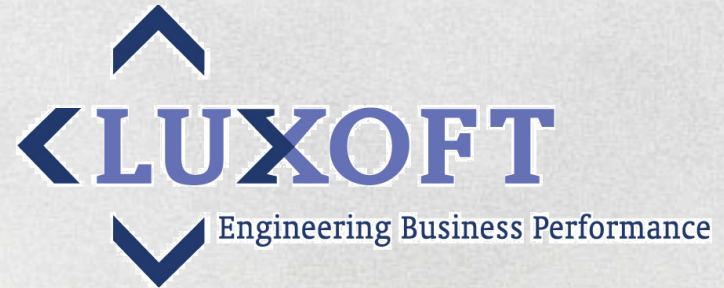


Main sponsor



HTML5 WebSockets - the Web Communication revolution, making the impossible, possible

Brad Drysdale

Picasso

Matejko + Canaletto

Malczewski + Chelmonski

State of Scala

Venkat Subramaniam

Don't code - create software!

Paweł Lipiński

Java Boilerplate Busters

Hamlet D'Arcy



Kaazing. Connect. Everything.

HTML5 WebSockets

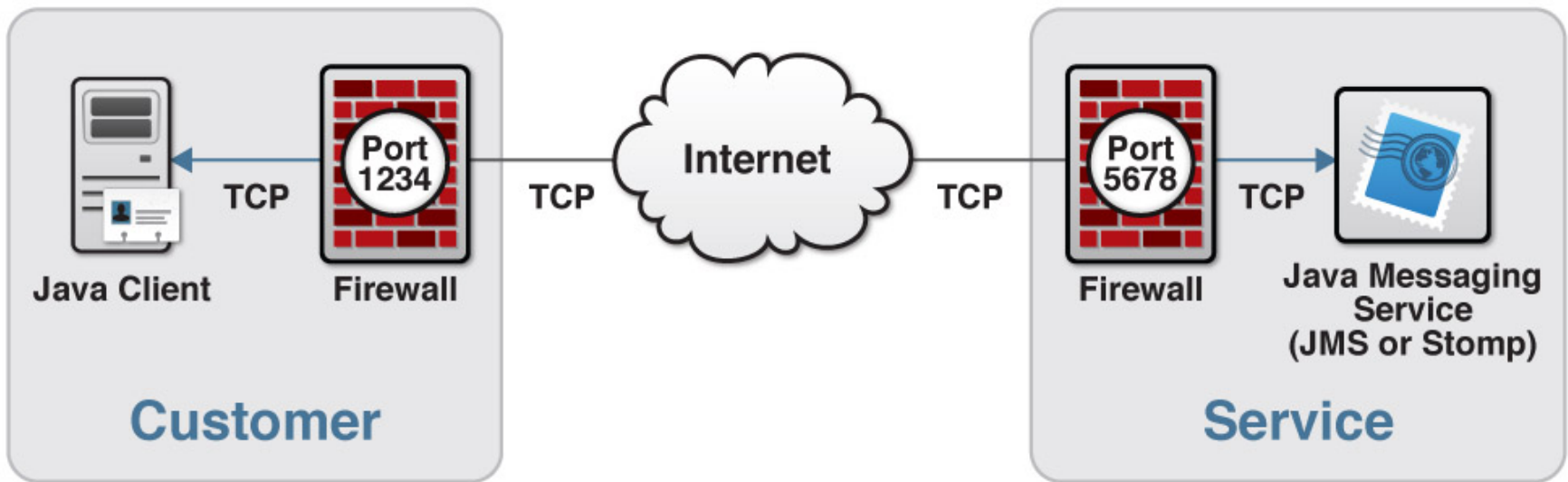
The Web Communication Revolution

Brad Drysdale
Director of Technology - Kaazing

What do WebSocket and model trains have in common?



