Comet

AKA server push, HTTP push, HTTP streaming

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- Check that people are comfortable with JavaScript, Ajax, and Periodic Refresh. If there aren't many, then say that the talk won't take long!
- This is similar to Ajax, but isn't going to make the same impact, because the pay-offs aren't as big – it's more difficult to implement and understand.
- Coined by Alex Russell of the Dojo Foundation about two years ago. Name is a pun on Ajax being an American cleaning product.
- I hope the talk doesn't bore people because it isn't likely to be a lot of use to everyday development, even my own.
- Simon Willison was the inspiration, as he had a very good blog post back in December.

Comet

"Any technique that uses a long-lived HTTP connection to reduce
the latency with which messages are passed to the server."

Joe Walker
Buzzword Overload, 5th of Feb 2008
http://cometdaily.com/2008/02/05/buzzword-overload/

- The key word here is "any" – Comet doesn't necessarily mean just JavaScript.
- The reduction in latency can be brought about by using alternatives to regular polling.
- Comet Daily appeared in October of 2007 and sparked my interest. I feel that it's oriented towards Java programmers, a lot of the projects that the authors work on are Java based or inspired – Dojo, DWR (Dynamic Web Remoting), the Jetty/Liberator web server. There's one guy on there using Erlang!
- Or to put it another way...

Ajax and Comet

Ajax allows the client to call the server whenever an event occurs.

The aim of **Comet** is to allow the server to do the same.

- Hence Comet is sometimes referred to as Reverse Ajax.
- If the server is able to respond to clients whenever it likes then real-time broadcasting is possible – all of the users of a page can be notified of any changes made by other users.
- There have been attempts at this for years – as far back as 1995 when Netscape implemented "Server push" as part of Navigator, it used XHR multipart.
- Most people were still on dial-up back then, so they didn't want to send requests to often.
- A number of companies have made a business out of doing this with intranet applications like browser-based stock tickers for trading firms.

Key Benefit

If the server is able to respond to its clients at
any time then real-time broadcasting is possible.

Changes to a page can be shared between all clients,
without those clients needing to make a request.

Uses

- Live chat - GTalk in GMail, Meebo, and Facebook

- Collaborative editing - JotSpot Live (now Google Sites)

- Real-time stock tickers - Lightstreamer, Caplin Trader

- Real-time news aggregation - KnowNow

- Facebook Chat wasn't live when I gave the first version of this talk so I didn't know what it was using. It uses a Comet technique known as Long Polling which I'll go into.
- Meebo is an instant messaging aggregator.
- Google Sites only launched recently as part of Google Apps but probably doesn't support the collaborative editing that JotSpot Live did. You had to pay for JotSpot Live.
- Alex Russell used to work for JotSpot.
- Caplin are a British company and have a free Comet server called Liberator, I assume that the trading software had security implications so couldn't use Flash. If you were getting sent false data about trades then you would end up in a lot of trouble!

Comet is a hack

"Comet is a giant hack. Even when it works flawlessly and efficiently, bringing us real-time interactive applications, deftly weaving around firewalls and browsers, avoiding unfriendly side effects, and cutting latency to near zero, it does so using mechanisms unforeseen by browser vendors, and unspecified by web standards."

Jacob Rus
The Future of Comet: Part 1, Comet Today, 11th of Dec 2007
http://cometdaily.com/2007/12/11/the-future-of-comet-part-1-comet-today/

– Jacob Rus works on a Comet server written in Python called Orbited.

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But Ajax was a hack too!

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Techniques for Real-Time Updates

- Polling – Although Comet is intended as an alternative to polling, the Bayeux protocol expects implementations to include it so that it can be used when regular Comet techniques fail for whatever reason.
- I'm not going to go into detail about streaming, because it is very dirty and some of the audience may not be interested. Simon Willison's excellent talk in December covers it in quite a bit of depth. Flash can also be used as a streaming transport.
- If you use streaming then the client-side has to split the response up.
- Long polling is a simple cross-browser solution, and is becoming popular, but only if your server can handle it...

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  - The whole response gets flushed every time:

    - "1", "12", "123" instead of "1", "2", "3".

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  - Works in every browser that supports XHR.

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Long-polling

- Receive a request and hold the response open until there are events to deliver.

- Goal is to always have a pending request available.

- Client will be told to reconnect after a period (say 2 mins.)

