Optimizing a News Website for Speed and Stability

Julian Dunn
SecondMarket, Inc.

Blake Crosby
Canadian Broadcasting Corp.

– Who has worked for a news website
– Who has configured a CDN – familiar with a CDN?

What's This Talk About?

What's This Talk About?

- How to build & operate a large media website

- **without spending millions of $**

- **without having it go down every 5 minutes**

Some technical things, but set the stage with non-technical things

How to build and operate a large media website...

... without spending millions of dollars

... and without your site going down every 5 minutes.

Who Am I?

Systems engineer, worked for CBC as digital operations team lead for many years
Now working for alternative markets startup in New York City doing cloud infrastructure &
web operations.

CBC – Canada's National Public Broadcaster

– Similar to NPR + PBS – combined radio and television station

CBCnews

| Home | World | Canada | Politics | Business | Health | Arts & Entertainment | Technology & Science | Community | Weather | Video |

Home › Photo Galleries   The National   CBC News Network

DEVELOPING   Coroner's jury wants all Ontario daycares registered »   ‹ ‖ ›

NHL rejects latest CBA proposal from players' association

The NHL labour talks have hit another roadblock — and this one appears to be massive. After two optimistic days that suggested a deal could be imminent, negotiations between the league and the NHL Players' Association broke off dramatically Thursday. 9:52 PM ET

- Statements from Ron Burkle, other NHL owners
- Social Media: NHL players react to latest rejected offer
- WATCH: Theo Fleury confident in Sidney Crosby's role in ending lockout
- NHL, NHLPA still need to bridge 'critical open issues' 10:07 AM ET

NEW | F-35 deal not cancelled, Tories insist

The Harper government says it has not made a decision on the F-35 as a replacement for Canada's CF-18 fighter

More Headlines

Pregnant Kate leaves hospital feeling 'much better'

EXCLUSIVE | Costa Concordia wreck an accident, not crime, captain says

No plans to end restrictions on prohibited guns, Harper says

UPDATED | Man arrested in Surrey, B.C., SUV hit and run

Accused in NYC subway death says man grabbed him first

Neutrality on Mideast supported by half of Canadians, poll suggests

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Must Watch

The National for December 06, 2012
1:00:02
Welcome to The National, the flagship nightly newscast of CBC News,

Political punch
1:34
Definitely not democracy; the top political brawls from around the world

'End of the world is coming'

RAW: Winter arrives out West

Friday, December 14, 12

cbc.ca

– Most popular news website in Canada – 1 million unique visitors per day
– News, sports, radio & TV streaming (live and on demand), regional news, arts & entertainment, etc. etc.

2005

Me at the zoo

Quality
● 240p
Auto

0:19 / 0:19

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Very first YouTube video was posted in 2005. Jawed Karim co-founder right here in San Diego at the zoo. (which I highly recommend -- it's $44 but worth the money. one of the best zoos)

CANADA – Political

———	International boundary
- - - - -	Provincial/territorial boundary
Alberta	Province/territory
☆ <u>Ottawa</u>	National capital
✦ Regina	Provincial/territorial capital

Scale

0   250   500   750   1 000 km

2005 was also the year of a provincial election in British Columbia

News

Overall Election Results

Party	Elected	Leading	Total	Vote Share
LIB	46	0	46	46.03%
NDP	33	0	33	41.27%
GRN	0	0	0	9.11%
DR	0	0	0	.84%
OTH	0	0	0	2.76%
Last Update: June 1, 5:11:20 PM PDT				79 seats

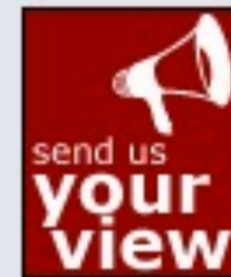[an error occurred while processing this directive]

B.C. Premier Gordon Campbell greets his supporters during a rally in Vancouver, B.C., after he and his Liberal party won a second term in office, Tuesday, May 17, 2005.

[an error occurred while processing this directive]

District Profiles

Select a district

Highlights

Your View
If you have something to say about the results, this is the place say it.
more »

B.C. Votes 2005
Main
Features
Parties & Leaders
District Profiles
Analysis & Commentary
News Archive
Voters Toolkit
Your View
Radio & TV Coverage

cbc.ca/bc

ÉLECTION COLOMBIE-BRITANNIQUE 2005

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We put up this website -- unbelievably it's still up. I can also talk about data retention issues on a news website but that's a whole other talk.