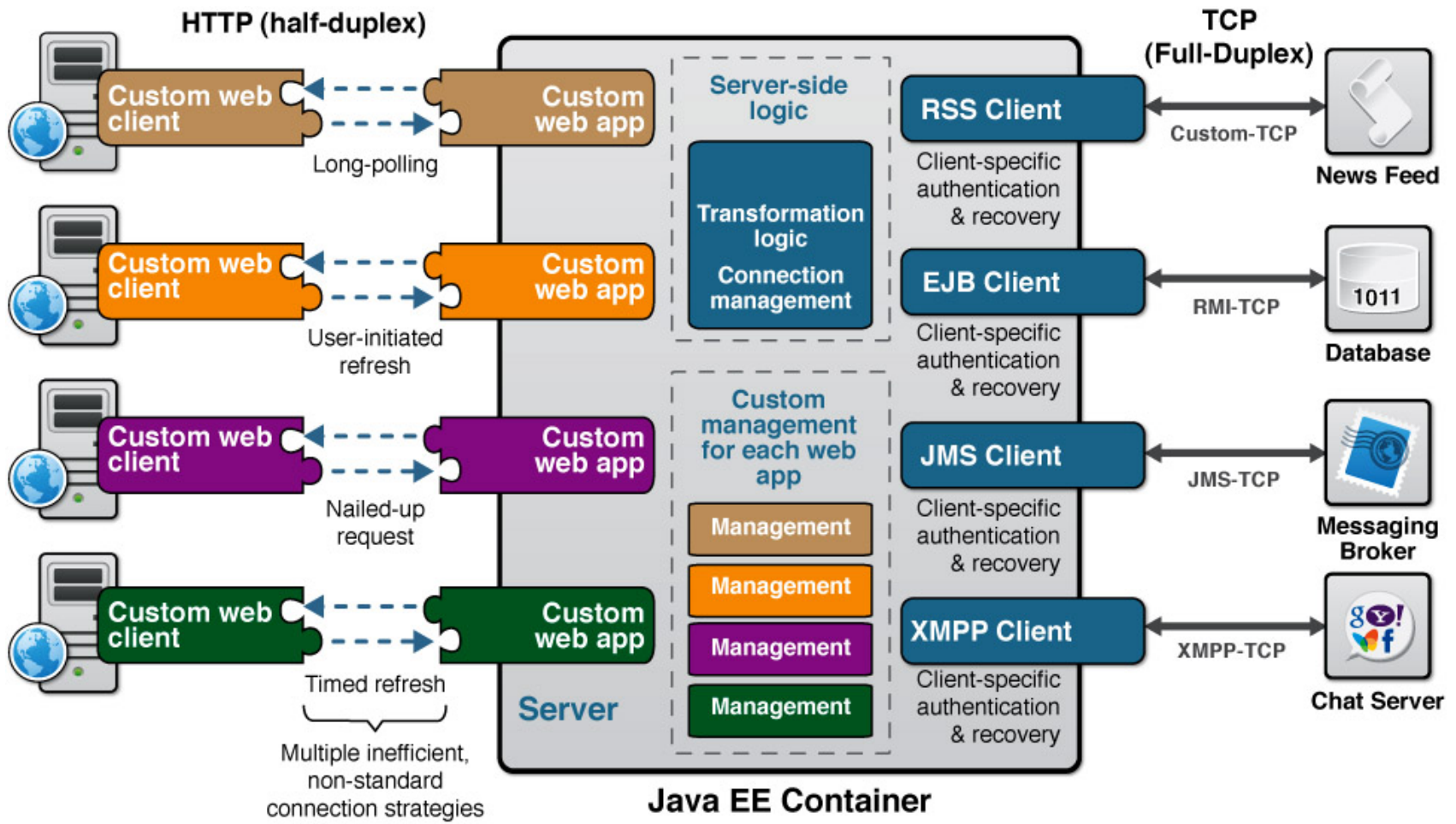
Client-Server Architecture



HTTP Is Not Full Duplex



Half-Duplex Architecture



The Legacy Web Stack



Half duplex

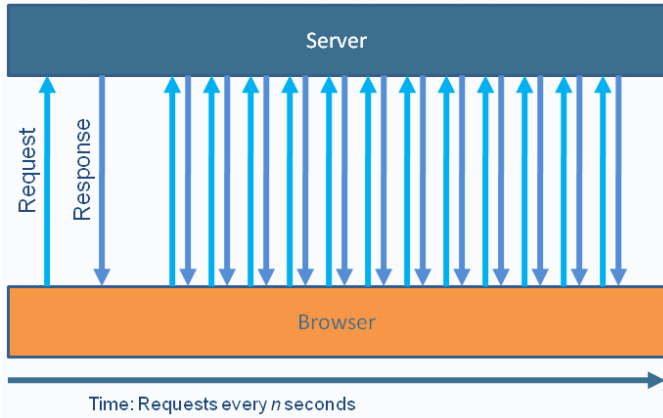


Full duplex

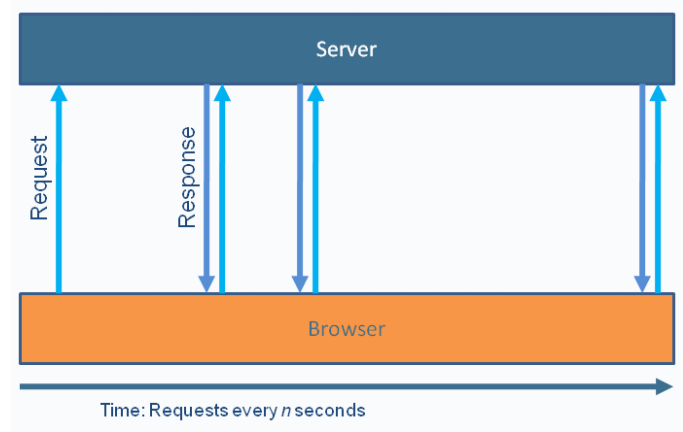
- Designed to serve static documents
 - HTTP
 - Half duplex communication
- High latency
- Bandwidth intensive
 - HTTP header traffic approx. 800 to 2000 bytes overhead per request/response
- Complex architecture
 - Not changed since the 90's
 - Plug-ins
 - Polling / long polling
 - Legacy application servers
- Expensive to “Webscale” applications

- Ajax applications use various “hacks” to simulate real-time communication
 - Polling - HTTP requests at regular intervals and immediately receives a response
 - Long Polling - HTTP request is kept open by the server for a set period
 - Streaming - More efficient, but not complex to implement and unreliable
- Excessive HTTP header traffic, significant overhead to each request response

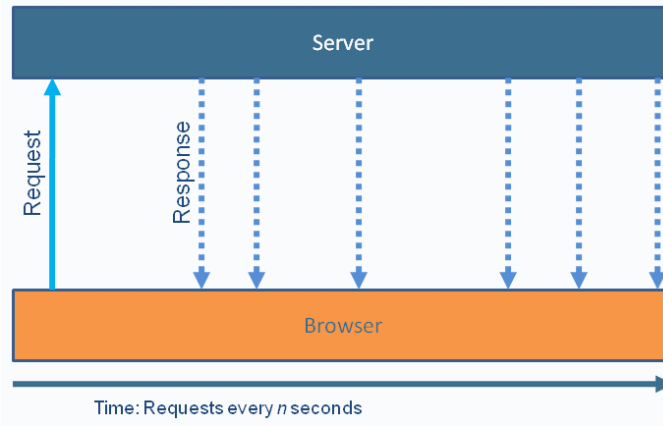
Hack the Web for Real-Time



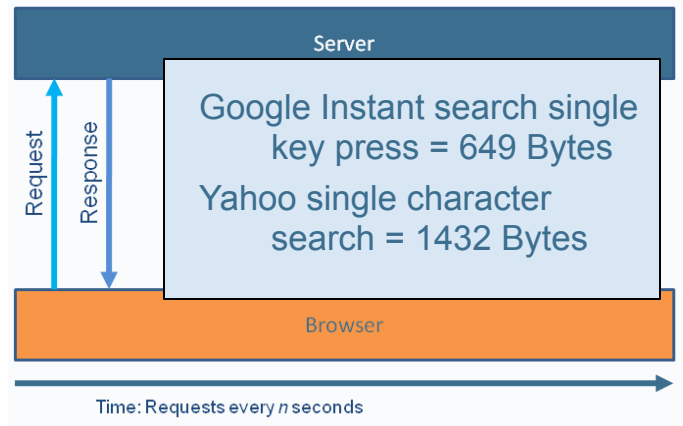
Polling



Long-Polling



Streaming



Request Response Overhead

Client

```
GET /PollingStock//PollingStock HTTP/1.1
Host: localhost:8080
User-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:
1.9.1.5) Gecko/20091102 Firefox/3.5.5
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-us
Accept-Encoding: gzip,deflate
Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7
Keep-Alive: 300
Connection: keep-alive
Referer: http://localhost:8080/PollingStock/
Cookie: showInheritedConstant=false;
showInheritedProtectedConstant=false; showInheritedProperty=false;
showInheritedProtectedProperty=false; showInheritedMethod=false;
showInheritedProtectedMethod=false; showInheritedEvent=false;
showInheritedStyle=false; showInheritedEffect=false;
```

Server

```
HTTP/1.x 200 OK
X-Powered-By: Servlet/2.5
Server: Sun Java System Application Server 9.1_02
Content-Type: text/html;charset=UTF-8
Content-Length: 321
Date: Sat, 07 Nov 2009 00:32:46 GMT
```

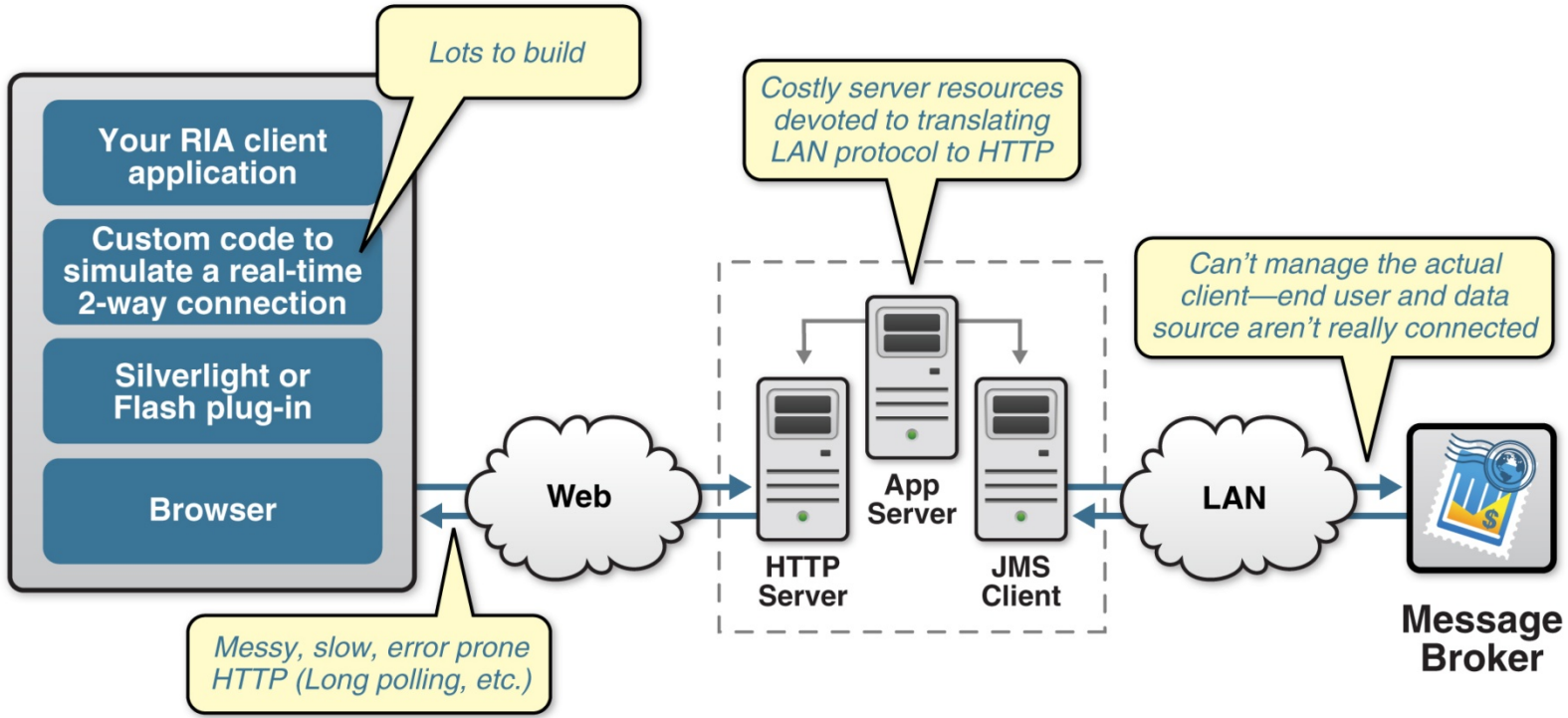
- Total (unnecessary) HTTP request and response header information overhead: 871 bytes (example)
- Overhead can be as much as 2000 bytes

