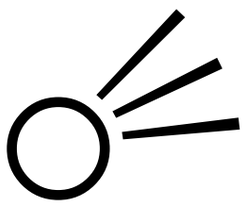
Comet 

The Rise of Highly Interactive Web Sites

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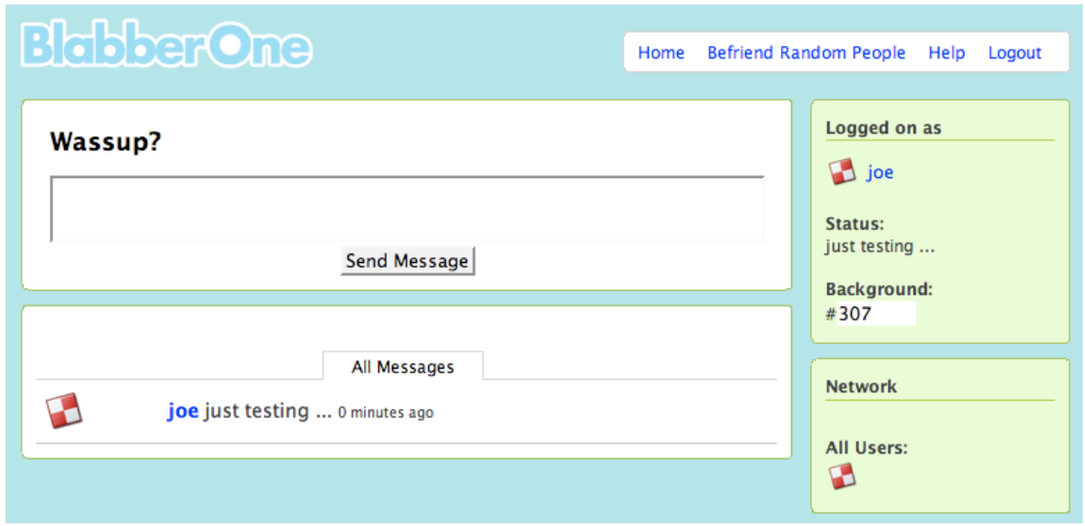
Introduction

Perspectives on Comet

blabberone.sitepen.com

Architectures

Technical



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Long lived HTTP

A pattern not a protocol

Distinct from polling

Reverse Ajax == Comet + Polling

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Pushing data to the browser without needing the browser to ask

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AJAX

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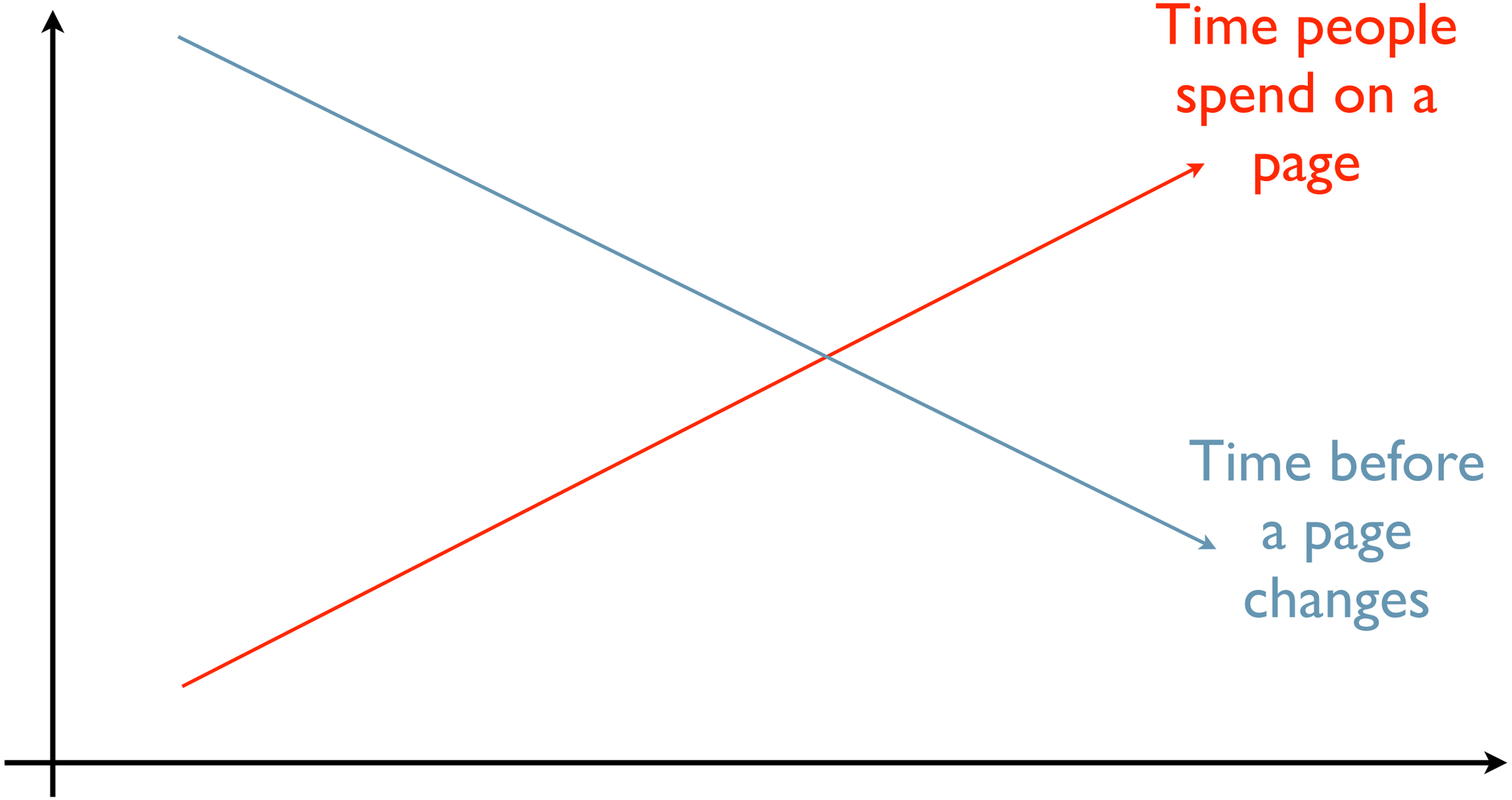
Comet

Why?

Ajax made individual pages interactive places to explore

More and more of the data on the web is social and therefore changing

Why?


Time people spend on a page
Time before a page changes
Evolution of the Web

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Server

Time

Ajax Interaction

Server

Time

Comet Updates State

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Perspectives

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Comet is for ...

- keeping me up to date

... with ...

- every*one* else, and
- every*thing* else

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Every*one* else

What are the other guys are doing?

- Editing things that interest you
- Talking to/about you
- Saying and doing interesting things
- Playing games

Every*thing* else

What is System X doing?

- Data streaming
- Async processing
- Transaction fulfillment

Chat is everywhere: GMail, Meebo, Facebook ...

