



HTTP/2

---

*frank*

# What is HTTP/2?

---

- ❑ Next generation HTTP
- ❑ Based on Google's SPDY Protocol
- ❑ Published as proposed standard on Feb. 17, 2015
- ❑ RFC 7540
- ❑ No change to HTTP semantics
  - only how it transfers on wire
- ❑ Binary instead of textual

# Why HTTP/2?

---

- ❑ Still manipulate HTTP
  - HTTP methods
  - Status codes
  - URIs
  - Header fields
- ❑ Reduce page load latency
  - Multiplexing **over single TCP connection**
  - Header compression
  - Server push
- ❑ Less web optimization needed
  - No image spriting/CSS,JS bundling needed
  - No inline resources
  - No domain sharding

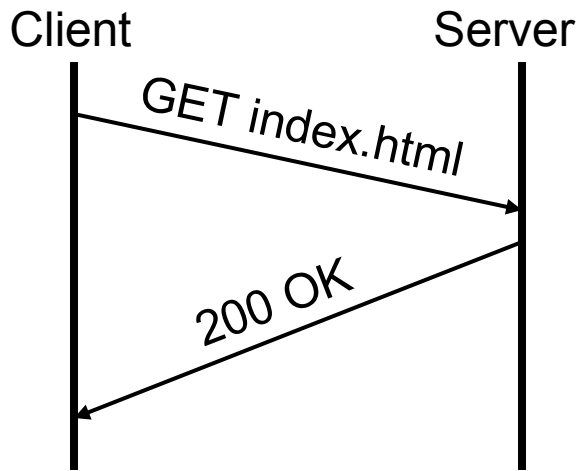
# Multiplexing

---

- ❑ HTTP/1.0
  - One request per TCP connection
  - F\*cking slow
- ❑ HTTP/1.0 w/ Keep-Alive
  - Avoid frequent connection setup
  - Allowing only one outstanding request at a time
    - Still blocks
- ❑ HTTP/1.1 w/ pipelining
  - Allow multiple ordered request
  - HOL Blocking
- ❑ Browsers support multiple connections
  - TCP needs warm up
  - Multiple connections waste memory of routers

