

Making Cloud Data Usable

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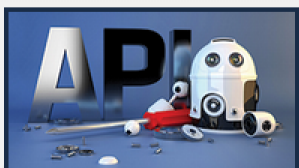
Your Guide to API Design & Implementation Best Practices

API Academy delivers free online lessons and in-person consulting services covering essential API techniques and tools for business managers, interface designers and enterprise architects



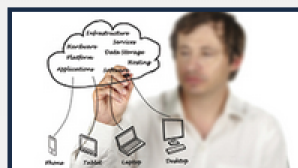
What is an API?

Get an overview of what an API is and what it does, to help you realize the business value of APIs



API Design Basics

Understand the API architecture process and learn basic design and implementation best practices



Web API Architectural Styles

Get a detailed overview of the main architectural styles for Web and mobile API design



Choosing a Solution

Choose between the various solutions that offer the basic components for enterprise API Management



Building

Hypermedia
APIs with
HTML5 & No



Designing APIs for the Web

Mike Amundsen

VIDEO

RESTful Web APIs



*Leonard Richardson,
Mike Amundsen & Sam Ruby*

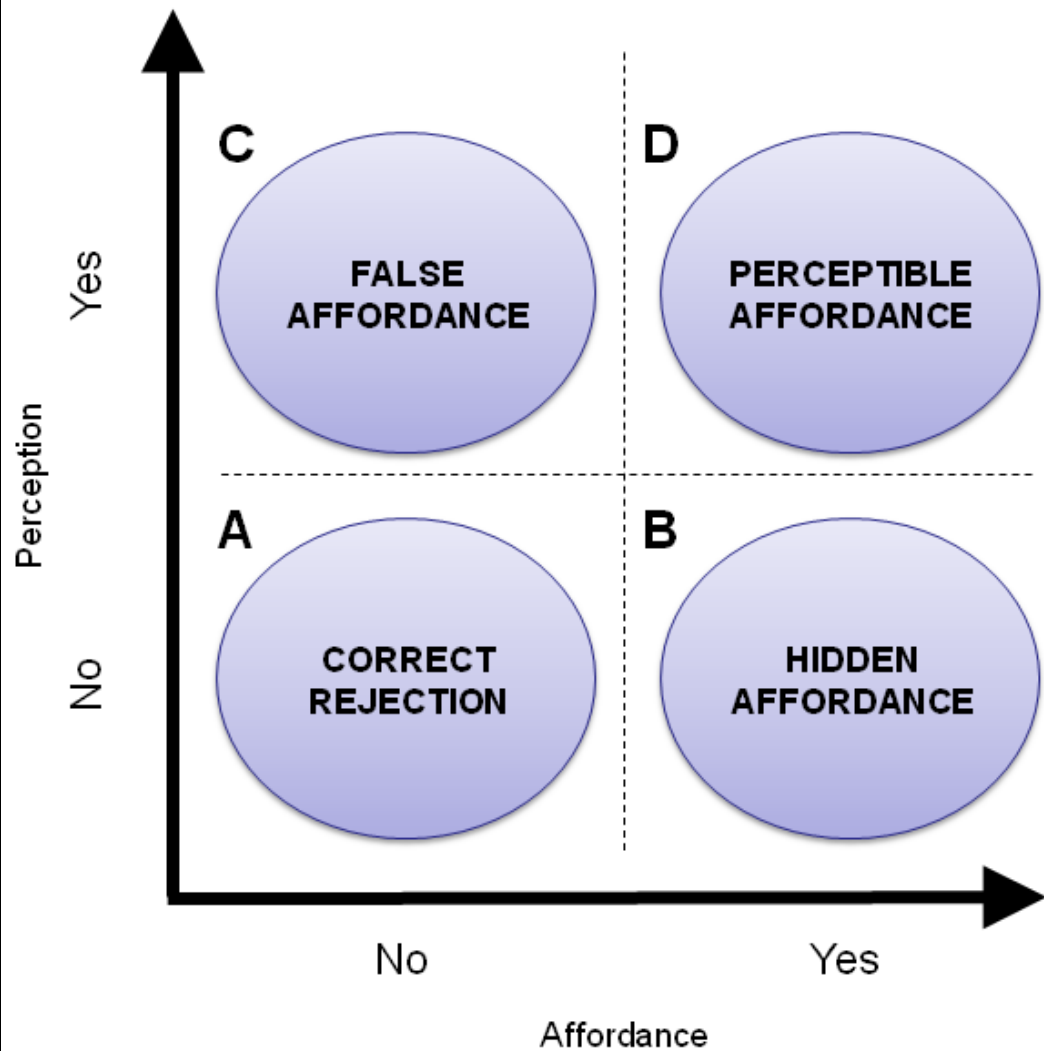
Usability

Usability is the ease of use and learnability of a human-made object. The object of use can be a software application, website, book, tool, machine, process, or anything a human interacts with.



affordance





**Usability =
Perceived Affordances**

I'll get back to this...


da·ta

/ˈdætə, ˈdātə/ 

noun

- **COMPUTING**

the quantities, characters, or symbols on which operations are performed by a computer, being stored and transmitted in the form of electrical signals and recorded on magnetic, optical, or mechanical recording media.





