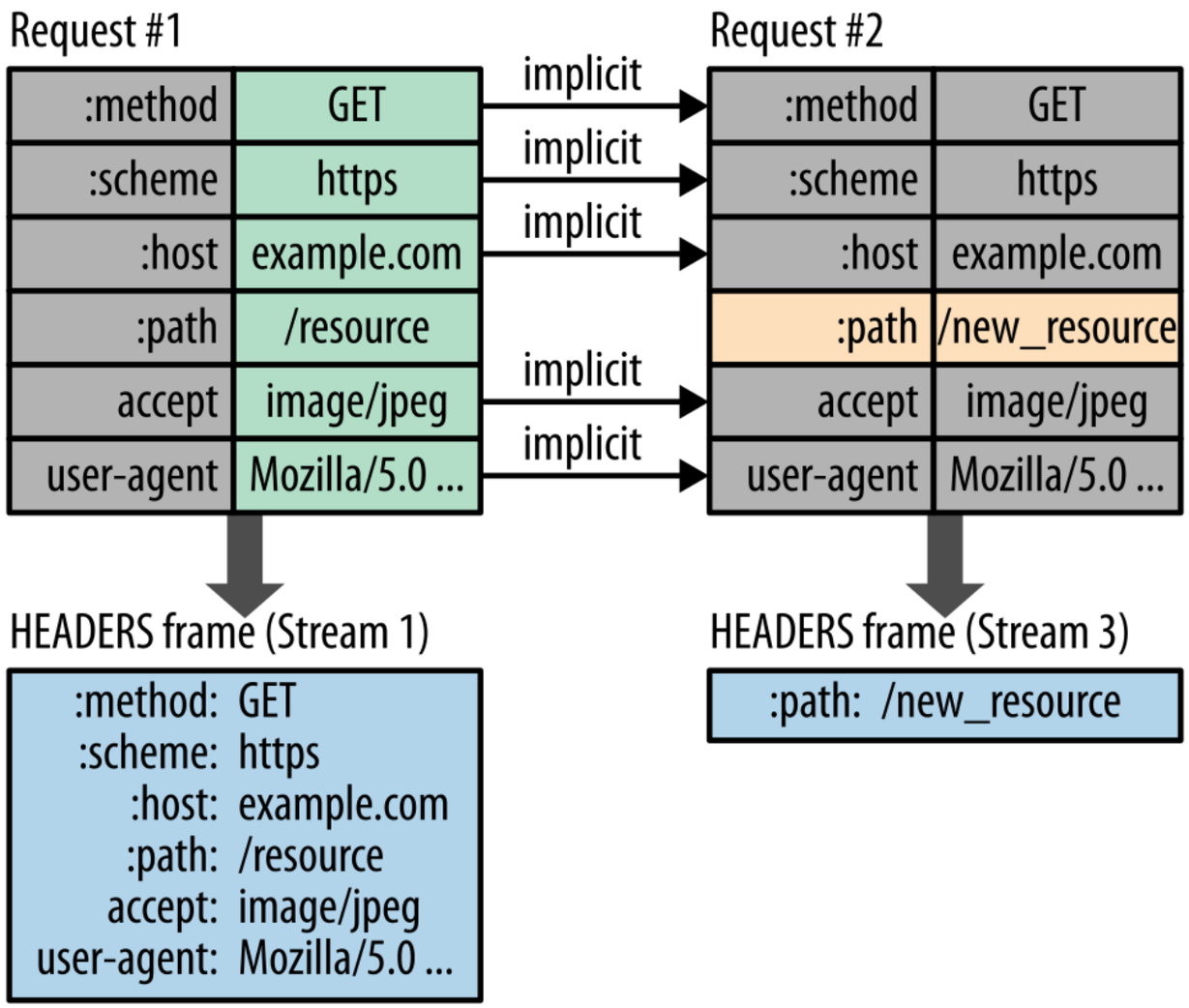

implicit root
stream
weight
A
12
B
4
D
1
C
8
D
1
C
8
A
12
B
4
D
1
E
8
C
8
A
12
B
4

服务器推送



stream 1: /page.html (client request)
stream 2: /script.js (push promise)
stream 4: /style.css (push promise)