- Example network throughput for HTTP request and response headers associated with polling
 - **Use case A:** 1,000 clients polling every second:
 - Network throughput is $(871 \times 1,000) = 871,000$ bytes = 6,968,000 bits per second (**~6.6 Mbps**)
 - **Use case B:** 10,000 clients polling every second:
 - Network throughput is $(871 \times 10,000) = 8,710,000$ bytes = 69,680,000 bits per second (**~66 Mbps**)
 - **Use case C:** 100,000 clients polling every second:
 - Network throughput is $(871 \times 100,000) = 87,100,000$ bytes = 696,800,000 bits per second (**~665 Mbps**)

- Great toilet cleaners...
- Ajax (Asynchronous JavaScript and XML) is used to build highly interactive Web apps
 - Content can change without loading the entire page
 - User-perceived low latency
- "Real-time" often achieved through polling and long-polling
- Comet lack of a standard implementation
- Comet adds lots of complexity

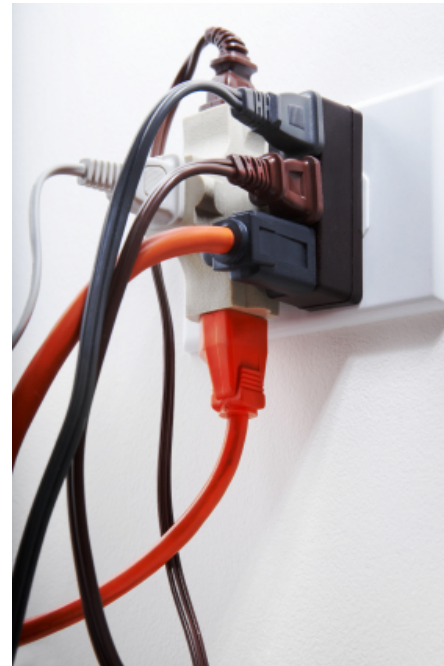


Comet Problems



- Desktop Networking
 - Full-duplex bidirectional TCP sockets
 - Access any server on the network
- Browser Networking
 - Half-duplex HTTP request-response
 - HTTP polling, long polling fraught with problems
 - Lots of latency, lots of bandwidth, lots of server-side resources
 - Bespoke solutions became very complex over time

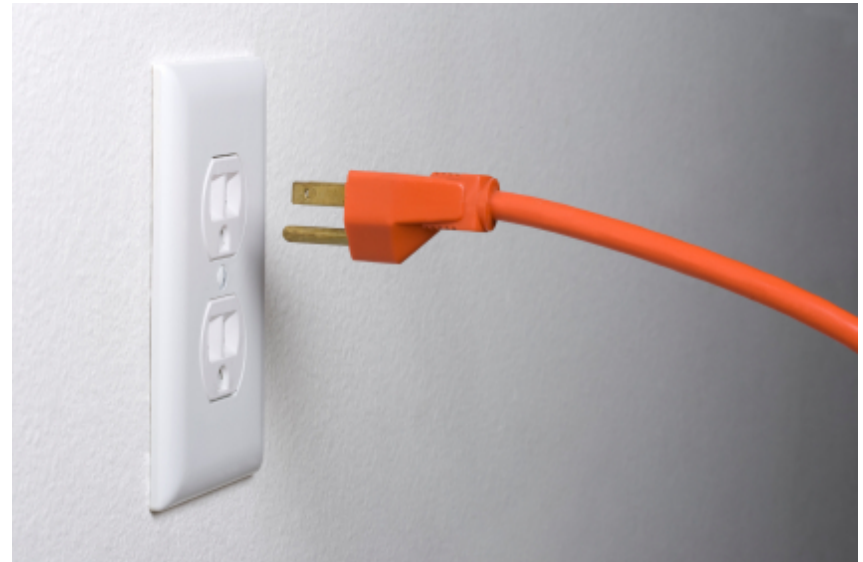
Complexity does not scale



The Web gets a new Superhero



Enter HTML5 WebSocket!



- HTML5 is the next set of W3C HTML standards backed by Google, Apple, Mozilla, Opera, Microsoft, Cisco, etc
- Consists of W3C API and IETF Protocol
- WebSockets provides a full-duplex, single socket over the Web
- Traverses firewalls, proxies, and routers seamlessly
- Leverages Cross-Origin Resource Sharing (CORS)
- Share port with existing HTTP content

- **WebSocket**

`ws://www.websocket.org/text`

- **WebSocket Secure**

`wss://www.websocket.org/encrypted-text`

Checking For Browser Support

JavaScript

```
//Checking for browser support
if (window.WebSocket) {
    document.getElementById("support").innerHTML =
        "HTML5 WebSocket is supported";
} else {
    document.getElementById("support").innerHTML =
        "HTML5 WebSocket is not supported";
}
```

JavaScript

```
//Create new WebSocket
var mySocket = new WebSocket("ws://
www.WebSocket.org");

// Associate listeners
mySocket.onopen = function(evt) {
    alert("Connection open...");
};

mySocket.onmessage = function(evt) {
    alert("Received message: " + evt.data);
};

mySocket.onclose = function(evt) {
    alert("Connection closed..");
};
```

JavaScript

```
// Sending data  
mySocket.send("WebSocket Rocks!");  
  
// Close WebSocket  
mySocket.close();
```

```
GET /chat HTTP/1.1
Host: server.example.com
Upgrade: websocket
Connection: Upgrade
Sec-WebSocket-Key: dGhllHNhbXBsZSBub25jZQ==
Sec-WebSocket-Origin: http://example.com
Sec-WebSocket-Protocol: chat, superchat
Sec-WebSocket-Version: 5
```

```
HTTP/1.1 101 Switching Protocols
Upgrade: websocket
Connection: Upgrade
Sec-WebSocket-Accept: s3pPLMBiTxaQ9kYGzzhZRbK+xOo=
```

Source: <http://tools.ietf.org/html/draft-ietf-hybi-thewebsocketprotocol>

- Connection established by upgrading from HTTP protocol to WebSocket protocol using the same TCP connection
- Once upgraded, WebSocket data frames can be sent back and forth between client and server in full-duplex mode
- Frames can be sent full-duplex, in both directions at the same time

Each frame of data:

