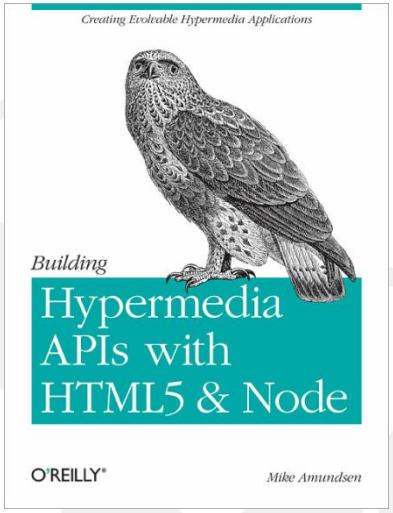
Mike Amundsen

The Costs and Benefits of Building Hypermedia APIs (with Node.js)



LAYER 7 TECHNOLOGIES

Mike Amundsen

- Author
- Presenter
- Software Explorer
- **Principal API Architect**

LAYER 7 TECHNOLOGIES

OK, let's get started…

Theonia

"a looking at, viewing, beholding”

LAYER 7 TECHNOLOGIES

Theory

"a looking at, viewing, beholding”

Praxis

“doing”

Practice

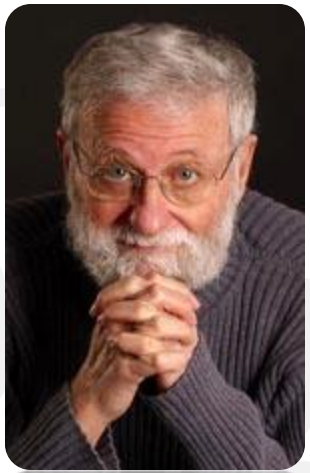
“doing”

First, a lesson to remember from Donald Norman…

Affordances

"The value of a well-designed object,
Is when it has such a rich set of affordances,
That the people who use it,
Can do things with it,
That the designer never imagined."

- Donald Norman



LAYER 7 TECHNOLOGIES

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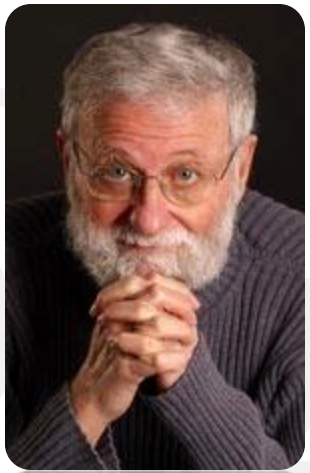

LAYER 7 TECHNOLOGIES

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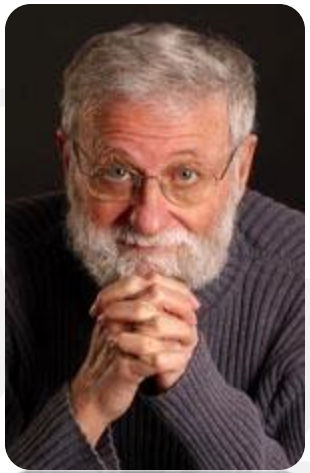

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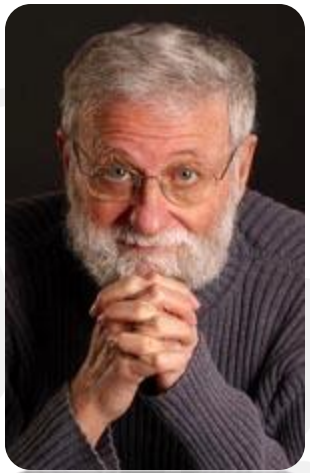

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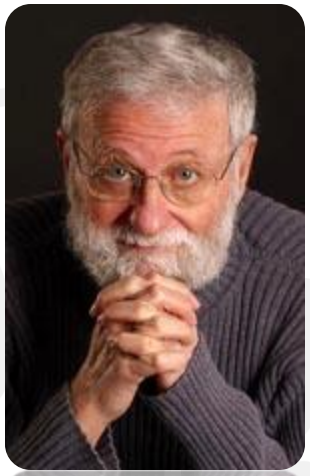


Some background…

Affordances

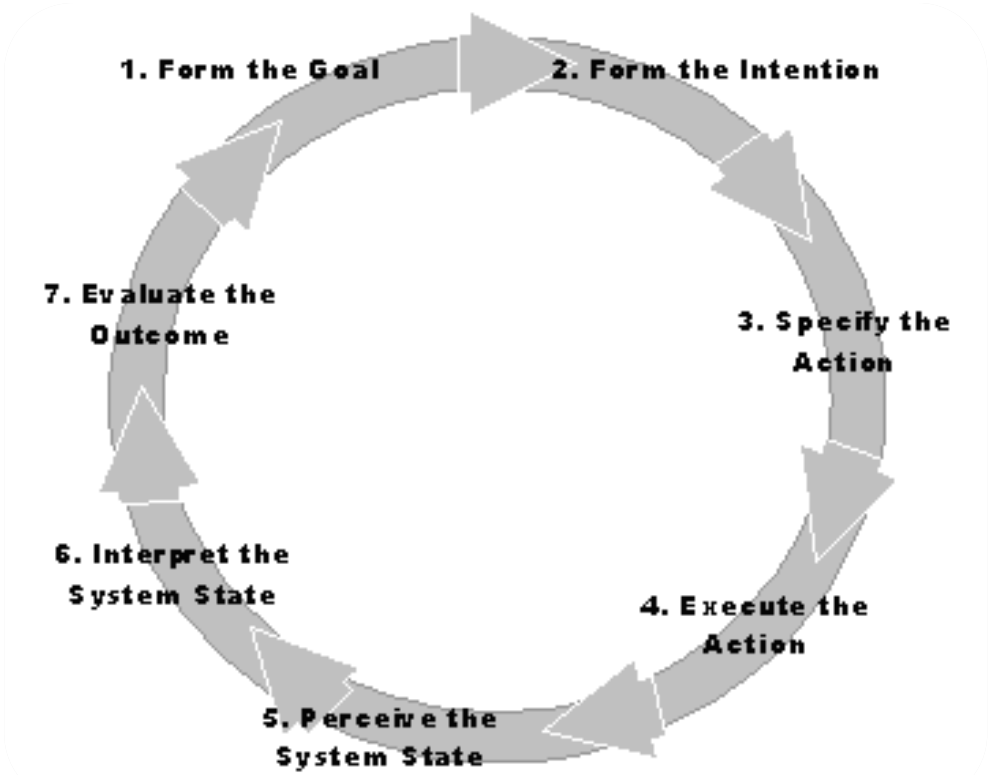
- The *foundation* for perception is ambient, ecologically available information.

- **Affordances** are all "action possibilities" latent in the environment.

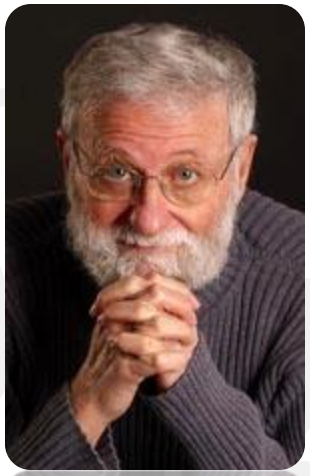
Theory of Affordances, 1979
- James J. Gibson

Affordances

- Seven Stages of Action



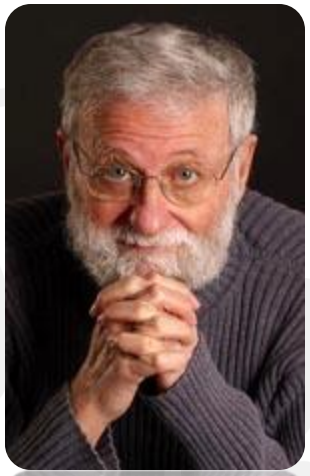
The Design of Everyday Things, 1988 - Donald Norman



Affordances

Knowledge (“head” vs. “world”)

Property	Knowledge in the World	Knowledge in the Head
Learning	Learning not required. Interpretation substitutes for learning. How easy it is to interpret information is the world depends upon how well it exploits natural mappings and constraints.	Requires learning, which can be considerable. Learning is made easier if there is meaning of structure to the material (or if there is a good mental model).
Efficiency of use	Tends to be slowed up by the need to find and interpret the external information.	Can be very efficient
Ease of use at first encounter	High	Low



Affordances

- *"Hypermedia is defined by the presence of application control information embedded within, or as a layer above, the presentation of information“ (2001)*
- *“When I say [Hypermedia], I mean the simultaneous presentation of information and controls such that the information becomes the affordance through which the user obtains choices and selects actions” (2008)*

Architectural Styles and the Design of Network-based Software, 2001
- Roy T. Fielding

LAYER 7 TECHNOLOGIES

Affordances

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LAYER 7 TECHNOLOGIES

Affordances

Affordances make Hypermedia possible.

Affordances

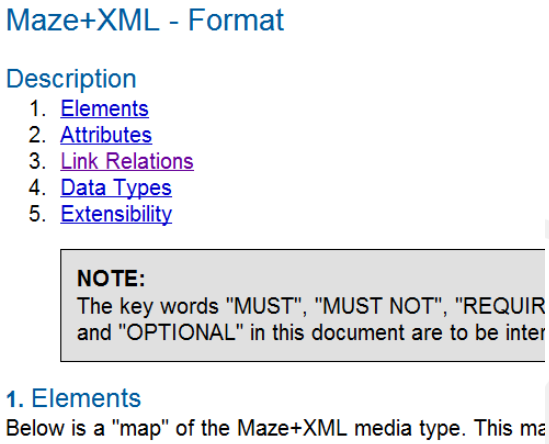
Hypermedia
can provide a
Rich Set of Affordances

Design #1:
A big pile of Affordances

Maze+XML

- **Maze+XML** media type
- First design in late 2010, registered w/ IANA 2011
- *"…an XML data format for sharing maze state information between clients and servers. It can be used to implement simple mazes, adventure games, and other related data."*
- *Read-only navigational links*
- *Nine link identifiers:*

  collection, maze, start, exit, current, north, south, east, west


Maze+XML - Format

Description

1. Elements
2. Attributes
3. Link Relations
4. Data Types
5. Extensibility

NOTE:
The key words "MUST", "MUST NOT", "REQUIR
and "OPTIONAL" in this document are to be inter

1. Elements

Below is a "map" of the Maze+XML media type. This ma

LAYER 7 TECHNOLOGIES

Maze+XML

Message

```
1  <?xml version="1.0" encoding="UTF-8" standa
2  <maze version="1.0">
3    <cell>
4      <link href="..." rel="current" />
5      <link href="..." rel="west" />
6      <link href="..." rel="east" />
7    </cell>
8  </maze>
```

