

Developing a CouchDB Application With CouchApp



TRAVEL PLACES

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Travel Places (WS) Limited



CouchDB
relax

Today's Itinerary

- Definitions
- CouchDB
- Futon
- CouchApp
- A couchapp
- “Prospects” couchapp
- Security
- Who uses CouchDB?

CouchApp

- A couchapp is a web application served directly by CouchDB.
- CouchApp is also a python application for managing couchapps by representing them as separate, editable files in the file system with commands to transfer changes to and from a CouchDB design document.
 - generate, init, clone, push

CouchDB - What They Say

- Apache CouchDB is a distributed, fault-tolerant and schema-free document-oriented database accessible via a RESTful HTTP/JSON API. Among other features, it provides robust, incremental replication with bi-directional conflict detection and resolution, and is queryable and indexable using a table-oriented view engine with JavaScript acting as the default view definition language.
- CouchDB is written in Erlang, but can be easily accessed from any environment that provides means to make HTTP requests. There are a multitude of third-party client libraries that make this even easier for a variety of programming languages and environments.

CouchDB in Layman's Terms

- CouchDB is a NoSQL database
- Damien Katz, former IBM Lotus Notes developer
- Stores documents using JSON
- Stores document attachments
- Query engine for map/reduce views and indexes
- Provides HTTP REST API
- Supports replication
- Serves web applications entirely from database
- Supports many databases

CouchDB Technologies

- Erlang
- Javascript Query Server using Mozilla SpiderMonkey
- jQuery
- OAuth support
- Experimental NodeJS Query Server

Tools

- Futon
 - The default administration “couchapp” released with CouchDB. Basic database, user, document and replication management. Can edit map/reduce views.
- CouchApp
 - Separately downloadable from GitHub. Actively developed. Windows version less reliable. Worked well under Ubuntu.
- Fauxton
 - New management application from v2.0. Does not play nice with Ubuntu, at the moment.

Get CouchDB?

- Via Python.
 - `sudo apt-get install python-setuptools`
 - `sudo easy_install -U couchapp`
 - `couchapp --help`

Under the Hood - CouchDB

- **`/etc/couchdb`** - configuration
- **`/var/log/couchdb`** - log files
- **`/var/lib/couchdb`** - databases
- **`/usr/share/couchdb`** - Futon couchapp
- **`/usr/share/doc/couchdb`** - documentation

Under the Hood - Databases

- /var/lib/couchdb
 - <database>.couch file
 - .<database>_design directory
 - mrview
 - <design doc revision>.view

This is not intended to be directly editable!
Owned by couchdb user.

Futon

- Web application - the built-in couchapp
- Database creation and deletion
- User & role creation and deletion
- Design creation, modification, deletion
- Document creation, modification, deletion
- Replication

Futon

The screenshot displays the Apache CouchDB Futon interface. The main content area shows an 'Overview' page with a table of databases. The table has four columns: Name, Size, Number of Documents, and Update Seq. Two databases are listed: **_replicator** (8.1 KB, 1 document, update seq 1) and **_users** (20.1 KB, 1 document, update seq 5). Below the table, it indicates 'Showing 1-2 of 2 databases' and provides navigation options: '- Previous Page | Rows per page: 10 | Next Page -'. The sidebar on the right features the CouchDB logo with the tagline 'relax' and a menu with the following items: Tools (Overview, Configuration, Replicator, Status), Documentation (Manual), Diagnostics (Verify Installation), and Recent Databases. At the bottom of the sidebar, there is a message: 'Welcome to Admin Party! Everyone is admin. [Fix this](#)' and the version information 'Futon on Apache CouchDB 1.4.0'.

Name	Size	Number of Documents	Update Seq
_replicator	8.1 KB	1	1
_users	20.1 KB	1	5

Showing 1-2 of 2 databases - Previous Page | Rows per page: 10 | Next Page -

CouchDB
relax

Tools

- Overview
- Configuration
- Replicator
- Status

Documentation

- Manual

Diagnostics

- Verify Installation

Recent Databases

Welcome to Admin Party!
Everyone is admin. [Fix this](#)

Futon on Apache CouchDB 1.4.0

Fauxton

- A new, slicker Web Management GUI for CouchDB and couchapps?
- Does not work, out of the box, with Ubuntu package for NodeJS.
- Part of CouchDB v2.0?

Get CouchApp?

- <https://github.com/couchapp/couchapp>
- or
- `curl -O https://bootstrap.pypa.io/get-pip.py`
- `$ sudo python get-pip.py`
- `$ sudo pip install couchapp`
- `$ sudo pip install --upgrade couchapp`

A Simple Web Application

- Prospects database for marketing and sales.
- Capture prospect details.
- Update prospect information.
- Fetch relevant prospects for campaigns.