标头压缩


Request #1
:method GET
:scheme https
:host example.com
:path /resource
accept image/jpeg
user-agent Mozilla/5.0 ...
implicit
implicit
implicit
implicit
implicit
Request #2
:method GET
:scheme https
:host example.com
:path /new_resource
accept image/jpeg
user-agent Mozilla/5.0 ...
HEADERS frame (Stream 1)
:method: GET
:scheme: https
:host: example.com
:path: /resource
accept: image/jpeg
user-agent: Mozilla/5.0 ...
HEADERS frame (Stream 3)
:path: /new_resource

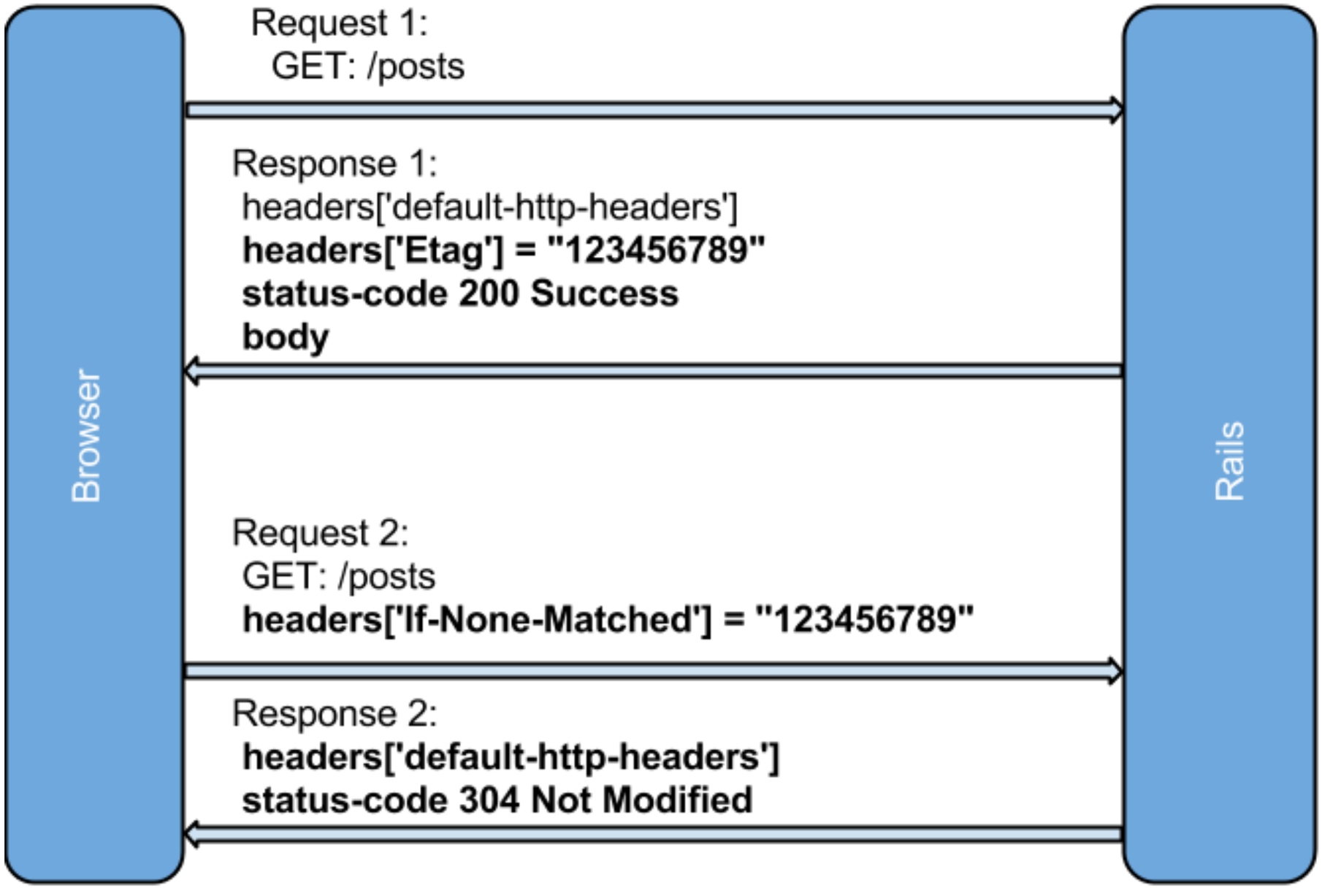
HTTP/2 下优化思路

- 不用合并文件
- 不用内联资源
- 不用域名分片

缓存

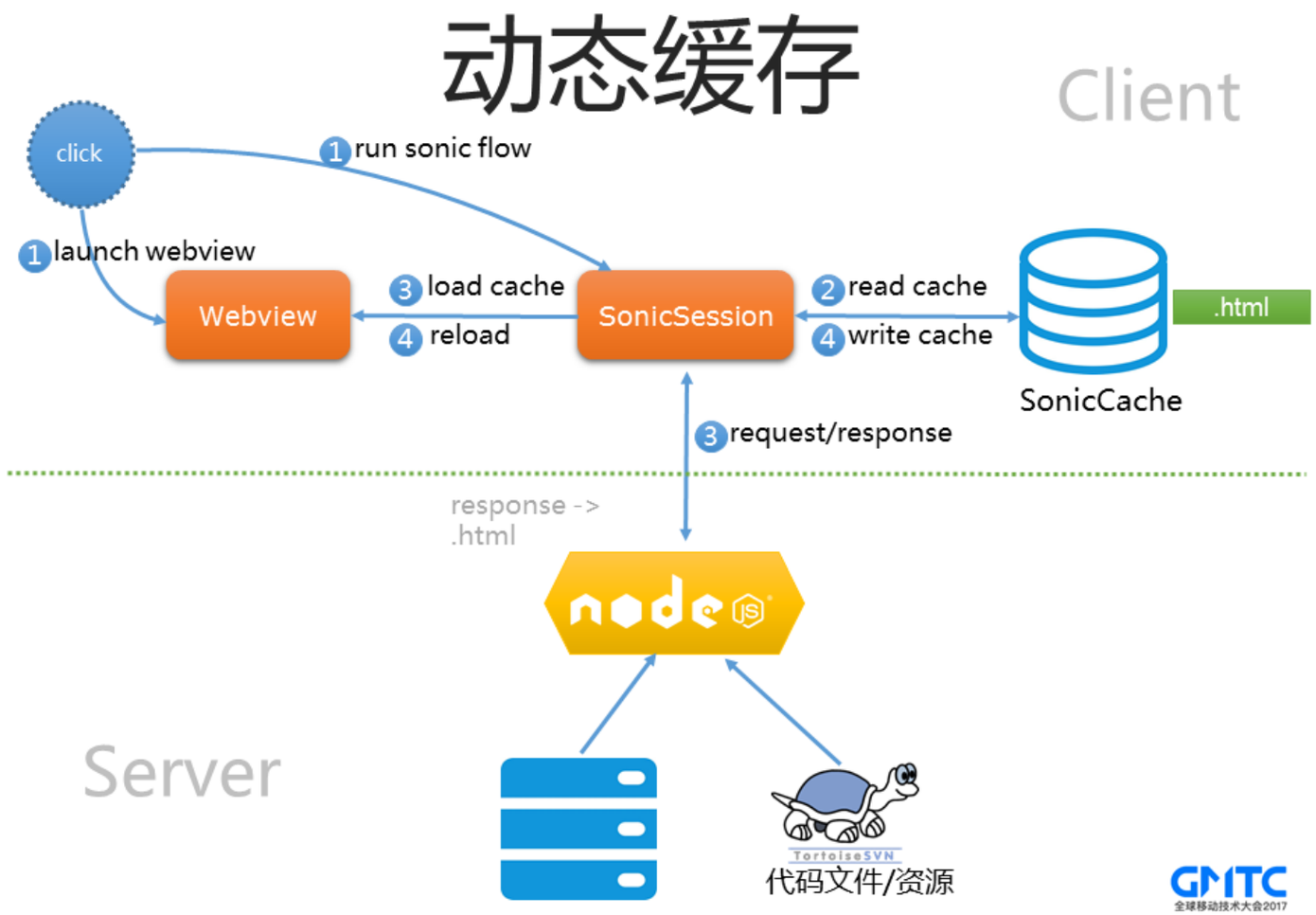
- Cache-Control: max-age=<seconds>, public