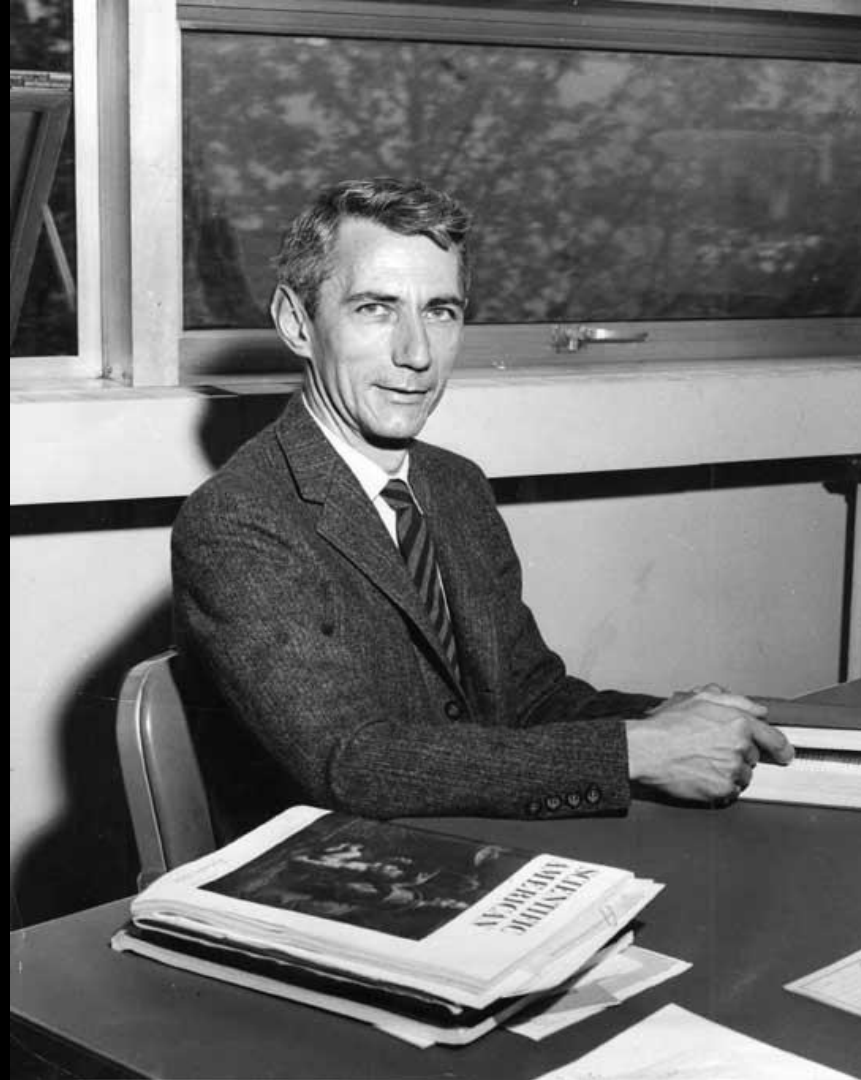
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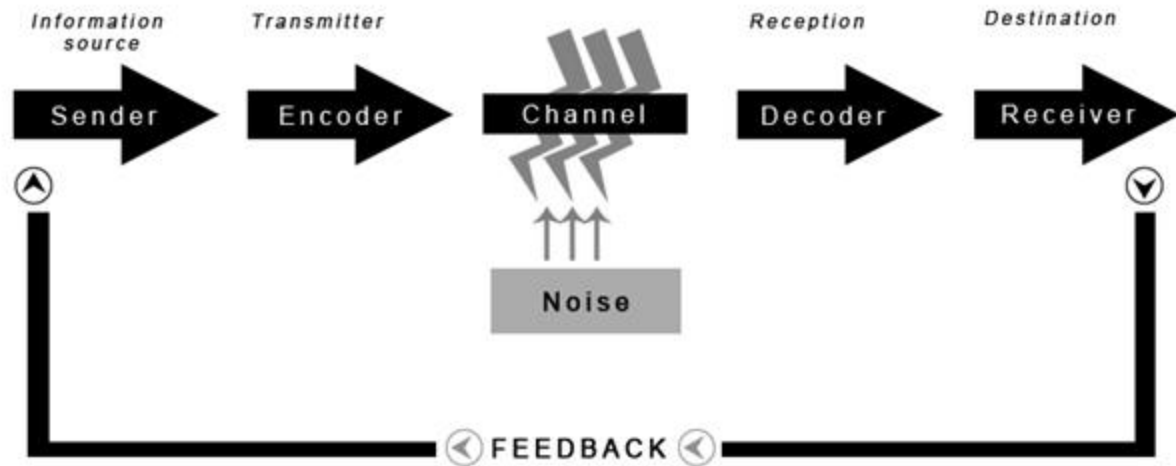
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]
}

```

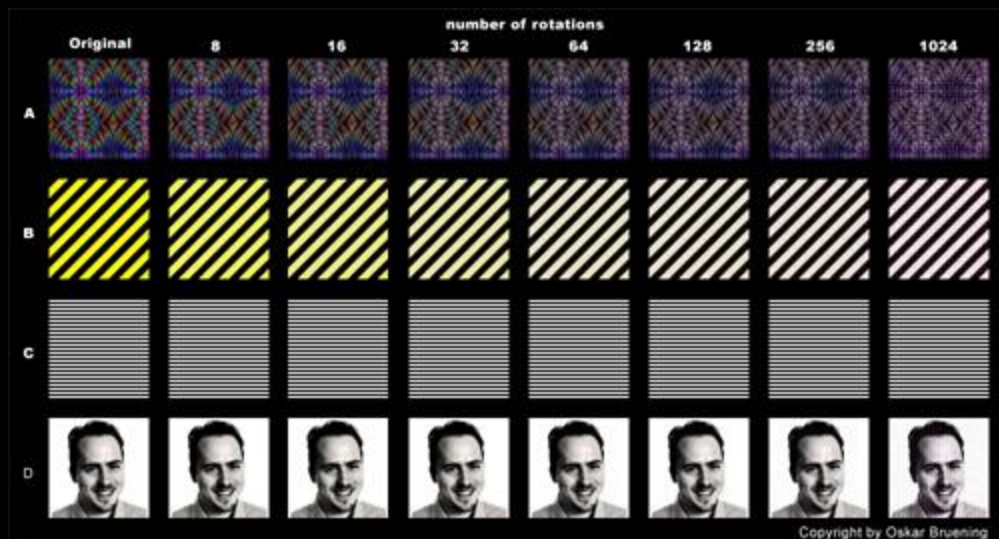
It's called a database

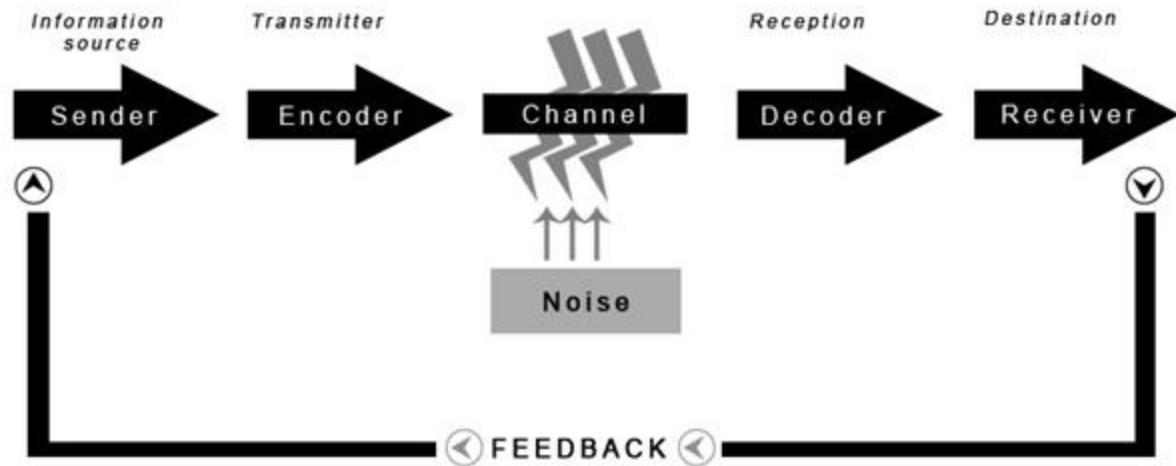
**It's called a database
not an informationbase**





SHANNON-WEAVER'S MODEL OF COMMUNICATION





SHANNON-WEAVER'S MODEL OF COMMUNICATION