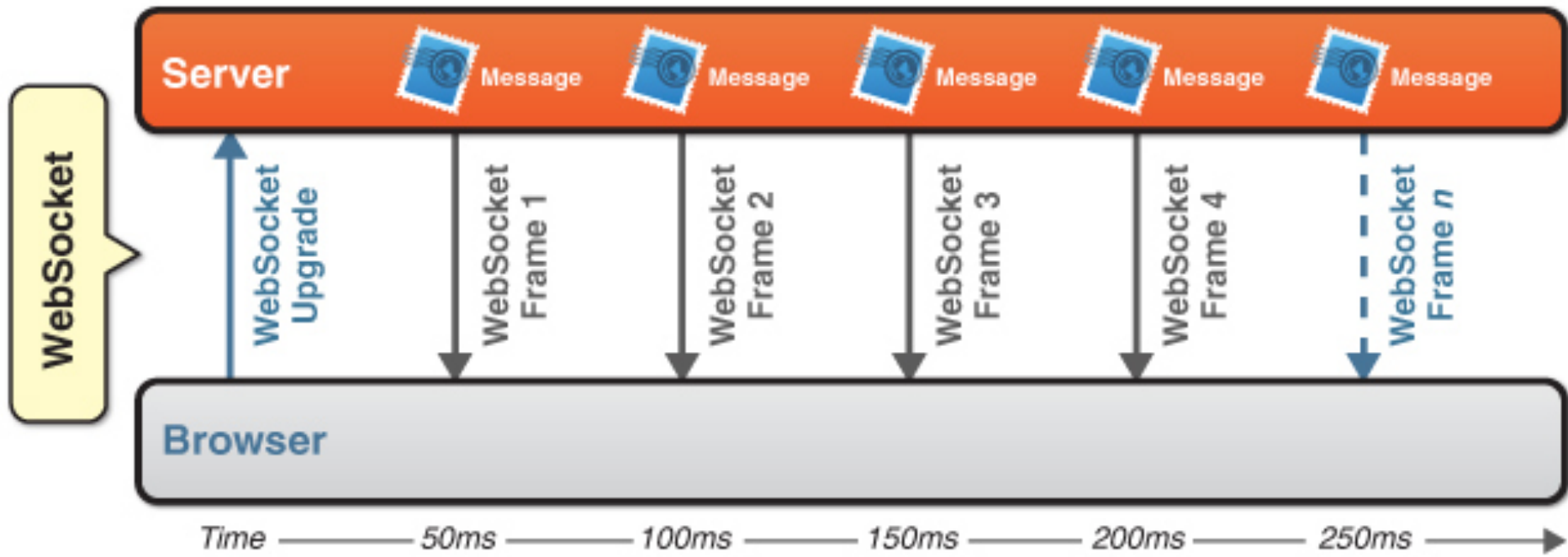
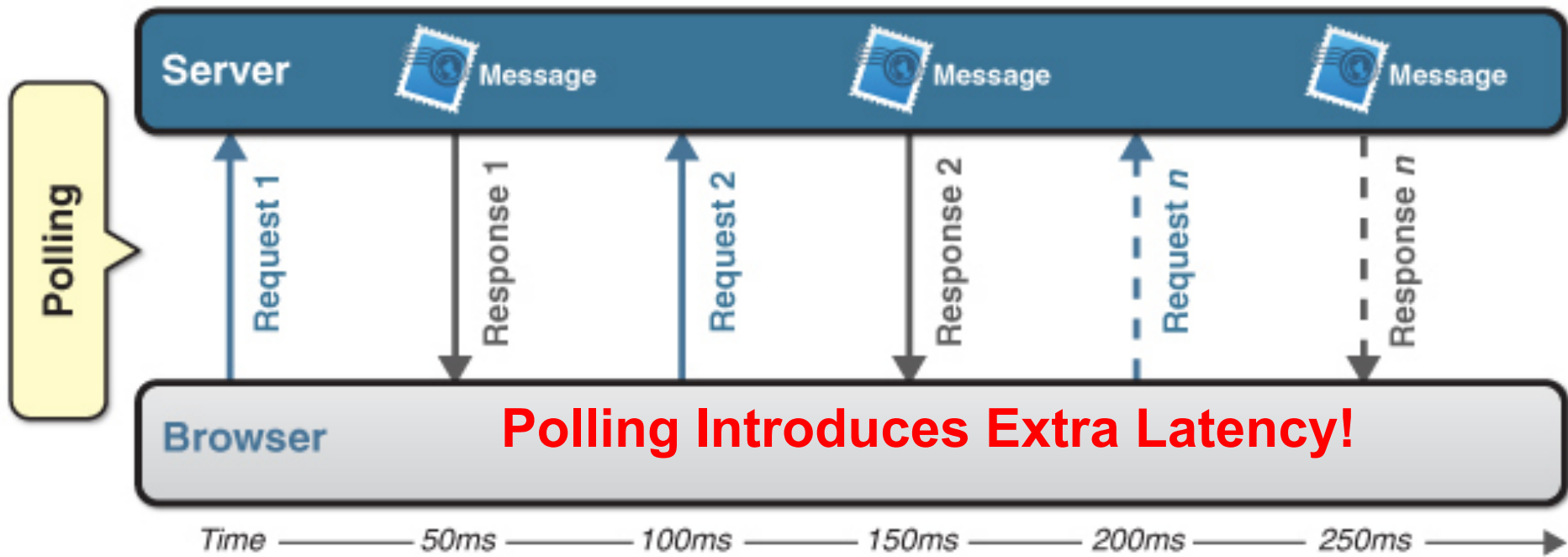
Starts with a 0x00 byte and ends with a 0xFF byte

Contains UTF-8 data in between:

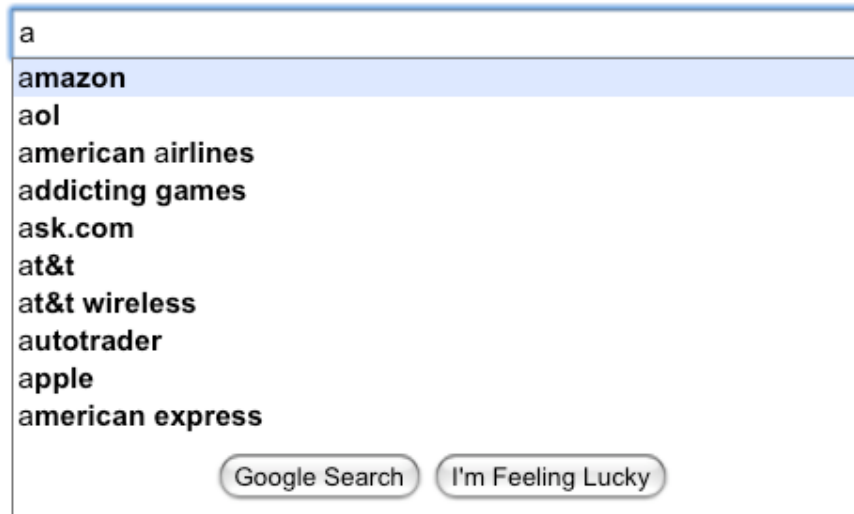
`\x00Hello, WebSocket\x00\xff`

There is no defined maximum size, but JavaScript does not allow >4GB of data)

- Dramatic reduction in unnecessary network traffic and latency
 - WebSocket requires only single byte framing
 - 500:1 or even 1000:1 bandwidth reduction
 - WebSocket does not necessitate new TCP connections for each or group of messages
 - Faster response, even more so with TLS/SSL
- Vastly simplified, more straight through architecture



