Web 2.0 On Speed

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A More Demanding Web.

- Mining the long tail = **global audience**
- Handling flash crowds = **flexible scaling**
- Serving AJAX = **more requests**
- User content = **more interactive**
- Context-sensitive = **more dynamic**
- Software as a Service = **high reliability**

What's a server to do?

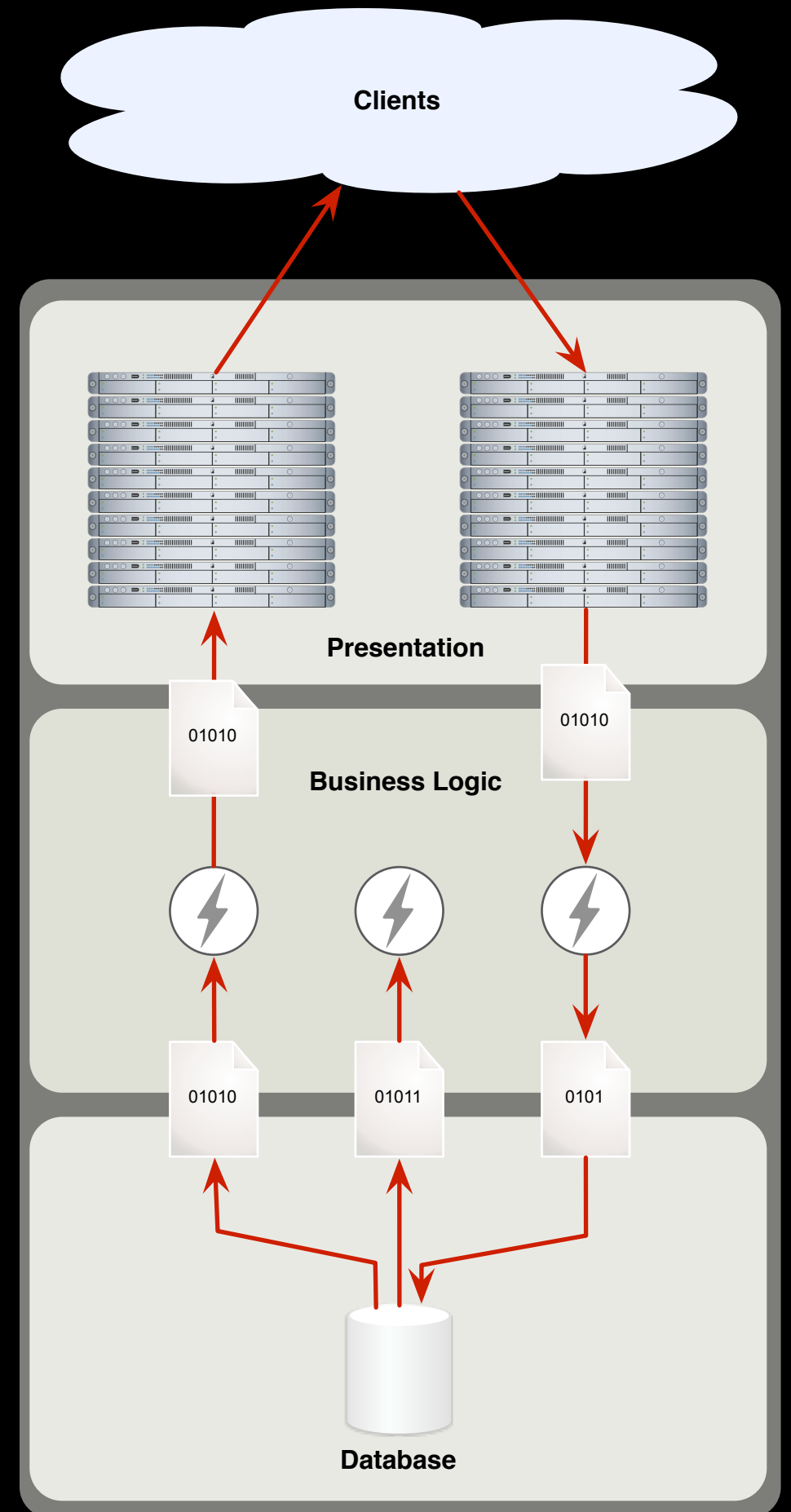# The "Modern" Web App

Three-tier / MVC

Layered frameworks for templating, personalisation, authentication, caching...