Collaborative Editing: GDocs, Thinkature

Streaming Financial Data: Lightstreamer, Caplin

Asynch Updates: GMail, Yes.com

Online Gaming: GPokr, Chess.com

Async Server Processing: Polar Rose

Before comet,
services were one way.
Now services can talk back

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Async made easy

- fire and forget
- growl/toast for the web

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Programming model changes:

- Waiter vs. Buffet
- The server is an event bus
- State changes are events!

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Changing the user experience

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Architectures

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Inboard vs Outboard

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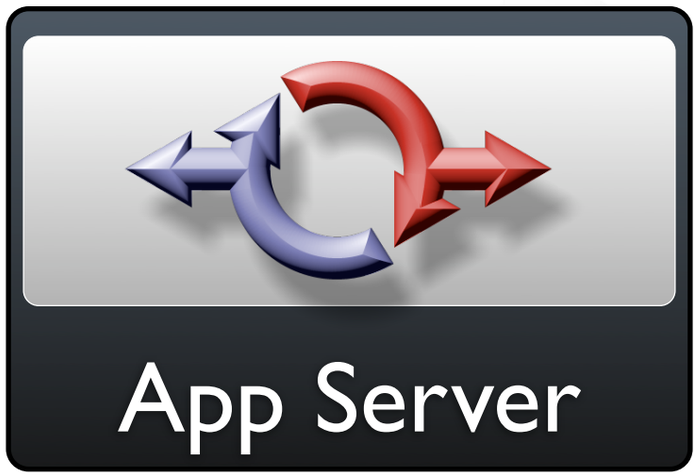

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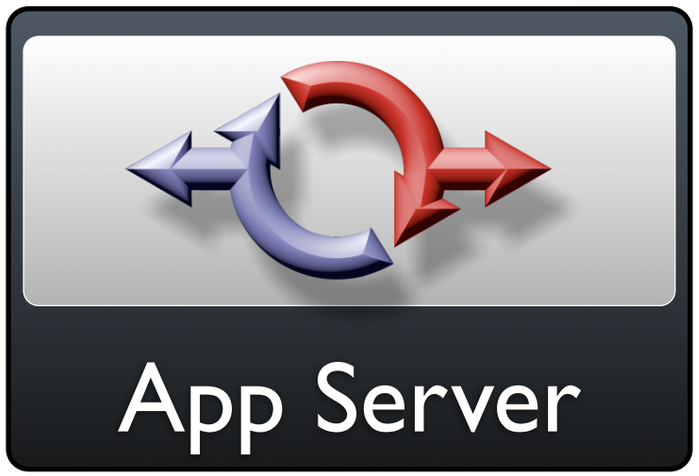

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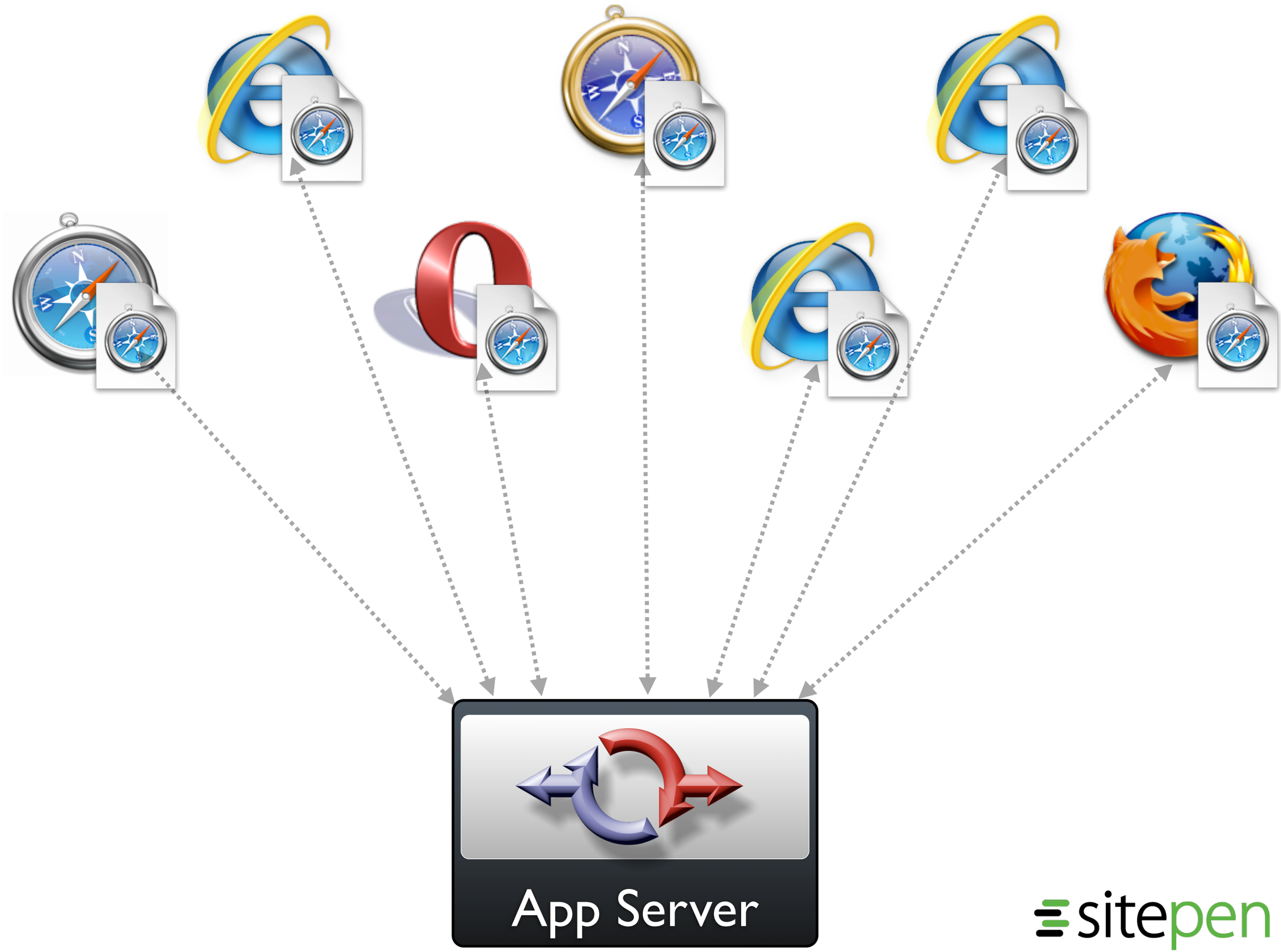