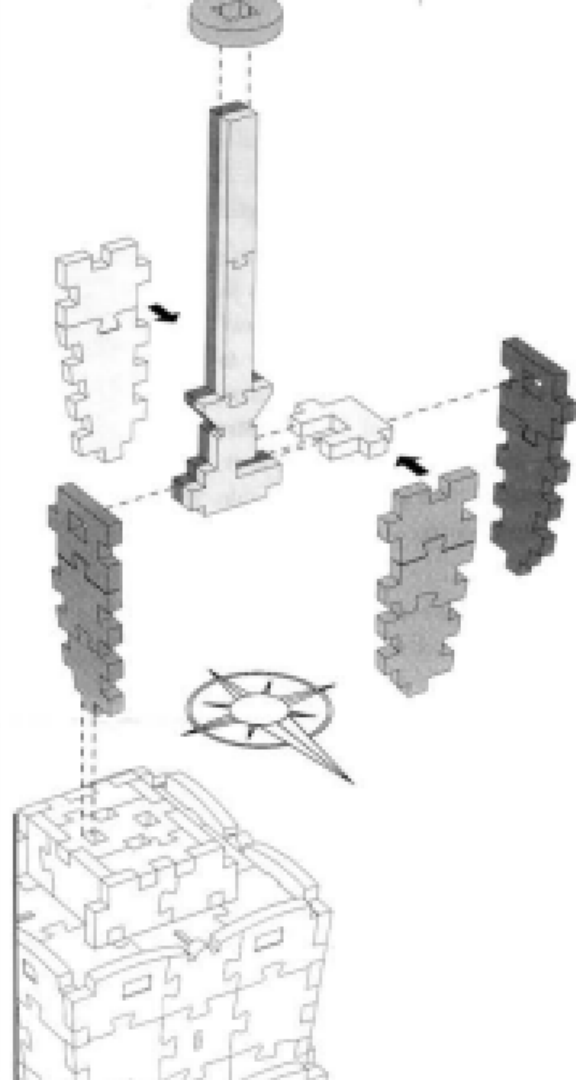
mod·el

/ˈmɑːdl/ 

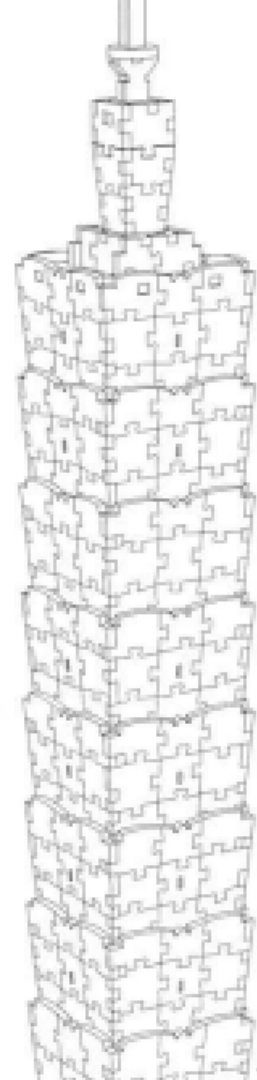
noun

2. a system or thing used as an example to follow or imitate.
"the law became a model for dozens of laws banning nondegradable plastic products"





No. 8121467 Japanese Patent No. 3,776,318 Hong Kong Patent No. 1,606,815



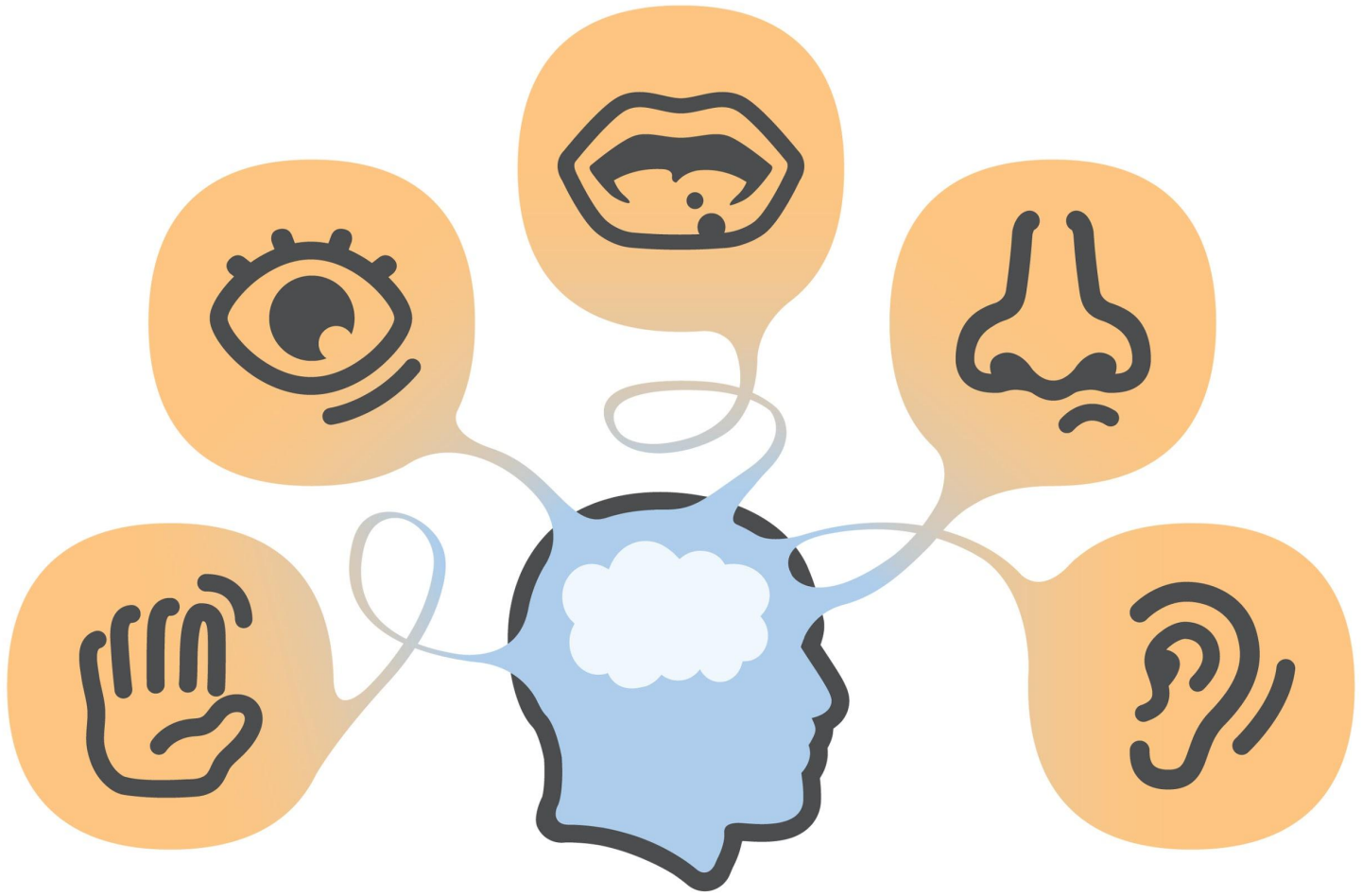
```
{
  "_id" : "_design/microblog",

