Hydras and Hypermedia

Ian Robinson, ThoughtWorks
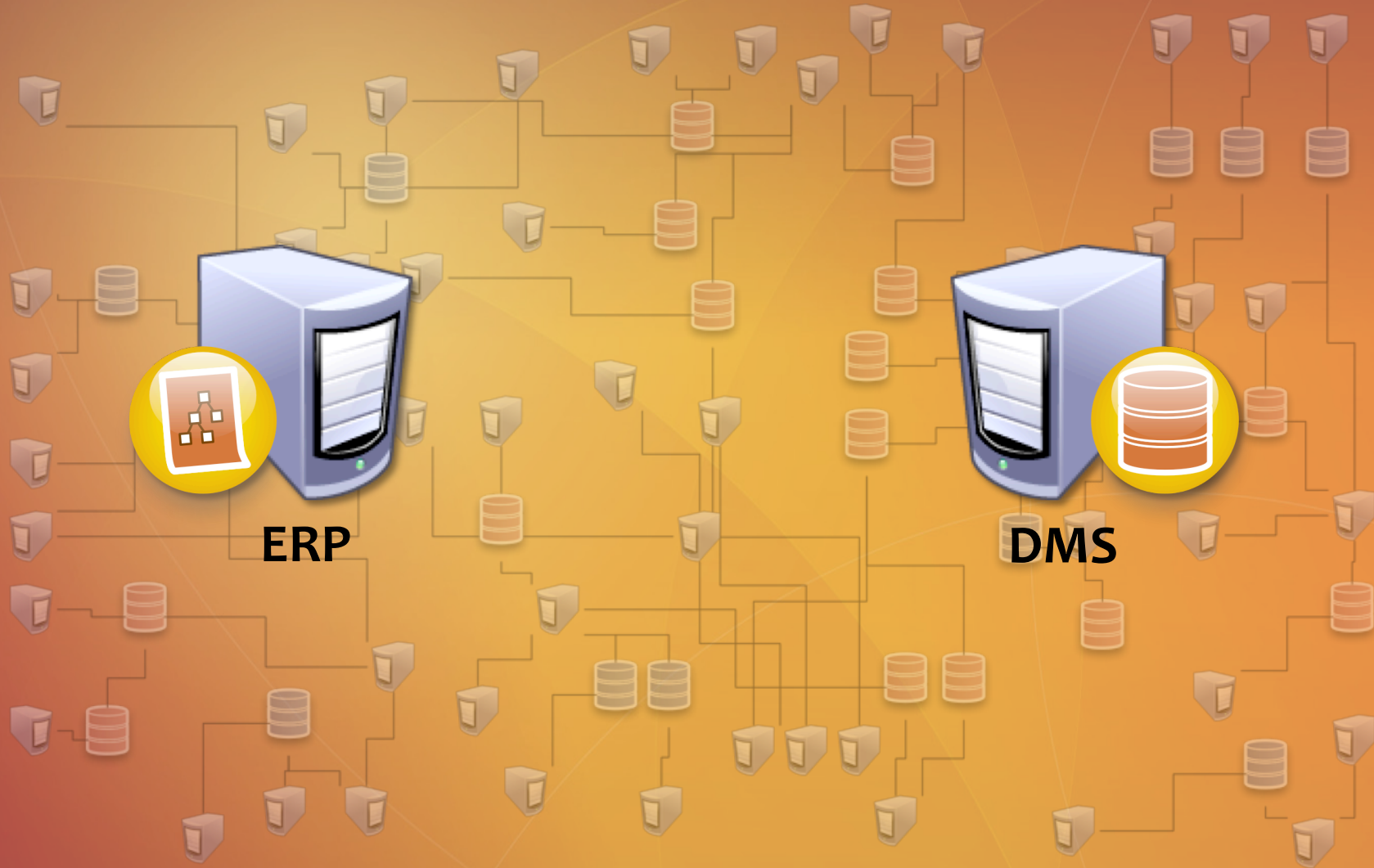
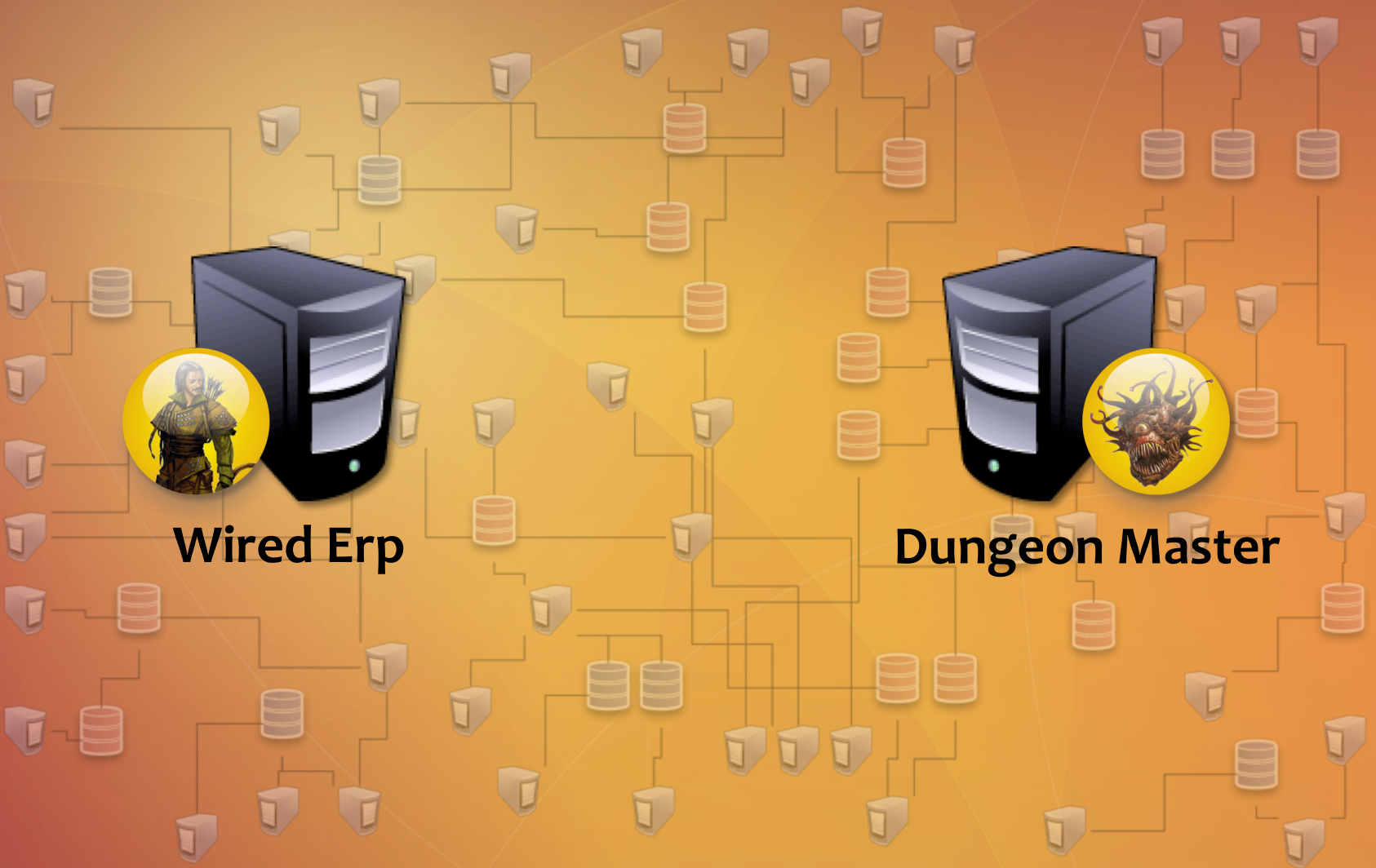http://iansrobinson.com