Aw Jeez, not this shit again!
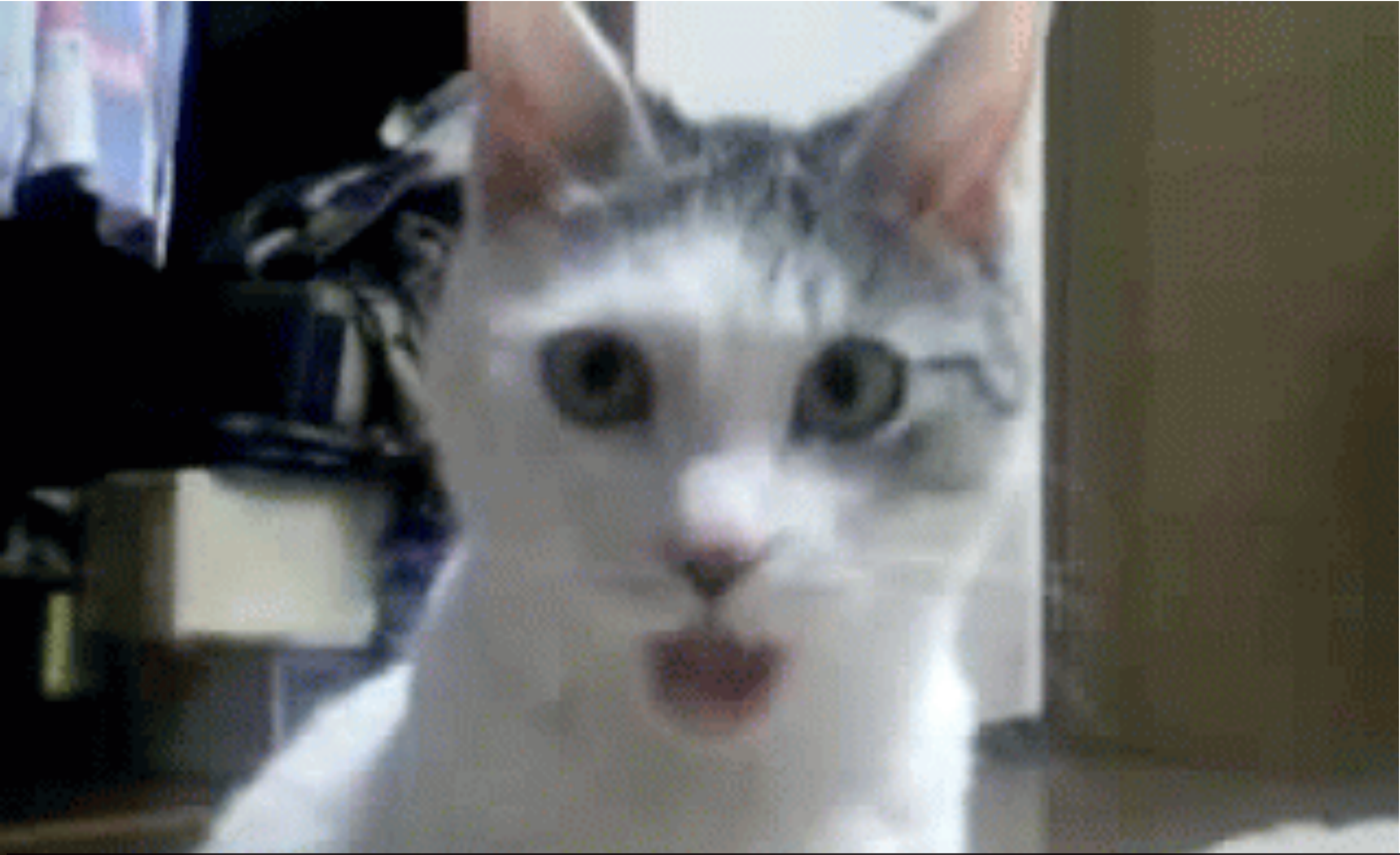
Error 500 - Internal Server Error

I've got some bad news for you sunshine : the server made a boo-boo. Please go take a coffee and retry in a few minutes.

If you feel that contacting me will somehow improve your experience on my site, go ahead : mail ozh at planetozh dot com.

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Polls closed at 9 p.m. Pacific Time

Shortly after the site was down for over two hours

50 requests/sec per server!

(300 origin req/sec over 6 servers) WTF, right? Why?

Bad Assumptions

"Make the news stories appear as fast as possible"

Journalists say, "I want the stories to be as fresh as possible" – we're a news site after all

Developers say, ok that's great, we'll put all the stories in an Oracle database

+

And we'll render them using a J2EE web application.