  "views" : {

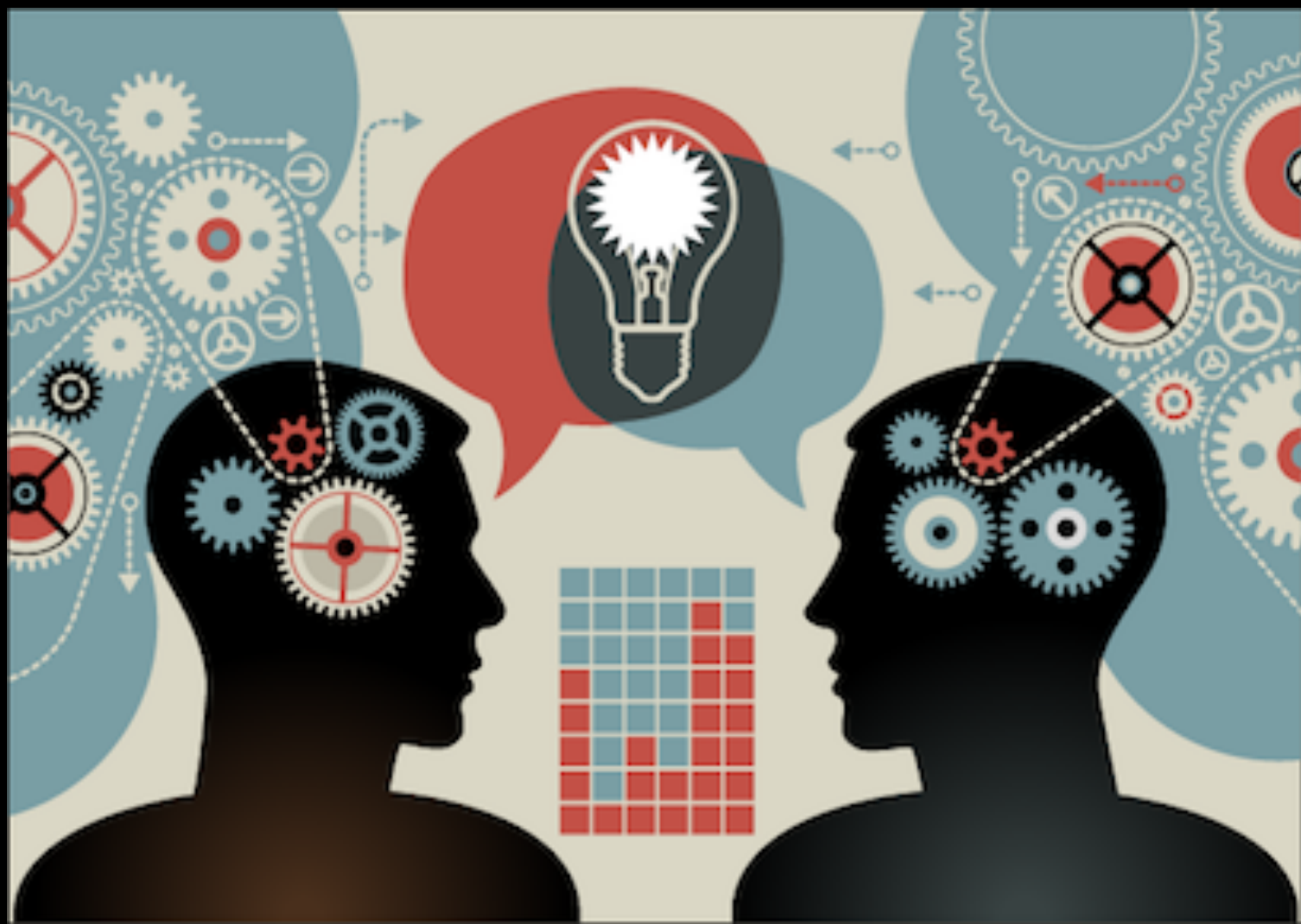
    "users_search" : {
      "map" : "function(doc){
        if(doc._id && doc.type==='user') {
          emit(doc._id,doc);
        }
      }"
    },

    "users_by_id" : {
      "map" : "function(doc){
        if(doc._id && doc.type==='user') {
          emit(doc._id,doc);
        }
      }"
    }
  }
}
```

**Models allow us to
add meaning to data**









data + model = information

in·for·ma·tion

/ˌɪnfərˈmāʃən/ 

noun

what is conveyed or represented by a particular arrangement or sequence of things.

"genetically transmitted information"