Server

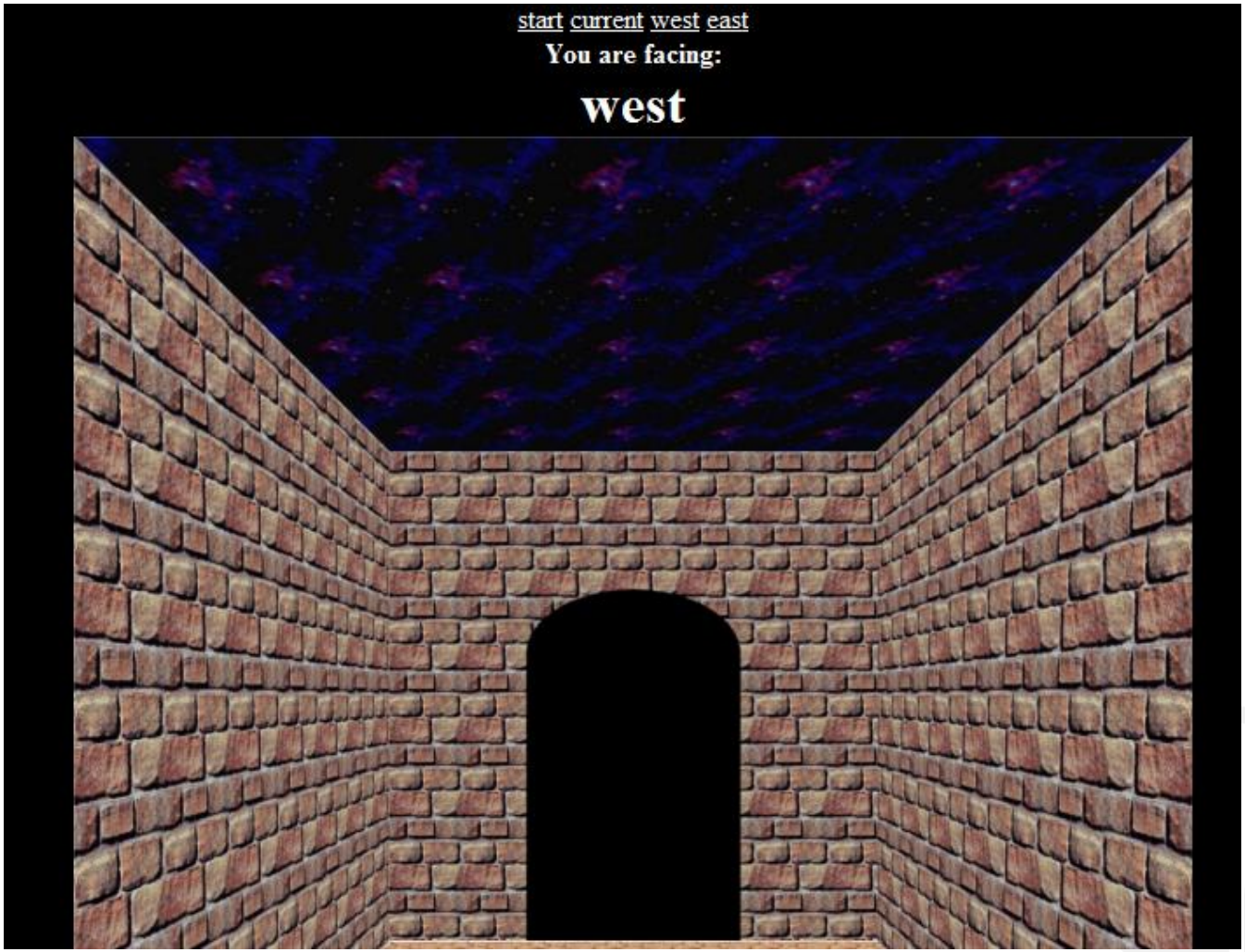
Maze+XML

```
1
2  private void Get(string[] accepted)
3  {
4    string accept = MimeParse.BestMatch(accepted);
5    if(accept==string.Empty)
6    {
7      Options(406);
8      return;
9    }
10
11   id = ctx.Request["id"];
12   mv = ctx.Request["mv"];
13   if (id == string.Empty)
14   {
15     rtn = GetMazeList(accept);
16   }
17   else
18   {
19     if (mv != string.Empty)
20     {
21       rtn = GetMove(id, mv, accept);
22     }
23     else
24     {
25       rtn = GetMaze(id,accept);
26     }
27   }
28
29   ctx.Response.StatusCode = 200;
30   ctx.Response.StatusDescription = "OK";
31   ctx.Response.ContentType = accept;
32   ctx.Response.Write(rtn);
33 }
```

LAYER 7 TECHNOLOGIES

Maze+XML

Client

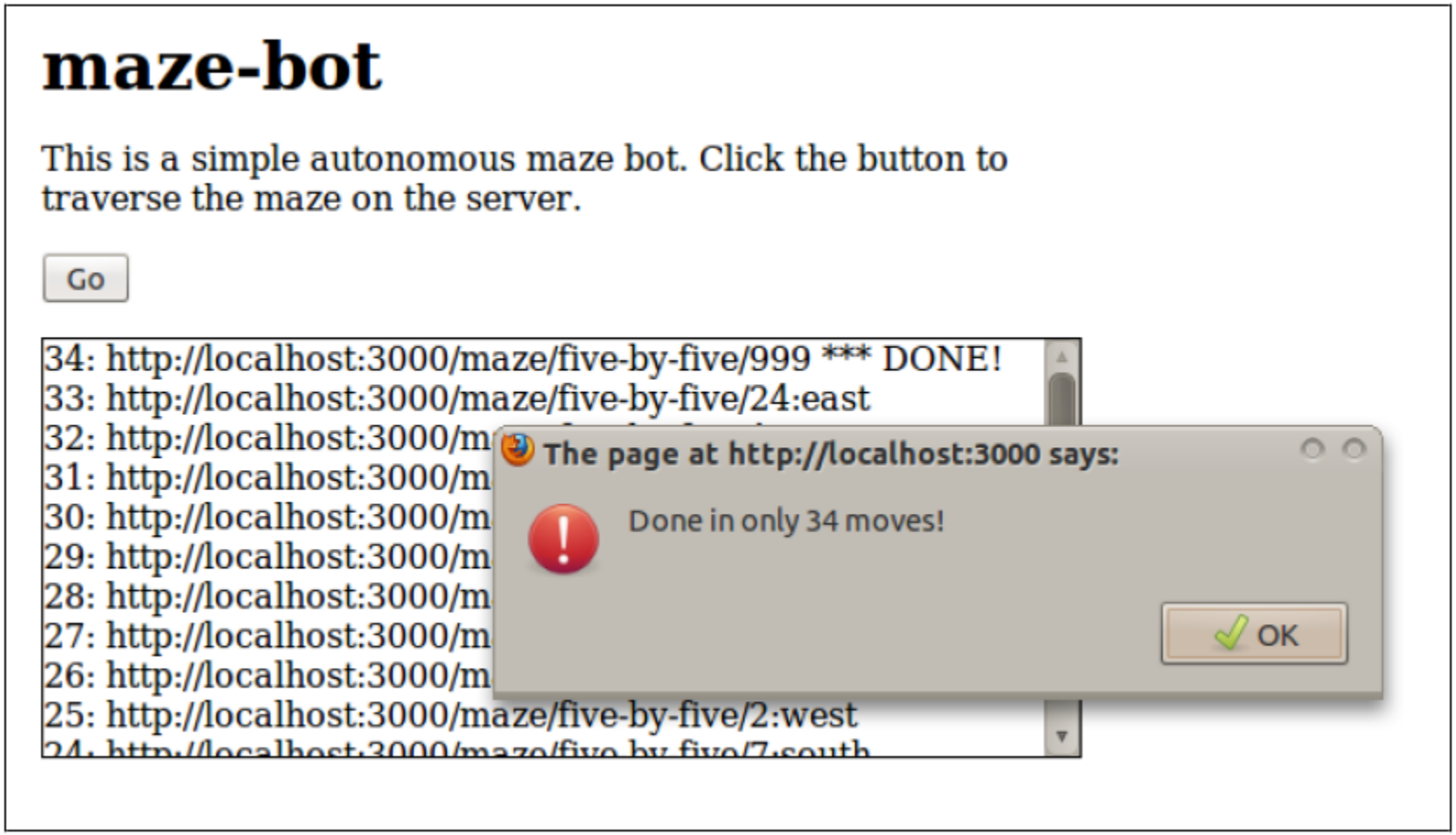


Maze+XML

Client

Maze+XML

Client



Maze+XML

Client Code

```
110     // is there an exit?
111     href = getLinkElement('exit');
112     if(href !== '') {
113       g.done = true;
114       printLine(href + ' *** DONE!');
115       alert('Done in only ' + --g.idx + ' moves!');
116       return;
117     }
118
119     // is there an entrance?
120     if(flg === false && g.start === false) {
121       href = getLinkElement('start');
122       if(href !== '') {
123         flg = true;
124         g.start = true;
125         g.facing = 'north';
126         printLine(href);
127       }
128     }
129
130     // ok, let's "wall-follow"
131     if(flg === false) {
132       rules = g.rules[g.facing];
133       for(i = 0, x = rules.length; i < x; i++) {
134         href = getLinkElement(rules[i]);
135         if(href !== '') {
136           flg = true;
137           g.facing = rules[i];
138           printLine(href);
139           break;
140         }
141       }
142     }
143
144     // update pointer, handle next move
145     if(href !== '') {
```

LAYER 7 TECHNOLOGIES

Maze+XML

In the wild…

Maze+XML

- **Darrel Miller**
- *“A good example of using link relations to convey domain specific semantics.”*
- *“Has been a good test bed for trying to develop a UI transparently that tracks the state of the user agent as it navigates between representations.”*

LAYER 7 TECHNOLOGIES

Maze+XML

Darrel Miller – C#

```
var link = new Link() {Target = new Uri("http://amundsen.com/examples/mazes/2d/five-by-five/")};

restagent.NavigateTo(link);

var startlink = restagent.CurrentContent.GetLink<StartLink>();
restagent.NavigateTo(startlink);

// Pick first available door
var firstlink = (from lk in restagent.CurrentContent.GetLinks() where !(lk is CurrentLink || lk is
restagent.NavigateTo((Link)firstlink);

var linkfrom = firstlink;

while (restagent.CurrentContent.GetLink<ExitLink>() == null) {

    Link chosenLink = null;
    var availablelinks = (from lk in restagent.CurrentContent.GetLinks() select lk).ToDictionary(lk

    switch(linkfrom.Relation) {
        case "east":
            chosenLink = ChooseDoor(availablelinks, "south", "east", "nort
            break;
        case "west":
            chosenLink = ChooseDoor(availablelinks, "north", "west", "sout
            break;
        case "south":
            chosenLink = ChooseDoor(availablelinks, "west", "south", "east
            break;
        case "north":
            chosenLink = ChooseDoor(availablelinks, "east", "north", "west
            break;

    }
    Console.WriteLine("Going : " + chosenLink.Relation);
```