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Meet the apps

ERP

DMS
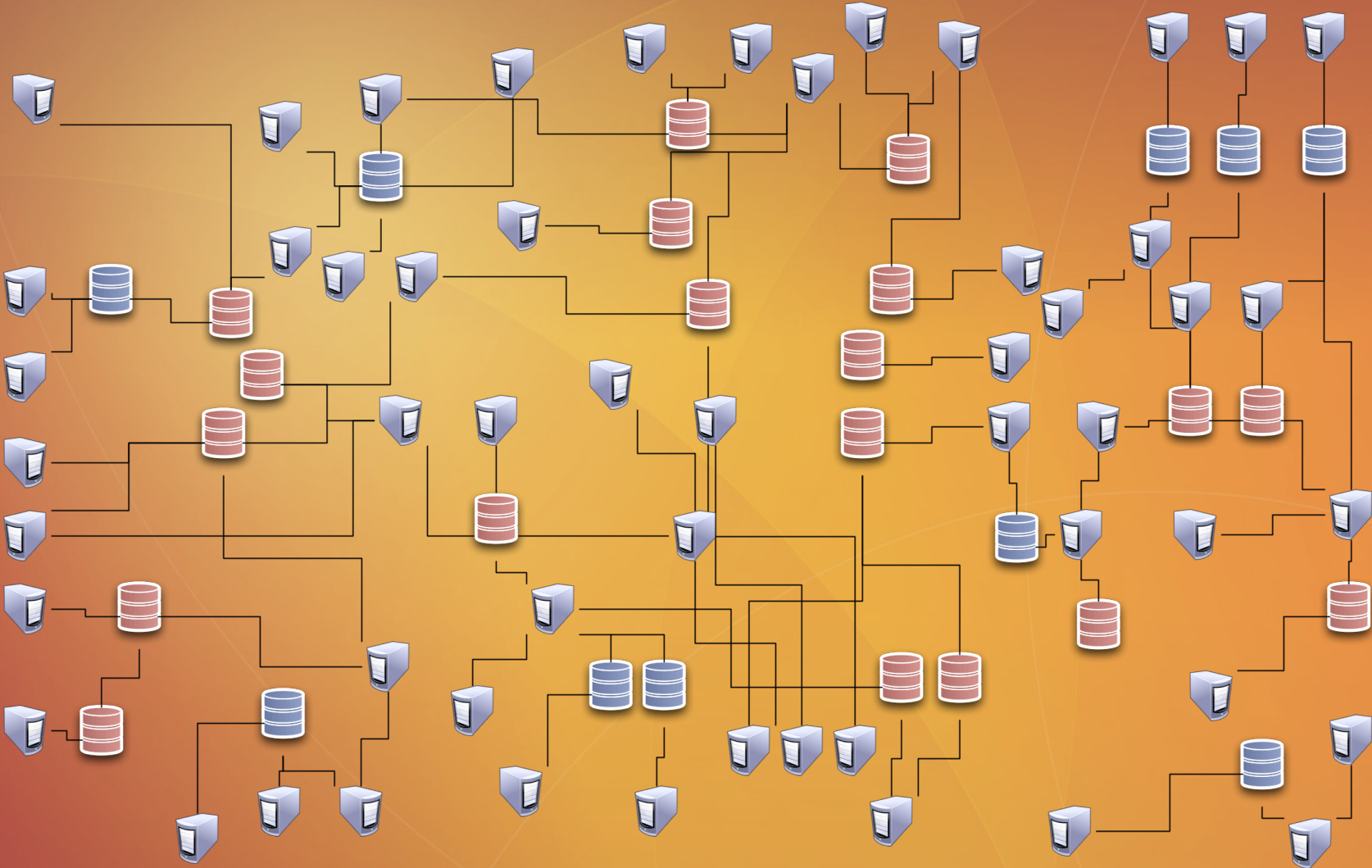
Fighting Fantasy
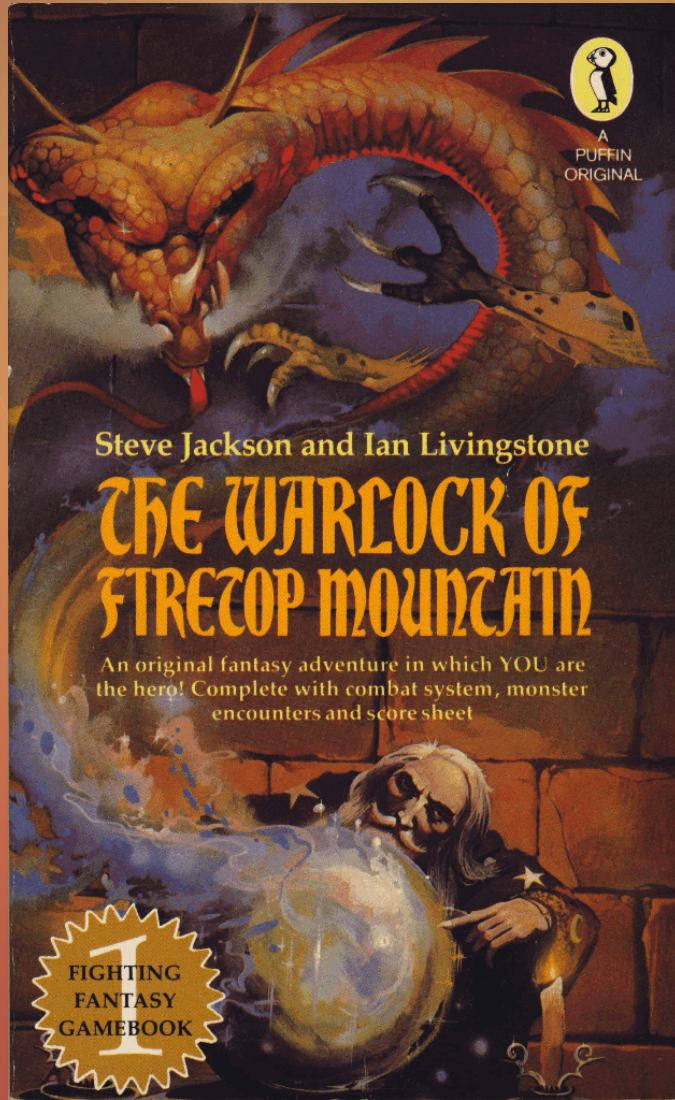
Pick your path to adventure