Architecture was wrong

But this is actually not a great architecture for a news website.

To understand why this is a bad idea, you have to look at news site access patterns
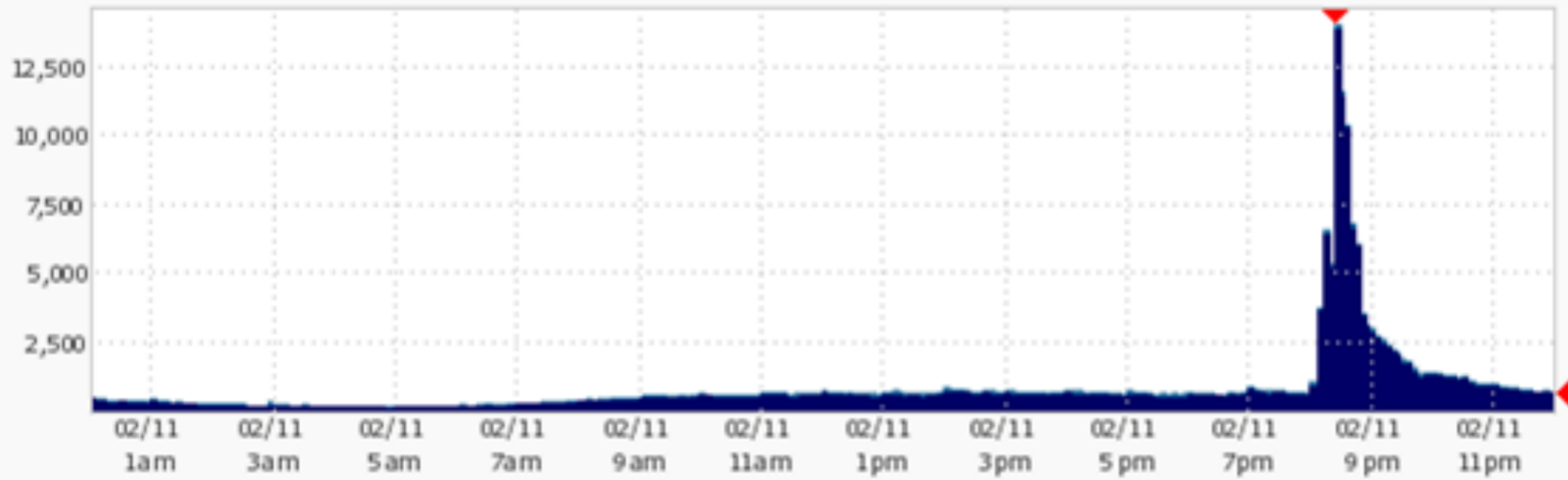
Site Content Delivered, in Mbits per Second

Total bandwidth includes all request traffic plus edge, midgress, and origin response traffic.