# Multiplexing

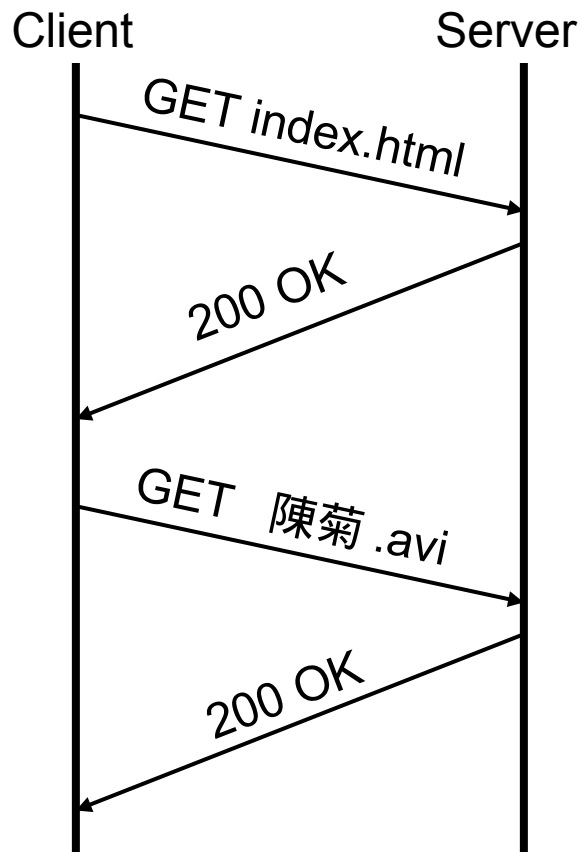
## □ HTTP/1.0



One request per TCP connection

# Multiplexing

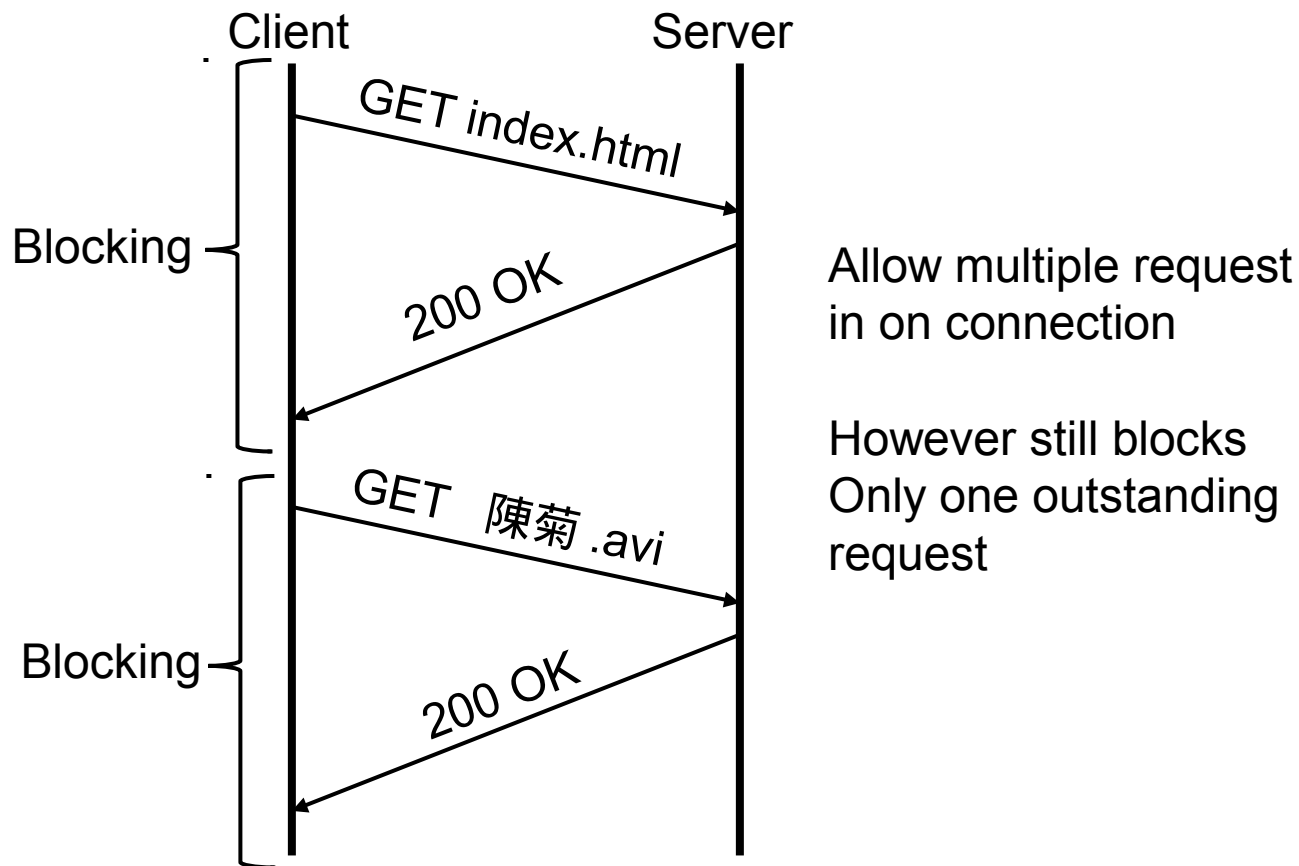
## □ HTTP/1.0 with Keep-Alive



Allow multiple requests  