hinges. Listening at the door, you hear strange mutterings and the clatter of what could be pots and pans. Whatever is in there, there are several of them. Do you want to go through the door (turn to **159**) or turn back (turn to **237**)?

79

The passageway ends in front of you in a dead end If you wish to search for secret passageways, turn to **137**. If not, return to the crossroads at **267**

80

The key fits the lock and opens the door You find yourself in a large boathouse. Various boats, in different stages of construction, are lying around Apart from the door behind you there is another in the north wall. As you enter, the Skeletons stop their work and crane their bony necks around to look at you. They pick up planks of wood and hammers and advance towards you There are five of them. Do you.

Smile nervously and back out of
the door into the passage?   Turn to **129**
Tell them you've come about
buying a boat?   Turn to **123**
Tell them you're their new boss
and order them back to work?   Turn to **195**
Draw your sword and prepare for
battle?   Turn to **140**

flies through the air directly at him, stops centimetres from his chest and falls to the floor. He looks up and smiles at you with an evil, gloating smile. What can you do:

Draw your sword and advance?   Turn to **142**
Try something else from your
backpack?   Turn to **105**

195

This is a rather unlikely story, considering that they see very few humans around. Nevertheless, Skeletons are pretty dim – you knew this and that's why you tried the story. Roll one die. If you roll a 1 or 2, they don't believe you and keep on advancing. Turn to **140**.

A 3 or 4 means that they aren't sure, and send two of their number off through the north door whilst the rest hold you at bay with their weapons. Turn to **164**

A roll of 5 or 6 means they've believed you and they all get back to work! Turn to **9**. Add 2 LUCK points

196

You search the room. Try as you may you cannot find the secret switch to open the door in the bookshelf – the old man must have locked it from the inside. You do find 5 Gold Pieces in a drawer in the table. You decide to return to the junction to the south Turn to **280**

197

At the top of the stairs the passage turns sharply to

Find
and
Defeat

```
E0920ba0'df0e-42a1-b304-a312c834fd62
```

the **tyrannical Lich-Uuid**

The plan…

until goal achieved
   while healthy
     fight
   | flee
   | without retracing steps
     | north
     | east
     | west
     | south
 | investigate
 | retrace steps

Once upon a time…

```
POST /quests
Host: dms
Content-Type: application/prs.dms+xml
Content-Length: ...
```

```
<difficulty>intermediate</difficulty>
```

```
HTTP/1.1 201 Created
Content-Type: application/prs.dms+xml
Location: http://dms/quests/1/locations/1
Content-Length: ...
```

```
<location>
  <title>Entrance</title>
  <summary>
    Your adventure begins as you descend a rope into a rubble-strewn hall.
    The air is cold and dank.
  </summary>
  <dimensions>
    <north-south>20</north-south>
    <east-west>20</east-west>
  </dimensions>
  <link rel="http://dms/north" type="application/prs.dms+xml" href="/quests/1/locations/2"/>
  <link rel="http://dms/east" type="application/prs.dms+xml" href="/quests/1/locations/3"/>
  <link rel="http://dms/west" type="application/prs.dms+xml" href="/quests/1/locations/4"/>
</location>
```