Example: Entering a character in a search field with auto suggestion

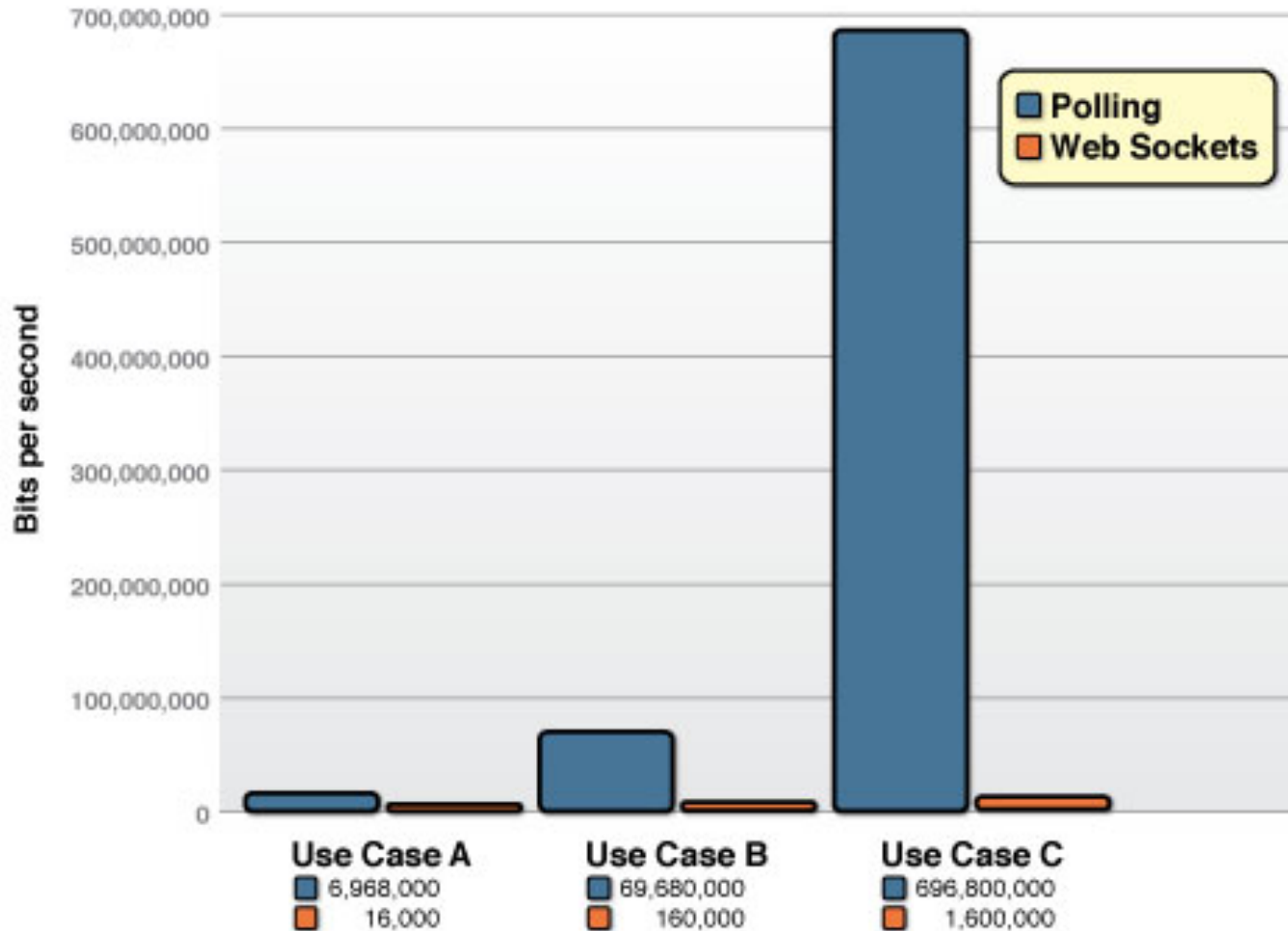


	HTTP traffic*	WebSocket Traffic*
Google	788 bytes, plus 1 byte	1 byte, plus 1 byte
Yahoo	1737 bytes, plus 1 byte	1 byte, plus 1 byte

* Header information for each character entered into search bar

WebSockets reduces bandwidth overhead up to 1000x

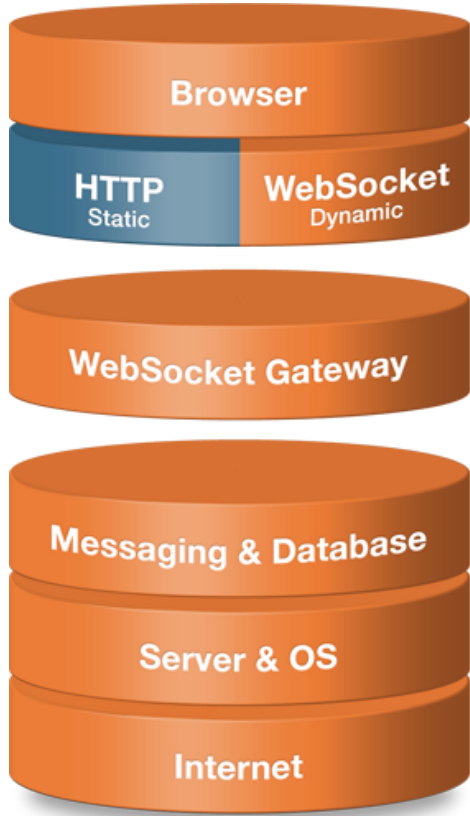
Polling vs. Web Sockets



“Reducing kilobytes of data to 2 bytes...and reducing latency from 150ms to 50ms is far more than marginal. In fact, these two factors alone are enough to make WebSocket seriously interesting to Google.”

—Ian Hickson (Google, HTML5 spec lead)

The New Web Stack



- Designed for full-duplex high performance transactional Web
 - HTTP & HTML5 WebSocket
 - Full duplex communication
- Lower latency
- Reduced bandwidth
- Simplified architecture
- Massive scalability