in one connection

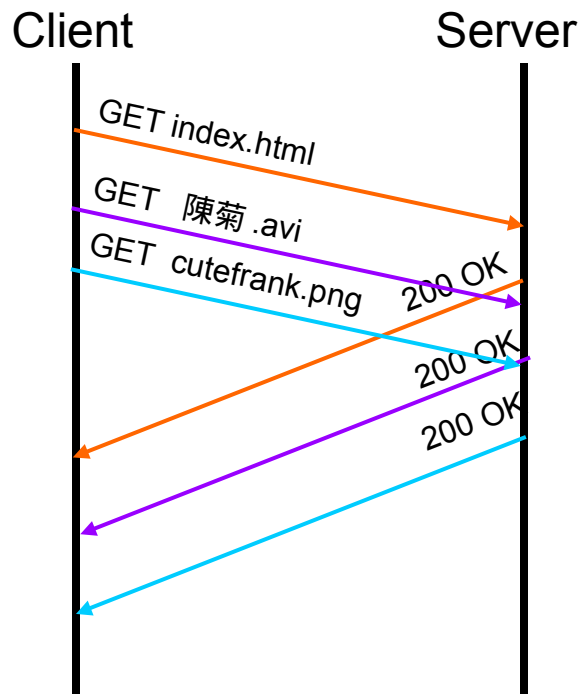
# Multiplexing

## □ HTTP/1.0 with Keep-alive



# Multiplexing

- HTTP/1.1 with pipelining

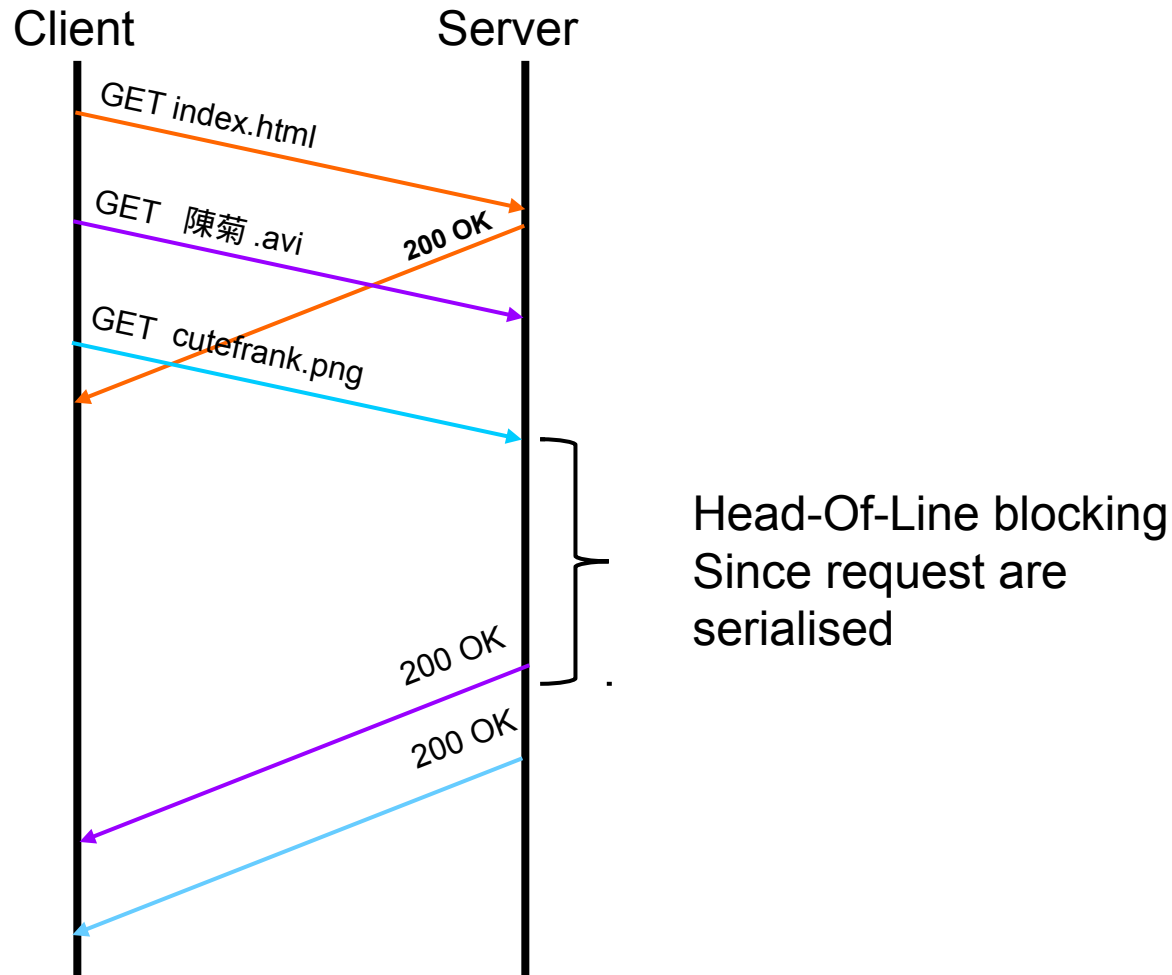