缓存

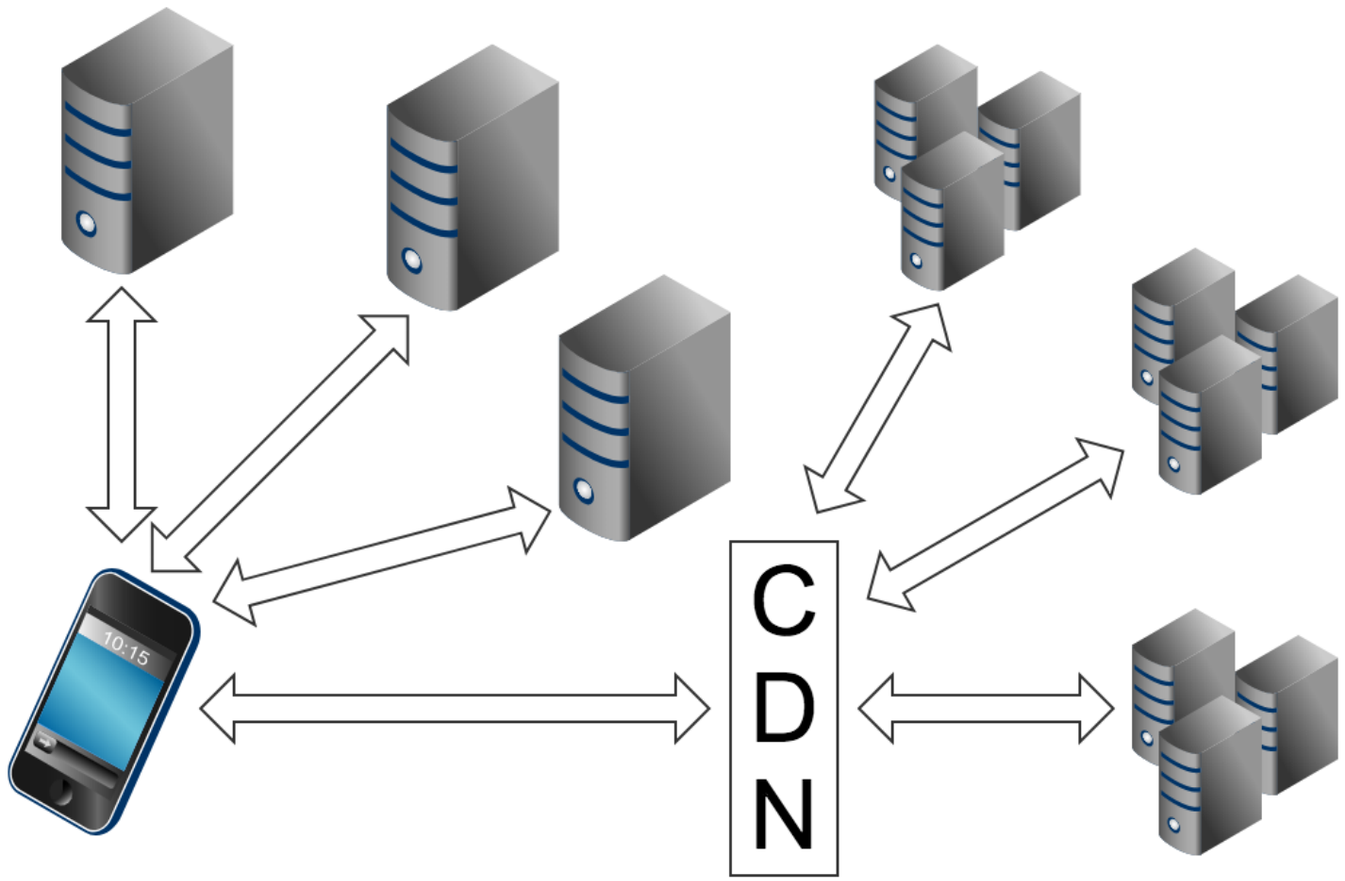

Request 1:
GET: /posts
Response 1:
headers['default-http-headers']
headers['Etag'] = "123456789"
status-code 200 Success
body
Request 2:
GET: /posts
headers['If-None-Matched'] = "123456789"
Response 2:
headers['default-http-headers']
status-code 304 Not Modified
Browser
Rails