```
{
  total_rows: 678,
  offset: 0,
- rows: [
  - {
    id: "0c8b4d6cefc1123854429a9f0f2d6dd6",
    key: "0c8b4d6cefc1123854429a9f0f2d6dd6",
  - value: {
      rev: "2-f2261c5bc9f640188416bb1511d0faa9"
    }
  },
  - {
    id: "0c8b4d6cefc1123854429a9f0f3fb4db",
    key: "0c8b4d6cefc1123854429a9f0f3fb4db",
  - value: {
      rev: "1-f86b1553cdaeb859ae5ead24895abf3c"
    }
  },
  - {
    id: "0c8b4d6cefc1123854429a9f0f65dab5",
    key: "0c8b4d6cefc1123854429a9f0f65dab5",
  - value: {
      rev: "1-5e2f59b8c82e6e28aa93d3aceb393df0"
```

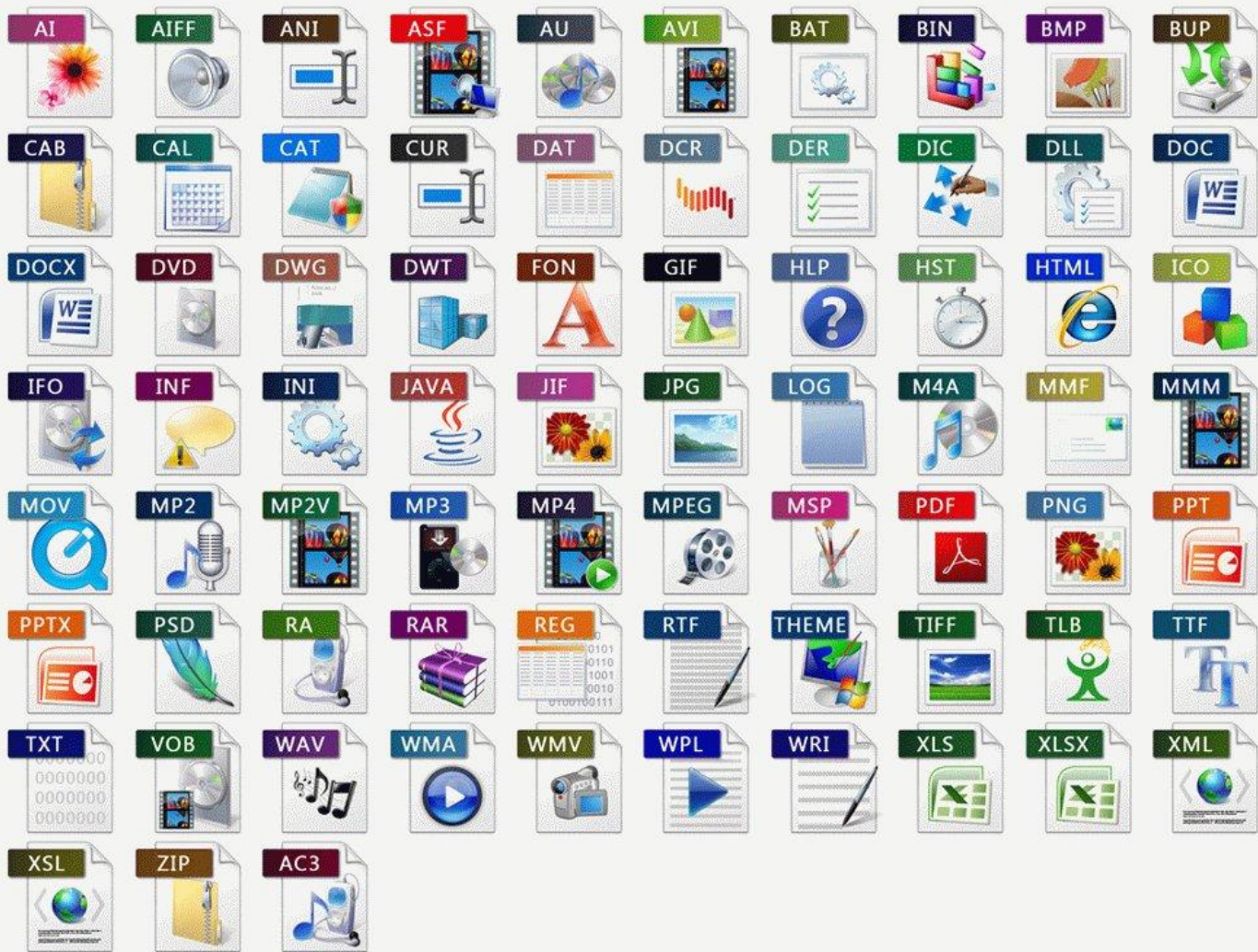

We can improve

**We can improve
the usability of messages**

**We can improve
the usability of messages
by adding affordances**

**There are three ways to
do that...**

1. Format



application/json

adds very little affordance

```
{"message":"Hello, there!","id":"7416349041741341","date":"2014-05-28T02:17:25.362Z"}
```


**collection+json
adds quite a bit
of affordance**

```
{
  "collection" :
  {
    "version" : "1.0",
    "href" : "http://localhost:1337/api/",

    "items" :
    [{
      "href": "http://localhost:1337/api/5266722824890167",
      "data": [
        {
          "name": "text",
          "value": "tasting"
        },
        {
          "name": "date_posted",
          "value": "2013-01-09T15:58:22.674z"
        }
      ]
    }
  ],

  "template" : {
    "data" : [
      {
        "prompt" : "Text of message",
        "name" : "text",
        "value" : ""
      }
    ]
  }
}
```

2. Protocol





XMPP



HTTP



XMPP



HTTP



FTP



XMPP



HTTP



FTP



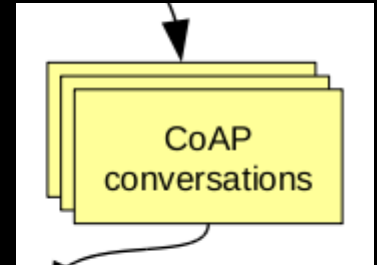


XMPP



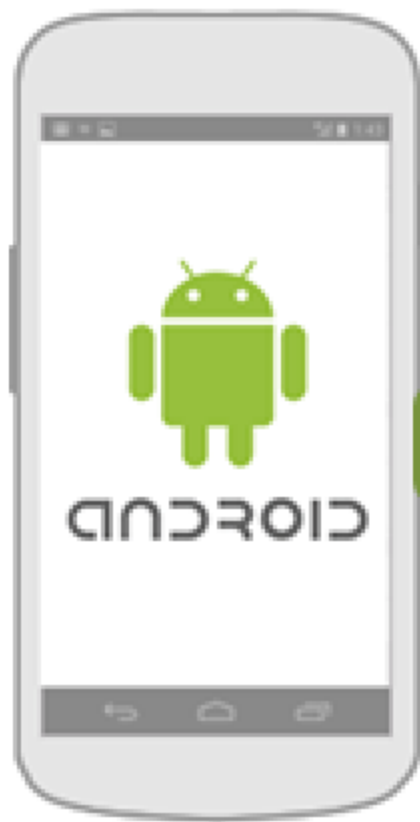


XMPP



for the
action
his new





HTTP POST JSON

Internet

URI

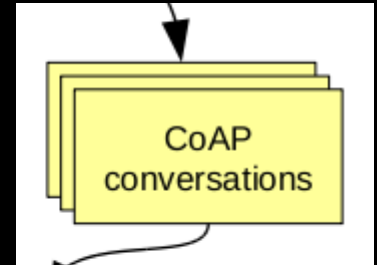
```
graph LR; URI((URI)) -- POST --> Resource[Non-idempotent representation of a resource];
```

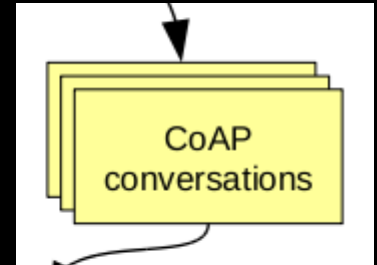
POST

Non-idempotent
representation
of a resource

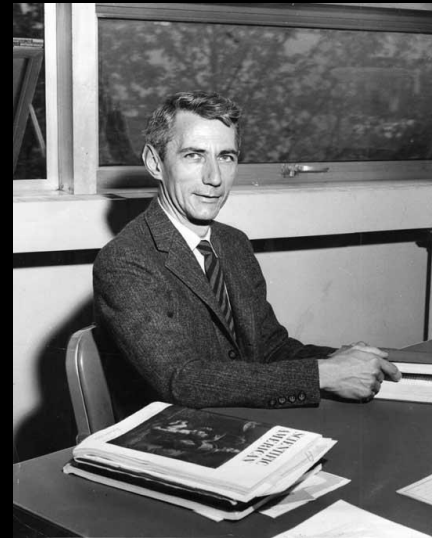


XMPP





**So far, we're still in
"Shannon-land"**



3. Semantics

THEM'S FIGHTIN' WORDS,
MISTER...UNLESS'N, O' COURSE,
THEM'S JUST SEMANTICS.



9-6
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SPEEDBUMP.COM
DIST. BY CREATORS SYND. INC.

**On the web,
the "internal model"
is represented by
Semantics**