Multiple ordered request



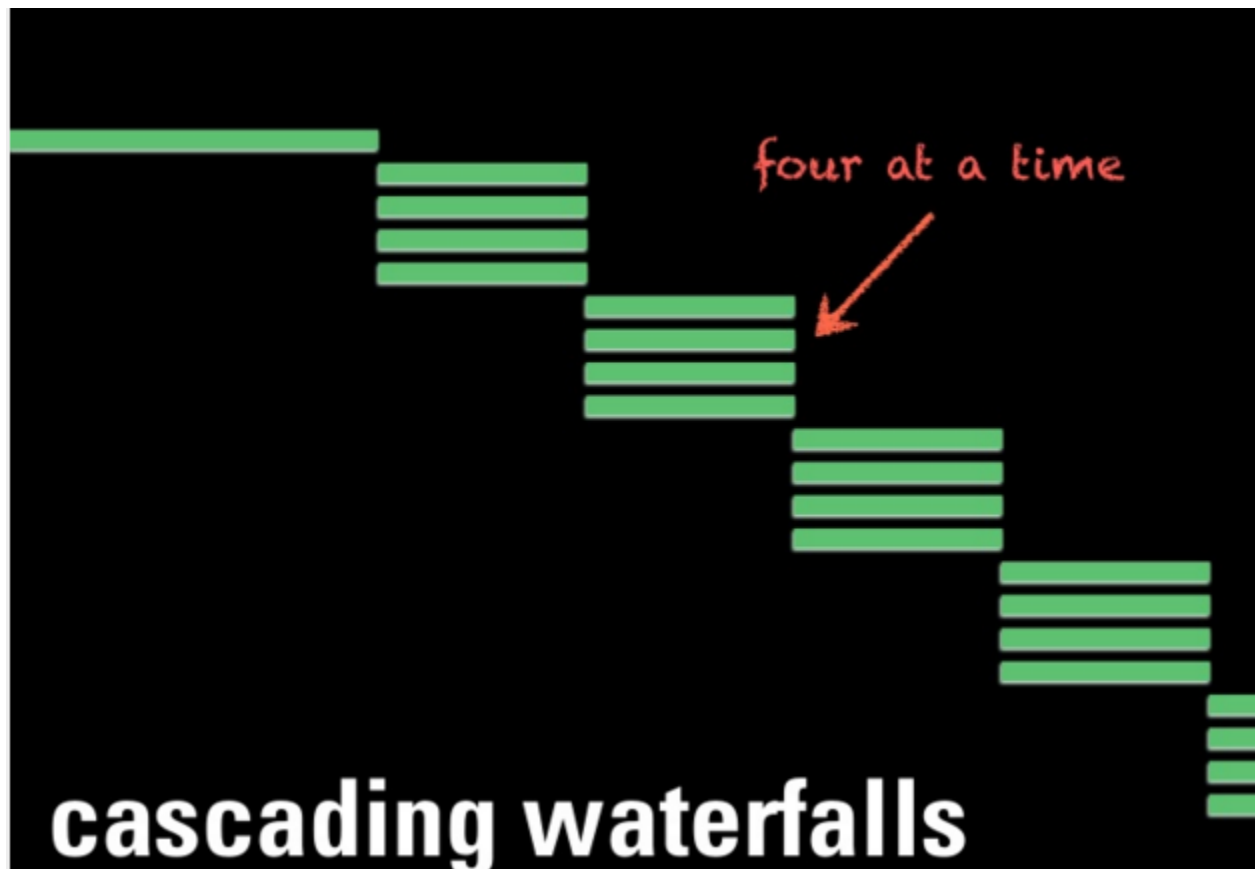
# Multiplexing

## □ HTTP/1.1 with pipelining



# Multiplexing

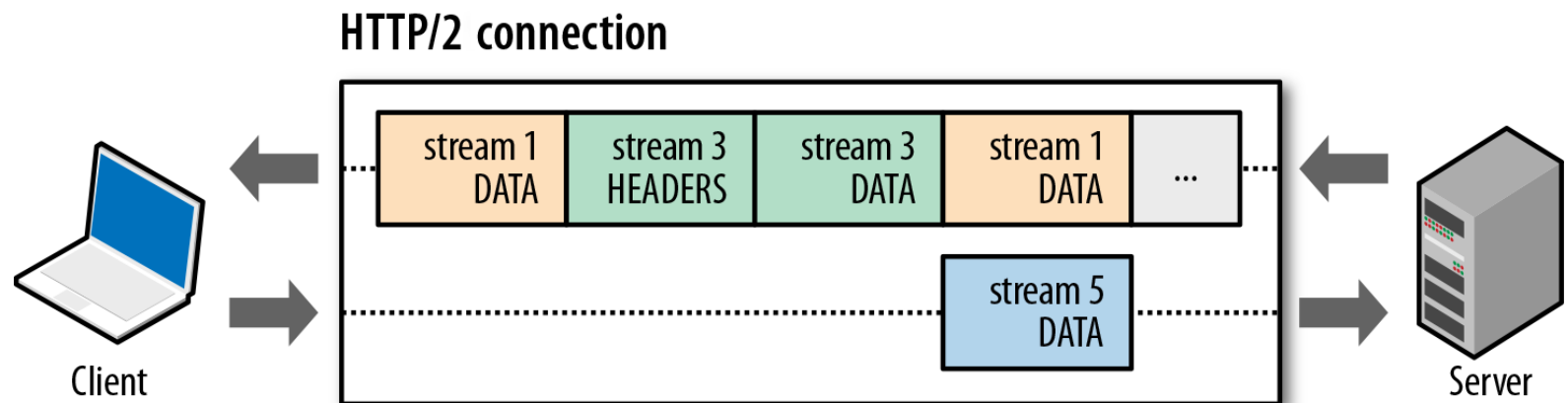
- ❑ Browsers support parallel http requests