Total Volume: 8.8 TB

▼ Peak: 13,960.78 MBits/sec at 08:25PM
◄ Latest: 692.98 MBits/sec at 11:55PM

Eastern Daylight Time

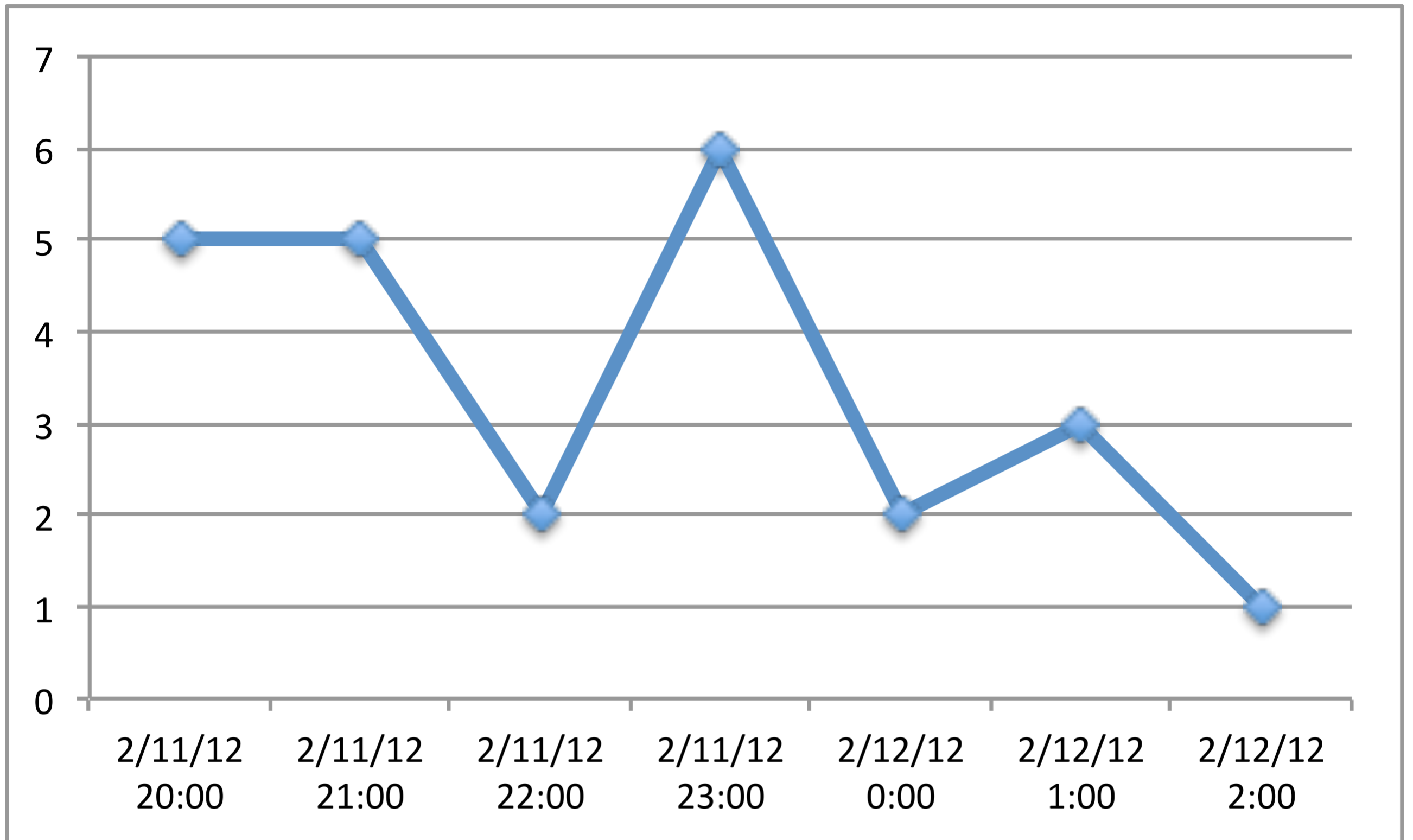|	Total Volume	% Volume
■ Edge Traffic	7.8 TB	88.1%
■ Midgress Traffic	654.7 GB	7.4%
■ Origin Traffic	397.4 GB	4.5%

Show Upload/download breakdown

Origin Bandwidth Offload 94.9% of bytes offloaded to Akamai

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News of Whitney Houston's death Feb 11, 2012