Database for shared state

LAMP, MARS, PAID, whatever

Almost *everything is custom code* and takes place *on the server*

Servers... Lots of Servers

Clients

Presentation

Business Logic

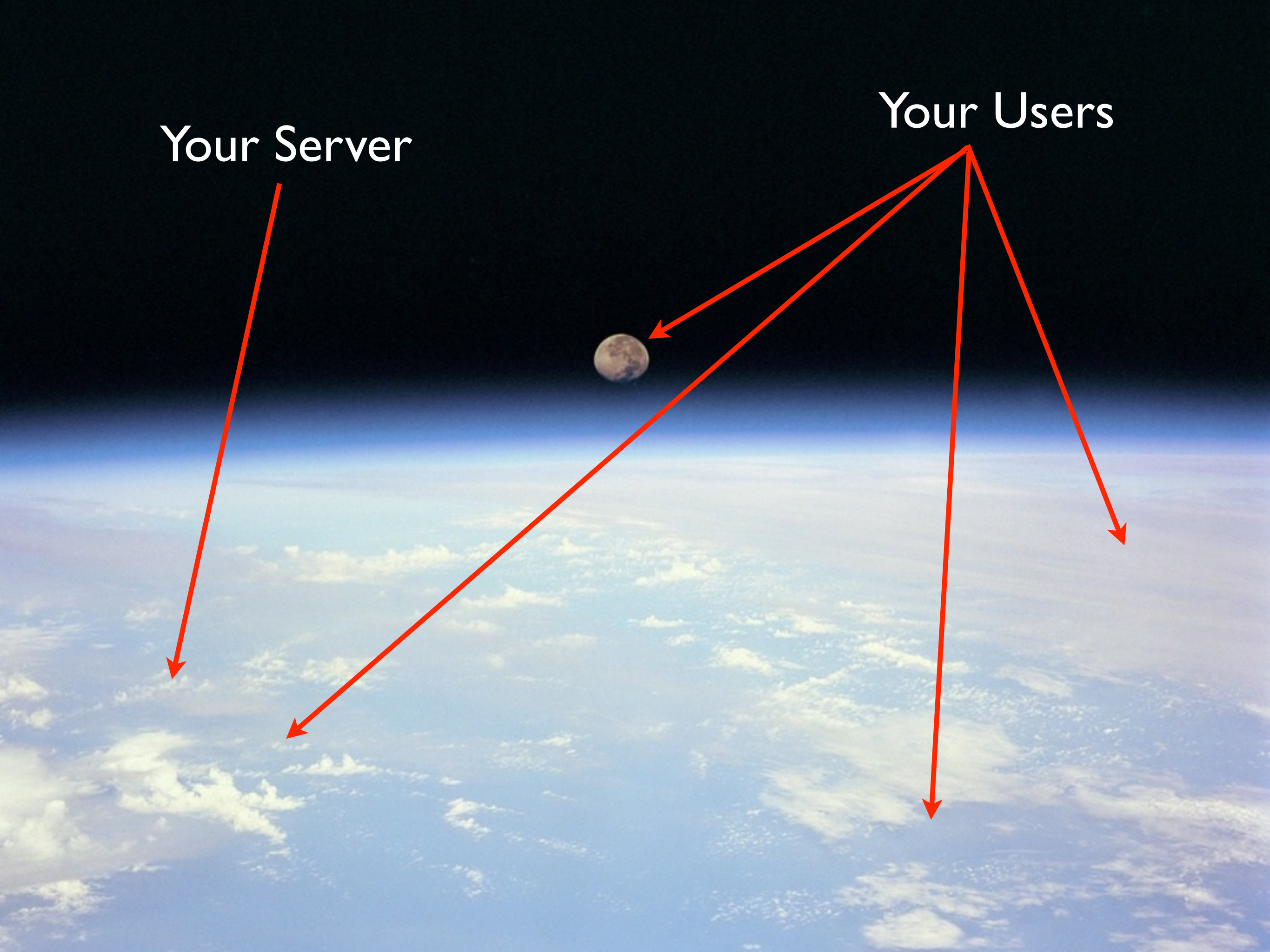01010 01010

01010 01011 0101

Database

Throwing Servers at it Only Helps:

- Your hardware vendor

- Your hosting provider

- Your ISP

- Your power company

- Crackers

- Your sysadmin's job security

Is LAMP Helping?