LAYER 7 TECHNOLOGIES

Maze+XML

- **Yannick Loiseau**
- *“I can say that a non-restful architecture would have been a lot harder to deal with in bash, because hypermedia obviously made the maze exploration really easy”*
- *“I think that Link headers would be even easier to deal with…”*

LAYER 7 TECHNOLOGIES

Maze+XML

Yannick Loiseau - Python

```
#!/bin/env python
# Python solution to mamund's maze problem (functional style)
# see http://amundsen.com/examples/misc/maze-client.html

from xml.etree.ElementTree import XML
from httplib2 import Http

MAZE = "http://amundsen.com/examples/mazes/2d/five-by-five/"
RULES = {
    'east'  : ['south','east','north','west'],
    'south' : ['west','south','east','north'],
    'west'  : ['north','west','south','east'],
    'north' : ['east','north','west','south']
}

def get(uri):
    """ return the XML from the given uri """
    resp, content = Http().request(
                        uri,
                        headers={
                          'Accept':
                            "application/vnd.amundsen.maze+xml"})
    return XML(content)

def get_links(uri):
    """
    return a dict {rel: href} of the <link>s found at the given uri
    """
    return dict(
```

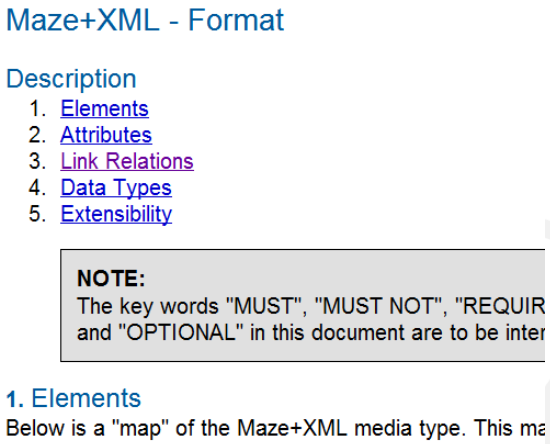
Maze+XML

Yannick Loiseau - Bash

```
49 }
50 #----------------------------------------------------------------------
51
52 #----------------------------------------------------------------------
53 function get {
54     # return the maze+xml from the given uri
55     local uri="${1:?}"
56     curl -sL --compressed \
57         -H 'Accept: application/vnd.amundsen.maze+xml' \
58         "$uri" |
59         tr '\n' ' ' | tr -s ' '
60 }
61
62
63 #----------------------------------------------------------------------
64 function get_links {
65     # return rel href for the given uri
66     local uri="${1:?}"
67     get "$uri" | grep -o '<link [^>]*/>' | tr "'" '"' |
68     grep -v 'rel="current"' |
69     while read line ; do
70         echo $(get_rel "$line") $(get_href "$line")
71     done
72 }
73 function get_href {
74      echo "$1" | sed 's!.*href="\([^"]*\)".*!\1!'
75 }
76 function get_rel {
77      echo "$1" | sed 's!.*rel="\([^"]*\)".*!\1!'
```

Maze+XML

- Characteristics
  - Read-Only navigational links
  - Limited set of identifiers
  - Domain specific
- Benefits
  - Simple, direct design
  - Easy to create servers/clients
  - M2M works when algorithm is available
- Costs
  - Limited reach
  - M2M clients challenge evolvability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Below is a "map" of the Maze+XML media type. This ma

LAYER 7 TECHNOLOGIES

H-Factors

“Pardon me, did you say ‘links’?”

H-Factors

- *"The **H Factor** of a media-type is a measure of the level of hypermedia support within that media-type."*
- *"**H Factor** values can be used to compare and contrast media types in order to aid in selecting the proper media-type(s) for your implementation."*

REST: From Research to Practice : Hypermedia Types, 2011
- Mike Amundsen

LAYER 7 TECHNOLOGIES

H-Factors

Analyzing Media Types

```
<html>
  <head>
    <title>H-Factor Sample</title>
  </head>
  <body>
    <img src="..." class="logo" />
    <p>
      <a href="..." class="home">Home</a>
    </p>
    <form action="..." class="search">
      <input name="search" value="" />
      <input type="submit" />
    </form>
  </body>
</html>
```

LAYER 7 TECHNOLOGIES

H-Factors

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H-Factors

Analyzing Media Types

```
<html>
  <head>
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  </head>
  <body>
    <LE src="..." class="logo" />
    <p>
      <LO href="..." class="home">Home</LO>
    </p>
    <LT action="..." class="search">
      <input name="search" value="" />
      <input type="submit" />
    </LT>
  </body>
</html>
```
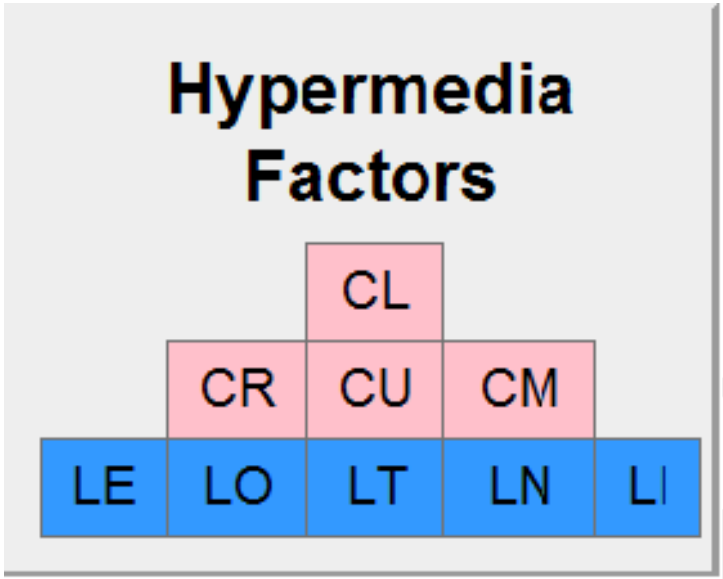

LAYER 7 TECHNOLOGIES

H-Factors

- There are five LINK Factors (LO, LE, LT, LI, LN)
- There are four CONTROL Factors (CR, CU, CM, CL)



H-Factors

- **There are five LINK Factors (LO, LE, LT, LI, LN)**
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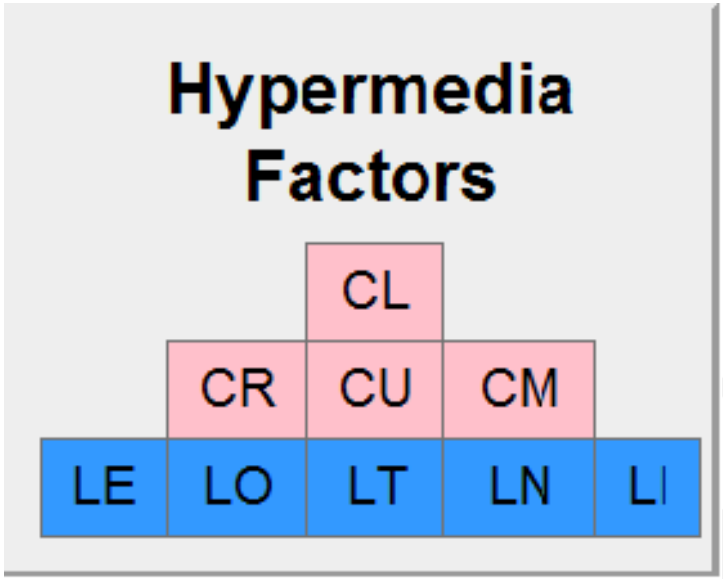


Linking

- **Outbound Links (LO)**

```
<html:a href="..." title="...">...</a>
```

H-Factors

Linking

- Outbound Links (LO)
- Embedded Links (LE)

```
<x:include href="..." />
```

H-Factors

Linking

- Outbound Links (LO)
- Embedded Links (LE)
- Templated Links (LT)

```
<html:form method="get" action="...">
...
<html:form>
```

H-Factors

Linking

- Outbound Links (LO)
- Embedded Links (LE)
- Templated Links (LT)
- Idempotent Links (LI)

```
<atom:link href="..." rel="edit" />
```

H-Factors

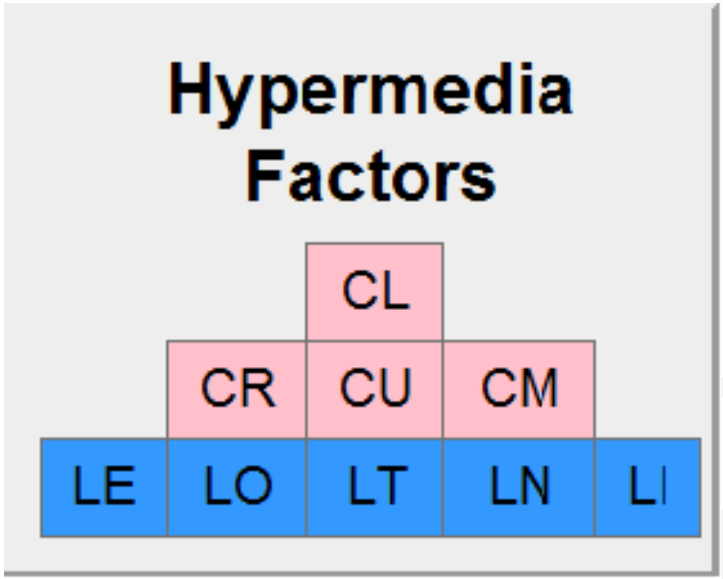
Linking

- Outbound Links (LO)
- Embedded Links (LE)
- Templated Links (LT)
- Idempotent Links (LI)
- Non-Idempotent Links (LN)

```
<html:form method="post" action="...">
...
<html:form>
```

H-Factors

- There are five LINK Factors (LO, LE, LT, LI, LN)
- **There are four CONTROL Factors (CR, CU, CM, CL)**



LAYER 7 TECHNOLOGIES

Control

- **Request Controls (CR)**

```
<xsl:include href="..."
   accept="application/rss" />
```

H-Factors

Control

- Request Controls (CR)
- Update Controls (CU)

```
<html:form method="..." action="..."
  enctype="text/plain" />
```

H-Factors

Control

- Request Controls (CR)
- Update Controls (CU)
- Method Controls (CM)

```
<html:form method="post" action="...">
...
<html:form>
```