```
{
  "collection" :
  {
    "version" : "1.0",
    "href" : "http://localhost:1337/api/",
    "items" :
    [{
      "href": "http://localhost:1337/api/5266722824890167",
      "data": [
        {
          "name": "text",
          "value": "tasting"
        },
        {
          "name": "date_posted",
          "value": "2013-01-09T15:58:22.674Z"
        }
      ]
    }
  ]
},
  "template" : {
    "data" : [
      {
        "prompt" : "Text of message",
        "name" : "text",
        "value" : ""
      }
    ]
  }
}
```

Relation Name 	Description 	Reference 
about	Refers to a resource that is the subject of the link's context.	[RFC6903] , section 2
alternate	Refers to a substitute for this context	[http://www.w3.org/TR/html5/links.html#link-type-alternate]
appendix	Refers to an appendix.	[http://www.w3.org/TR/1999/REC-html401-19991224]
archives	Refers to a collection of records, documents, or other materials of historical interest.	[http://www.w3.org/TR/2011/WD-html5-20110113/links.html#rel-archives]
author	Refers to the context's author.	[http://www.w3.org/TR/html5/links.html#link-type-author]
bookmark	Gives a permanent link to use for bookmarking purposes.	[http://www.w3.org/TR/html5/links.html#link-type-bookmark]
canonical	Designates the preferred version of a resource (the IRI and its contents).	[RFC6596]
chapter	Refers to a chapter in a collection of resources.	[http://www.w3.org/TR/1999/REC-html401-19991224]
collection	The target IRI points to a resource which represents the collection resource for the context IRI.	[RFC6573]
contents	Refers to a table of contents.	[http://www.w3.org/TR/1999/REC-html401-19991224]
copyright	Refers to a copyright statement that applies to the link's context.	[http://www.w3.org/TR/1999/REC-html401-19991224]
create-form	The target IRI points to a resource where a submission form can be obtained.	[RFC6861]
current	Refers to a resource containing the most recent item(s) in a collection of resources.	[RFC5005]
describedby	Refers to a resource providing information about the link's context.	[http://www.w3.org/TR/powder-dr/#assoc-linking]
describes	The relationship A 'describes' B asserts that resource A provides a description of resource B. There are no constraints on the format or representation of either A or B, neither are there any further constraints on either resource.	[RFC6892]

Relation Name ⌵	Description ⌵	Reference ⌵
about	Refers to a resource that is the subject of the link's context.	[RFC6903], section 2
alternate	Refers to a substitute for this context	[http://www.w3.org/TR/html5/links.html#link-type-alternate]
appendix	Refers to an appendix.	[http://www.w3.org/TR/1999/REC-html401-19991224]
archives	Refers to a collection of records, documents, or other materials of historical interest.	[http://www.w3.org/TR/2011/WD-html5-20110113/links.html#rel-archives]
author	Refers to the context's author.	[http://www.w3.org/TR/html5/links.html#link-type-author]
bookmark	Gives a permanent link to use for bookmarking purposes.	[http://www.w3.org/TR/html5/links.html#link-type-bookmark]
canonical	Designates the preferred version of a resource (the IRI and its contents).	[RFC6596]
chapter	Refers to a chapter in a collection of resources.	[http://www.w3.org/TR/1999/REC-html401-19991224]
collection	The target IRI points to a resource which represents the collection resource for the context IRI.	[RFC6573]
contents	Refers to a table of contents.	[http://www.w3.org/TR/1999/REC-html401-19991224]
copyright	Refers to a copyright statement that applies to the link's context.	[http://www.w3.org/TR/1999/REC-html401-19991224]
create-form	The target IRI points to a resource where a submission form can be obtained.	[RFC6861]
current	Refers to a resource containing the most recent item(s) in a collection of resources.	[RFC5005]
describedby	Refers to a resource providing information about the link's context.	[http://www.w3.org/TR/powder-dr/#assoc-linking]
describes	The relationship A 'describes' B asserts that resource A provides a description of resource B. There are no constraints on the format or representation of either A or B, neither are there any further constraints on either resource.	[RFC6892]

Property	Expected Type	Description
Properties from <u>Thing</u>		
<u>additionalType</u>	URL	An additional type for the item, typically used for adding more is a relationship between something and a class that the thing is 'typeof' attribute - for multiple types. Schema.org tools may have defined externally.
<u>alternateName</u>	Text	An alias for the item.
<u>description</u>	Text	A short description of the item.
<u>image</u>	URL	URL of an image of the item.
<u>name</u>	Text	The name of the item.
<u>potentialAction</u>	Action	Indicates a potential Action, which describes an idealized action
<u>sameAs</u>	URL	URL of a reference Web page that unambiguously indicates the item's page, or official website.
<u>url</u>	URL	URL of the item.

Relation Name ⌵	Description ⌵	Reference ⌵
about	Refers to a resource that is the subject of the link's context.	[RFC6903], section 2
alternate	Refers to a substitute for this context	[http://www.w3.org/TR/html5/links.html#link-type-alternate]
appendix	Refers to an appendix.	[http://www.w3.org/TR/1999/REC-html401-19991224]
archives	Refers to a collection of records, documents, or other materials of historical interest.	[http://www.w3.org/TR/2011/WD-html5-20110113/links.html#rel-archives]
author	Refers to the context's author.	[http://www.w3.org/TR/html5/links.html#link-type-author]
bookmark	Gives a permanent link to use for bookmarking purposes.	[http://www.w3.org/TR/html5/links.html#link-type-bookmark]
canonical	Designates the preferred version of a resource (the IRI and its contents).	[RFC6596]
chapter	Refers to a chapter in a collection of resources.	[http://www.w3.org/TR/1999/REC-html401-19991224]
collection	The target IRI points to a resource which represents the collection resource for the context IRI.	[RFC6573]
contents	Refers to a table of contents.	[http://www.w3.org/TR/1999/REC-html401-19991224]
copyright	Refers to a copyright statement that applies to the link's context.	[http://www.w3.org/TR/1999/REC-html401-19991224]
create-form	The target IRI points to a resource where a submission form can be obtained.	[RFC6861]
current	Refers to a resource containing the most recent item(s) in a collection of resources.	[RFC5005]
describedby	Refers to a resource providing information about the link's	[http://www.w3.org/TR/powder-dr/#assoc-linking]

describes	Term Name: contributor
	URI: http://purl.org/dc/elements/1.1/contributor

Label:	Contributor
--------	-------------

Definition:	An entity responsible for making contributions to the resource.
-------------	---

Comment:	Examples of a Contributor include a person, an organization, or a service. Typically, the
----------	---

Term Name: coverage

URI:	http://purl.org/dc/elements/1.1/coverage
------	---

Label:	Coverage
--------	----------