P is slow!
Typical Perl/Python/PHP does 50-250 requests a second
(often because of too much **M**)

M is complex and centralised

A doesn't help.
Maxes out at 2-3,000 requests a second

(**L**? That's OK.)

Developer productivity vs. scalability, reliability...

Some Observations

1. Static Web content can be served a lot faster than "dynamic" content.

2. It's easier and cheaper to deploy, secure and administer a commodity, non-application-specific box than custom code.

3. There are always more clients than servers, and they're usually idle.

Think Outside of the Box

Combination/co-ordination of:

1. Highly scalable Web servers

2. Existing caching infrastructure

3. AJAX magic on the client

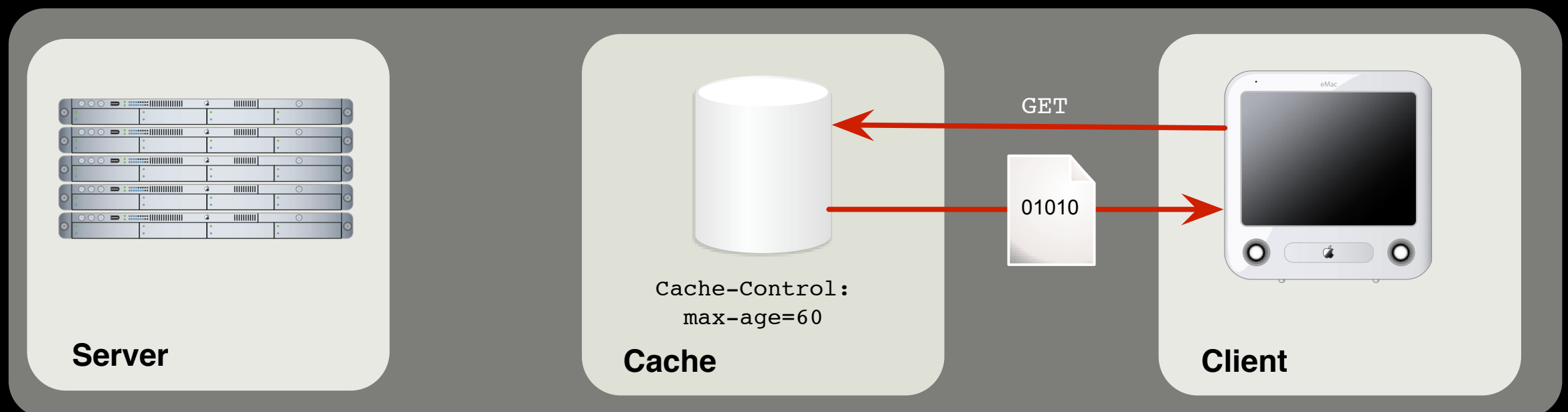Processing offline, in-browser = no server bottleneck!