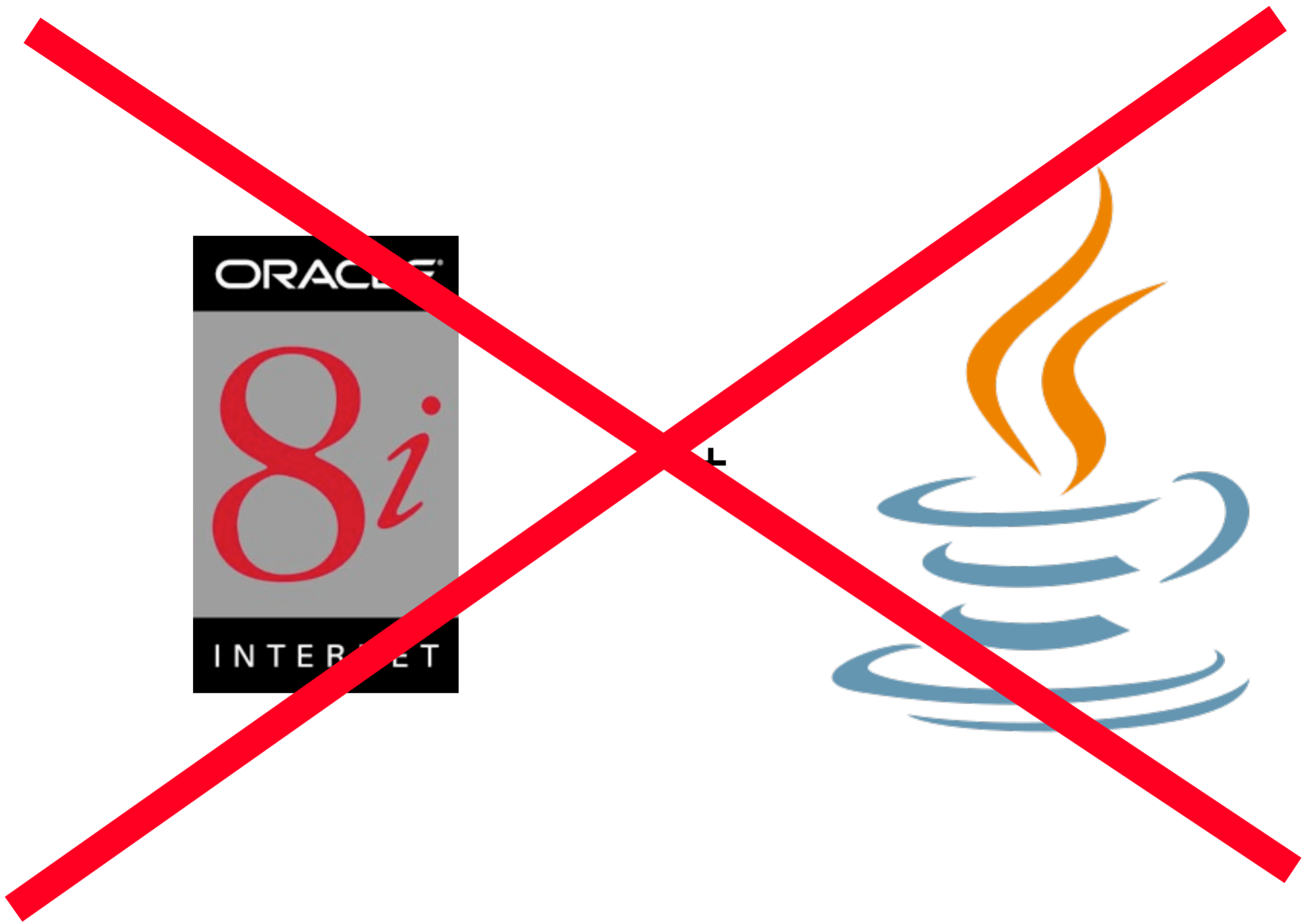From < 1 Gbps to 13 Gbps virtually instantaneously

Number of Story Updates Per Hour

Story is updated very infrequently, though. Only about 5-6 times per hour even when news is breaking, and over a story's lifetime perhaps one or two dozen times.

Senseless to use J2EE application to render stories.

Wastes a lot of CPU doing the same thing over and over.

Can even read about this in the outage post-mortem report from BC Votes 2005.

- "Election news stories were not cached on disk."

- "All stories were generated dynamically which requires more computer processing, hence resulting in more load on the servers."

Real, Conflicting Requirements

- Stability and reliability

- Content freshness

- System complexity

- Cost

Site Architecture: SSI

- Primitive, but fast/secure

- Audit trail

- Easy to turn off site features

- Details of "wrapper" mechanism in paper

- "Cache cache cache" -- we took this to the extreme and made the backend as close to a cache as possible.

- News portion: no dynamic features outside SSI

  - SSI is primitive, but fast/secure

  - Audit trail - nothing gets into production w/o going through CMS

  - Turn off features easily by modifying wrappers to discard site elements

Delivery Parameters

Set Global Site TTL

Originally all kinds of TTL rules for different types of content, path names, etc. Too complicated; journalists constantly calling helpdesk to "purge things from cache"

If you have to "purge things from cache" you're doing it wrong.

Setting a global site TTL (of 20 seconds) covers most cases and is "fresh enough" (ran some experiments with journalists and they seem not to notice that publishing is not actually instant)

If-Modified-Since:

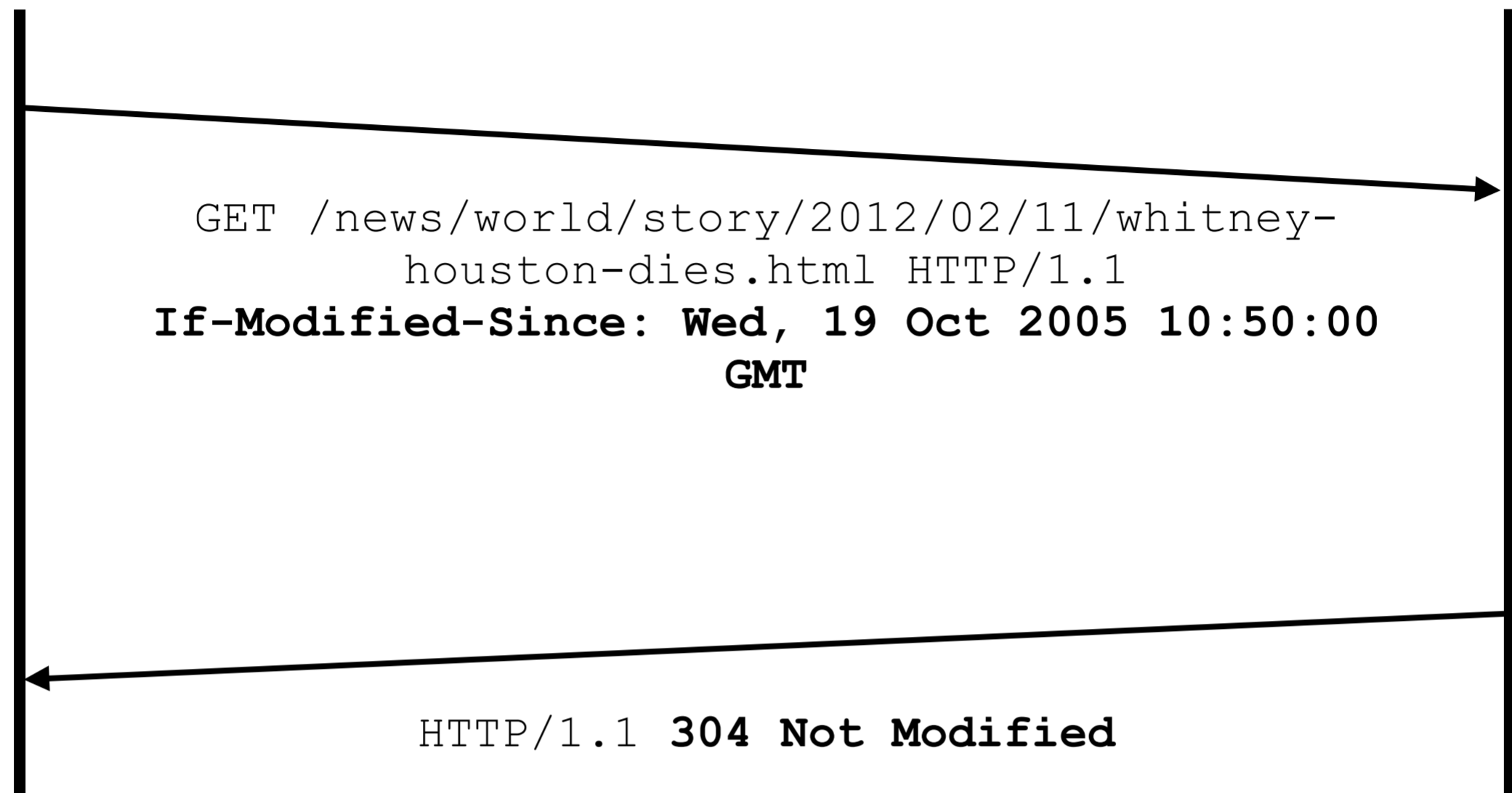CDN   Origin

```
GET /news/world/story/2012/02/11/whitney-
        houston-dies.html HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: text/html
```

This is the regular HTTP transaction that we all know and love.

If-Modified-Since:

CDN   Origin

```
GET /news/world/story/2012/02/11/whitney-
         houston-dies.html HTTP/1.1
If-Modified-Since: Wed, 19 Oct 2005 10:50:00
                    GMT
```

```
HTTP/1.1 304 Not Modified
```
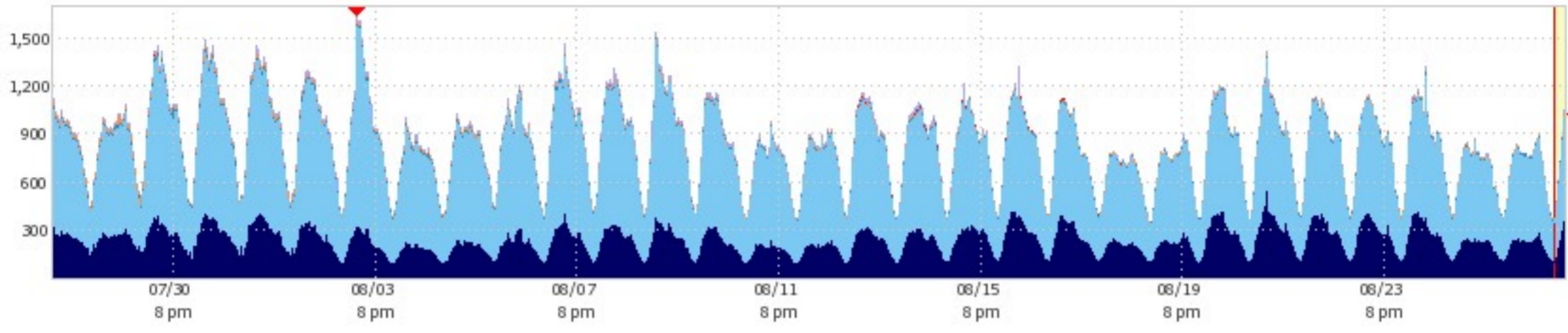
If IMS is configured properly and the CDN has the object in cache, this is what the interaction looks like. Very small origin response, no need to send content body in most cases.