Definition:	The spatial or temporal topic of the resource, the spatial applicability of the resource
-------------	--

Comment:	Spatial topic and spatial applicability may be a named place or a location specified by a range. A jurisdiction may be a named administrative entity or a geographic place in a vocabulary such as the Thesaurus of Geographic Names [TGN]. Where appropriate, references may be made to as sets of coordinates or date ranges.
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References:	[TGN] http://www.getty.edu/research/tools/vocabulary/tgn/index.html
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Term Name: creator

URI:	http://purl.org/dc/elements/1.1/creator
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Label:	Creator
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Definition:	An entity primarily responsible for making the resource.
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Comment:	Examples of a Creator include a person, an organization, or a service. Typically, the
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Term Name: date

Property	Expected Type	Description
Properties from Thing		
additionalType	URL	An additional type for the item, typically used for adding more specific types. This is a relationship between something and a class that the thing is an instance of. Schema.org tools may have a 'typeof' attribute - for multiple types. Schema.org tools may have defined externally.
alternateName	Text	An alias for the item.
description	Text	A short description of the item.
image	URL	URL of an image of the item.
name	Text	The name of the item.
potentialAction	Action	Indicates a potential Action, which describes an idealized action that can be performed on the item.
sameAs	URL	URL of a reference Web page that unambiguously indicates the item's identity, e.g. the item's official page, or official website.
url	URL	URL of the item.

Relation Name	Description	Reference
about	Refers to a resource that is the subject of the link's context.	[RFC6903], section 2
alternate	Refers to a substitute for this context	[http://www.w3.org/TR/html5/links.html#link-type-alternate]
appendix	Refers to an appendix.	[http://www.w3.org/TR/1999/REC-html401-19991224]
archives	Refers to a collection of records, documents, or other materials of historical interest.	[http://www.w3.org/TR/2011/WD-html5-20110113/links.html#rel-archives]
author	Refers to the context's author.	[http://www.w3.org/TR/html5/links.html#link-type-author]
bookmark	Gives a permanent link to use for bookmarking purposes.	[http://www.w3.org/TR/html5/links.html#link-type-bookmark]
canonical	Designates the preferred version of a resource (the IRI and its contents).	[RFC6596]
chapter	Refers to a chapter in a collection of resources.	[http://www.w3.org/TR/1999/REC-html401-19991224]
collection	The target IRI points to a resource which represents the collection resource for the context IRI.	[RFC6573]
contents	Refers to a table of contents.	[http://www.w3.org/TR/1999/REC-html401-19991224]
copyright	Refers to a copyright statement that applies to the link's context.	[http://www.w3.org/TR/1999/REC-html401-19991224]
create-form	The target IRI points to a resource where a submission form can be obtained.	[RFC6861]
current	Refers to a resource containing the most recent item(s) in a collection of resources.	[RFC5005]
describedby	Refers to a resource providing information about the link's	[http://www.w3.org/TR/powder-dr/#assoc-linking]

describes	Term Name: contributor
	URI: http://purl.org/dc/elements/1.1/contributor
	Label: Contributor
	Definition: An entity responsible for making contributions to the resource.
	Comment: Examples of a Contributor include a person, an organization, or a service. Typically, the
	Term Name: coverage
	URI: http://purl.org/dc/elements/1.1/coverage
	Label: Coverage
	Definition: The spatial or temporal topic of the resource, the spatial applicability of the resource
	Comment: Spatial topic and spatial applicability may be a named place or a location specified by a range. A jurisdiction may be a named administrative entity or a geographic place in a vocabulary such as the Thesaurus of Geographic Names [TGN]. Where appropriate, ranges may be as sets of coordinates or date ranges.
	References: [TGN] http://www.getty.edu/research/tools/vocabulary/tgn/index.html
	Term Name: creator
	URI: http://purl.org/dc/elements/1.1/creator
	Label: Creator
	Definition: An entity primarily responsible for making the resource.
	Comment: Examples of a Creator include a person, an organization, or a service. Typically, the
	Term Name: date

Keyword	Effect on link	Effect on a, area	Brief description (from the relevant specification where possible)
acquaintance	not allowed	external relation	the person represented by the current document considers the person represented by the referenced document to be an acquaintance
alternate	external resource	external relation	Designates substitute versions for the document in which the link occurs. When used together with the lang attribute, it implies a translated version of the document. When used together with the media attribute, it implies a version designed for a different medium (or media).
appendix	allowed	allowed	Refers to a document serving as an appendix in a collection of documents.
bookmark	not allowed	allowed	Refers to a bookmark. A bookmark is a link to a key entry point within an extended document. The title attribute may be used, for example, to label the bookmark. Note that several bookmarks may be defined in each document.
chapter	allowed	allowed	Refers to a document serving as a chapter in a collection of documents.
child	not allowed	external relation	the referenced person is a child of the person represented by the current document
colleague	not allowed	external relation	the referenced person is a colleague of the person represented by the current document
contact	not allowed	external relation	the person represented by the current document considers the person represented by the referenced document to be a contact
contents	allowed	allowed	Refers to a document serving as a table of contents. Some user agents also support the synonym ToC (from "Table of Contents").
copyright	allowed	allowed	Refers to a copyright statement for the current document.

additionalType	URL	An additional type for the item, typically used for adding more specific types. It is a relationship between something and a class that the thing is a member of - for multiple types. Schema.org tools may have been defined externally.
alternateName	Text	An alias for the item.
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image	URL	URL of an image of the item.
name	Text	The name of the item.
potentialAction	Action	Indicates a potential Action, which describes an idealized action that can be performed on the item.
sameAs	URL	URL of a reference Web page that unambiguously indicates the item's page, or official website.
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Relation Name	Description	Reference