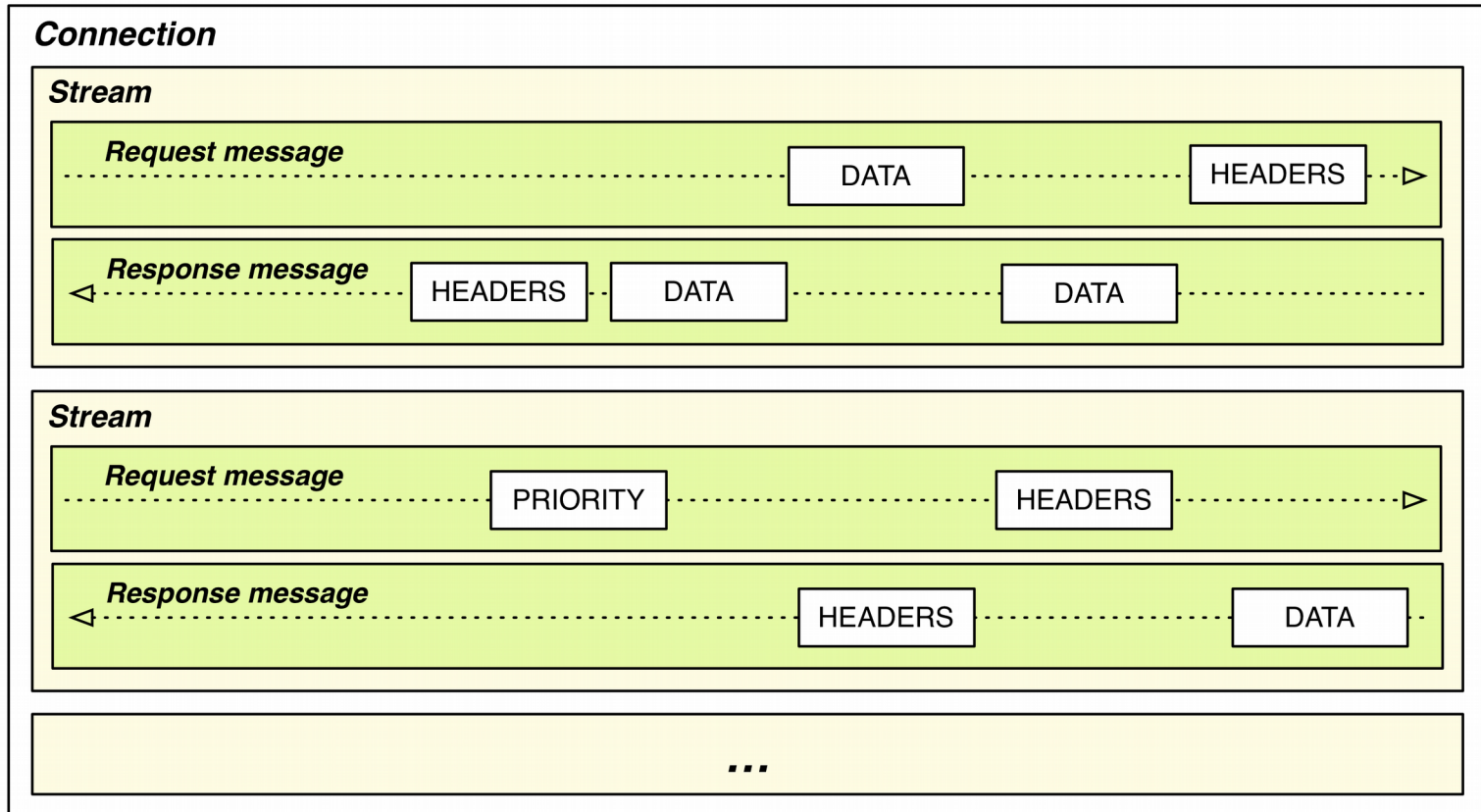
# Multiplexing

## □ HTTP/2 is stream-based.

- Multiple concurrently open streams on one single connection
- Either endpoint interleaving frames from multiple streams
- Prioritized stream
  - Important resources are responded first