Labels in diagram: Clients, Network, Caches, Business Logic, Web Server, 01010, 01011, 0101
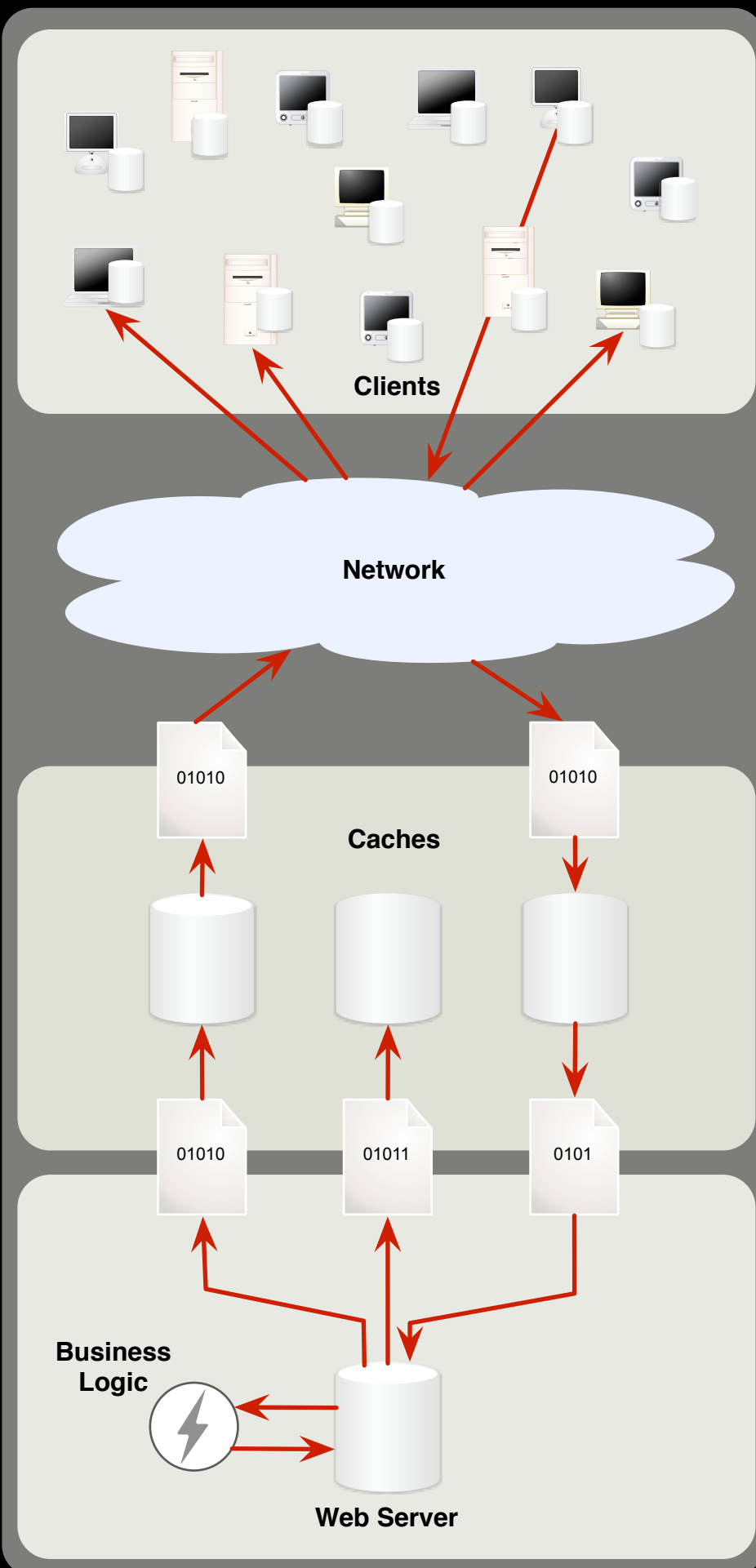
C10k? Try C100k.

- Apache is slow (on purpose).

- Serious Web servers use *event loops*
  http://www.kegel.com/c10k.html
  http://lighttpd.net/

- Properly used, holds 100,000+ persistent connections with no performance penalty

- 30,000+ requests/second attainable

- That's 1,000x some LAMP applications.

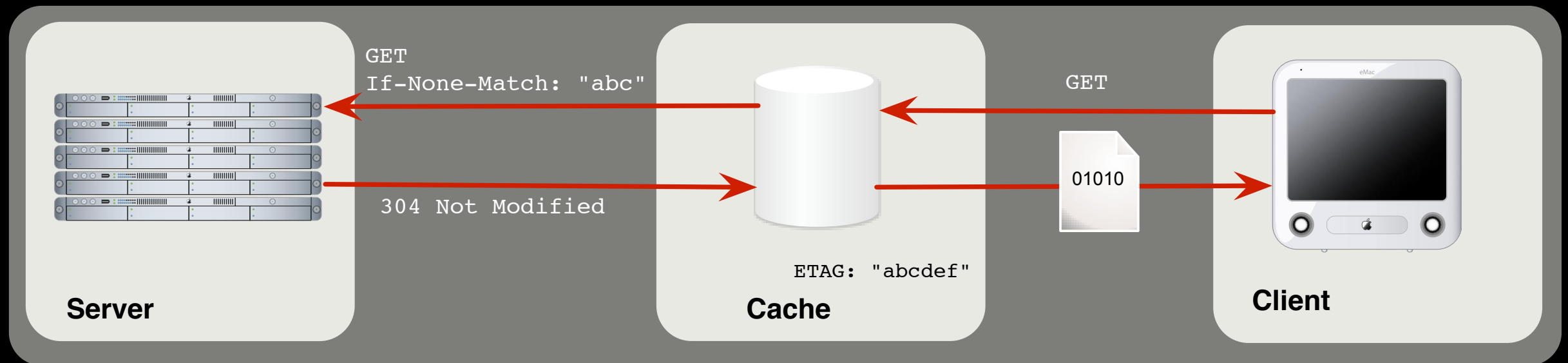- Put another way: *one server or 1,000?*

Leveraging the Caching Infrastructure

Freshness

- Most powerful technique: free!