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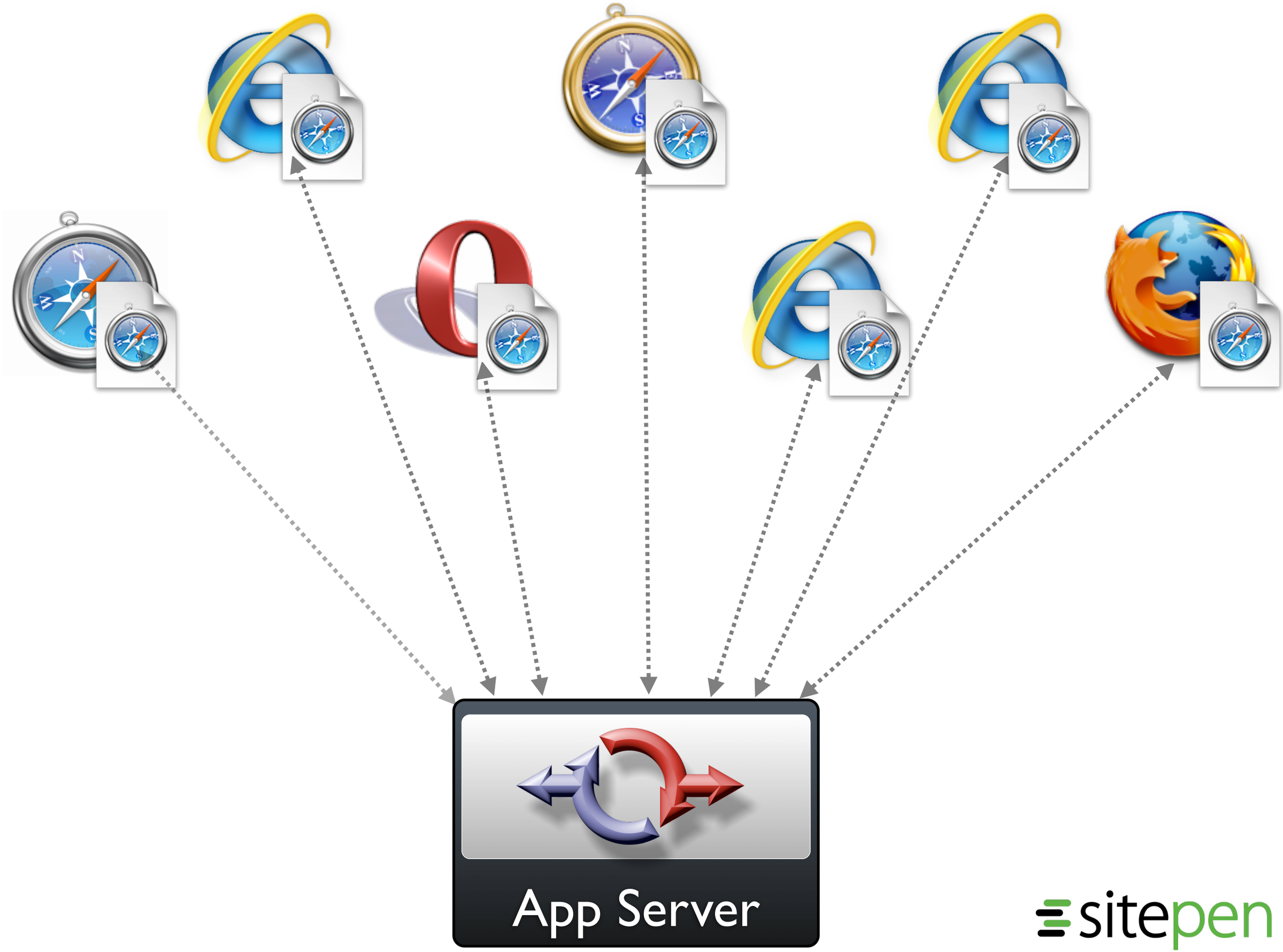

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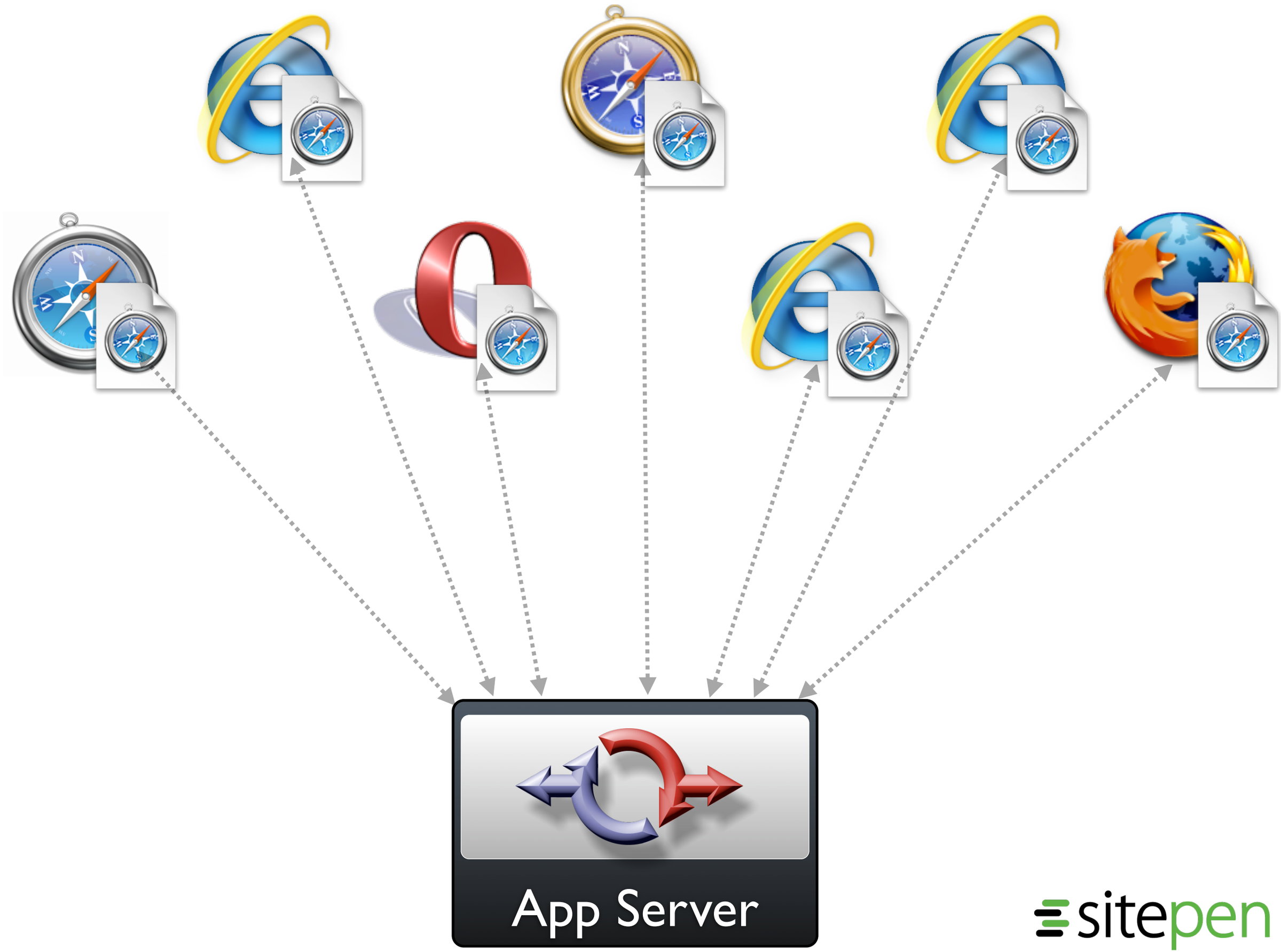