H-Factors

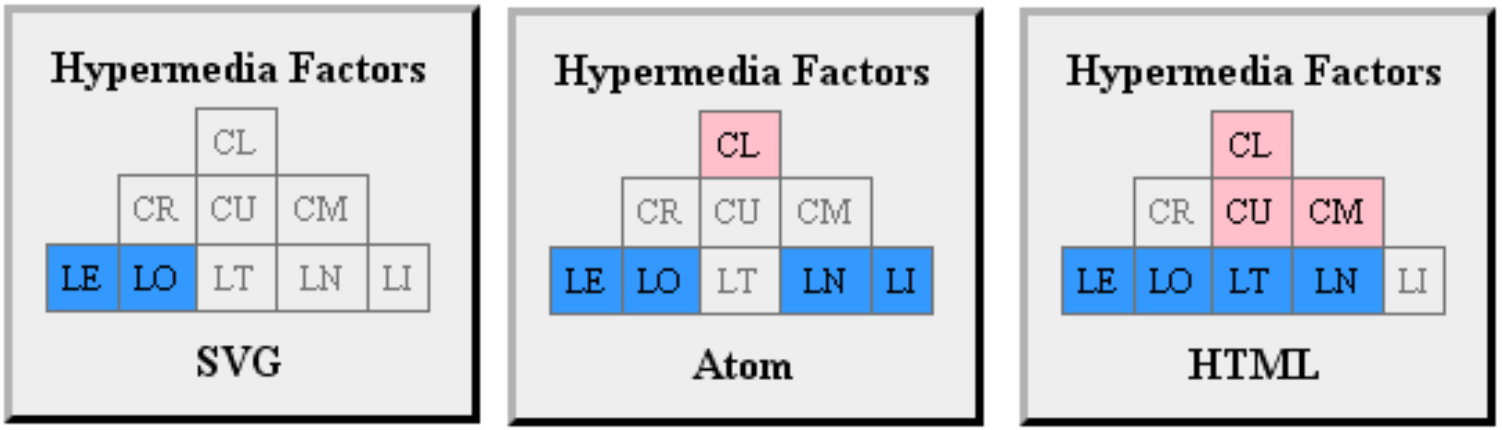
Control

- Request Controls (CR)
- Update Controls (CU)
- Method Controls (CM)
- Link Controls (CL)

```
<html:link href="..." rel="stylesheet" />
```

H-Factors

- A pre-defined collection of H-Factors is called a “Media Type”
- Each media type has it’s own “H-Factor” signature.



H-Factors document the Affordances of the Media Type

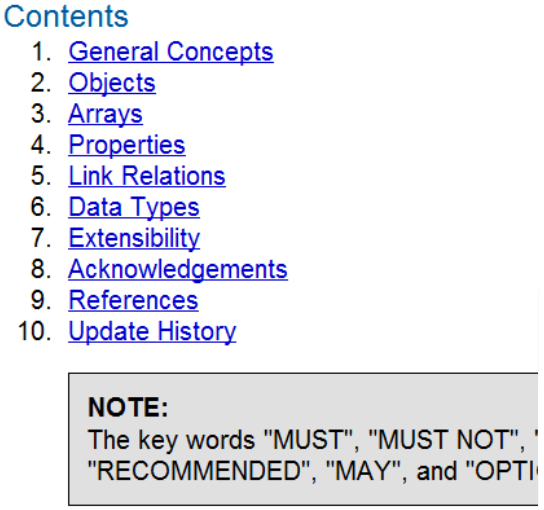
H-Factors

“OK, media types, affordances, I see…

Design #2:
A read/write hypermedia type

Collection+JSON

- **Collection+JSON** media type
- First designs in early 2011, registered w/ IANA mid 2011
- *"…a JSON-based read/write hypermedia-type designed to support management and querying of simple collections."*
- It's Atom w/ LT + templated writes
- Very limited link identifiers
  - collection, item, templates, query


Contents

1. General Concepts
2. Objects
3. Arrays
4. Properties
5. Link Relations
6. Data Types
7. Extensibility
8. Acknowledgements
9. References
10. Update History

NOTE:
The key words "MUST", "MUST NOT", "
"RECOMMENDED", "MAY", and "OPTI

LAYER 7 TECHNOLOGIES

Collection+JSON

Message

```
{
  - collection: {
        href: "http://localhost:3000/collection",
      + links: [ … ],
      + items: [ … ]
    },
  + queries: [ … ],
  + template: { … }
}
```

Collection+JSON

Message


```
{
  - collection: {
        href: "http://localhost:3000/collection",
      - links: [
          - {
                prompt: "Hypermedia",
                href: "http://amundsen.com/hypermedia/",
                rel: "http://amundsen.com/relations/hypermedia"
            },
          - {
                prompt: "Media Types",
                href: "http://amundsen.com/media-types/",
                rel: "http://amundsen.com/relations/media-types"
            }
        ],
      + items: [ … ]
    },
```

Collection+JSON

Message


```
{
  - collection: {
        href: "http://localhost:3000/collection",
    + links: [ … ],
    - items: [
      - {
            href: "http://localhost:3000/collection/1",
        - data: [
          - {
                name: "title",
                value: "first task"
            },
          - {
                name: "completed",
                value: "false"
            },
          - {
```

Collection+JSON

Message

```
{
  - collection: {
        href: "http://localhost:3000/collection",
      + links: [ … ],
      + items: [ … ]
    },
  - queries: [
      - {
            prompt: "Open Items",
            href: "http://localhost:3000/collection/queries/open",
            rel: "http://amundsen.com/relations/open"
        },
      - {
            prompt: "Closed Items",
            href: "http://localhost:3000/collection/queries/closed",
            rel: "http://amundsen.com/relations/closed"
        },
```

Collection+JSON

Message

```
{
  - collection: {
        href: "http://localhost:3000/collection",
      + links: [ … ],
      + items: [ … ]
    },
  + queries: [ … ],
  - template: {
      - data: [
          - {
                name: "title",
                value: "",
                prompt: "Title"
            },
          - {
                name: "completed",
                value: "",
```

Collection+JSON

Server

```
42  /* handle default task list */
43  app.get('/collection/tasks/', function(req, res){
44
45    var view = '/_design/example/_view/due_date';
46
47    db.get(view, function (err, doc) {
48      res.header('content-type',contentType);
49      res.render('tasks', {
50        site  : 'http://localhost:3000/collection/tasks/',
51        items : doc
52      });
53    });
54  });
55
56  /* filters */
57  app.get('/collection/tasks/;queries', function(req, res){
58    res.header('content-type',contentType);
59    res.render('queries', {
60      layout : 'item-layout',
61      site  : 'http://localhost:3000/collection/tasks/'
62    });
```

LAYER 7 TECHNOLOGIES

Collection+JSON

Server

```
149  /* handle creating a new task */
150  app.post('/collection/tasks/', function(req, res){
151
152    var description, completed, dateDue, data, i, x;
153
154    // get data array
155    data = req.body.template.data;
156
157    // pull out values we want
158    for(i=0,x=data.length;i<x;i++) {
159      switch(data[i].name) {
160        case 'description' :
161          description = data[i].value;
162          break;
163        case 'completed' :
164          completed = data[i].value;
165          break;
166        case 'dateDue' :
167          dateDue = data[i].value;
168          break;
169      }
```

LAYER 7 TECHNOLOGIES

Collection+JSON

Server

```
/* handle deleting existing task */
app.delete('/collection/tasks/:i', function(req, res) {
  var idx = (req.params.i || '');
  var rev = req.header("if-match", "*");

  db.remove(idx, rev, function (err, doc) {
    if(err) {
      res.status=400;
      res.send(err);
    }
    else {
      res.status= 204;
      res.send();
    }
  });
});
```

Collection+JSON

Client Code

```
7   g.data = {};
8   g.item = {};
9   g.collectionUrl = '';
10  g.contentType = 'application/collection+json';
11  g.filterUrl = '';
12
13  g.inputForm=true;
14  g.editForm=true;
15
16  function init() {
17    g.filterUrl = getArg('filter');
18    if(g.filterUrl!=='') {
19      loadList(unescape(g.filterUrl));
20    }
21    else {
22      loadList();
23    }
24    showLinks();
25    showItems();
26    showQueries();
27    buildTemplate();
28  }
```

LAYER 7 TECHNOLOGIES

Client Code

```
190   function processData(coll) {
191     var i, x, ul, li, sp;
192
193     ul = document.createElement('ul');
194
195     if(coll) {
196       for(i = 0, x = coll.length; i < x; i++) {
197         if(coll[i].name && coll[i].value) {
198           li = document.createElement('li');
199           sp = document.createElement('span');
200           sp.className = coll[i].name;
201           sp.title = coll[i].name;
202           sp.innerHTML = coll[i].value;
203           li.appendChild(sp);
204           ul.appendChild(li);
205         }
206       }
207     }
208     return ul;
209   }
```