- Expires or Cache-Control: max-age

- *Understand that caches don't have to store what you allow them to*

- http://www.mnot.net/cache_docs/

Server

GET

01010

Cache-Control:
max-age=60

Cache

eMac

Client

Validation

GET
If-None-Match: "abc"

304 Not Modified
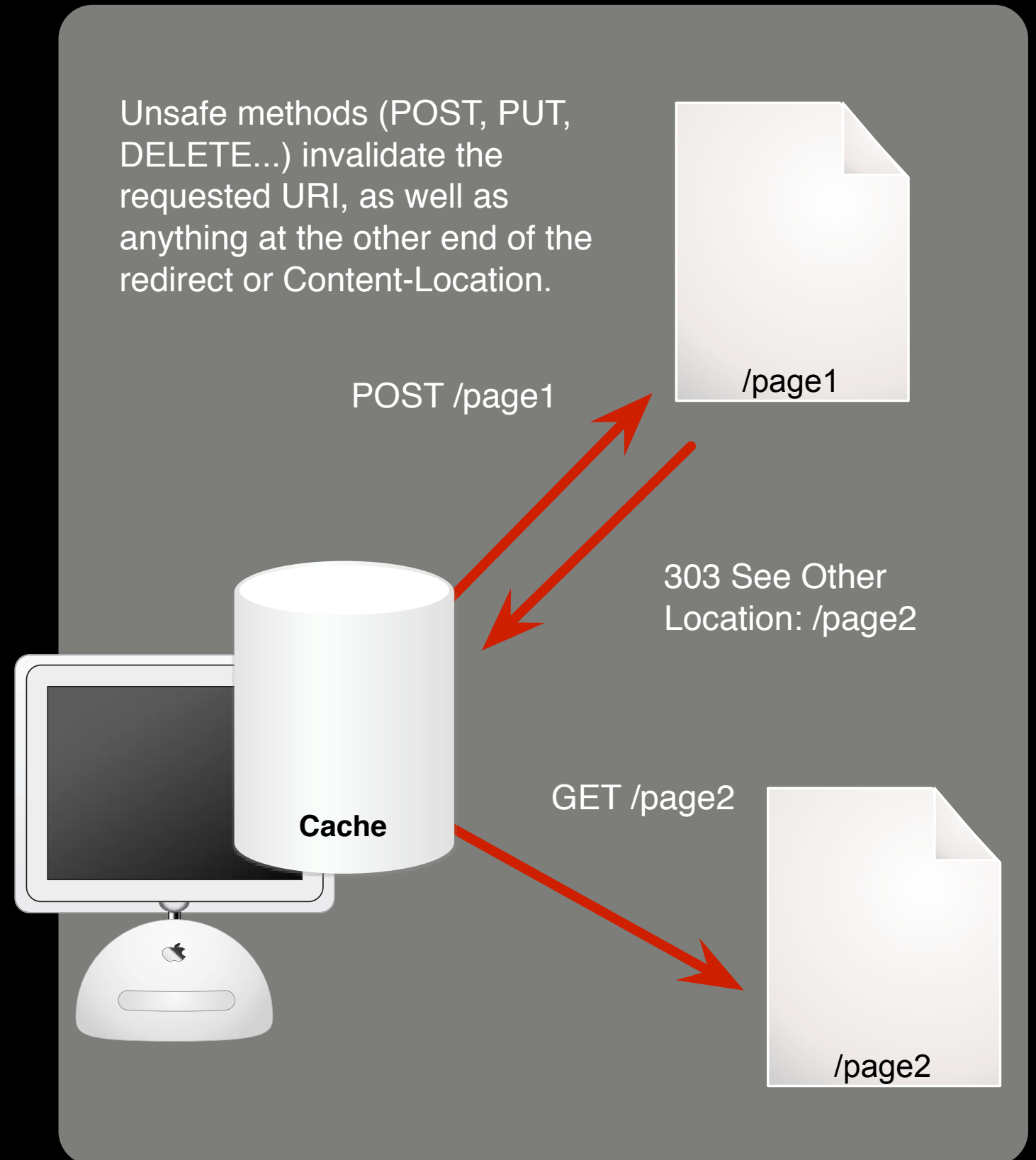
ETAG: "abcdef"

GET

01010

Server

Cache

Client

- Last-Modified / If-Modified-Since

- ETag / If-None-Match

- Saves transmission cost of bytes on the wire

- Still requires a round-trip, though

Invalidation by Side Effect

- Localised cache invalidation; doesn't propogate to off-path caches

- That's OK, especially for private or "sloppy" cases

- Allows caching of user-manipulated content

Unsafe methods (POST, PUT, DELETE...) invalidate the requested URI, as well as anything at the other end of the redirect or Content-Location.