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Inboard (e.g. DWR)

- Simpler for new development
- Harder scaling
- Comet is just part of the infrastructure

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CometD

App Server

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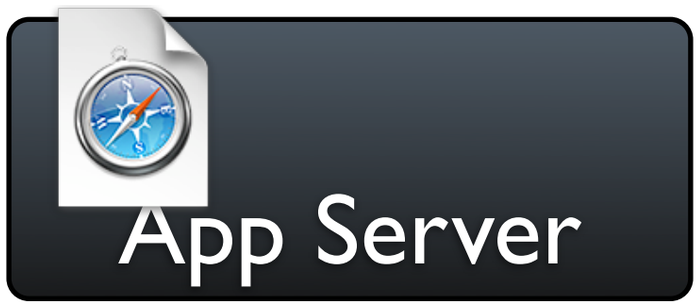
CometD



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CometD

App Server

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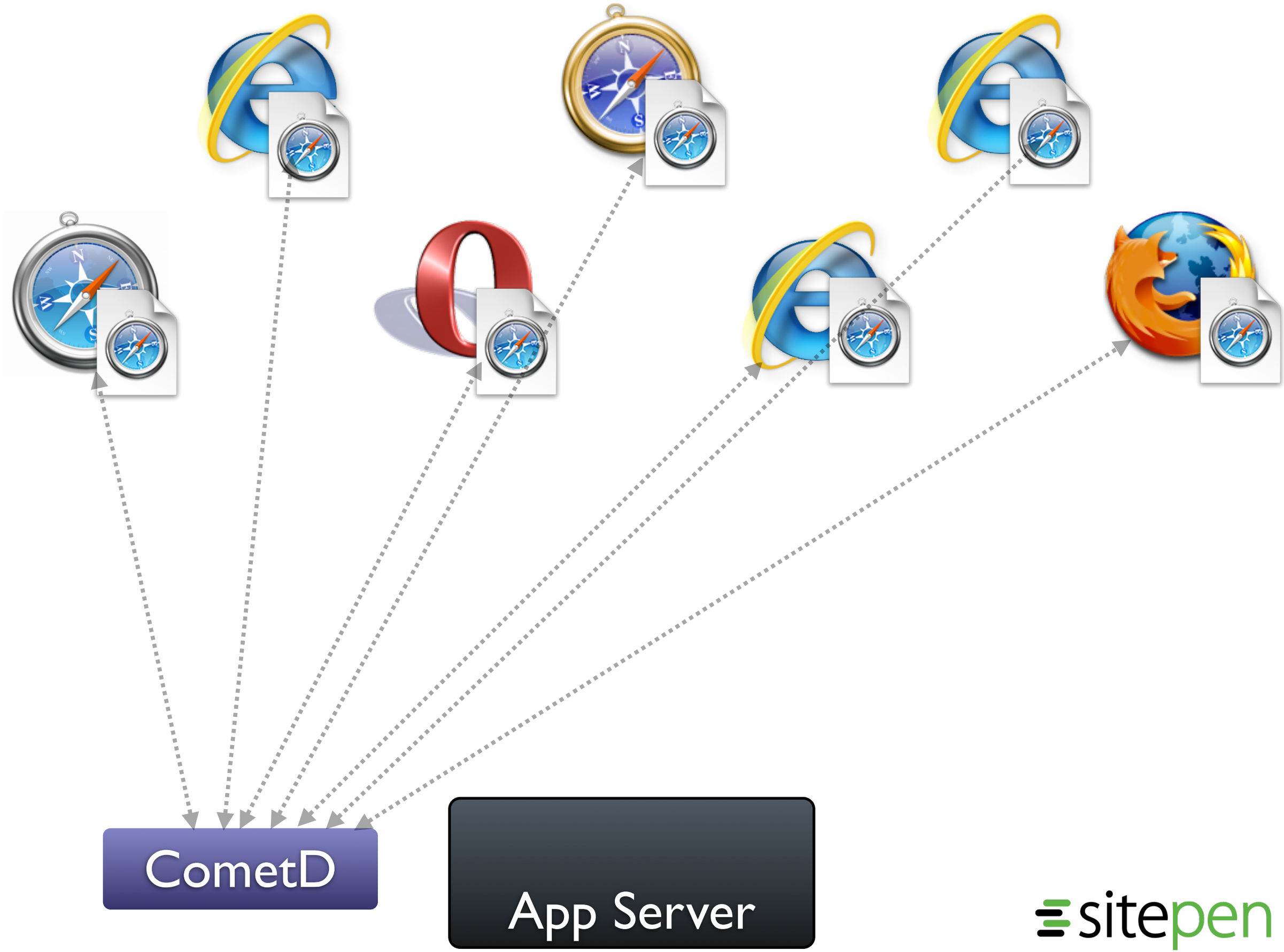

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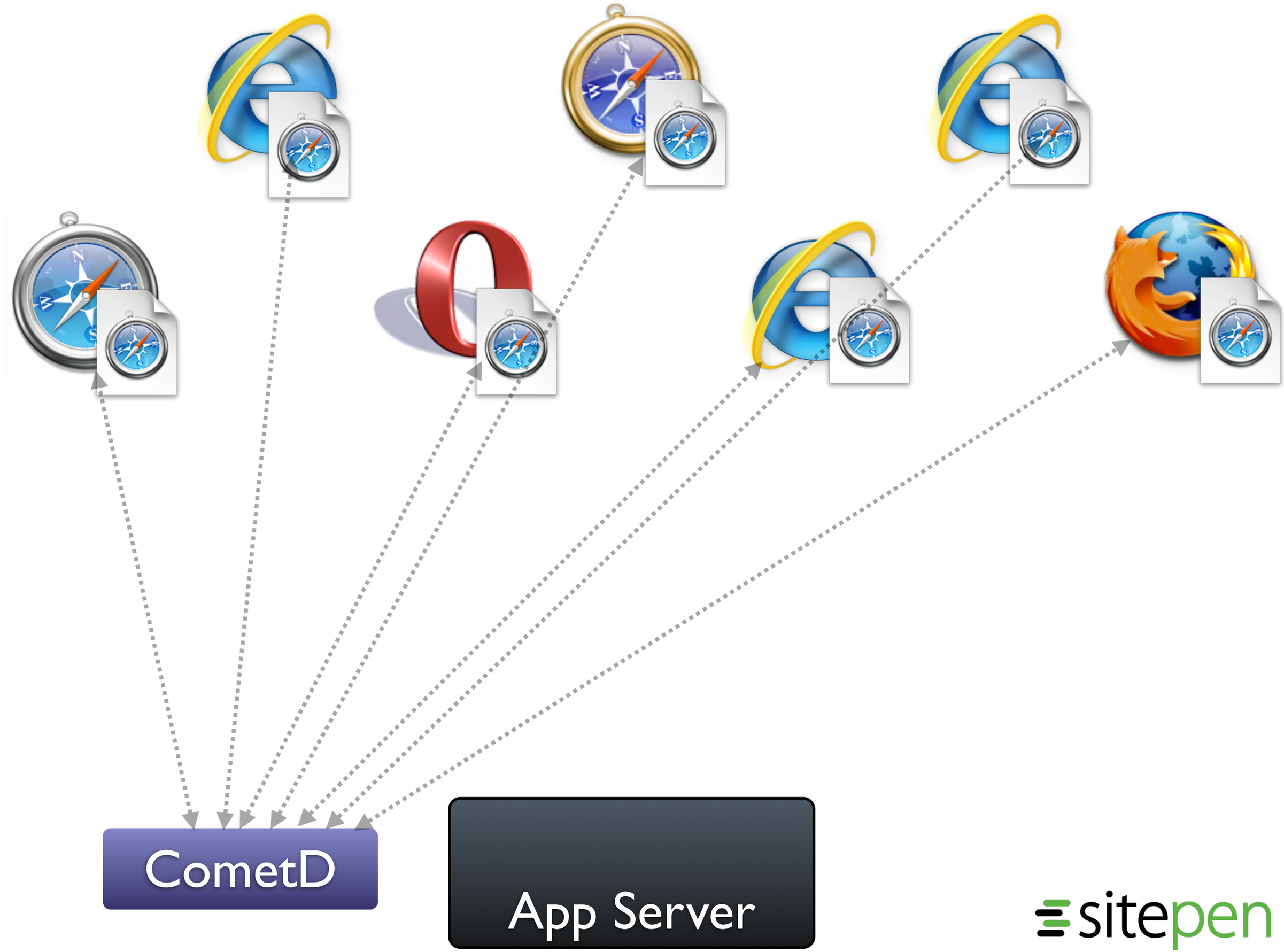