Origin Response Codes, in Requests per Second

Origin Requests: 2.1 Billion

▼ Peak: 1,623.2 requests/sec at 11:30AM
◄ Latest: 1,051 requests/sec at 10:00AM

Eastern Daylight Time   ☐ Estimated data begins at 5:00 AM

	NUMBER OF REQUESTS	% OF REQUESTS
■ OK: 200, 201, 204, 206, 210	547,613,196	26.2%
■ Not-Modified: 304	1,457,472,639	69.8%
■ Redirect: 301, 302	22,993,403	1.1%
■ Not-Found: 404	29,173,266	1.4%
■ Permission: 401, 403, 415	782,026	0%
■ Server Error: 500, 501, 502, 503, 504	107,952	0%
■ Other: (all other status codes)	28,530,176	1.4%

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"Most cases" actually turns out to be a lot... over two thirds of requests can be served out of CDN cache

Organize filesystem by desired TTL

Allows you to override TTLs by path, e.g. long-lived objects can go in one top-level directory, medium-lived objects go in another, and so on. (examples: /favicon.ico, global site JS and CSS, etc.)

Last mile acceleration, origin compression

origin compression – make sure to talk gzip to the CDN
LMA – enable CDN to pass along the same gzipped content to the end-user

Persistent connections
Appropriate timeouts

* Set pconns with the CDN
* Origin KeepAliveTimeout value synchronized with CDN (CDN, max 300s for pconn, origin KeepAliveTimeout 301s) so that origin doesn't kill the pconn before the CDN does

General Lessons Learned

- Keep cache rules simple

- Keep tuning knobs at origin if you can

- Organize & categorize content

- **Understand meaning of "TTL"**

TTL is not like a DNS TTL. It just means the time after which the CDN will check the origin for object freshness. If still fresh, then it'll keep serving the object out of cache.