Heading north…

```
GET /quests/1/locations/2 HTTP/1.1
Host: dms
```

```
HTTP/1.1 303 See Other
Content-Type: application/prs.dms+xml
Location: http://dms/quests/1/encounters/1
Content-Length: ...
```

```
<link rel="related" type="application/prs.dms+xml" href="/quests/1/encounters/1"/>
```

When frameworks go bad...

```
GET /quests/1/encounters/1 HTTP/1.1
Host: dms
```

```
HTTP/1.1 200 OK
Content-Type: application/prs.dms+xml
Content-Length: ...
```

```xml
<encounter>
  <title>Skeleton!</title>
  <summary>
    From out of the shadows lurches a skeleton brandishing a scimitar.
  </summary>
  <model>
    <instance rel="http://dms/attack">
      <intention>
        <attack>
          <weapon/>
          <strategy/>
        </attack>
      </intention>
    </instance>
    <submission resource="/quests/1/encounters/1/fight" method="POST" mediatype="application/prs.dms+xml"/>
  </model>
  <model>
    <instance rel="http://dms/flee">
      <intention>
        <flee/>
      </intention>
    </instance>
    <submission resource="/quests/1/encounters/1/flight" method="POST" mediatype="application/prs.dms+xml"/>
  </model>
</encounter>
```

Hacker...

```
POST /quests/1/encounters/1/fight HTTP/1.1
Host: dms
Content-Type: application/prs.dms+xml
Content-Length: ...
```

```xml
<intention>
  <attack>
    <weapon>sword</weapon>
    <strategy>slash</strategy>
  </attack>
</intention>
```

```
HTTP/1.1 201 Created
Content-Type: application/prs.dms+xml
Location: http://dms/quests/1/encounters/1/outcomes/1
Content-Length: ...
```

```xml
<outcome>
  <title>Success</title>
  <summary>
    The skeleton shatters and its scimitar clatters to the ground.
    Searching the fragments, you find a silver key.
  </summary>
  <items>
    <link type="application/prd.dms+xml" href="/quests/1/objects/1">silver key</link>
  </items>
  <link rel="next" type="application/prs.dms+xml" href="/quests/1/locations/2"/>
</outcome>
```

Stone door

```
GET /quests/1/locations/2 HTTP/1.1
Host: dms
```

```
HTTP/1.1 200 OK
Content-Type: application/prs.dms+xml
ETag: "FEC6956217C1"
Content-Length: ...
```

```
<location>
  <title>Stone door</title>
  <summary>
    The hall narrows, and you follow a low passage to a stone door with a deeply recessed keyhole.
  </summary>
  <dimensions>
    <north-south>15</north-south>
    <east-west>5</east-west>
  </dimensions>
  <link rel="http://dms/south" type="application/prs.dms+xml" href="/quests/1/locations/1"/>
  <model>
    <instance rel="http://dms/action">
      <intention>
        <unlock>
          <key/>
        </unlock>
      </intention>
    </instance>
    <submission resource="/quests/1/locations/2" method="POST" mediatype="application/prs.dms+xml"/>
  </model>
</location>
```

But we've got a key…

```
POST /quests/1/locations/2 HTTP/1.1
Host: dms
If-Match: "FEC6956217C1"
Content-Type: application/prs.dms+xml
Content-Length: ...
```

```
<intention>
  <unlock>
    <key>http://dms/quests/1/objects/1</key>
  </unlock>
</intention>
```

```
HTTP/1.1 412 Precondition Failed
```

What's going on?

```
GET /quests/1/locations/2 HTTP/1.1
Host: dms
If-None-Match: "FEC6956217C1"
```

```
HTTP/1.1 200 OK
Content-Type: application/prs.dms+xml
ETag: "6809E4D87D43"
Content-Length: ...
```

```xml
<location>
  <title>Stone door</title>
  <summary>
    You're standing in front of a stone door with a deeply recessed keyhole.
    Electricity crackles around the keyhole.
  </summary>
  <dimensions>
    <north-south>15</north-south>
    <east-west>5</east-west>
  </dimensions>
  <link rel="http://dms/south" type="application/prs.dms+xml" href="/quests/1/locations/1"/>
  <model>
    <instance rel="http://dms/action">
      <intention>
        <unlock>
          <key/>
        </unlock>
      </intention>
    </instance>
    <submission resource="/quests/1/locations/2" method="POST" mediatype="application/prs.dms+xml"/>
  </model>
</location>
```

Wait...


```
GET /quests/1/locations/2 HTTP/1.1
Host: dms
If-None-Match: "6809E4D87D43"
```

```
HTTP/1.1 304 Not Modified
```

Wait...

```
GET /quests/1/locations/2 HTTP/1.1
Host: dms
If-None-Match: "6809E4D87D43"
```

```
HTTP/1.1 200 OK
Content-Type: application/prs.dms+xml
ETag: "871CDA1C9935"
Content-Length: ...
```

```xml
<location>
  <title>Stone door</title>
  <summary>
    You're standing in front of a stone door with a deeply recessed keyhole.
  </summary>
  <dimensions>
    <north-south>15</north-south>
    <east-west>5</east-west>
  </dimensions>
  <link rel="http://dms/south" type="application/prs.dms+xml" href="/quests/1/locations/1"/>
  <model>
    <instance rel="http://dms/action">
      <intention>
        <unlock>
          <key/>
        </unlock>
      </intention>
    </instance>
    <submission resource="/quests/1/locations/2" method="POST" mediatype="application/prs.dms+xml"/>
  </model>
</location>
```