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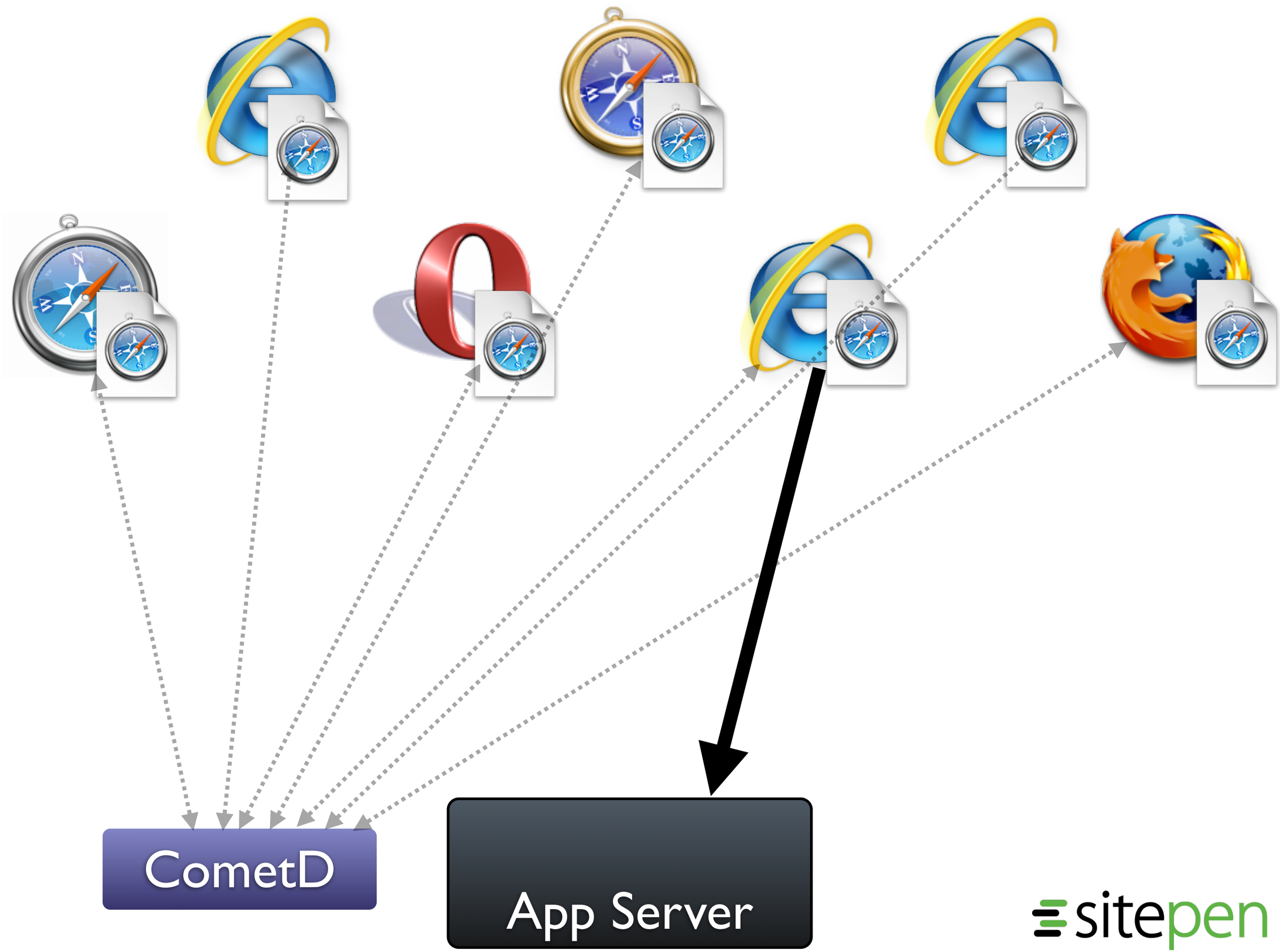