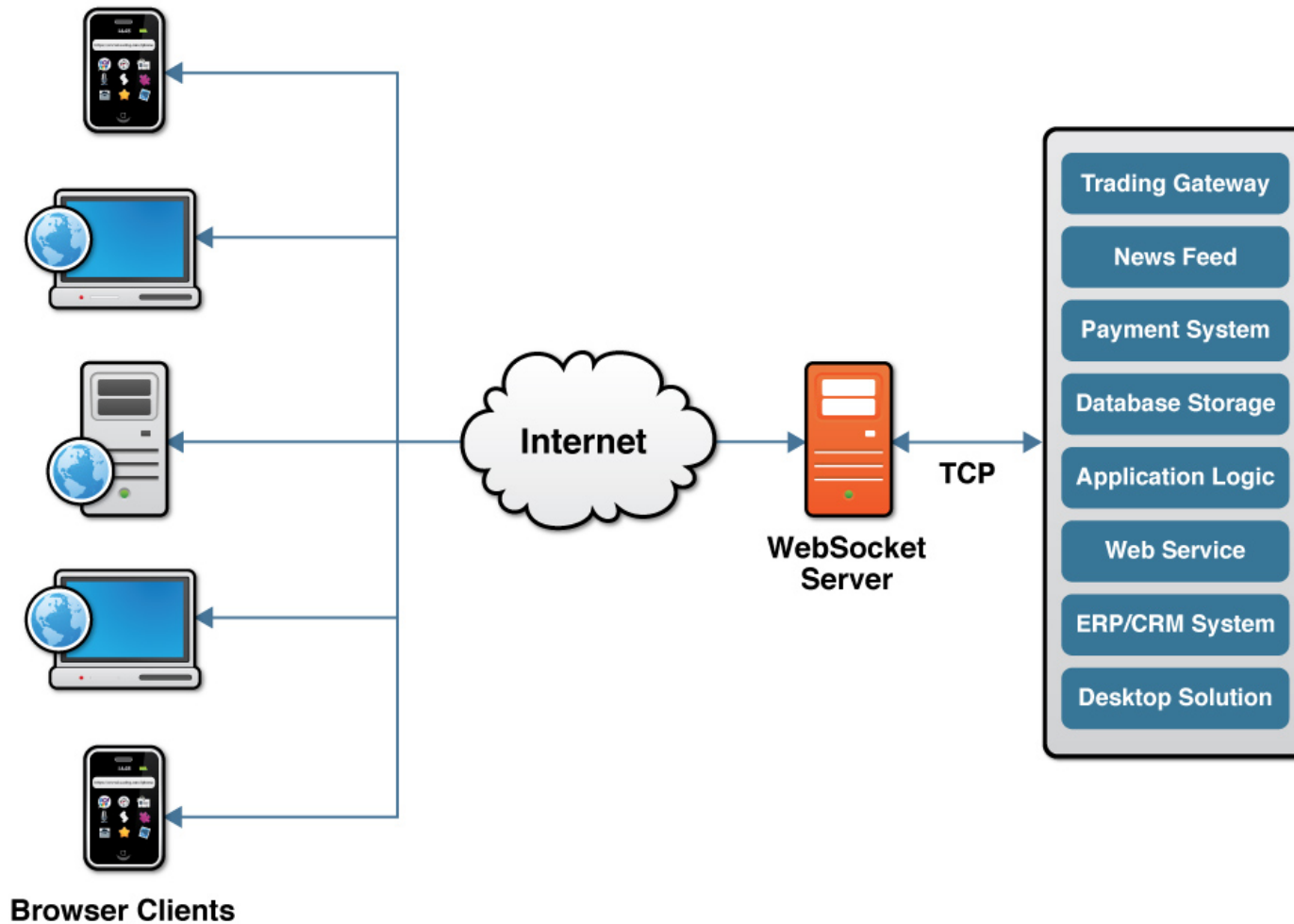


Half duplex



Full duplex

WebSockets Architecture



Browser and Server Support

- Browsers:
 - Chrome
 - Safari
 - Firefox 4
 - Coming in Opera and “on the list” for IE
- Servers:
 - Kaazing WebSocket Gateway
 - Apache mod_pywebsocket
 - phpwebsockets
 - web-socket-ruby
 - More...

- Kaazing WebSocket Gateway
 - <http://www.kaazing.com/download>
 - Makes WebSocket work in all browsers today (including I.E. 6)
- Flash WebSocket implementation
 - <http://github.com/gimite/web-socket-js>
 - Requires opening port on the server's firewall

Discovering WebSockets



- Major upgrade for web traffic, use it!
 - Simple text
 - JSON
 - Existing protocols (why reinvent the wheel?)
 - Text Protocols: XMPP, STOMP
 - Binary Protocols: AMQP, IRC, Pub/Sub
- Build high performance, scalable messaging for web apps
- Extend the reach of *any* TCP-based protocol you want, all the way to the browser
- The browser is a true client of that protocol – powerful paradigm shift

Example: Financial Apps

Receiving 34 Updates Per Sec. and 1.59 KB Per Sec.

COMPANY	SYMBOL	PRICE	CHANGE	SPARKLINE	OPEN	LOW	HIGH
THE WALT DISNEY COMPANY	DIS	27.45	0.36		27.09	24.39	29.80
GARMIN LTD.	GRMN	34.30	-0.49		34.79	31.32	38.26
SANDISK CORPORATION	SNDK	18.82	-1.42		20.24	18.22	22.26
GOODRICH CORPORATION	GR	51.90	-0.44		52.34	47.11	57.57
NVIDIA CORPORATION	NVDA	13.46	-0.39		13.85	12.47	15.23
CHEVRON CORPORATION	CVX	67.89	-0.41		68.30	61.48	75.12
THE ALLSTATE CORPORATION	ALL	32.63	1.61		31.02	27.92	34.11
EXXON MOBIL CORPORATION	XOM	67.73	1.21		66.52	59.87	73.17
METLIFE INC.	MET	35.64	-0.09		35.73	32.16	39.30
J. C. PENNEY COMPANY INC.	JCP	32.66	-0.29		32.95	29.66	36.24
OFFICEMAX INCORPORATED	OMX	12.22	-0.19		12.41	11.17	13.65
AETNA INC.	AET	27.30	0.43		26.87	24.19	29.56
CONOCOPHILLIPS	COP	43.59	-3.03		46.62	41.96	51.27
UNITEDHEALTH GROUP INC.	UNH	24.43	0.07		24.36	21.93	26.79

Example: Financial Apps

Markets

		DAILY CHANGE	SELL	BUY
UK 100 - Daily Rolling Future	↑	+26.2	5995.0	5996.0
UK 100 - Daily Rolling Cash	↑	+30.4	6035.5	6037.5
WALL STREET - Daily Rolling Future	↑	+55	12376	12381
S&P 500 - Daily Rolling Future (per 0.1)	↕	+6.3	1333.0	1333.3
DAX - Daily Rolling Future	↑	+44.5	7241.5	7242.5
EURUSD - Rolling Spot	↓	+0.0070	1.4302	1.4303
GBPUSD - Rolling Spot	↓	-0.0015	1.6289	1.6291
AUDUSD - Rolling Spot	↓	+0.0044	1.0379	1.0380
GOLD Rolling Spot (per 0.1)	↑	+3.7	1458.0	1458.4
BRENT CRUDE - Daily Rolling Future	↑	+97	12253	12256