/page1

POST /page1

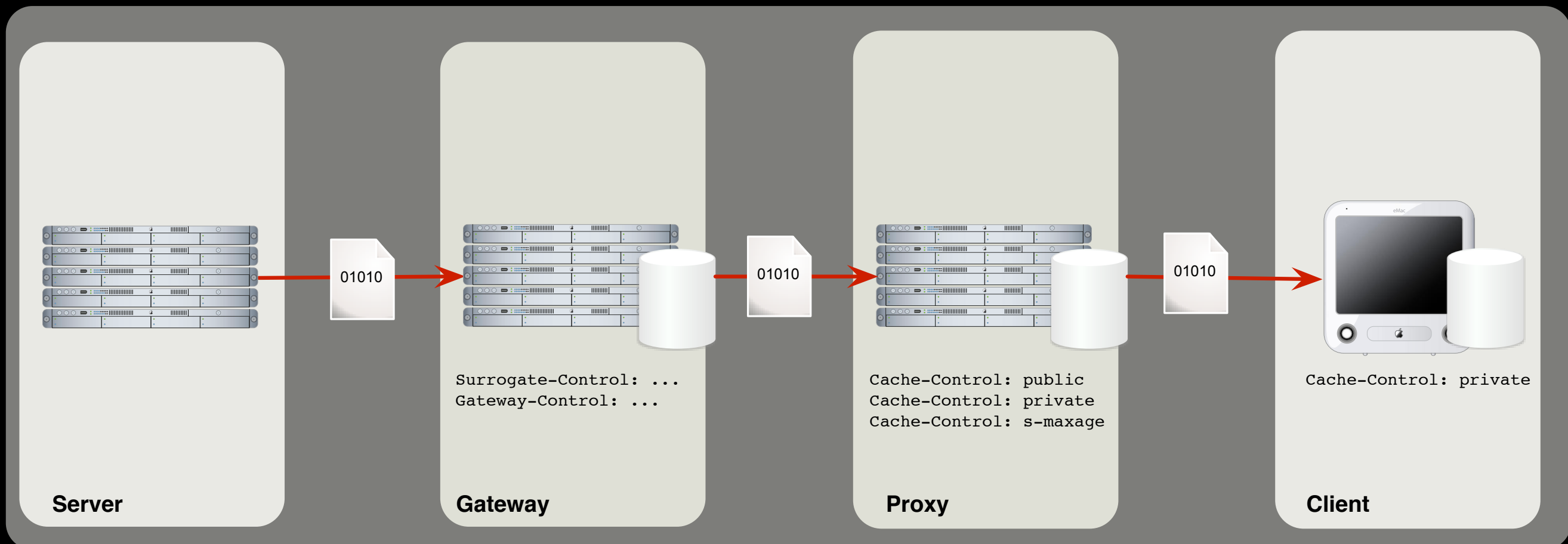303 See Other Location: /page2

Cache

GET /page2

/page2

A Fly in the Ointment

- Invalidation not supported by most browsers

- Work-around: invalidate.js

- rewrites URIs based on HTTP methods, stores state in cookies

- UGLY!

- Browser vendors, **please fix this**.

Cache Targeting

- Combinations of headers allow you to control different parts of the caching hierarchy

- Avoid ISP, Enterprise caches if you don't trust them.


```
01010
```

```
Surrogate-Control: ...
Gateway-Control: ...
```

```
01010
```

```
Cache-Control: public
Cache-Control: private
Cache-Control: s-maxage
```

```
01010
```

```
Cache-Control: private
```