- Fall back to normal polling if there are problems.

- POST either as text/json, or the "message" parameter of a application/x-www-form-urlencoded.
- POST response of type text/json.
- Long-polling will back off if it can't establish a connection and the polling interval will increase.
- The client should reconnect if the connection is lost. Reconnect after 2 mins is to avoid being disconnected by firewalls.
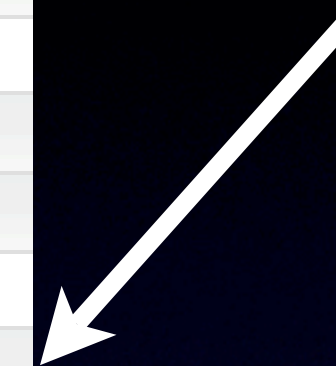
Here's where I reconnected after receiving a response

Here's my pending request

Here's where I timed-out and reconnected

Long polling and Firebug

The intervals between reconnects can be altered, as with smart polling.

Two connection problem

- HTTP 1.1 specification states that "A single-user client should not maintain more than 2 connections with any server or proxy".

- If the long-poll request is open and the page is loading, standard Ajax requests will be denied.

- Solved by creating a separate hostname (usually a subdomain) for Comet requests.

- Bayeux uses JSONP for cross-domain requests.

Server Load

- Each open long-poll will require a thread on a traditional synchronous server - this won't scale to large numbers.

- Solution is asynchronous request handling - share threads between connections (as most are idle). The thread polls each connection to see if they are ready to send or receive.

Bayeux

Bayeux Protocol

- Channels

- Publish/Subscribe to those channels

- Messages are JSON

- Two main connection types:

  - Long-polling

  - Callback-polling (a cross-domain form of regular polling)

• Origins of the name – Halley's Comet appears in the Bayeux
 tapestry

Client-side Bayeux

- From `dojox.cometd`

- Four main functions:

  - `init(address)`

  - `subscribe(channel)`

  - `publish(channel, message)`

  - unsubscribe(channel)

- jQuery: http://plugins.jquery.com/project/Comet

- The client-side API is very simple, a point that Simon Willison made.
- Any client-side implementation should be able to talk to any server side implementation.
- This is currently implemented by dojox.cometd.

Bayeux Implementations

- Java - Jetty has cometd support

  - http://www.mortbay.org

- Python - Twisted Cometd Server

  - http://svn.xantus.org/shortbus/trunk/cometd-twisted/

- Perl - cometd-perl from Six Apart

  - http://svn.xantus.org/shortbus/trunk/cometd-perl/

  - also an event-based server Perlbal - http://www.danga.com/perlbal/

- I don't think there are any .NET implementations yet, but that doesn't mean that a .NET application can't work with a Bayeux implemntation in another language, as it sits in the middle.
- Bayeux servers can work as routers, just passing the messages on to another server acting as a Bayeux client.