Hybrid 优化

- VasSonic



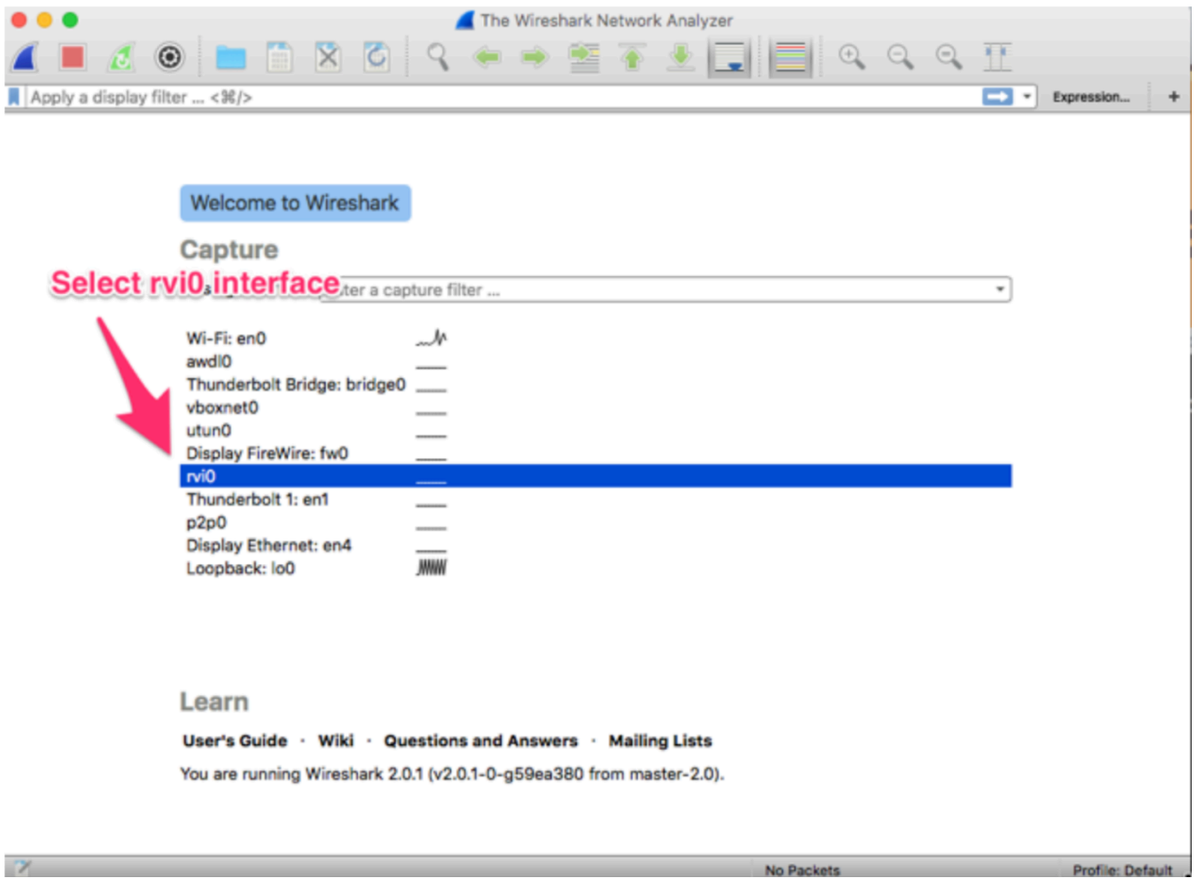
CF_NETWORK 诊断信息



https://developer.apple.com/library/content/qa/qa1887/_index.html

远程虚拟网络接口

- `rvictl -s <udid>`
- 设备必须通过 USB 连接



思考

- 使用系统框架（NSURLSession）
- 服务器端：使用了最新版本的 TLS 吗？缓存正确配置了吗？是否要使用 HTTP/2？
- 使用 CDN，做好性能监控
- 减少每个主机的请求数

总结

性能优化的思路：

1. 预取

2. 合并

3. 分优先级

谢谢