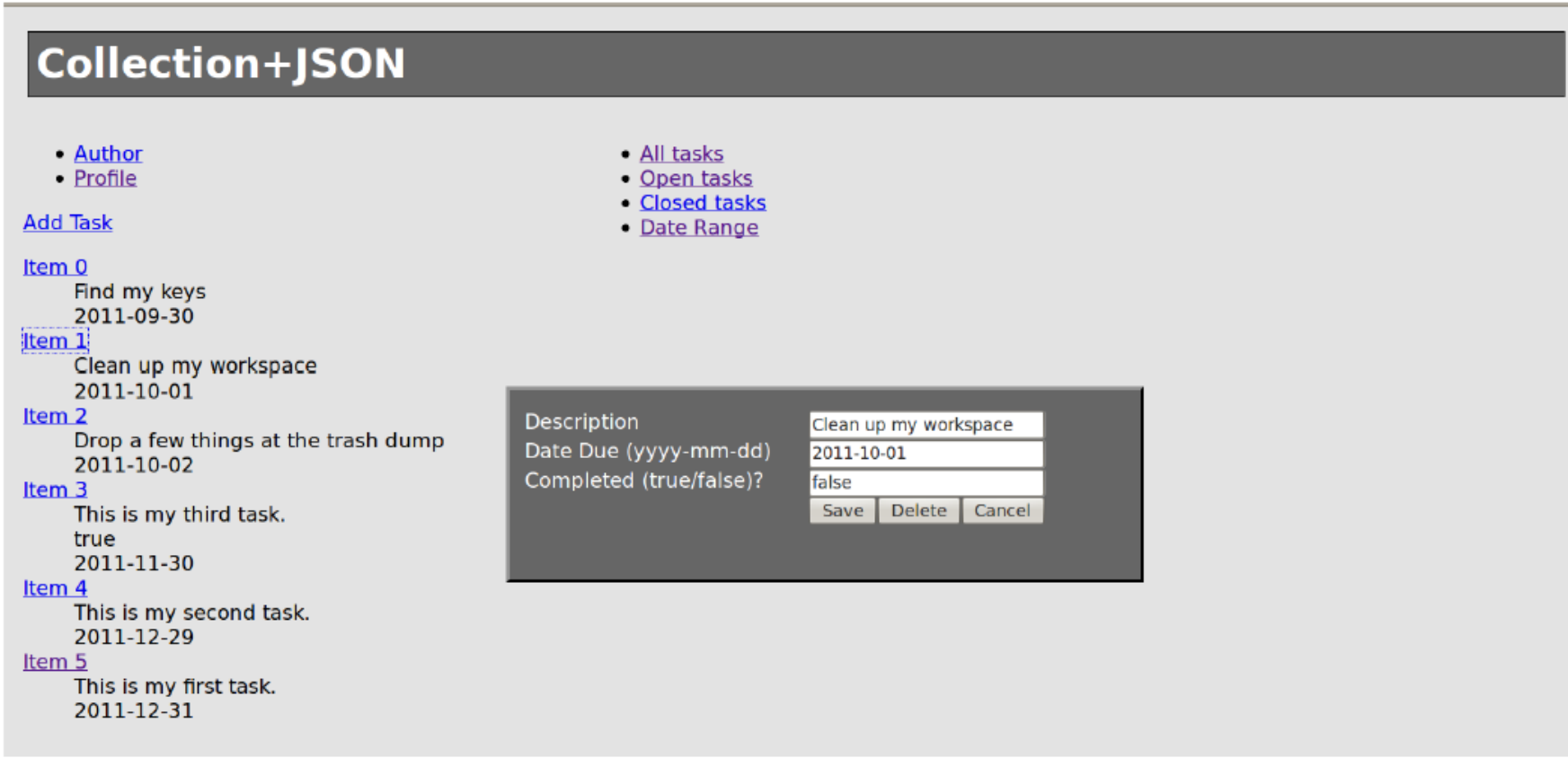
Collection+JSON

Client Code

```
211  function buildTemplate() {
212    var dst, coll, i, x, form, fset;
213
214    dst = document.getElementById('write-template');
215    if(dst) {
216      form = templateForm();
217      fset = document.createElement('fieldset');
218
219      coll = g.data.collection.template.data;
220      for(i = 0, x = coll.length; i < x; i++) {
221        fset.appendChild(processInputElement(coll[i]));
222      }
223
224      fset.appendChild(templateButtons());
225      form.appendChild(fset);
226
227      dst.appendChild(templateLink());
228      dst.appendChild(form);
229    }
230  }
```

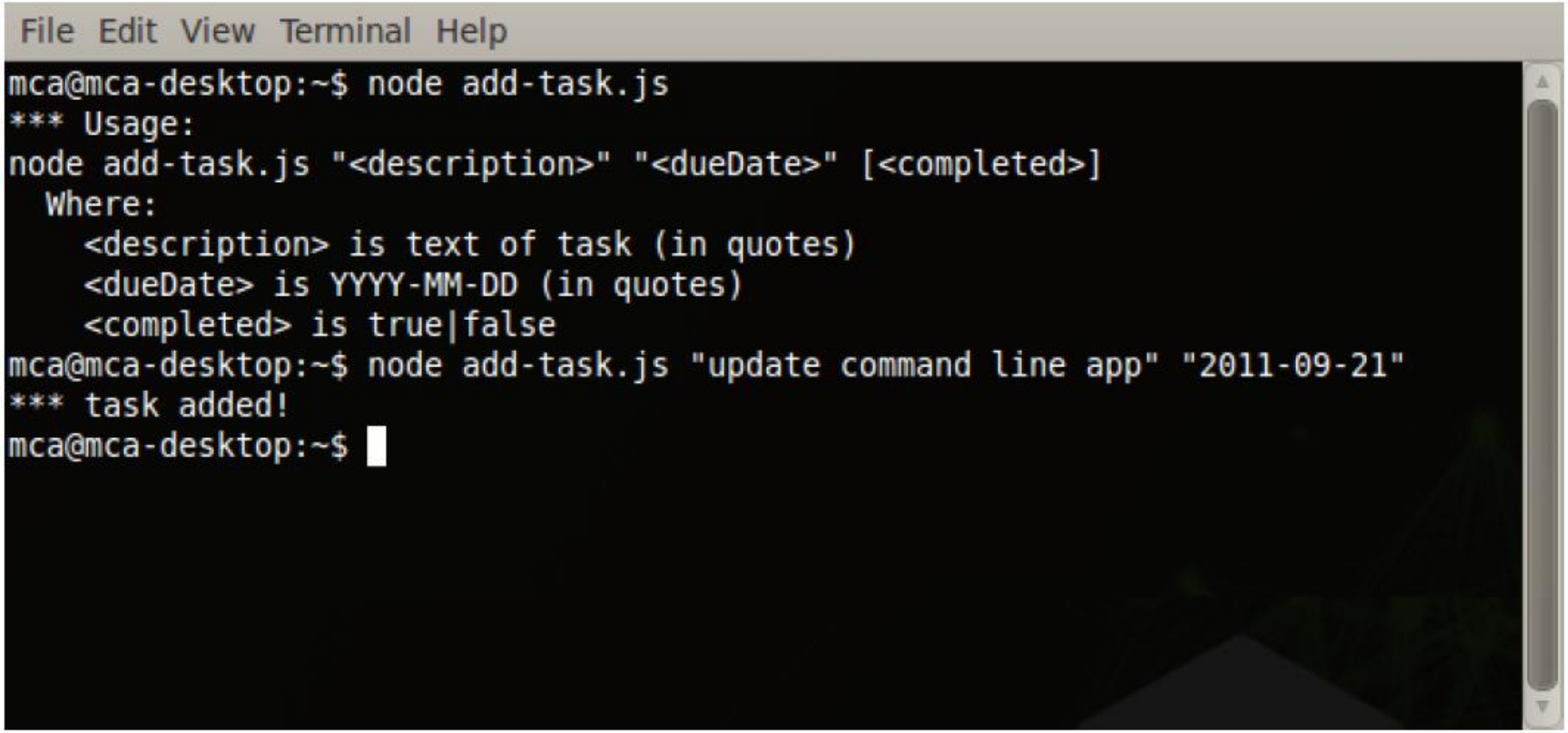
LAYER 7 TECHNOLOGIES

Client App


Collection+JSON
Author
Profile
Add Task
All tasks
Open tasks
Closed tasks
Date Range
Item 0
Find my keys
2011-09-30
Item 1
Clean up my workspace
2011-10-01
Item 2
Drop a few things at the trash dump
2011-10-02
Item 3
This is my third task.
true
2011-11-30
Item 4
This is my second task.
2011-12-29
Item 5
This is my first task.
2011-12-31
Description
Clean up my workspace
Date Due (yyyy-mm-dd)
2011-10-01
Completed (true/false)?
false
Save
Delete
Cancel

Collection+JSON

Client App



Collection+JSON

In the wild…

Collection+JSON

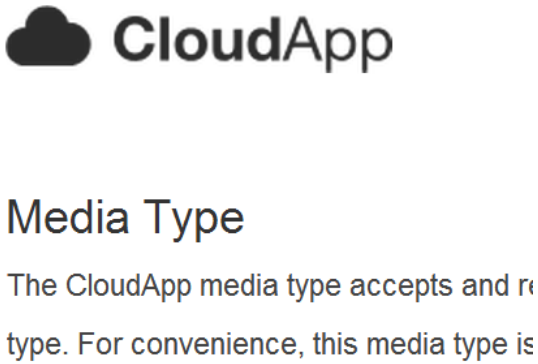
- **Nokia Research - Live Mixed Reality - Vlad Stribu**
- *"[Collection+JSON] … allows us to develop authoring tools that have the ability to self-adapt the user interface to the usage context."*

Collection+JSON

- **Nokia Research - Live Mixed Reality - Vlad Stribu**
- *“Collection+JSON was close enough to what we were looking for…”*
- *“Most important factor that influenced our decision was the community around this format…”*

Collection+JSON

- **CloudApp – Larry Marburger**
- *“CloudApp allows you to share images, links, music, videos and files.”*
- *“[Due to developer team changes] we had some setbacks with the Mac app and subsequently the API. We just started working with another developer who's making amazing progress.”*



LAYER 7 TECHNOLOGIES

Collection+JSON

- **ember.js – Yehuda Katz**
- *“A framework for creating ambitious applications.”*
- *“By default, it's somewhat repetitive, but that can be addressed…”*
- *“It was straight-forward to extend it with features I needed”*
- *“I am starting to feel like with the number of extensions, I should consider [creating] my own media type.”*

LAYER 7 TECHNOLOGIES

Collection+JSON

- Characteristics
  - Read/Write w/ Templates
  - Small set of link identifiers
  - General “List Domain” handler
- Benefits
  - Limited design means simple parser
  - Servers easy, clients harder
  - Built-in support for custom domain annotations
- Costs
  - Domain mapping is more difficult
  - M2M clients limited to pre-declared vocabulary

Contents

1. General Concepts
2. Objects
3. Arrays
4. Properties
5. Link Relations
6. Data Types
7. Extensibility
8. Acknowledgements
9. References
10. Update History

NOTE:
The key words "MUST", "MUST NOT", "
"RECOMMENDED", "MAY", and "OPTI

LAYER 7 TECHNOLOGIES

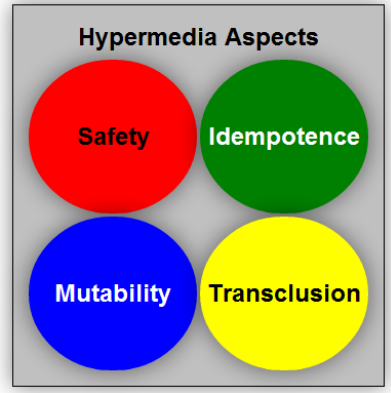
Affordance Aspects

“So, are all affordances essentially the same?”