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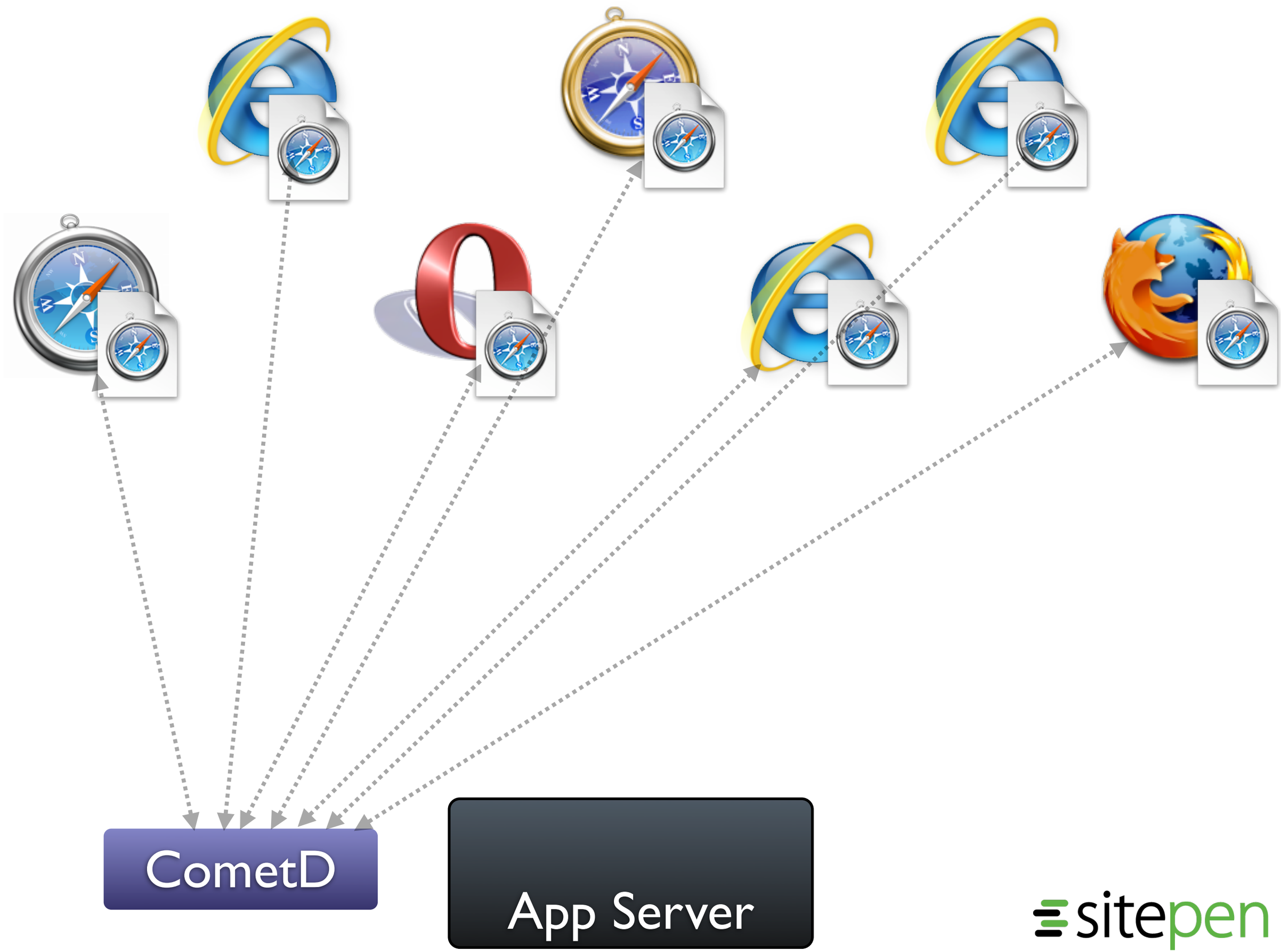

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Outboard (e.g. Cometd):

- Add-on that doesn't affect the server
- Easier to add to existing apps
- Harder to get started

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Demo

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On the Client

share.html

```
<p>Share price:
  <span id='price'>
  </span>
</p>
```

On the Server

On the Client

share.html

```
<p>Share price:
  <span id='price'>
  </span>
</p>
```

On the Server

```
import org.directwebremoting.ui.dwr.Util;

Util.setValue("price", 42);
```

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On the Client

share.html

```
<p>Share price:
  <span id='price'>
  </span>
</p>
```

On the Server

```
import org....scriptaculous.Effect

Effect.shake("price");
```

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On the Client

share.html

```
<p>Share price:
  <span id='price'>
  </span>
</p>
```

On the Server

```
import jsx3.gui.*

Server s = GI.getServer("app");
Button b = s.getJSXById("id", Button.class);
b.setEnabled(Form.STATEDISABLED, true);
```

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On the Client

share.html

```
<p>Share price:
  <span id='price'>
  </span>
</p>
```

On the Server

```
import org.dojotoolkit.dijit.Dijit;
import org.dojotoolkit.dijit.Editor;

Editor e = Dijit.byId("price", Editor.class);
e.setValue(42);
```

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On the Client

share.html

```
<p>Share price:
  <span id='price'>
  </span>
</p>
```

On the Server

```
ScriptSessionFilter f = ...;

Runnable r = new Runnable() {
    public void run() {
        ...
    }
};

Browser.withAllSessionsFiltered(f, r);
```

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On the Client

share.html

```
<p>Share price:
  <span id='price'>
  </span>
</p>
```

On the Server

```
String s = "dwr.util.setValue('price', 42)";
ScriptBuffer b = new ScriptBuffer(s);

for (ScriptSession session : sessions) {
  session.addScript(b);
}
```

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On the Client

share.html

```
<p>Share price:
  <span id='price'>
  </span>
</p>
```

On the Server

Diagrams

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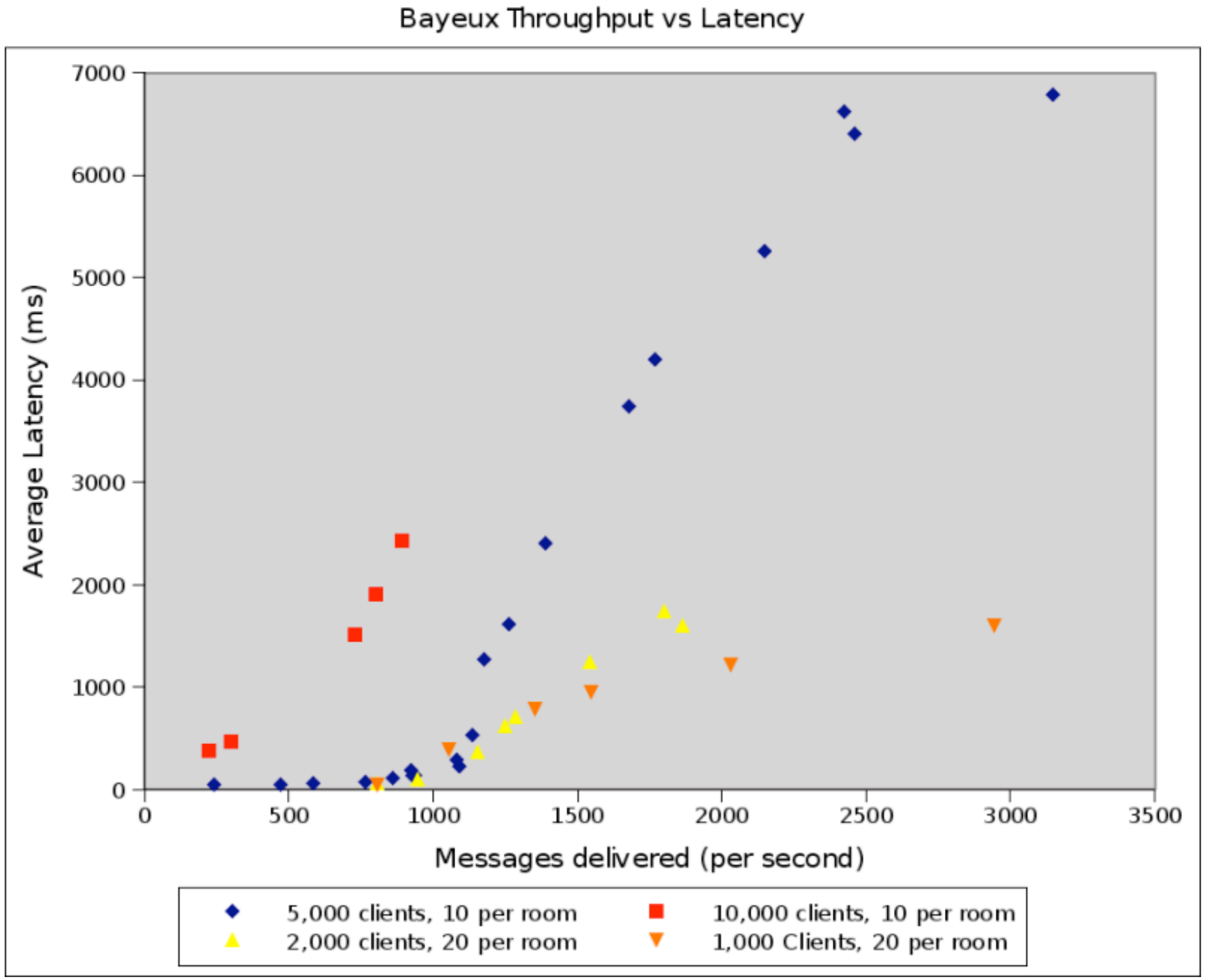
Bayeux Performance