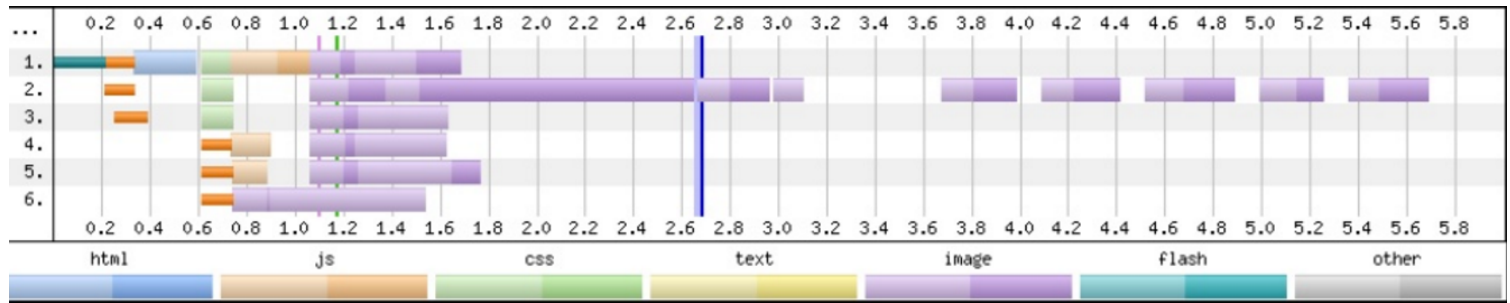


# Multiplexing

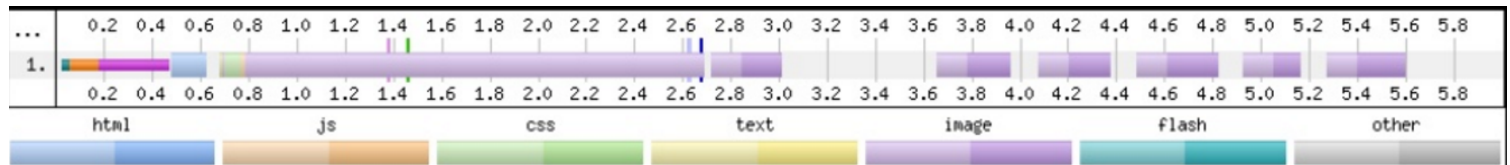


# Multiplexing

## □ HTTP/1.1

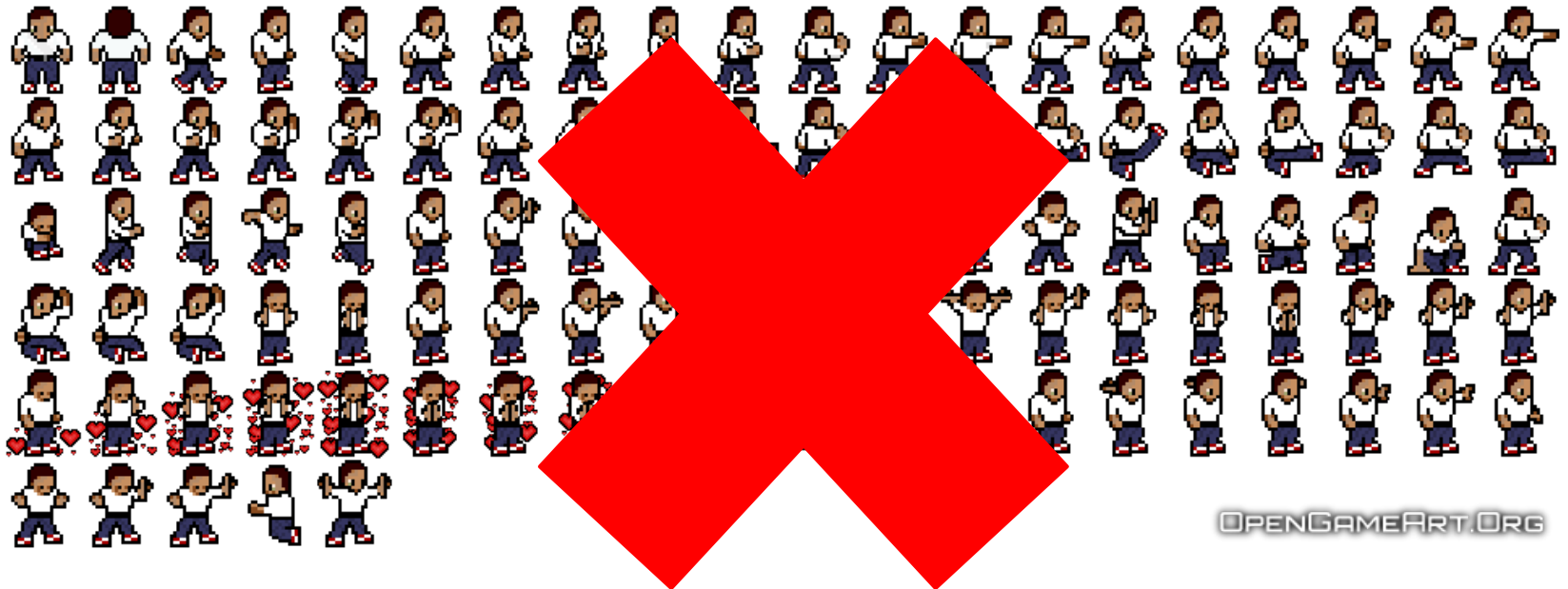


## □ HTTP/2



# Common HTTP/1.x Optimization

- Image spriting
- Small Resource Inlining
- JS/CSS Bundling
  - Not needed anymore



OPENGAMEART.ORG

# Common HTTP/1.x Optimization

---

## ❑ Domain sharding

- Multiplexing makes multiple connections unnecessary
- We get TCP connection “warm” as quickly as possible, and keep it there

# Header compression

---

```
GET / HTTP/1.1
Host: www.etsy.com
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_8_2) AppleWebKit/536.26.14
(KHTML, like Gecko) Version/6.0.1 Safari/536.26.14
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
DNT: 1
Accept-Language: en-us
Accept-Encoding: gzip, deflate
Cookie: uaid=uaid%3DVdhk5W6sexG-_Y7ZBeQFa3cq7yMQ%26_now%3D1325204464%26_sl
%3Ds_LCLVpU%26_kid%3D1%26_ver%3D1%26_mac
%3DlVnlM3hMdb3Cs3hqMVuk_dQEixsqQzU\NYCs9H_Kj8c.;
user_prefs=1&2596706699&q0tPzMlJLaoEAA==
Connection: keep-alive
```



# Header compression

```
GET /assets/dist/js/etsy.recent-searches.20121001205006.js HTTP/1.1
Host: www.etsy.com
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_8_2) AppleWebKit/536.26.14
(KHTML, like Gecko) Version/6.0.1 Safari/536.26.14
Accept: */*
DNT: 1
Referer: http://www.etsy.com/
Accept-Language: en-us
Accept-Encoding: gzip, deflate
Cookie: autosuggest_split=1;
etala=111461200.1476767743.1349274889.1349274889.1349274889.1.0;
etalb=111461200.1.10.1349274889; last_browse_page=%2F; uaid=uaid%3DVdhk5W6sexG-
_Y7ZBeQFa3cq7yMQ%26_now%3D1325204464%26_slt%3Ds_LCLVpU%26_kid%3D1%26_ver%3D1%26_mac
%3DlVnLM3hMdb3Cs3hqMVuk_dQEixsqzULNYCs9H_Kj8c.;
user_prefs=1&2596706699&q0tPzMlJLaoEAA==
Connection: keep-alive
```