Affordance Aspects

- *"For the purposes of applying affordances to hypermedia, there are four important aspects to consider"*

```
<uber
   safe="true|false"
   idempotent="true|false"
   mutable="true|false"
   transclude="true|false" />
```

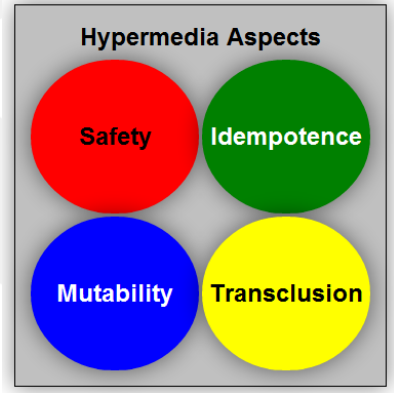


LAYER 7 TECHNOLOGIES

Affordance Aspects

- **Safe**
- The HTTP protocol supports a number of "safe" actions such as HEAD, and GET.

```
<!-- HTML:A -->
<uber
  href="..."
  safe="true"
  idempotent="true"
  mutable="false"
  transclude="false" />
```

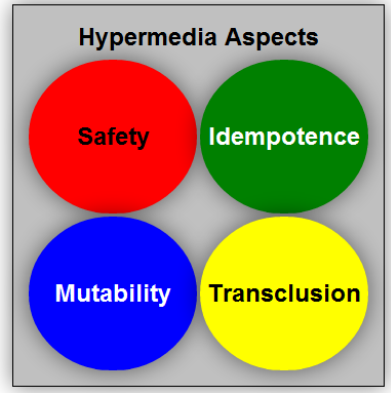


LAYER 7 TECHNOLOGIES

Affordance Aspects

- **Safe**
- The HTTP protocol supports a number of "safe" actions such as HEAD, and GET.
- The HTTP methods PUT, POST, and DELETE are categorized as "unsafe" actions.

```
<!-- atom:link@rel="edit" -->
<uber
  href="..."
  safe="false"
  idempotent="true"
  mutable="false"
  transclude="false" />
```

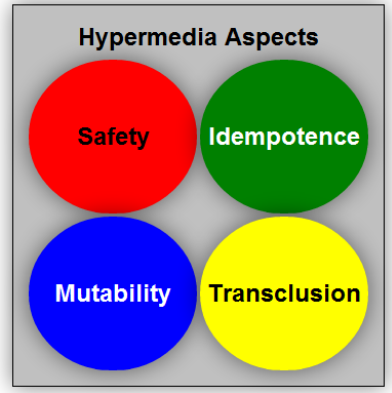


LAYER 7 TECHNOLOGIES

Affordance Aspects

- **Idempotent**
- When an HTML:FORM element has the METHOD property set to "get" it represents an idempotent action.

```
<!-- html:form@method="get" -->
<uber
  href="/search{?query,max-returned}"
  safe="true"
  idempotent="true"
  mutable="true"
  transclude="false" />
```

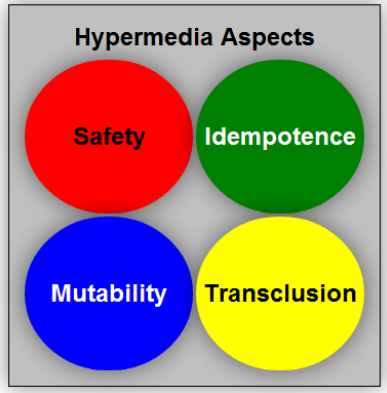


LAYER 7 TECHNOLOGIES

Affordance Aspects

- **Idempotent**
- When an HTML:FORM element has the METHOD property set to "get" it represents an idempotent action.
- When the same property is set to "post" the affordance represents a non-idempotent action.

```
<!-- html:form@method="post" -->
<uber
  href="/blog-post/"
  body="{title,body}"
  safe="false"
  idempotent="false"
  mutable="true"
  transclude="false" />
```

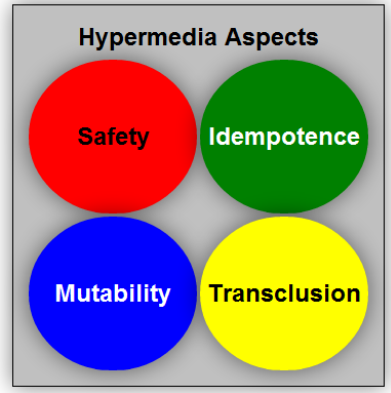


LAYER 7 TECHNOLOGIES

Affordance Aspects

- **Mutability**
- HTML:FORM affords mutability

```
<!-- html:form@method="post" -->
<uber
  href="/blog-post/"
  body="{title,body}"
  safe="false"
  idempotent="false"
  mutable="true"
  transclude="false" />
```

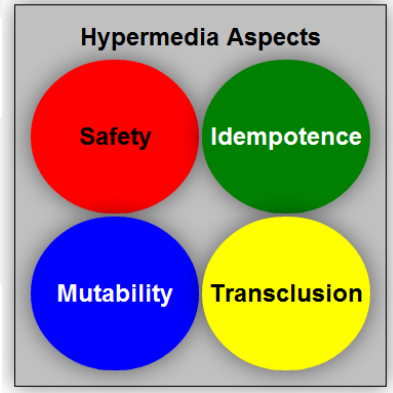


LAYER 7 TECHNOLOGIES

Affordance Aspects

- **Mutability**
- HTML:FORM affords mutability
- HTML:LINK is immutable

```
<!-- html:link -->
<uber
  href="/styles/main.css"
  safe="true"
  idempotent="true"
  mutable="false"
  transclude="true" />
```

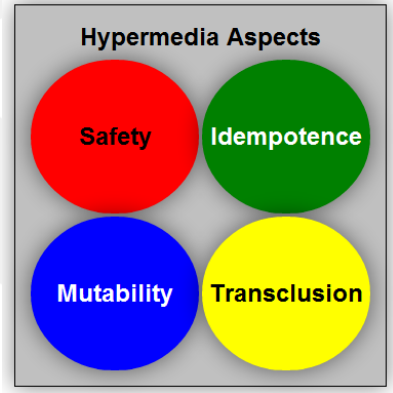


LAYER 7 TECHNOLOGIES

Affordance Aspects

- **Transclusion**
- HTML:IMG affords transclusion

```
<!-- html:img -->
<uber
  href="/images/logo.png"
  safe="true"
  idempotent="true"
  mutable="false"
  transclude="true" />
```

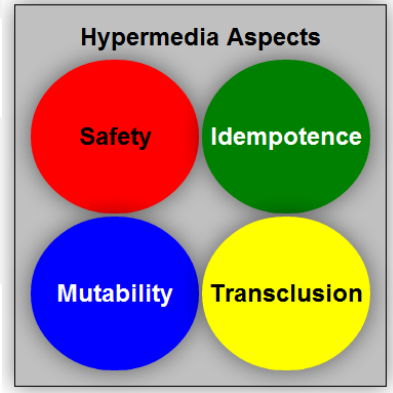


LAYER 7 TECHNOLOGIES

Affordance Aspects

- **Transclusion**
- HTML:IMG affords transclusion
- HTML:A does not

```
<!-- HTML:A -->
<uber
  href="..."
  safe="true"
  idempotent="true"
  mutable="false"
  transclude="false" />
```

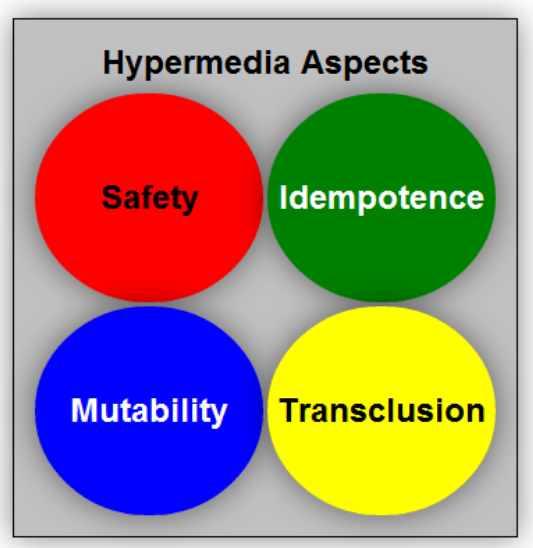


LAYER 7 TECHNOLOGIES

Affordance Aspects

- However, this single affordance is not very usable.

```
<uber
   safe="true|false"
   idempotent="true|false"
   mutable="true|false"
   transclude="true|false" />
```



Affordance Aspects

Media types should be usable

Affordance Aspects

Messages should be usable

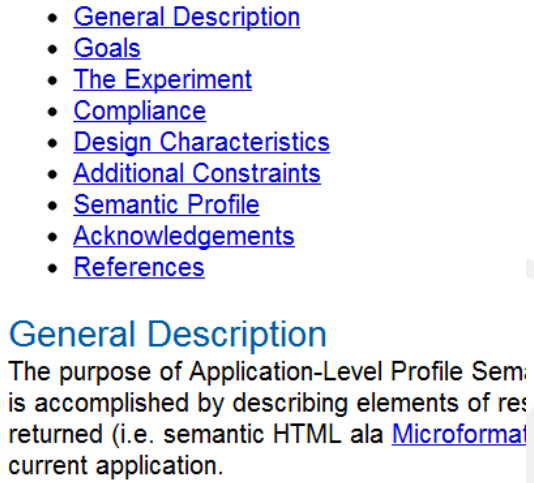
Affordance Aspects

APIs should be usable

Design #3:
Aspects, Factors, Abstractions

ALPS for HTML

- **ALPS profile URI**
- First designs in early 2011 (not registered)
- *"The purpose of Application-Level Profile Semantics (ALPS) is to document the application-level semantics of a particular implementation."*
- *"The example profile here contains details on customizing the XHTML media type for a specific application domain:* ***Micro-blogging****."*



LAYER 7 TECHNOLOGIES

ALPS for HTML

- **ALPS profile URI**
- Multiple parties building their own client or server applications without seeing each other's work or accessing a running "reference" implementation.
- Developers are expected to rely on the constraints and definitions found in this document (and the referenced RFCs) as the sole instruction.

General Description

The purpose of Application-Level Profile Sema
is accomplished by describing elements of res
returned (i.e. semantic HTML ala Microformat
current application.