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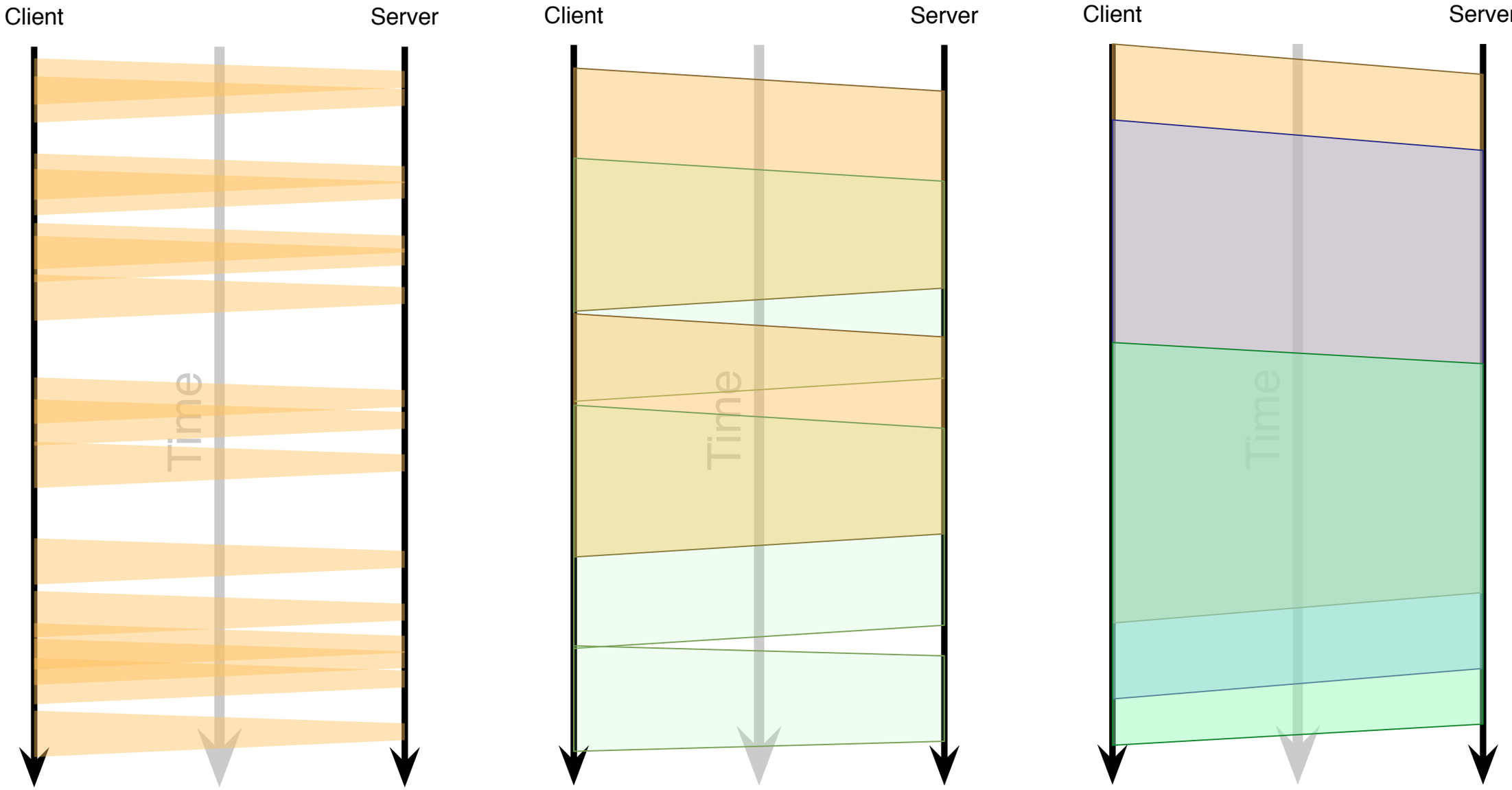