# Header compression

---

```
GET /assets/dist/js/jquery.appear.20121001205006.js HTTP/1.1
Host: www.etsy.com
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_8_2) AppleWebKit/536.26.14
(KHTML, like Gecko) Version/6.0.1 Safari/536.26.14
Accept: */*
DNT: 1
Referer: http://www.etsy.com/
Accept-Language: en-us
Accept-Encoding: gzip, deflate
Cookie: autosuggest_split=1;
etala=111461200.1476767743.1349274889.1349274889.1349274889.1.0;
etalb=111461200.1.10.1349274889; last_browse_page=%2F; uaid=uaid%3DVdhk5W6sexG-
_Y7ZBeQFa3cq7yMQ%26_now%3D1325204464%26_sl%3Ds_LCLVpU%26_kid%3D1%26_ver%3D1%26_mac
%3DlVnlM3hMdb3Cs3hqMVuk_dQEixsqQzULNYCs9H_Kj8c.;
user_prefs=1&2596706699&q0tPzMlJLaoEAA==
Connection: keep-alive
```

# Header compression

---

```
GET /assets/dist/js/bootstrap/username-suggester.20121001205006.js HTTP/1.1
Host: www.etsy.com
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_8_2) AppleWebKit/536.26.14
(KHTML, like Gecko) Version/6.0.1 Safari/536.26.14
Accept: */*
DNT: 1
Referer: http://www.etsy.com/
Accept-Language: en-us
Accept-Encoding: gzip, deflate
Cookie: autosuggest_split=1;
etala=111461200.1476767743.1349274889.1349274889.1349274889.1.0;
etalb=111461200.1.10.1349274889; last_browse_page=%2F; uaid=uaid%3DVdhk5W6sexG-
_Y7ZBeQFa3cq7yMQ%26_now%3D1325204464%26_slt%3Ds_LCLVpU%26_kid%3D1%26_ver%3D1%26_mac
%3DlVnlM3hMdb3Cs3hqMVuk_dQEixsqQzUlNYCs9H_Kj8c.;
user_prefs=1&2596706699&q0tPzMLJLaoEAA==
Connection: keep-alive
```

# Header compression

---

- ❑ Headers are sent in every request
- ❑ Too many redundant bytes in HTTP header
  - Request URI
  - User-Agent
  - **Cookies**
  - **Referer**

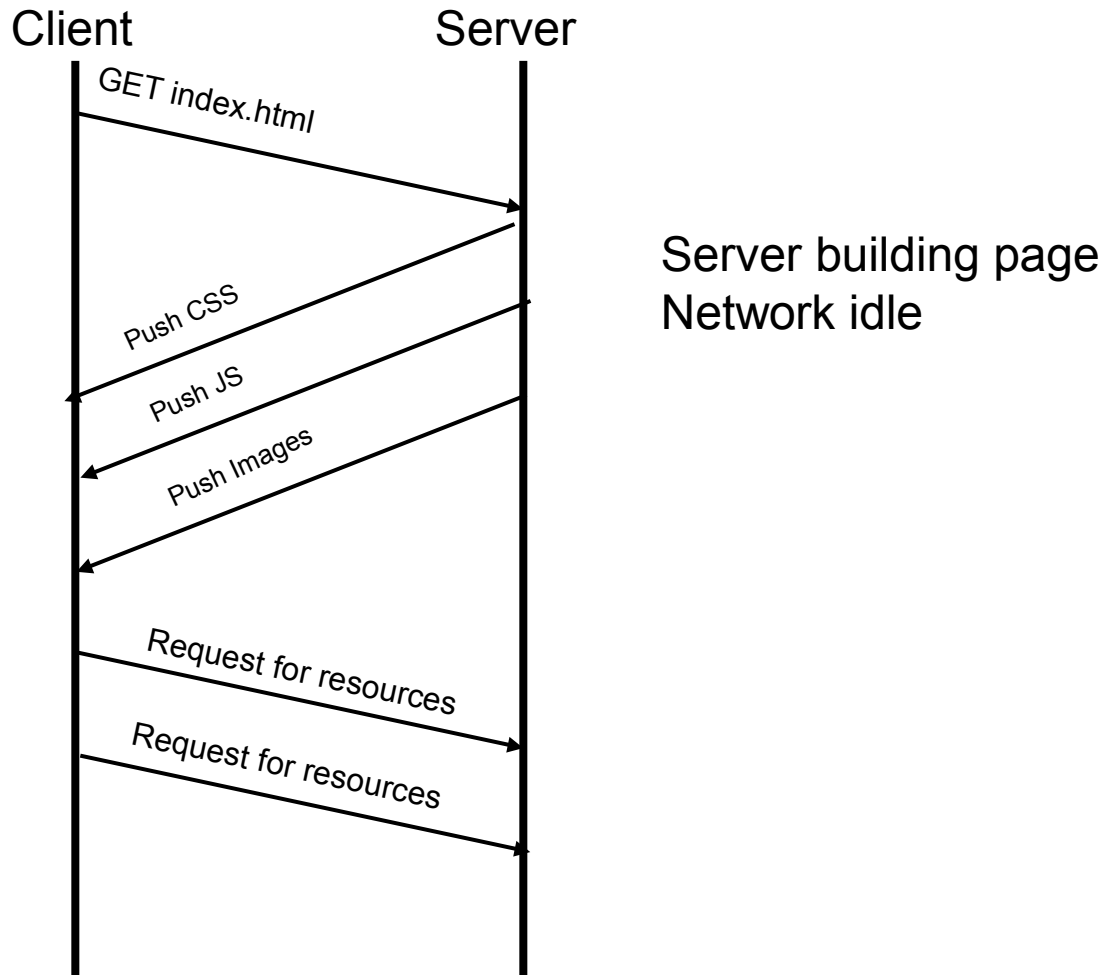
# Server Push

---

- ❑ Server push
  - Push resources to client's cache upon request
  - No further requests for resources needed