LAYER 7 TECHNOLOGIES

ALPS for HTML

Messages

```
<!-- state transfer for adding a new user -->
<form method="post" action="..." class="user-add">
  <input type="text" name="name" value="" required="true"/>
  <input type="text" name="email" value="" required="true"/>
  <input type="password" name="password" value="" required="true" />
  <textarea name="description"></textarea>
  <input type="file" name="avatar" value="" />
  <input type="text" name="website" value="" />

  <input type="submit" value="Send" />
</form>
```

ALPS for HTML

Messages

```
<!-- state transition to follow an existing user -->
<form method="post" action="..." class="user-follow">
  <input type="text" name="user" value="" required="true"/>

  <input type="submit" value="Send" />
</form>
```

ALPS for HTML

Messages

```
<!-- state transfer for adding a message -->
<form method="post" action="..." class="message-post">
  <textarea name="message" requried="true"></textarea>

  <input type="submit" value="Send" />
</form>
```

ALPS for HTML

Server Code

```
139 // add a message
140 app.post('/microblog/messages/', function(req, res) {
141
142   validateUser(req, res, function(req,res) {
143
144     var text, item;
145
146     // get data array
147     text = req.body.message;
148     if(text!=='') {
149       item = {};
150       item.type='post';
151       item.text = text;
152       item.user = req.credentials[0];
153       item.dateCreated = now();
154
155       // write to DB
156       db.save(item, function(err, doc) {
157         if(err) {
158           res.status=400;
159           res.send(err);
160         }
161         else {
162           res.redirect('/microblog/', 302);
163         }
164       });
165     }
166     else {
167       return badReqest(res);
168     }
169   });
```

ALPS for HTML

Client Code

ALPS for HTML

Client App

- Home
- Users
- Register

Microblog

Home

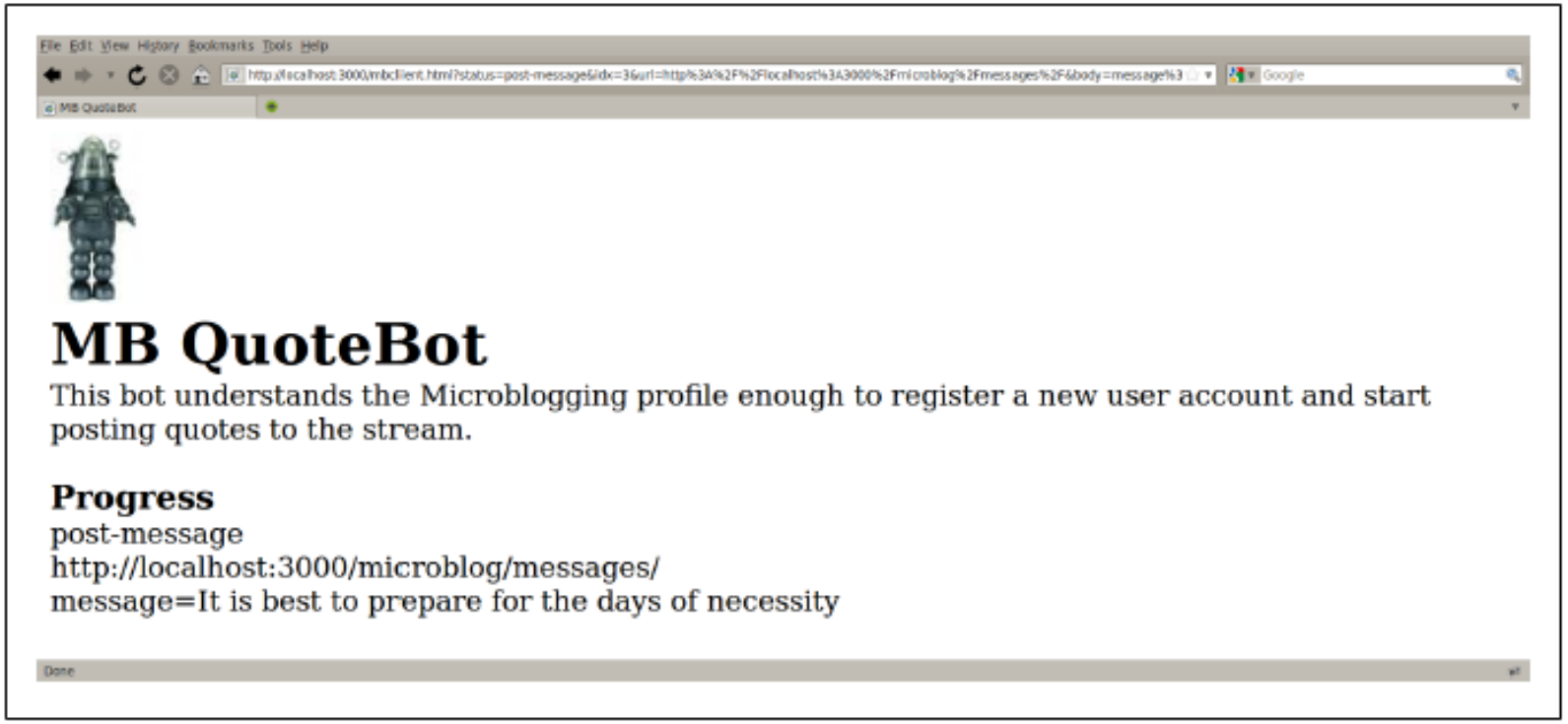
What's Up?

Submit Reset

- this is another test @ 2011-10-25 24:13:32 by MikeA
- another test here @ 2011-10-25 02:57:10 by MikeA
- this is a test @ 2011-10-25 02:55:54 by MikeA
- RT @Jon "the Troll" Moore: now seeing Darrell Miller talk about #restagent #restfest @ 2011-08-20 19:47:04 by restfestbot
- now seeing Darrell Miller talk about #restagent #restfest @ 2011-08-20 19:47:01 by the_troll
- RT @Jon "the Troll" Moore: i really liked randall's talk #restfest @ 2011-08-20 15:40:40 by restfestbot
- i really liked randall's talk #restfest @ 2011-08-20 15:40:21 by the_troll
- RT @Erik Mogensen: I'm bummed that I'm not at #restfest. @ 2011-08-20 12:48:51 by restfestbot
- RT @Jon "the Troll" Moore: i am trolling for #restfest retweets @ 2011-08-20 12:48:40 by restfestbot

ALPS for HTML

Client Bot



ALPS for HTML

Client Bot

```
/* form@class="add-user" */
g.user = {};
g.user.user = 'robieBot5';
g.user.password = 'robie';
g.user.email = 'robie@example.org';
g.user.name = 'Robie the Robot';
g.user.description = 'a simple quote bot';
g.user.avatar = 'http://amundsen.com/images/robot.jpg';
g.user.website = 'http://robotstxt.org';

/* form@class="message-post" */
g.msg = {};
g.msg.message = '';     /* some aesop's quotes to post */
                        g.quotes = [];
                        g.quotes[0] = 'Gratitude is the sign of noble souls';
                        g.quotes[1] = 'Appearances are deceptive';
                        g.quotes[2] = 'One good turn deserves another';
                        g.quotes[3] = 'It is best to prepare for the days of necessity';
                        g.quotes[4] = 'A willful beast must go his own way';
                        g.quotes[5] = 'He that finds discontentment in one place is not likely to find
                       appiness in another';
                        g.quotes[6] = 'A man is known by the company he keeps';
                        g.quotes[7] = 'In quarreling about the shadow we often lose the substance';
                        g.quotes[8] = 'They are not wise who give to themselves the credit due to others';
                        g.quotes[9] = 'Even a fool is wise-when it is too late!';
```

ALPS for HTML

Client Bot

```
if(ajax.status===200) {
  switch(g.status) {
    case 'start':
      findUsersAllLink(doc);
      break;
    case 'get-users-all':
      findMyUserName(doc);
      break;
    case 'get-register-link':
      findRegisterLink(doc);
      break;
    case 'get-register-form':
      findRegisterForm(doc);
      break;
    case 'post-user':
      postUser(doc);
      break;
    case 'get-message-post-link':
      findMessagePostForm(doc);
      break;
    case 'post-message':
      postMessage(doc);
      break;
    case 'completed':
      handleCompleted(doc);
      break;
    default:
      alert('unknown status: ['+g.status+']');
      return;
  }
```

LAYER 7 TECHNOLOGIES

ALPS for HTML

“In the wild…”

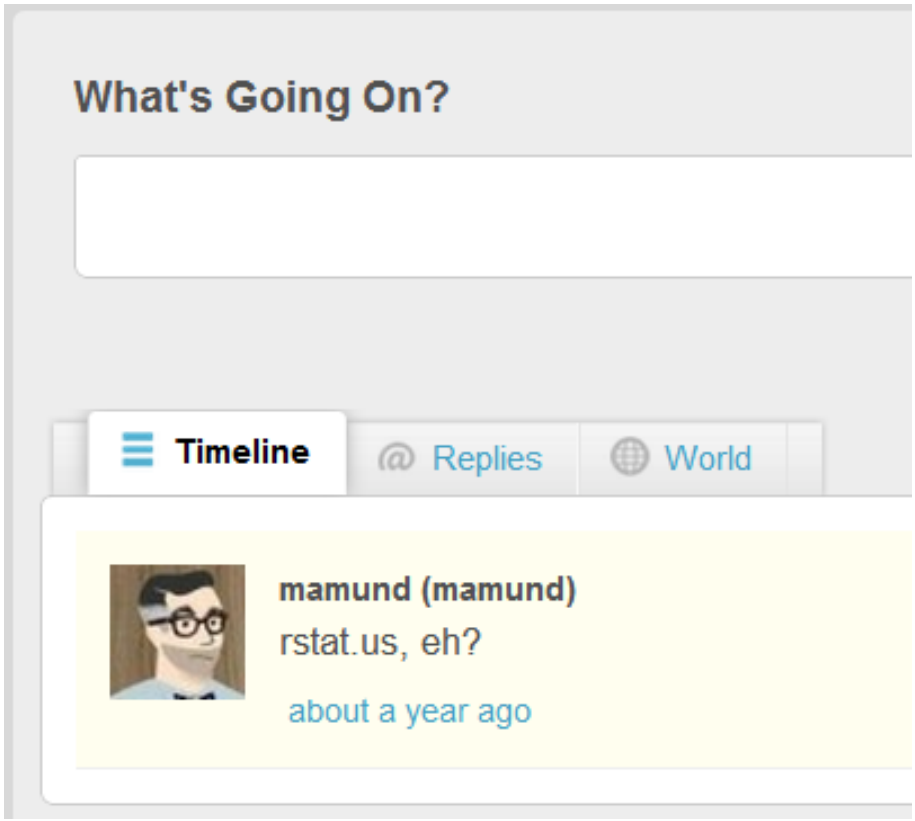
ALPS for HTML

Rstat.us – Carol Nichols

- *"There are two things that make rstat.us special: **simplicity** and **openness**."*
- *"[S]ince we already have a full-functioning end-user facing site, the ALPS microblogging spec means adding a few attributes rather than having to maintain a totally separate API interface."*
- "*The current way of presenting the ALPS spec is [too] flat."*

ALPS for HTML

Rstat.us – Carol Nichols



ALPS for HTML

Rstat.us – Carol Nichols

```
<form accept-charset="UTF-8" action="/updates"
  class="update-form" id="update-form" method="post" name="update_form">
  <div style="margin:0;padding:0;display:inline">
    <input name="utf8" type="hidden" value="&#x2713;" />
    <input name="authenticity_token" type="hidden" value="..." />
  </div>
  <h4>What's Going On?</h4>
  <div id='update-content'>
    <textarea id='update-textarea' name='text'></textarea>
  </div>
  <div id='update-info'>
    <input id='update-referral' name='referral_id' type='hidden' value=''>
    <input class='button' id='update-button' type='submit' value='Share'>
    <div id='update-count' title='Characters remaining'></di
  </div>
</form>
```

ALPS for HTML

- Characteristics
  - Domain Semantics Only
  - Media-type agnostic
- Benefits
  - Focused on problem domain
  - Treats “pages” as the “API”
- Costs
  - Very abstract model
  - Tough to document
  - Seems “over complex” esp. for M2M cases

General Description

The purpose of Application-Level Profile Sem
is accomplished by describing elements of re
returned (i.e. semantic HTML ala Microformat
current application.