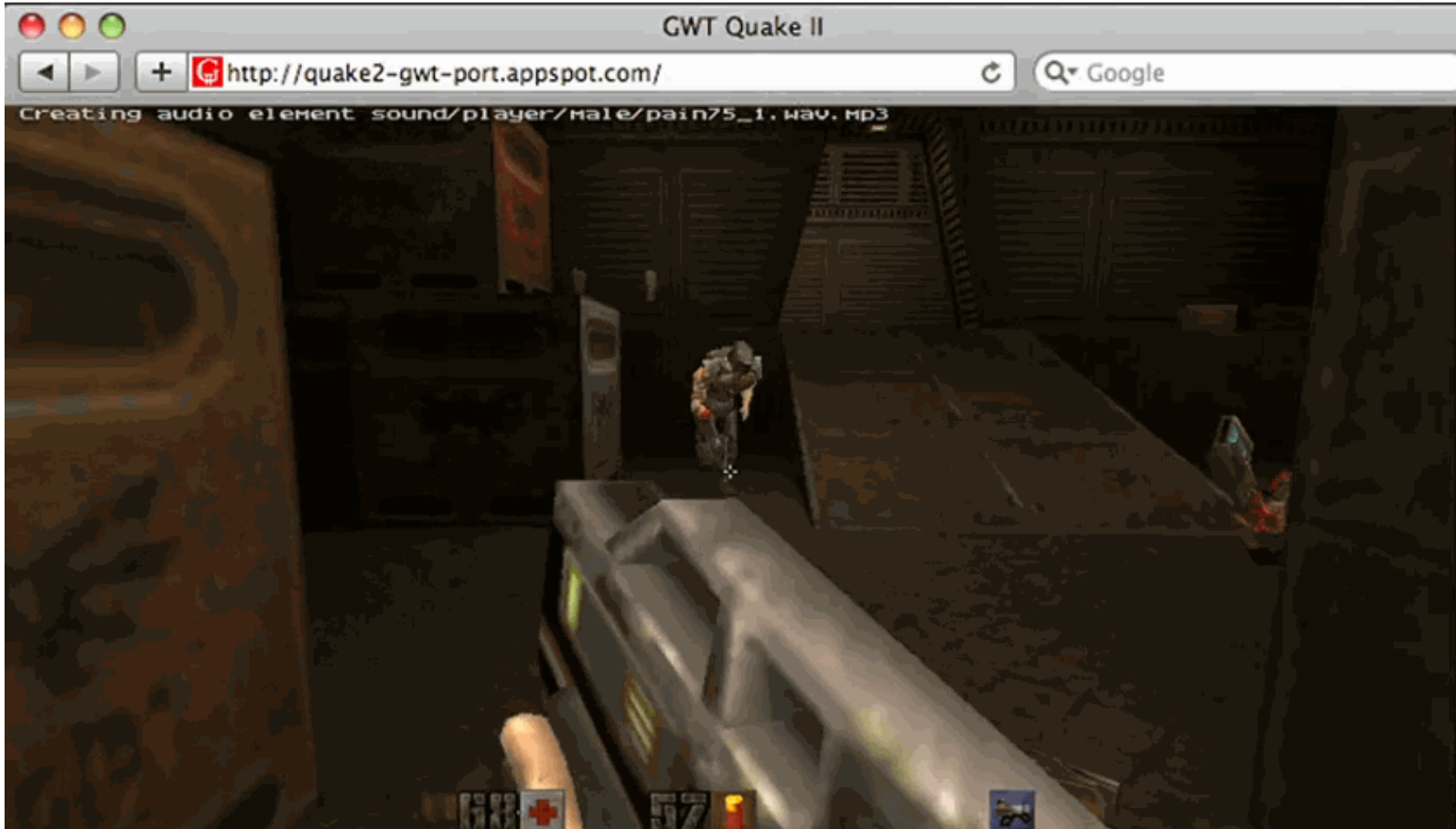
Market Commentary

FTSE100 set to open +16 6023, Dow Future +11 12338, £/\$ 1.6342 +49, E/\$ 1.4268 +47, Gold 1453 +2.5, Brent May 12190 -35
3 hours ago · reply · retweet · favorite

China shrugs off interest-rate hike but analysts remain deeply divided on further scope for tightening as inflationary pressures persist.
3 hours ago · reply · retweet · favorite

Dow cash closed 12393 -6, FTSE100 set to open 6017 +10. £/\$ 1.6285 +161, E/\$ 1.4223

WebSocket-Based Quake II



<http://code.google.com/p/quake2-gwt-port>

Example: Earth Control Game

facebook Home Profile Friends Inbox 2 Peter Lubbers Settings

EarthControl

High Scores - All ?

Rank

Ship Color - This Game

Playing How

Score	Name
1	323 Jason Derikozis
2	314 John Bergmans
3	239 Peter Lubbers
4	225 Jeff Logan
5	176 Jazz Alyce Peeters
6	106 Sean Lubbers
7	89 Karina Bergmans
8	44 Rocky Lubbers
9	39 Magnus

Telecom

Peter Lubbers says...

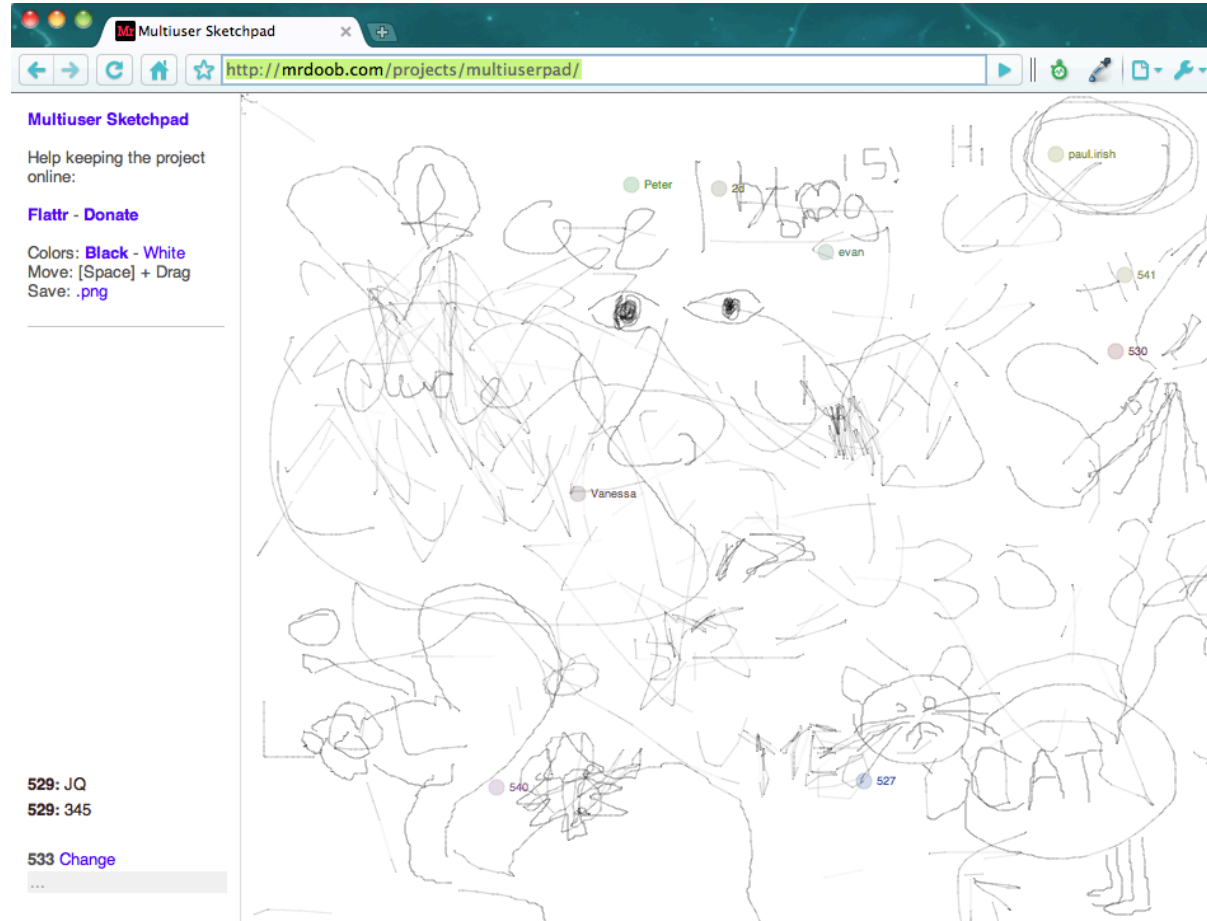
developed by Bergmans Mechatronics LLC

Share Become a Fan and get info at the EarthControl Profile Page

User Stats ?
Total Users 31
Playing Now 2

<http://apps.facebook.com/earthcontrol>

Example: Sketchpad

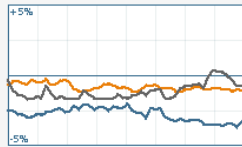


<http://mrdoob.com/projects/multiuserpad/>

Real-time is instantly refreshing

Hello Palo Alto | Thursday July 29 | 10:00:20 AM | Google Talk Account | Password | About

Market Ticker



KZNG	15.38	-0.25	(-1.60%)
WSKT	12.65	-0.03	(-0.24%)
RTIM	14.82	-0.71	(-4.57%)

Currency Exchange

GBP / USD		10:00:17	
SELL	1.62	BUY	1.62
	27⁵		32⁵
	50.0		

EUR / USD		10:00:20	
SELL	1.40	BUY	1.40
	27⁰		29⁰
	20.0		

Keep the conversation going in real-time.

Try our full featured web-based chat client.

Log on now »

New York Times

SENATE REJECTS WALL STREET TIGHTENING
 WASHINGTON — The Senate on Wednesday rejected a work on a sweeping financial regulatory bill as two key D sufficiently tighten rules on Wall Street.

The New York Times

By DAVID M. HERSHENFELD

Non-Crew in Cockpit of Doomed Polish Flight

MOSCOW — Aviation authorities offered new details of the plane crash that killed Poland's president and dozens of other top officials last month, including the revelation that two or more passengers were in the cockpit shortly before the pilots tried to land the aircraft in dense fog.