Now!

```
POST /quests/1/locations/2 HTTP/1.1
Host: dms
If-Match: "871CDA1C9935"
Content-Type: application/prs.dms+xml
Content-Length: ...
```

```
<intention>
  <unlock>
    <key>http://dms/quests/1/objects/1</key>
  </unlock>
</intention>
```

```
HTTP/1.1 201 Created
Content-Type: application/prs.dms+xml
Location: http://dms/quests/1/locations/2/outcomes/1
Content-Length: ...
```

```
<outcome>
  <title>Success</title>
  <summary>
    The key turns in the lock and the door grinds open.
    Beyond, a flight of steep steps lead down into the darkness.
    A blast of warm, fetid air issues from below, followed by an inhuman shriek.
  </summary>
  <link rel="related" type="application/prs.dms+xml" href="/quests/1/locations/2"/>
  <link rel="http://dms/north" type="application/prs.dms+xml" href="/quests/1/locations/5"/>
  <link rel="http://dms/south" type="application/prs.dms+xml" href="/quests/1/locations/1"/>
</outcome>
```

Leonard Richardson's Web service maturity heuristic

What?	Why?	How?
Divide and conquer	Spreads complexity around	URIs
Refactor (Do the same things in the same way)	Reduces complexity	HTTP
Describe special behaviour in a standard way	Makes complexity learnable	Hypermedia