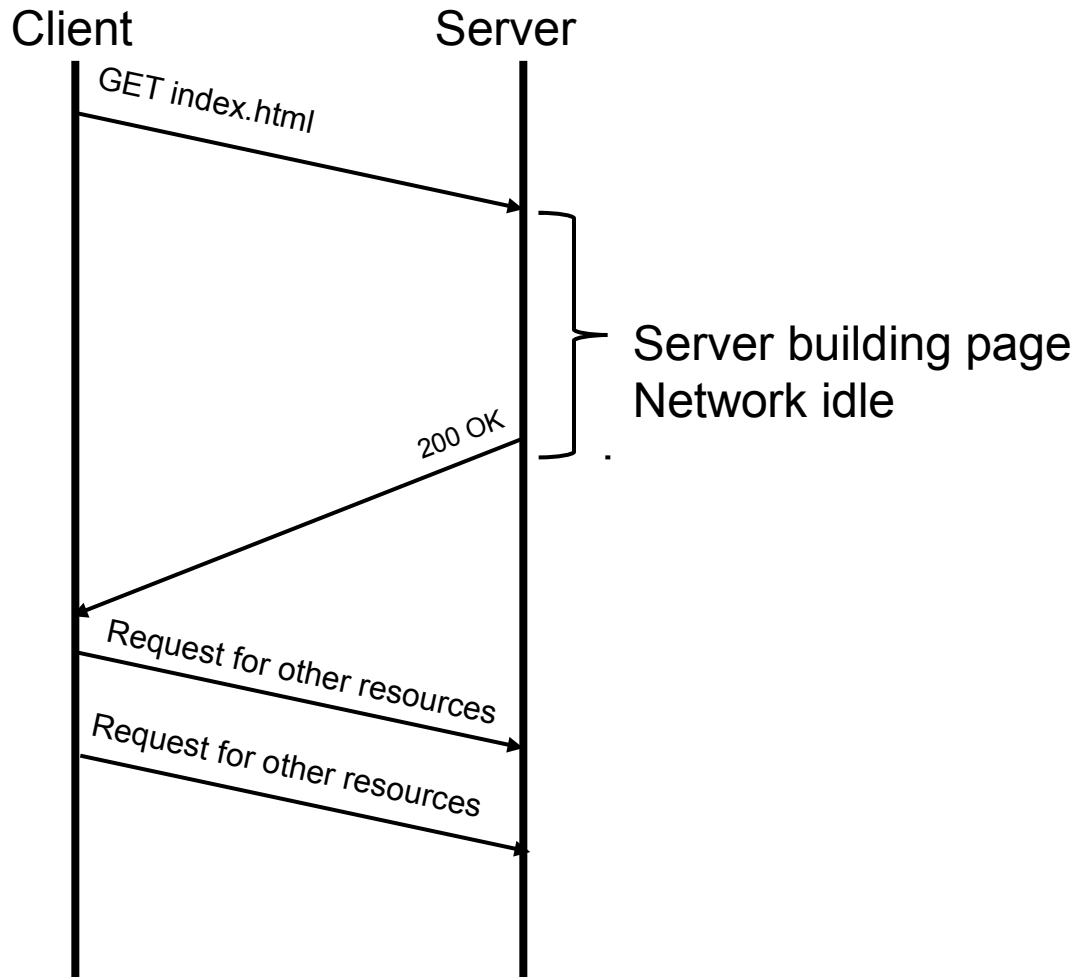
# Server Push

## ❑ Without server push



# Server Push

## ❑ With server push



# Browser Support

## HTTP/2 protocol OTHER

Networking protocol for low-latency transport of content over the web. Originally started out from the SPDY protocol, now standardized as HTTP version 2.

Taiwan 69.97% + 8.14% = 78.11%  
 Global 61.7% + 6.19% = 67.89%

Current aligned Usage relative Show all

IE	Edge *	Firefox	Chrome	Safari	Opera	iOS Safari *	Opera Mini *	Android Browser *	Chrome for Android
								4.1	
8								4.3	
9			44			7.1		4.4	
10	12	41	45			8.4		4.4.4	
11	13	42	46	9	33	9.1	8	44	46
	14	43	47		34				
		44	48		35				
		45	49						



# Deployment

---

- ❑ Nginx (starting from 1.9.5 release, 2015/9/22)

```
server {  
    listen 443 ssl http2;  
  
    ssl_certificate server.crt;  
    ssl_certificate_key server.key;  
    ...  
}
```

- ❑ Apache2 (starting from 2.4.17 release, 2015,10,13)

At the present you need to build apache24 from port with **HTTP2=ON**.

In **httpd.conf**:

```
LoadModule http2_module libexec/apache24/mod_http2.so  
  
# for a https server  
Protocols h2 http/1.1  
# for a http server  
Protocols h2c http/1.1
```