Load Profiles

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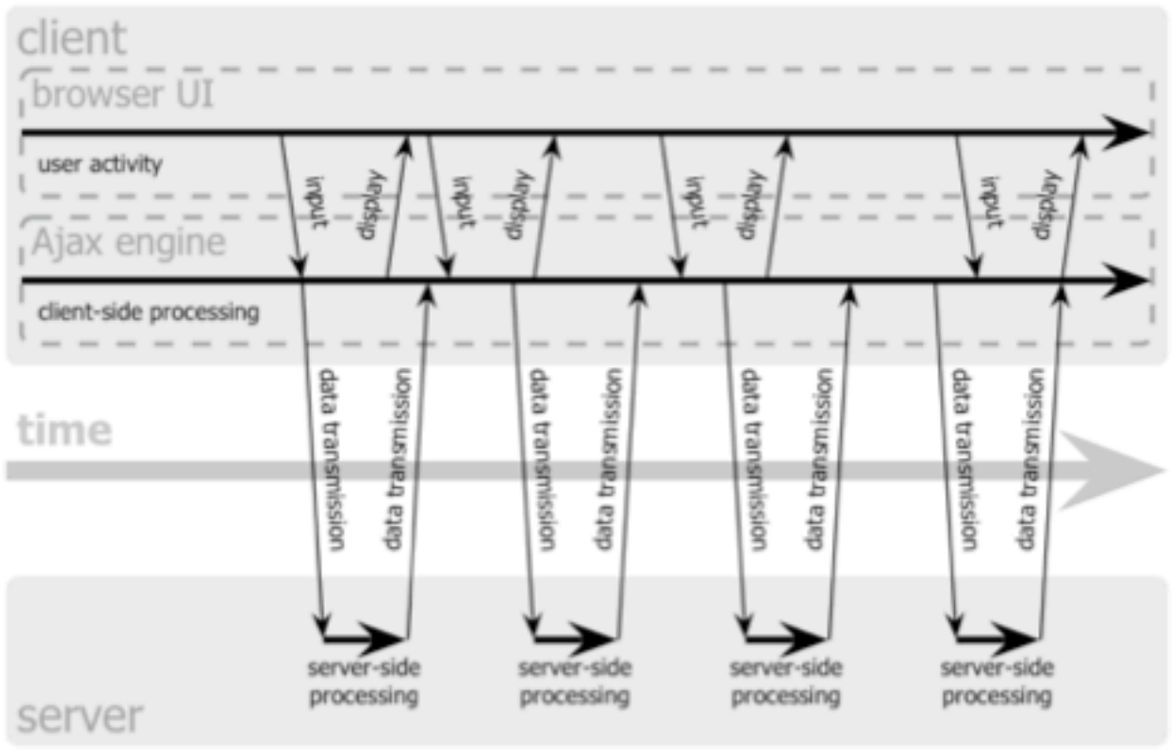
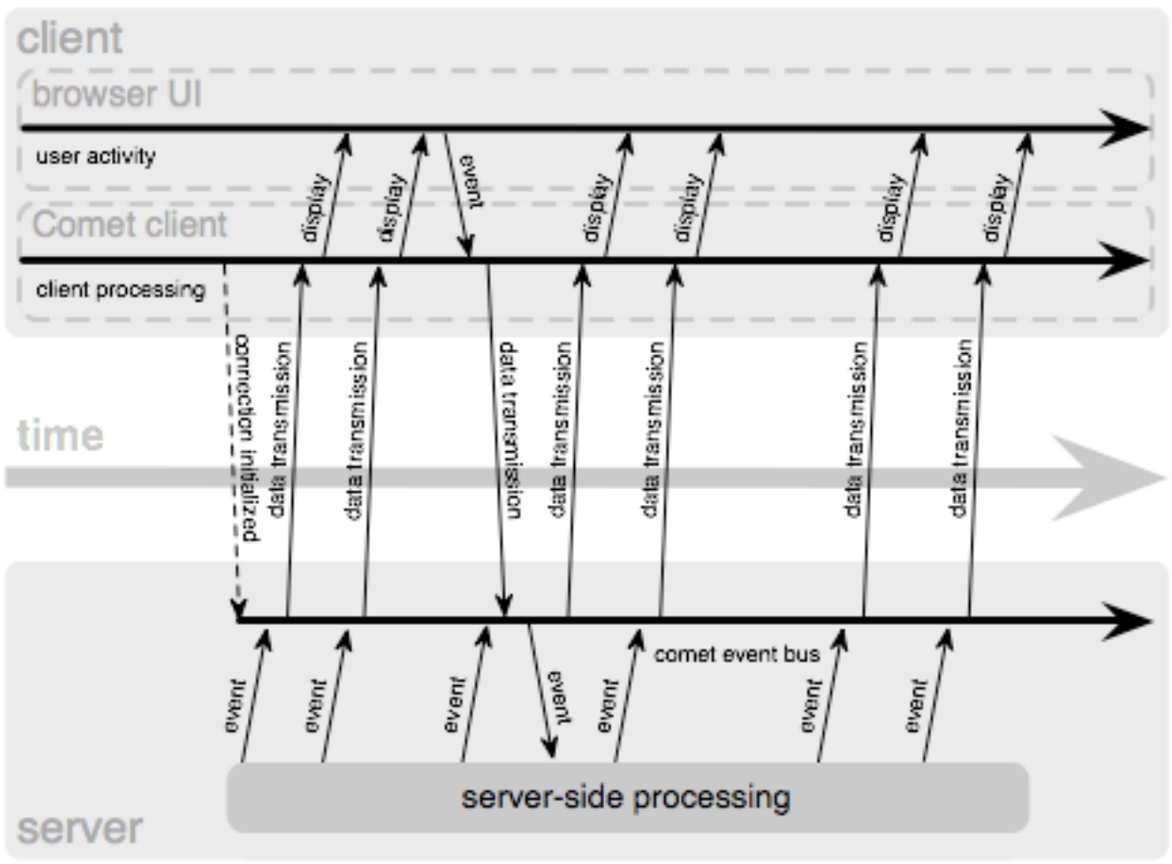
Ajax web application model (asynchronous)



Comet web application model



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client one

client two

.js

.js

ajax

ajax

request handler

app logic

database

server

Time

client one

client two

.js

.js

ajax

comet

request handler

app logic

database

server

Time

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But ...

It's a hack ... for now

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Client Issues

Maximum of 2 connections per browser per host (IE7/6)

- Coordination using `window.name` in the client
- or cookies using a server
- or use multi-home DNS

HTTP streaming is download only (chunked mode)

TCP connections are kept alive under HTTP 1.1

Server detection of failed connections

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Not A Hack Much Longer

New browsers will make it better:

- IE 8, FF3 raise number of connections
- HTML 5 event sources
  - Opera already implements
- HTML 5 DOM Storage provides way to synchronize across tabs and frames

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Client How-to: Forever Frame

Client posts an iframe which doesn't close quickly

- Send text/plain and poll in browser (not IE)
- Send text/plain with 4k whitespace to flush IE
- Flush with a <script> tag for each data block

The iframe will need killing and restarting to avoid memory leak

But IE clicks when iframe starts

Client How-to: Long Polling

Client makes an XHR request which does not return immediately

IE disallows reading XHR.responseText until connection is closed

Although you can keep XHR frames open forever, generally you poll

Client How-to: htmlfile

'htmlfile' is an ActiveX control like XHR:

```
htmlfile = new ActiveXObject("htmlfile");
htmlfile.open();
htmlfile.write("<html><iframe
src='javascript:void(0)'
     onload='cleanup();'></iframe></html>");
htmlfile.close();
htmlfile.parentWindow.dwr = dwr;
```

Avoids 'clicking', but doesn't work in IE/Server 2003

Not supported in Firefox, Safari, Opera, etc.

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Client How-to: Callback Polling

Create <script> blocks pointing to any domain

Create new script block when last completes

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Client How-to: Other Options

Mime Messaging:

- Uses Multipart Mime in HTML: x-multipart-replace
- Not in IE
- Excellent performance

Server-Sent Events: WHATWG, but Opera only

Flash: We probably have enough other options that we don't need to get into plugins

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Server Tricks

Watch out for stream-stoppers

- Apache: mod_jk
- Buggy network proxies
- Various application firewalls

Watch out for thread starvation

Does that stop us?

Ajax is also a hack, but that hasn't stopped it

And Comet does work

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Comet vs. Polling

For Polling:

- More efficient for very low latencies
- Simpler to implement

For Comet:

- More efficient for all but very low latencies
- More adaptable

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