Server

Gateway

Proxy

Client

Browser (Mis-)Behaviour

- Basic validation, freshness supported well

- All know they're private

- Side effect invalidation not well-supported

- Conneg broken on some

- http://mnot.net/javascript/xhr/cache.html

- http://mnot.net/blog/2006/05/11/browser_caching
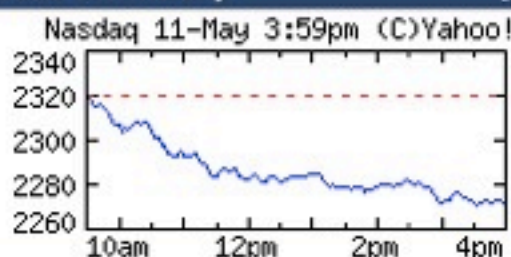
Forwards-Compatible AJAX

- Not targeted at programmers

- Reduce/eliminate application-specific logic on the server *and* client

- Implemented in JavaScript now

- Able to be directly implemented in browsers

- Deliverables:
  dynamic content and *personalisation*

Dynamic Content Can Be Cached

Thursday, May 11, 2006, 4:05PM ET - **U.S. Markets Closed.**

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Market Summary [Edit]

Nasdaq 11-May 3:59pm (C)Yahoo!

SYMBOL	LAST	CHANGE
Dow	11,500.73	↓ 141.92 (1.22%)
Nasdaq	2,272.70	↓ 48.05 (2.07%)
S&P 500	1,305.92	↓ 16.93 (1.28%)
BEA	12.30	↓ 0.35 (2.77%)
Microsoft	23.23	↓ 0.54 (2.27%)
Apple	68.25	↓ 2.35 (3.33%)
Yahoo!	31.0209	↓ 1.0691 (3.33%)
Google	387.94	↓ 15.04 (3.73%)
AU Dollar	0.7769	0.0000 (0.00%)

Indices: US - World | Most Actives

Brokers: Schwab Active Trader - Scottrade - TD AMERITRADE - E*TRADE

Currency Rates

$1 IS WORTH...

USD to ¥	110.54 ¥	0.0%
USD to Euro	0.7786 €	0.0%

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▪ Gold Prices Soar to New 26-Year High AP
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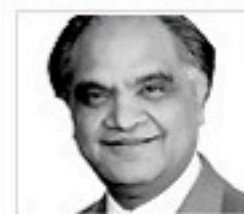
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LOAN TYPE	RATE	APR
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15-yr Fixed	5.85%	6.13%
5/1 ARM	5.83%	7.03%

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SYMBOL NAME	LAST	CHANGE

HTML Includes

- Allows **composition** of page fragments with different cacheability; portal-on-the-browser

- Early prototype: Edge Side Includes (ESI) *http://www.esi.org/*

- Doing it in-browser is better *http://tinyuri.com/a34v*

- AJAX/XHR gives us this capability now

- Goal: **handled by browsers directly**

HInclude Example

```
<html
 xmlns:hx="http://purl.org/NET/html_extensions">
  <head>
    <script type="text/javascript"
     src="hinclude.js"></script>
  </head>
  <body>
    <h1>Include Test</h1>
    <hx:include src="test.html"></hx:include>
  </body>
</html>
```

hinclude.js

- Can control rendering mode

- Can specify default/fallback content

- Advanced error handling w/ CSS

- data: URIs

- http://www.mnot.net/javascript/hinclude.html

- Used on every page at mnot.net

Personalisation Doesn't Require Server Code

My Yahoo!

http://my.yahoo.com/index.html

Inquisitor

MY YAHOO!

? help

Yahoo!   Mail   More Yahoo!

Category: **Web** | Images | Video | Local | News | Shopping

Thu, May 11, 04:16 pm

Search: [_____] (Yahoo! Search) · Advanced · My Web

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➕ **Add Content**   🔀 **Change Layout**   ✏️ **Change Colors**

📄 mnot | **Add New Page**

Stock Portfolios   edit ✖

Get up to **50** COMMISSION-FREE TRADES + $100 CASH
TD AMERITRADE   GO ▸

Index   Edit

DJIA	11500.73	-141.92
NASDAQ	2272.70	-48.05
^SPC	1305.92	-16.93
^AORD	5318.20	0.00

Money   Edit

^XAD	N/A	N/A
^XBP	N/A	N/A

▷ **Watch**   Edit

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U.S. Markets closed

[_____] (Get Quotes)

Symbol Lookup

Providers - Disclaimer
Quotes are delayed 20 minutes.
Get **Streaming Real-Time Quotes**.
* = news in the last 24hrs