http://www.crummy.com/writing/

Hypermedia
as
the
Engine
of
Application
State

Some definitions…

Application protocol

Application state

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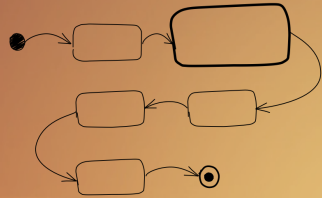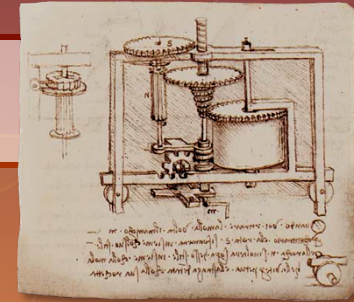# Application state transitions
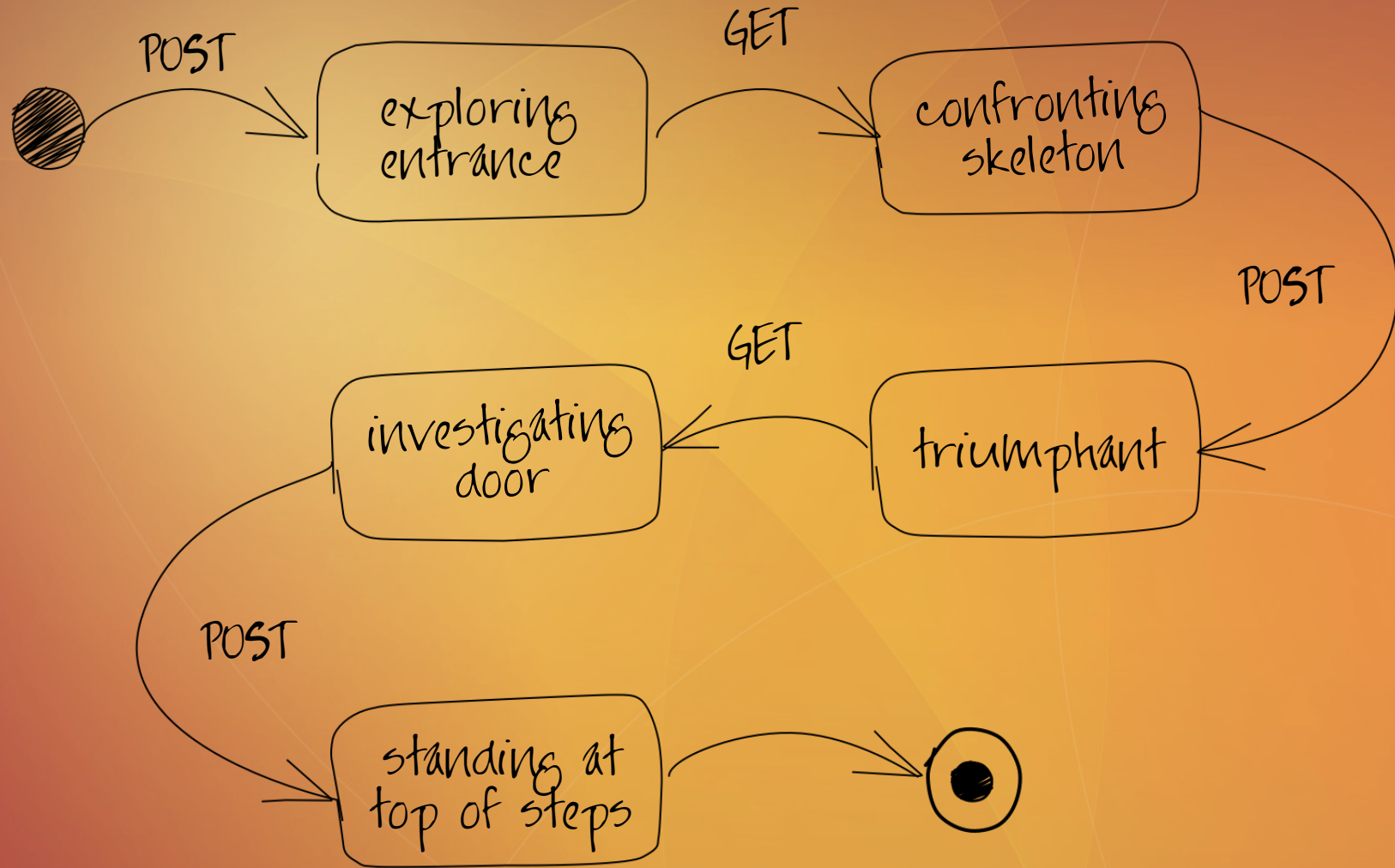
Reality intermission
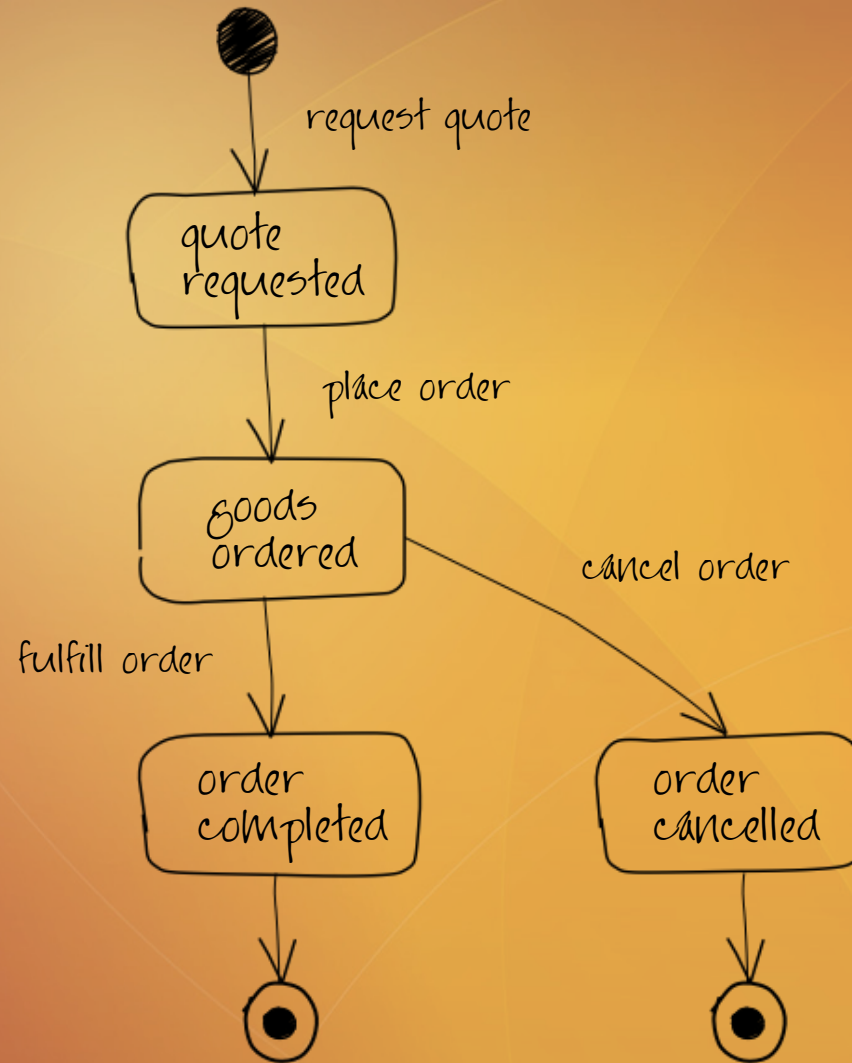
Hypermedia systems transform application state

```xml
<encounter>
  <title>Skeleton!</title>
  <summary>
    From out of the shadows lurches a skeleton brandishing a scimitar.
  </summary>
  <model>
    <instance rel="http://dms/attack">
      <intention>
        <attack>
          <weapon/>
          <strategy/>
        </attack>
      </intention>
    </instance>
    <submission resource="/quests/1/encounters/1"
      method="POST" mediatype="application/prs.dms+xml"/>
  </model>
  <model>
    <instance rel="http://dms/flee">
      <intention>
        <flee/>
      </intention>
    </instance>
    <submission resource="/quests/1/encounters/1"
      method="POST" mediatype="application/prs.dms+xml"/>
  </model>
</encounter>
```