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alternate	Refers to a substitute for this context	[http://www.w3.org/TR/html5/links.html#link-type-alternate]
appendix	Refers to an appendix.	[http://www.w3.org/TR/1999/REC-html401-19991224]
archives	Refers to a collection of records, documents, or other materials of historical interest.	[http://www.w3.org/TR/2011/WD-html5-20110113/links.html#rel-archives]
author	Refers to the context's author.	[http://www.w3.org/TR/html5/links.html#link-type-author]
bookmark	Gives a permanent link to use for bookmarking purposes.	[http://www.w3.org/TR/html5/links.html#link-type-bookmark]
canonical	Designates the preferred version of a resource (the IRI and its contents).	[RFC6596]
chapter	Refers to a chapter in a collection of resources.	[http://www.w3.org/
collection	The target IRI points to a resource which represents the collection resource for the context IRI.	[RFC6573]
contents	Refers to a table of contents.	[http://www.w3.org/
copyright	Refers to a copyright statement that applies to the link's context.	[http://www.w3.org/
create-form	The target IRI points to a resource where a submission form can be obtained.	[RFC6861]
current	Refers to a resource containing the most recent item(s) in a collection of resources.	[RFC5005]
describedby	Refers to a resource providing information about the link's	[http://www.w3.org/

describes	Term Name: contributor	
	URI:	http://purl.org/dc/elements/1.1/contributor
	Label:	Contributor
	Definition:	An entity responsible for making contributions to the resource.
	Comment:	Examples of a Contributor include a person, an organization, or a s
	Term Name: coverage	
	URI:	http://purl.org/dc/elements/1.1/coverage
	Label:	Coverage
	Definition:	The spatial or temporal topic of the resource, the spatial applicabi
	Comment:	Spatial topic and spatial applicability may be a named place or a location specified by range. A jurisdiction may be a named administrative entity or a geographic place in a vocabulary such as the Thesaurus of Geographic Names [TGN]. Where appropriate, r as sets of coordinates or date ranges.
	References:	[TGN] http://www.getty.edu/research/tools/vocabulary/tgn/index.html
	Term Name: creator	
	URI:	http://purl.org/dc/elements/1.1/creator
	Label:	Creator
	Definition:	An entity primarily responsible for making the resource.
	Comment:	Examples of a Creator include a person, an organization, or a service. Typically, the
	Term Name: date	

Verb	Description	Example
accept	Indicates that the actor has accepted the object. For instance, a person accepting an award, or accepting an assignment.	<pre>{ "actor": { "objecttype": "person", "displayname": "Sally"}, "verb": "accept", "object": { "objecttype": "job", "displayname": "Director of Marketing"}, "title": "Sally accepted the Director of Marketing job." } }</pre>
access	Indicates that the actor has accessed the object. For instance, a person accessing a room, or accessing a file.	<pre>{ "actor": { "objecttype": "person", "displayname": "Joe"}, "verb": "access", "object": { "objecttype": "file", "displayname": "AQ0812 Sales Forecast.xls"}, "published": "2012-12-12T12:12:12Z", "title": "Joe accessed the file \"AQ0812 Sales Forecast.xls\""} }</pre>
acknowledge	Indicates that the actor has acknowledged the object. This effectively signals that the actor	<pre>{ "actor": { "objecttype": "person", "displayname": "Sally"}, "verb": "acknowledge", "object": {</pre>

Keyword	Effect on link	Effect on a, area	Brief description (from the relevant specification where possible)
acquaintance	not allowed	external relation	the person represented by the current document considers the person represented by the referenced document to be an acquaintance
alternate	external resource	external relation	Designates substitute versions for the document in which the link occurs. When used together with the lang attribute, it implies a translated version of the document. When used together with the media attribute, it implies a version designed for a different medium (or media).
	..wed	allowed	Refers to a document serving as an appendix in a collection of documents.
	wed	allowed	Refers to a bookmark. A bookmark is a link to a key entry point within an extended document. The title attribute may be used, for example, to label the bookmark. Note that several bookmarks may be defined in each document.
	wed	external relation	the referenced person is a child of the person represented by the current document
	wed	external relation	the referenced person is a colleague of the person represented by the current document
	wed	external relation	the person represented by the current document considers the person represented by the referenced document to be a contact
	wed	allowed	Refers to a document serving as a table of contents. Some user agents also support the synonym ToC (from "Table of Contents").
	wed	allowed	Refers to a copyright statement for the current document.
	type	URL	An additional type for the item, typically used for adding more s is a relationship between something and a class that the thing is 'typeof' attribute - for multiple types. Schema.org tools may have defined externally.
alternateName	Text		An alias for the item.
description	Text		A short description of the item.
image	URL		URL of an image of the item.
name	Text		The name of the item.
potentialAction	Action		Indicates a potential Action, which describes an idealized action
sameAs	URL		URL of a reference Web page that unambiguously indicates the i page, or official website.
url	URL		URL of the item.

Format Protocol Semantics



Formats

Add support for:

- collection+json
- siren
- hal+json



Protocols

Add support for:

- CoAP
- MQTT



Semantics

Make it easy to use existing semantics:

- IANA
- schema.org
- microformats
- dublin core
- activity streams



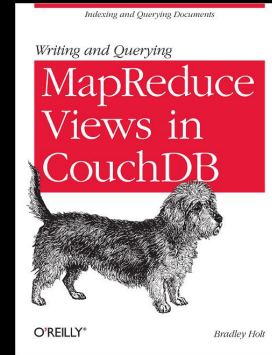
BRADLEY HOLT

« [PHP 5.4 Cheat Sheet](#) from DZone Refcardz Published
[Why Gigabit Matters](#) »

Building a Hypermedia API in CouchDB

The [latest issue of *php|architect*](#) includes an article of mine on Building a Hypermedia API in CouchDB. The article's description:

This article demonstrates how to create a hypermedia data API using CouchDB, a document database and application server that is accessed through an HTTP API. URIs identify CouchDB resources such as databases, documents, attachments, and configuration sections. HTTP methods define actions on these resources. Requests from CouchDB clients—and responses to CouchDB clients—are self-describing through the use of request headers, response status codes, and response headers. However, CouchDB's core API does not include hypermedia controls. This article will demonstrate how you can add hypermedia controls to your CouchDB application through the use of show functions, list functions, document update handlers, rewrite rules, and a virtual host or a reverse proxy.



Making Cloud Data Usable

<http://g.mamund.com/2014CloudantCon-talk>

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