Stock Upgrades &   edit ✖
Downgrades

Weather   edit ✖

London, UK	51...72 F	
Melbourne, AU	49...61 F	
Rome, IT	52...66 F	
Baltimore, MD*	58...69 F	
San Francisco, CA	55...68 F	
San Mateo, CA	53...78 F	

*indicates severe weather alert

[_____] (Search)

search by Zip Code or City

678 🗺️ **Your Credit Score - $0**

Best Fare Tracker   edit ✖

Depart: San Francisco, CA

Baltimore, MD	$203.00
Paris, FR - Charles De Gaulle	$630.00

Y! **Reuters: U.S. Market**   edit ✖

- UPDATE - Chile central bank keeps key rate at 5 pct - 39 minutes ago
- RPT-Japan investors eye foreign assets as yen rises - one hour ago
- UPDATE - Sherritt, Teachers spin off coal unit into trust - one hour ago
- U.S. stocks sink, oil and gold fan inflation fears - one hour ago
- US stock funds take in $7.3 bln in week - TrimTabs - 2 hours ago
- UPDATE - MOVES-GSC Partners, Deutsche Bank, Mulvaney - 2 hours ago
- U.S. Treasuries end lower, 10-yr auction slighted - 2 hours ago

---

Y! **Reuters: Internet Report**   edit ✖

- Yahoo turns to Washington for help on China - 2 hours ago
- Kodak unit settles US FTC spam charges - 3 hours ago
- CORRECTED: US government urged to work from home in pandemic - 16 minutes ago
- EU executive slams "interference" in sex site vote - 6 hours ago
- France amends bill amid opposition from Apple - 4 hours ago
- As freedom shrinks, teens seek MySpace to hang out - 10 hours ago
- Spammers breaking the law, UK judge rules - 8 hours ago

Currency Converter   edit ✖

Convert [1] [U.S. Dollar ▾] Into [Euro ▾]

(Convert)

Currency	British Pound (GBP)	Australian Dollar (AUD)	U.S. Dollar (USD)
GBP	1	0.411940	0.531124
AUD	2.425332	1	1.288494

Personalised URIs

- Give personalisation data identity

- Then, rewrite URIs based on personalisation data

- Result: personalisation data, template and modules separately cacheable

- Again, goal is to be supported in browsers directly

URL Templating Example

```html
<html>
  <head>
    <link rel="template_store" href="test.json"
      type="application/json+xml" title="user"/>
    <script type="text/javascript"
      src="url_template.js"></script>
  </head>
  <body>
    <h1>Templating Test</h1>
    <p><a href_template="{user.userid}/prefs">
      edit your prefs</a></p>
    <hx:include src="/default_content.html"
      src_template="/{user.top_content}">
    </hx:include>
  </body>
</html>
```

url_template.js

- Coverage: hx:include/@src, a/@href, img/@src, link/@href ...
- Variables:
  - Cookies
  - link/@href-loaded JSON
- Fallback:
  - Redirect to a URI
  - Default phrase
  - Use un-templated attribute
- http://www.mnot.net/javascript/url_template.js

Users without a *userid* cookie get bounced by template fallback **1**

```
Cache-Control:
    max-age=86400
```

/login.html

Otherwise, user prefs are loaded from a JSON file **2**

```
Cache-Control:
    max-age=3600,
    private
```

/joe/prefs.json

```html
<html>
 <head>
  <link rel="template_store" title="user"
   href="/{cookie.userid}/prefs.json"/>
  <link rel="template_redirect"
   href="/login.html"/>
  <script src="url_template.js"/>
  <script src="hinclude.js"/>
 </head>
 <body>
   <hx:include src="default.html"
    template_src="{json.user.top_mod}"/>
 </body>
</html>
```

Then, prefs are used to rewrite URIs to include personalised content. **3**

```
Cache-Control:
    max-age=1800
```

/modules/news.html

http://www.example.com/

Demo

http://www.mnot.net/javascript/demo/

Caveats

- Downgrade clients still need to be handled

- This isn't for everything - just one tool

- Open Source intermediary caches aren't as fast/functional as they could be

- Code is beta-quality

What Else?

- Services too - not just for Web pages

- More quantification, testing

- Authentication - can be distributed
  http://www.mnot.net/drafts/draft-nottingham-http-auth-cache-00.txt

- Invalidation sharing in gateway clusters

- Invalidation formats, headers

- Cache pinning, grouping

- Offline operation

Questions?

Thank you!