- Derailment! CTracker

A couchapp - One Approach

- Create part of couchapp using Futon.
- Clone a design document into a file system directory
 - `couchapp clone http://localhost:5984/db/_design/doc db`
- Drop in attachments
- Edit CSS, HTML and JS files directly
- Push changes back to CouchDB
 - `couchapp push db http://localhost:5984/db`

First Steps via Futon

- Create a database called prospects.
- Create a design document, with document id of `_design/prospects`.
- Define users and roles that can access this database.
- Manually create some test documents.
- Create an initial map/reduce view.
- From here on in, it gets fiddly so, in a terminal window.
 - `couchapp clone http://localhost:5984/prospects/_design/prospects prospects`
- We now have a Futon-originated couchapp in `./prospects`.

First Steps via CouchApp - init

- In a terminal window
 - `mkdir <couchapp directory name>`
 - `couchapp init <couchapp directory name>`
- Creates two hidden files
 - `.couchappignore`
 - `.couchapprc`
- Not immediately useful for the beginner...

First Steps via CouchApp - generate

- In a terminal window
 - `couchapp generate app prospects`
- We now have a CouchApp-originated couchapp in `./prospects`, with 5 directories and 12 files.
- This provides a standard couchapp template, provisioned with jQuery and Mustache templates.

What Does a couchapp Look Like?

- db
 - `_attachments`
 - whatever you want
 - `_id`
 - language
 - `lists`
 - `shows`
 - `templates`
 - `updates`
 - `validate_doc_update.js`
 - `vendor`
 - `views`
 - `myView`
 - `map.js`
 - `reduce.js`

First Level

• _attachments	Layout files, CSS, Javascript, HTML files for couchapp.
• .couchappignore	Regular expressions for files to exclude from CouchDB.
• couchapp.json	JSON for project information, e.g. name, description.
• .couchapprc	Optional JSON settings for different environments.
• _id	Target design document name - plain text.
• language	Query engine language - usually javascript. Plain text.
• lists	Directory of list functions.
• README.md	Information about the sample couchapp.
• shows	A directory of show functions.
• updates	?
• vendor	A place for vendor-supplied web assets.
• views	A directory of view directories, containing map.js , reduce.js

What is a Prospect

- Name
- Telephone
- Email Address
- School
- Position at School
- Sport
- Currently Tours?

A Prospect in CouchDB

```
{  
  "name": "Jeffrey Best",  
  "telephone": "01903 832851",  
  "emailAddress": "jeffreyb@travelplaces.co.uk",  
  "school": "Travel Places",  
  "position": "IT Manager",  
  "sport": "chess",  
  "currentlyTours": false  
}
```

Prospects Database

The screenshot shows the Apache CouchDB Futon interface in a Mozilla Firefox browser window. The browser title is "Apache CouchDB - Futon: Overview - Mozilla Firefox". The address bar shows the URL "127.0.0.1:5984/_utils/index.html". The main content area displays an "Overview" page with a table of databases. A "Create New Database" dialog box is open in the foreground, prompting the user to enter a database name. The dialog box text reads: "Please enter the name of the database. Note that only lowercase characters (a-z), digits (0-9), or any of the characters _, \$, (,), +, -, and / are allowed." Below the text is a text input field labeled "Database Name:" and two buttons: "Create" and "Cancel".

Name	Size	Number of Documents	Update Seq
_replicator	4.1 KB	1	1
_users		2	3
application_settings		2	8
prospects		2	7

Showing 1-4 of 4 databases

Rows per page: 10 | Next Page →

Tools

- Overview
- Configuration
- Replicator
- Status

Documentation

- Manual

Diagnostics

- Verify Installation

Recent Databases

- [_users](#)
- [application_settings](#)
- [prospects](#)

Signup or Login

Futon on Apache CouchDB 1.5.0

Create a Document

The screenshot shows the Apache CouchDB Futon interface in a Mozilla Firefox browser. The browser title is "Apache CouchDB - Futon: View Document - Mozilla Firefox". The address bar shows the URL "127.0.0.1:5984/_utils/document.html?prospects". The breadcrumb navigation shows "Overview > prospects > 87b19dcf495c97ae5ad9799b61000355".

At the top of the document view, there are three buttons: "Save Document" (checked), "Add Field", and "Upload Attachment...". Below these are two tabs: "Fields" and "Source", with "Source" selected. The source view displays a JSON document:

```
{
  "_id": "87b19dcf495c97ae5ad9799b61000355"
}
```

At the bottom of the source view, there are links for "← Previous Version" and "Next Version →".

On the right side, there is a sidebar with the CouchDB logo and the text "CouchDB relax". Below the logo, there are sections for "Tools", "Documentation", "Diagnostics", and "Recent Databases".