By MICHAEL SCHWIRTZ

British Coalition Offers Reform Plan

LONDON — Defying those who said it might be paralyzed by internal divisions, Britain's new coalition government of Conservatives and Liberal Democrats on Wednesday unveiled the most ambitious plan in decades for upending the highly centralized and often intrusive way the country is governed.

By JOHN F. BURNS

State Dinner Chef Tweets About Day of Creation

WASHINGTON (AP) -- Got my fingers crossed there are no hitches

By THE ASSOCIATED PRESS

In Ambush, a Glimpse of a Long Afghan Summer

BALUCH, Afghanistan — Minutes after surviving the first ambush, Cpl. John M. Boone, a Marine sniper, called over his radio. We have got a civilian here who got shot in his gut, he said.

By C. J. CHIVERS

Time-based Advertisement



Server Log

- "SBC Internet Services" from San Jose, CA, United States is visiting Kaazing.com
- "SBC Internet Services" from San Jose, CA, United States is visiting Kaazing.com
- "Google" from Hellertown, PA, United States is visiting Kaazing.com
- "Google" from Hellertown, PA, United States is visiting Kaazing.com
- "France Telecom R&D" from Issy-les-moulineaux, France is visiting Kaazing.com
- "France Telecom R&D" from Issy-les-moulineaux, France is visiting Kaazing.com
- "Comcast Business Communications" from San Francisco, CA, United States is visiting Kaazing.com
- "Comcast Business Communications" from San Francisco, CA, United States is visiting Kaazing.com

KAAZING

Twitter

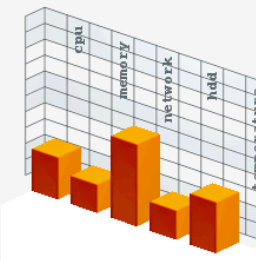
- etary guidelines say we should eat: <http://lat.ms/b1Ntx4> RT @LATimeshealth
- FOX News Radio <http://fb.me/vp06MSnB>
- FOX News Radio Radio Buzz: Shahzad Pleads Guilty in NYC Bomb Plot; Can Obama Hold Border Hostage? - <http://foxrad.io/1Pe>
- WSJ Market News AgBank IPO Investor List Grows <http://on.wsj.com/9Po0AV>
- CNN Political Ticker "Haley expected to cruise to GOP nod in S.C. governor's race" - <http://bit.ly/aq0NU1>
- FOX News Radio <http://fb.me/vp06MSnB>



Time-based Advertisement



Monitor



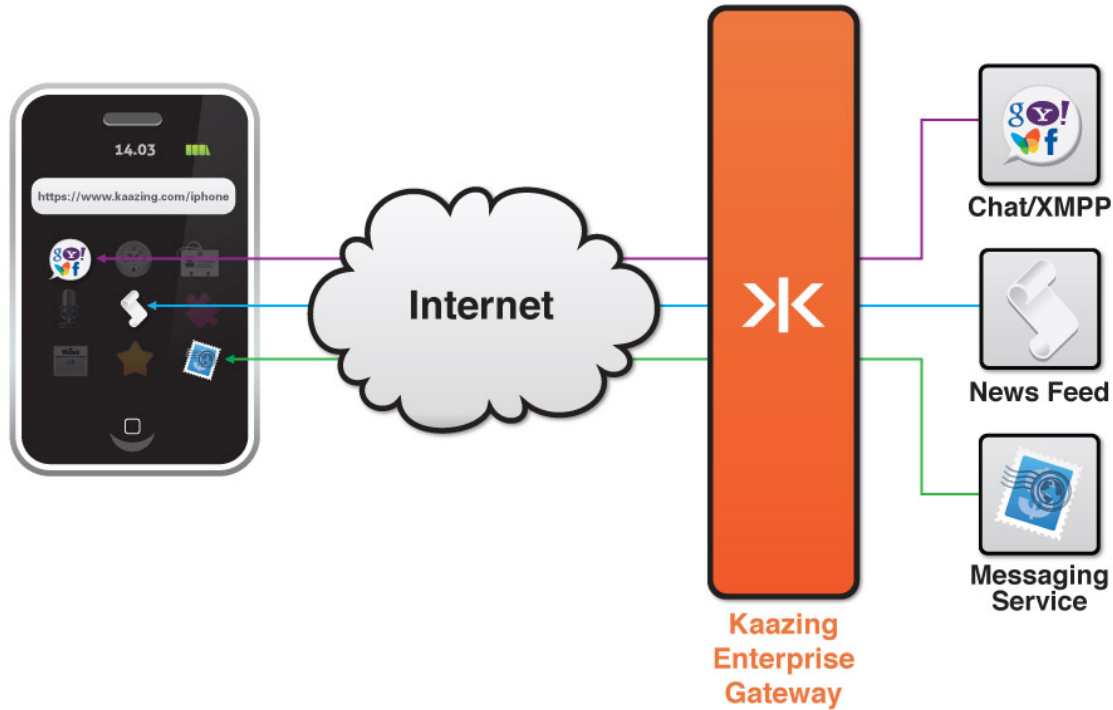
Monitor for Data Center
 Higher bar = larger ratio
 Left-to-right decrease

- Low latency Financial and Trading apps
- Online in-game betting and live auctions
- Social networking
- Performance and monitoring dashboards
- RFID and GPS Tracking
- Sports and news broadcasting applications
- Supply chain and inventory management
- Smart meters
- Next generation web application of your choice!

Your cool [HTML5 WebSocket] App
Here...



<http://iseeday.blogspot.com/>



Reduce dependencies on portal servers and portal farms.



Unconstrained Web

- Financial Services
- Transportation and Logistics
- Telecommunications
- Utilities
- Social Networking

Cloud Computing

- Server to Server communication
- Distributed Internet applications over any TCP protocol
- Services on demand

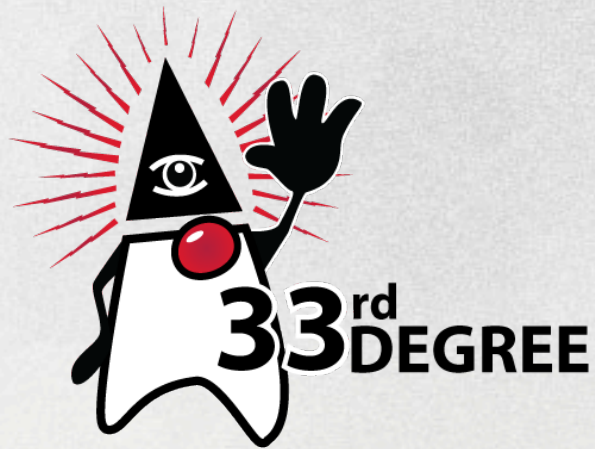
3G & 4G Mobile Networking

- Significant bandwidth reduction
- New Service Delivery
- New Customer Experience

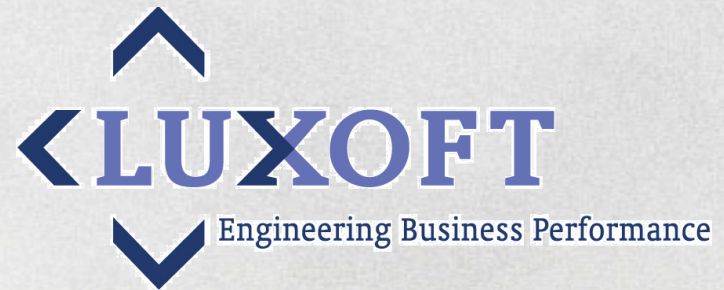


QUESTIONS

ANSWERS



Main sponsor



Arquillian: Real Java enterprise testing

Dan Allen

Picasso

Fractal TDD: Using tests to drive system design

Steve Freeman

Matejko + Canaletto

Pro Groovy
Dierk König

Malczewski + Chelmonski

“Same Data, Any API”,
making sure your application scales

Guy Korland



TM

KAAZING