GET /quests/1/encounters/1 HTTP/1.1

Anatomy of a hypermedia control

```
<link
    rel="http://dms/north"
    type="application/prs.dms+xml"
    href="/quests/1/locations/2"
    />
```

Semantic context
WHY access the linked
resource?

Interpretation
WHAT form does the
linked resource take?

Address
WHERE does the
linked resource
reside?

Media type is a key into an interpretative scheme

Schemas

Hypermedia controls

Processing model
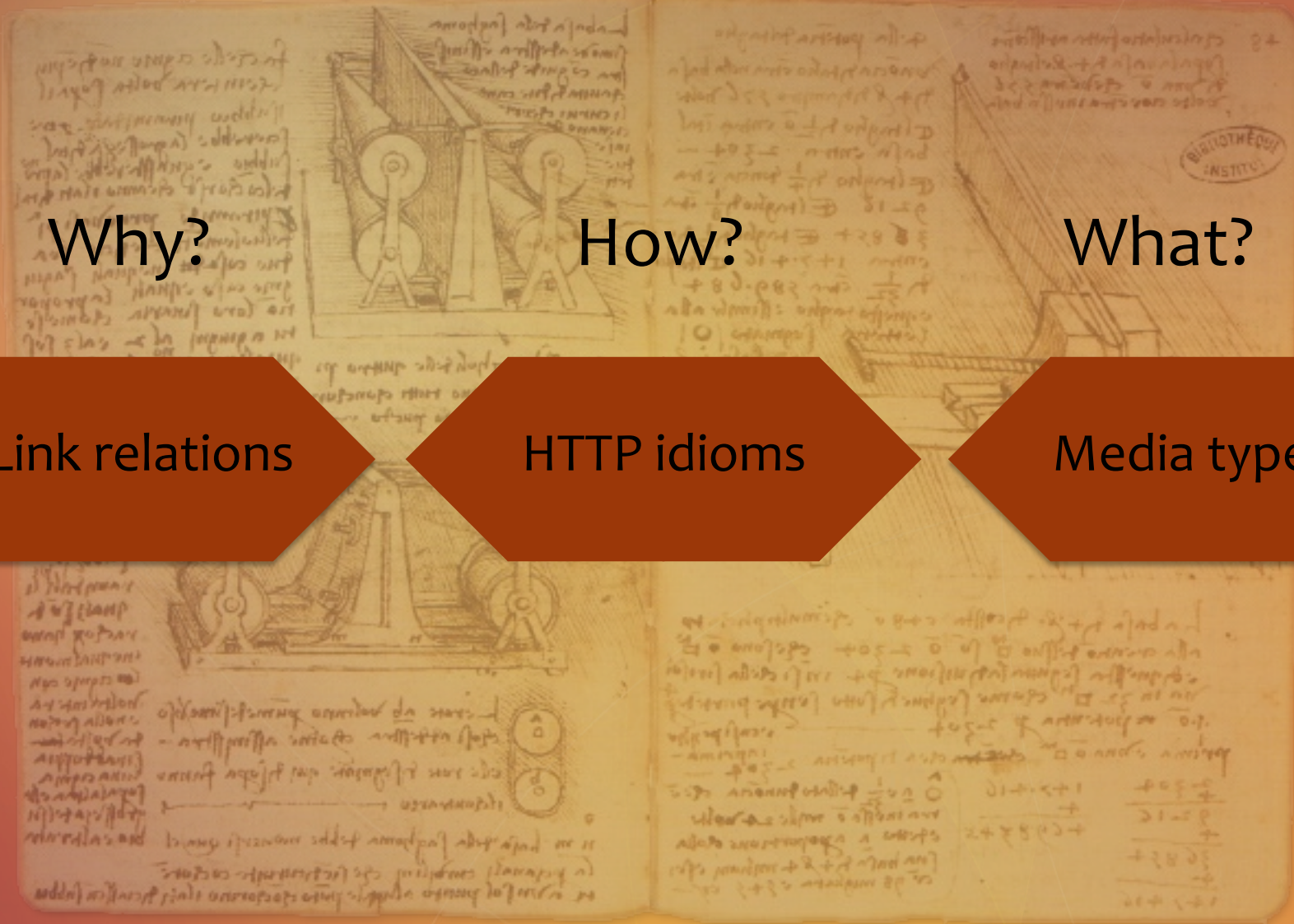
Link relations

Manipulate resources using HTTP idioms

```
<submission resource="/quests/1/locations/2"
  method="POST" mediatype="application/prs.dms+xml"/>
```

```
OPTIONS /quests/1/locations/2 HTTP/1.1
Host: dms
```
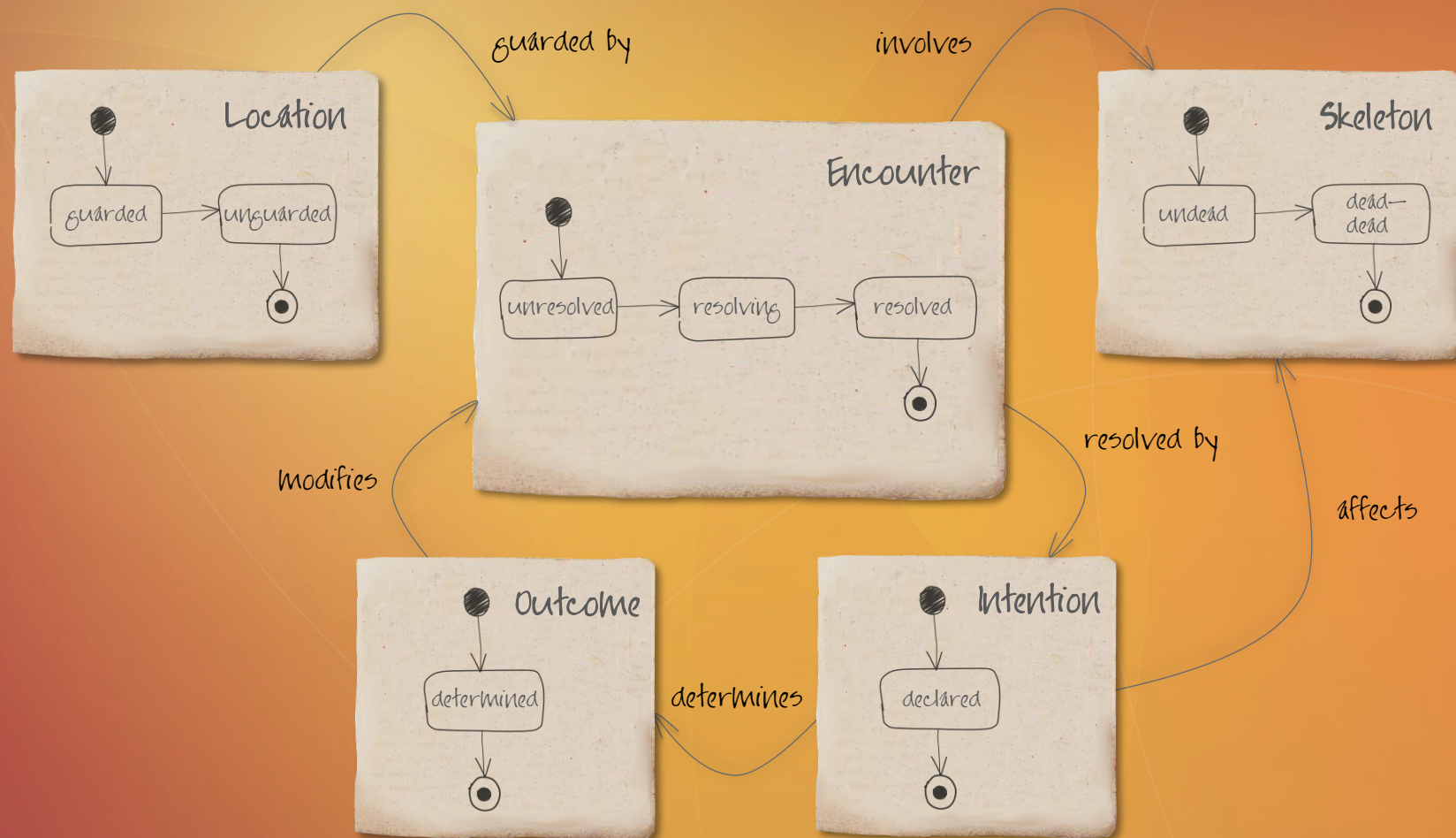
```
HTTP/1.1 200 OK
Allow: GET, POST
```

```
HTTP/1.1 200 OK
Content-Type: application/prs.dms+xml
ETag: "871CDA1C9935"
Content-Length: ...
```
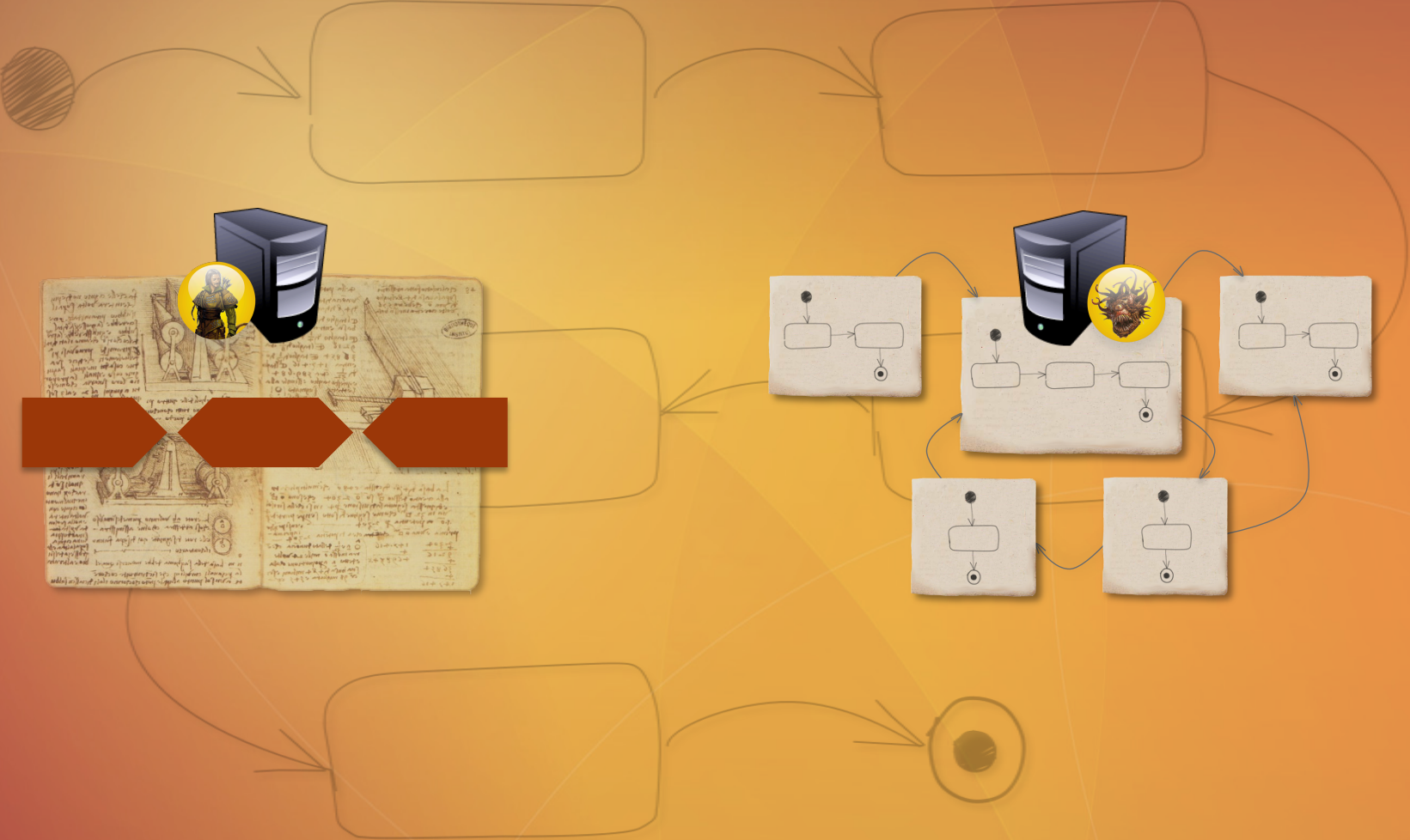
```
HTTP/1.1 303 See Other
Content-Type: application/prs.dms+xml
Location: http://dms/quests/1/encounters/1
Content-Length: ...
```

Down in the dungeons…

http://dms/quests/1/encounters/1/outcomes/1

Application state: a hauntingsk

Equipping the client

Capability	Description
Implement HTTP idioms	Implement HTTP application protocol 'units of work' (eg. conditional GET).
Handle hypermedia types	Parse/ assemble hypermedia representations; surface hypermedia controls.
Understand semantic context	Understand semantic context for controls in relation to client goal.
Choose and activate control	Decide on next transition based on goal, application state and available transitions.

Hypermedia and Systems Architecture

How to GET a Cup of Coffee

http://www.infoq.com/articles/webber-rest-workflow

Jim Webber   Savas Parastatidis   Ian Robinson

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Thank you

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