http://comet.martinowen.net
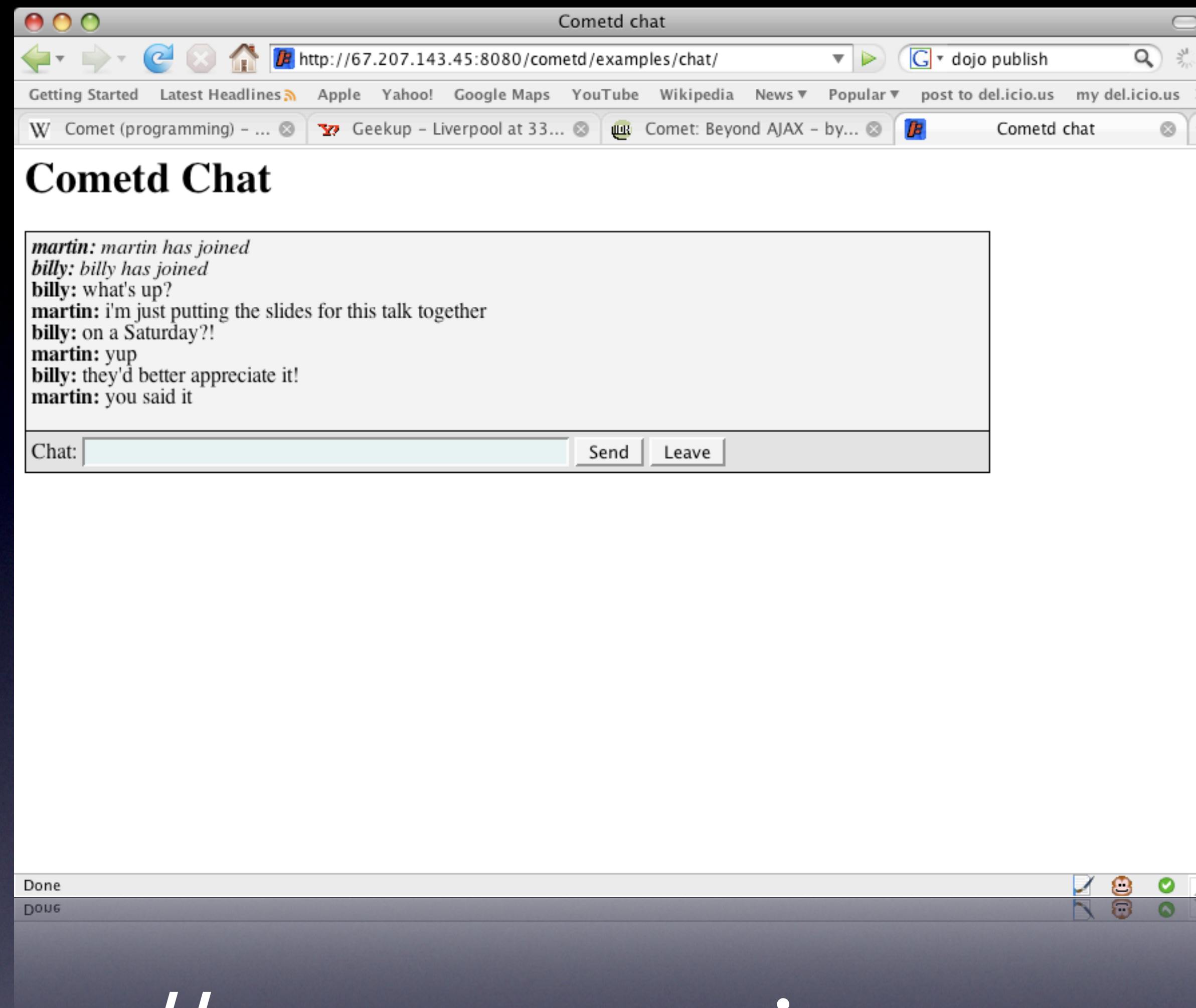
This is one of the demos that came with jetty.

The Future - HTML 5

- Current draft spec adds:

  - a new element: `<event-source>`

  - a new MIME type: `text/event-stream`

  - a new event: `message`

  - `<event-source src="http://stocks.example.com/ticker.php"`
    `onmessage="var data = event.data.split('\n');`
    `updateStocks(data[0], data[1], data[2]);">`

  - event-stream: `"data: YHOO\ndata: -2\ndata: 10"`

- HTTP isn't going to change

This is already implemented in Opera 9 (I'm not sure how complete it is).
The server side remains the same.

What's wrong with Flash?

- Not available on certain mobile devices (iPhone)

- More likely to be blocked by firewalls

- Proprietary

- JavaScript hackers love JavaScript!

- I know some people may not agree with this slide.
- Michael Carter had a Y-Combinator meeting with Paul Graham about starting a company that would develop various Comet-based widgets. Paul Graham asked him what was wrong with Flash for doing this kind of thing.
- Google go out of there way to avoid Flash, but Google Analytics uses it now.
- Is there an ECMA standard ActionScript?

Further resources

- Comet Daily - http://cometdaily.com

  - Posts from various experts, started last October

- Cometd project - http://cometd.com

- Simon Willison - http://simonwillison.net/2007/Dec/5/comet

  - Very inspiring post after his talk at Yahoo

  - Slides at http://www.slideshare.net/simon/time-for-comet

There is a lot of activity on Comet Daily, check it out.
Cometd lists the various implementations of Bayeux that I've listed.
Simon Willison goes into lots of detail about browser hacks.

Thank You

- This is all developing rapidly.

- Follow the discussions at Comet Daily.

- Bayeux may change.

- Server-sent events in HTML 5 may change.

- Comet techniques will become more widespread.

Experiment, read the Wikipedia article and have a play with a Comet server.