LAYER 7 TECHNOLOGIES

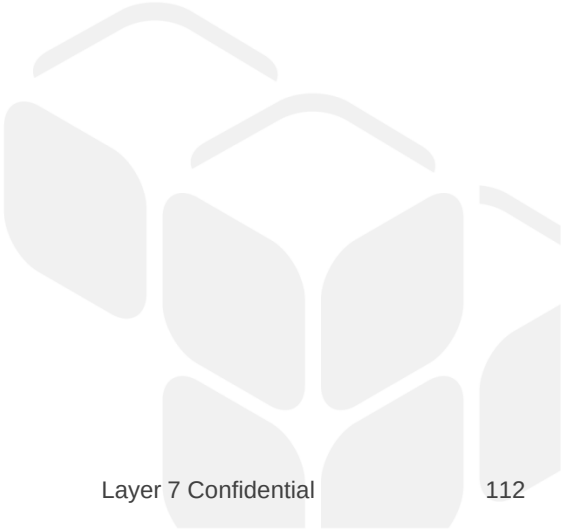
ALPS for HTML

“If HTML is not the only media-type we need…”

ALPS for HTML

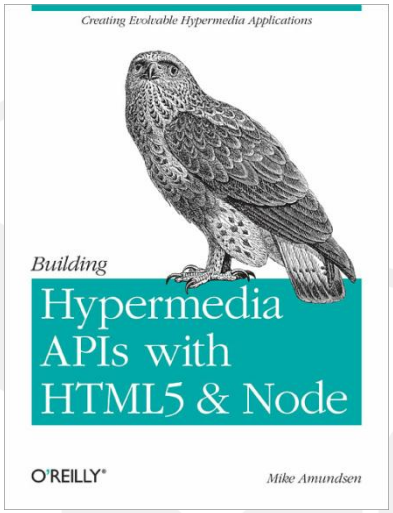
“How do you choose?”

Mapping your domain to HTTP



Methodology

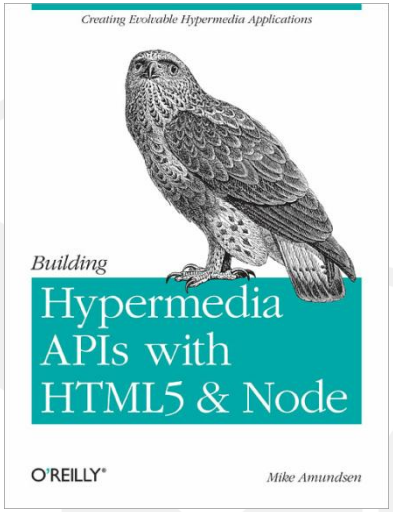
- Designing messages is the primary work
- Focus on mapping to payloads, not identifiers
- Survey existing media types first
- If you can't find a suitable H-Factor signature match, consider designing your own.
- *Pro Tip: you can always find a match.*



LAYER 7 TECHNOLOGIES

Methodology

- Start with a format (XML, JSON, HTML, etc.)
- You might need to support more than one
- Don’t assume you can “cross-map” formats easily
- *Pro Tip: you almost always need to support more than one.*



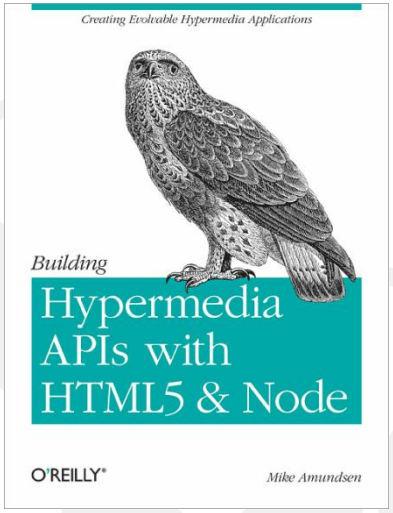
Methodology

- Select your other design elements as needed

Hypermedia Design Elements			
State Transfer	Read-Only	Predefined	Ad-Hoc
Domain Style	Specific	General	Agnostic
Application Flow	None	Intrinsic	Applied

Methodology

- Represent State, not Objects
- Remember both data and transitions
- Craft lots of messages
- *Pro Tip: you can never have enough messages*



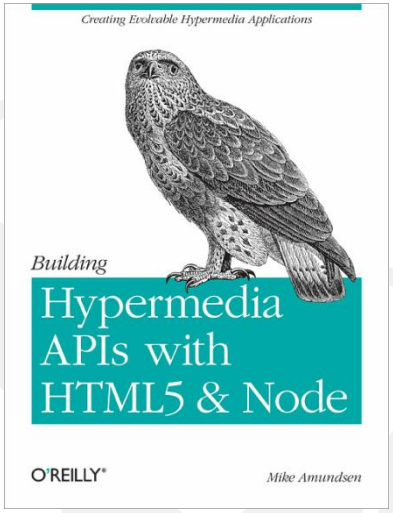
LAYER 7 TECHNOLOGIES

Methodology

When you are sure you have:

- The proper format
- The right H-Factor signature
- The correct mapping of domain to messages
- Sufficent message examples

Then, and only then…

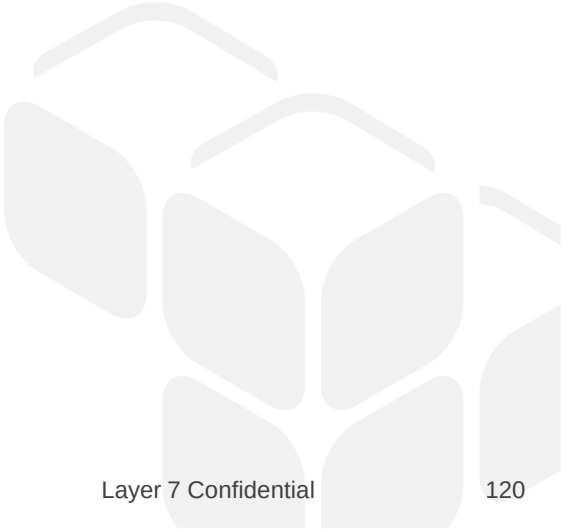


LAYER 7 TECHNOLOGIES

You can start writing the code

Because…

The code is only
the implementation

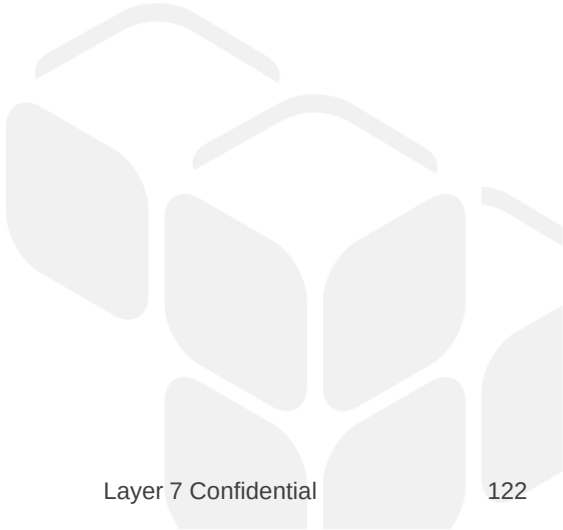


Methodology

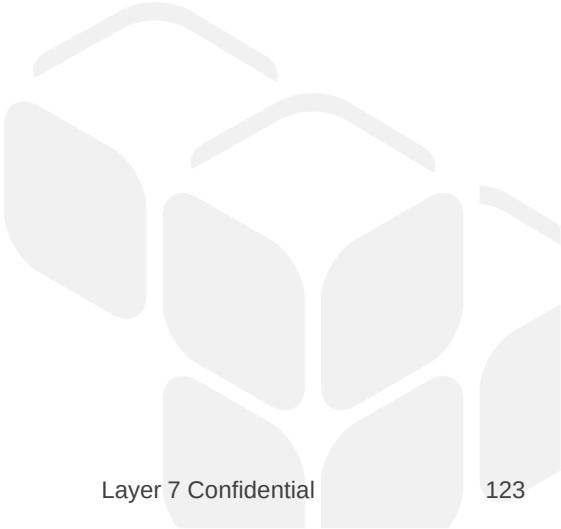
The code is only
the implementation

The media type is
the design.

And if you get the design right...

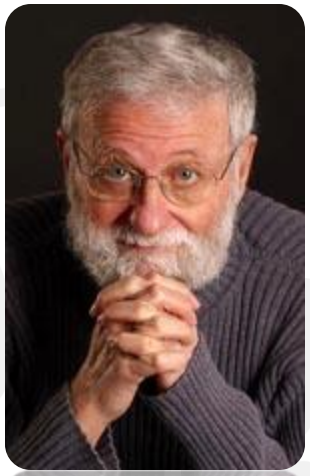


Your users will be able to do things



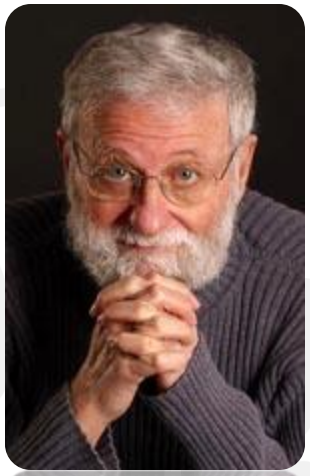
Methodology

Your users will be able to do things



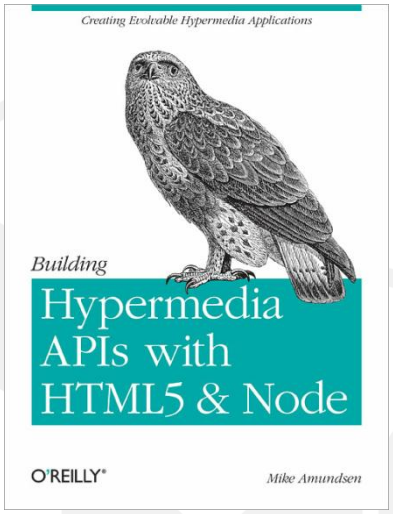
Methodology

Your users will be able to do things *you never imagined*



The Costs and Benefits of Building Hypermedia APIs (with Node.js)

@mamund



LAYER 7 TECHNOLOGIES