Outcomes

Outcomes

- 2003-2010 - no need to grow origin

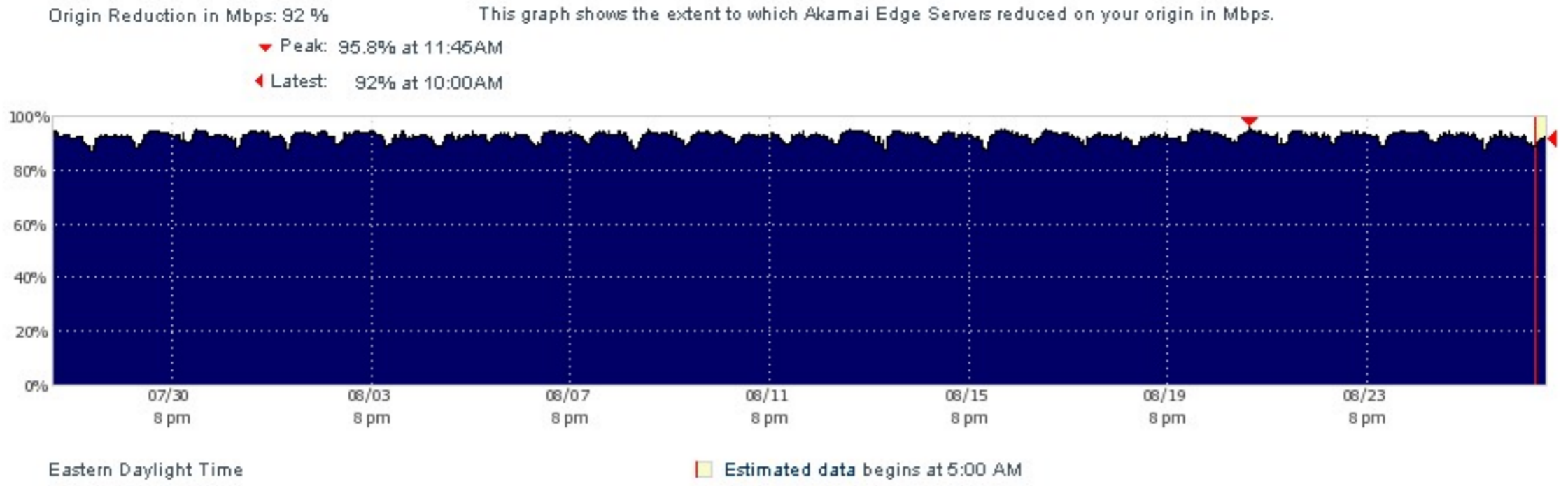- 2010-today - 9 origin webservers

- Average 40% CPU utilization

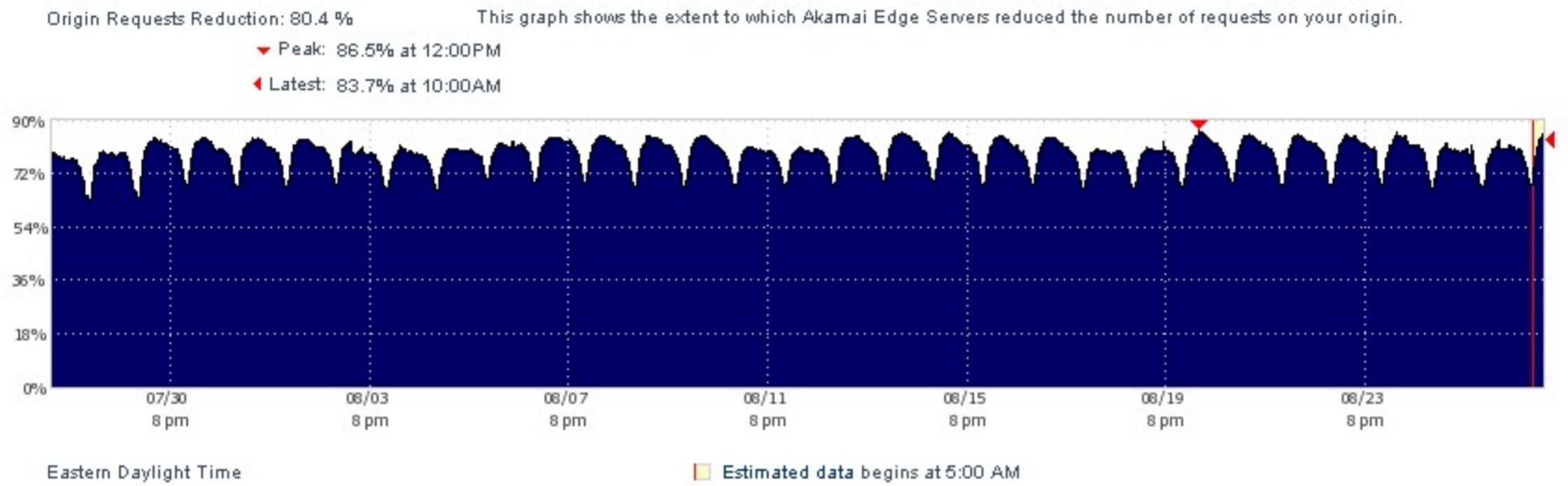7 years – upgraded from HP/UX to SUSE Linux to RHEL – 3 generations of servers but didn't change the quantity
2010 – decided to buy ourselves a bit more runway in the event of high traffic situations

Entire origin farm to deliver content costs around $15K to buy, astonishing for a large news website.

Origin Bandwidth Offload, in percentage

Origin Reduction in Mbps: 92 %   This graph shows the extent to which Akamai Edge Servers reduced on your origin in Mbps.

▼ Peak: 95.8% at 11:45AM

◀ Latest: 92% at 10:00AM

Eastern Daylight Time   ☐ Estimated data begins at 5:00 AM

Origin Request Offload, in percentage

Origin Requests Reduction: 80.4 %   This graph shows the extent to which Akamai Edge Servers reduced the number of requests on your origin.

▼ Peak: 86.5% at 12:00PM

◀ Latest: 83.7% at 10:00AM

Eastern Daylight Time   ☐ Estimated data begins at 5:00 AM

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Another set of graphs showing that the strategy pays off; CDN serves 80–90% of traffic (both bandwidth & requests)

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www.juliandunn.net
ICQ: 1326831
(that's what was cool in 2005)

My wife's ICQ # is 1290758 so she brags that she's cooler than me because her number is lower.