- Tools**
 - Overview
 - Configuration
 - Replicator
 - Status
- Documentation**
 - Manual
- Diagnostics**
 - Verify Installation
- Recent Databases**
 - _users
 - application_settings
 - prospects

At the bottom of the sidebar, there is a "Signup or Login" link and the text "Futon on Apache CouchDB 1.5.0".

Editing Options

- Edit source directly.
- Edit individual fields.
 - Remember to save field edit **and** Save Document
- Each document save generates a new Revision
- The `_id` field must be unique. Futon will generate a UUID, but you can override.

How do we access data?

- Each CouchDB database can have one or more design documents.
- A design document can store map/reduce views, show, list, update and validation functions, attachments and templates.
- Functions implemented in Javascript.
- Easy way to create map/reduce views via “Temporary view...” editor.

Saving a View

Apache CouchDB - Futon: Browse Database - Mozilla Firefox <2>

File Edit View History Bookmarks Tools Help

127.0.0.1:5984/_utils/database.html?prospects/_t

Overview > prospects

Jump to: Document ID View: Temporary view... Stale views

View Code

```
Map Function:
function(doc) {
  if ( doc.sport ) {
    if ( doc.sport == "chess" ) {
      emit(doc._id, doc);
    }
  }
}
```

Reduce Function (optional):

Save View As...

You can save this function code as a permanent view in the database. Just enter or select the design document and the name of the view below. Note that if you choose an existing view, it will be overwritten!

Design Document:

View Name:

Run Language:

Save Cancel Save

Warning: Please note that temporary views are not suitable for use in production, as they are really slow for any database with more than a few dozen documents. You can use a temporary view to experiment with view functions, but switch to a permanent view before using them in an application.

CouchDB relax

Tools

- Overview
- Configuration
- Replicator
- Status

Documentation

- Manual

Diagnostics

- Verify Installation

Recent Databases

- _users
- application_settings
- prospects

Signup or Login

Futon on Apache CouchDB 1.5.0

What can we put in our Functions?

- jQuery
- commonJS modules
- Mustache templates
- Any attachment to the design document.

Can we access programmatically?

- cURL Example

```
$ curl -sX GET http://localhost:5984/prospects/_all_docs
```

```
{ "total_rows":2, "offset":0, "rows":[  
  
  { "id":"4ad77c4c597d227f8db50ff3c9000399", "key":"4ad77c4c597d227f8db50ff3c9000399", "value":{"rev":"4-  
ffc2ef2731f3792917146b6a9e44ddc7"}},  
  
  { "id":"_design/prospects", "key":"_design/prospects", "value":{"rev":"9-b8f9760ad76a560dd987f1121794461f"}}  
]
```

- This is not very useful - we just get a list of all the documents in the database.
- Perhaps we need to use the view we defined?

Accessing a View Programmatically

- `$ curl -sX GET http://localhost:5984/prospects/_design/prospects/_view/getChessProspects`

```
{ "total_rows": 1, "offset": 0, "rows": [
  { "id": "4ad77c4c597d227f8db50ff3c9000399", "key": "4ad77c4c597d227f8db50ff3c9000399", "value": { "_id": "4ad77c4c597d227f8db50ff3c9000399", "_rev": "4-ffc2ef2731f3792917146b6a9e44ddc7", "name": "Jeffrey Best", "workPhone": "01903832851", "homePhone": "", "mobilePhone": "", "emailAddress": "jeffreyb@travelplaces.co.uk", "school": "Travel Places", "positionAtSchool": "IT Manager", "sportOrSubject": "chess", "currentlyTours": false, "toursWhere": "", "heardOfTravelPlaces": true, "whereHeardOfTravelPlaces": "trade show", "acceptedEmails": "offers", "acceptedPhoneCalls": "", "salesGroup": "IT" } }
] }
```
- A view will always return a JSON document. The output will always contain document id, key and a value that is the JSON for each document matched by the view.
- There must be a way to get output in other formats!

Validation Functions

- One `validate_doc_update` per design document
- Validation function for all design documents run
- Order of running not guaranteed
- **Sample Validation Function**

Validation Function

- `function(newDoc, savedDoc, userCtx) {...}`
- User Context Object
 - db
 - name
 - roles
- If revision to existing doc, then savedDoc
- Incoming doc in newDoc

List Functions

- List functions operate on a view.
 - http://localhost:5984/db/_design/doc/_list/listFn/view
 - http://localhost:5984/db/_design/doc/_list/listFn/_design/doc2/view
- List functions can provide separate handlers for different MIME types.
 - `format=<mime type>`
- List functions can send chunks of text when generating, to be batched and served by CouchDB.
- View order and paging can be specified.
 - `descending=true`
 - `limit=10`
 - `startkey=docid`

List Function

- `function(head, req) {...}`
 - `provides(mimeType, function() {...});`
 - `registerType("all", "*/*");`
 - `registerType("text", "text/plain; charset=utf-8", "txt");`
 - `registerType("html", "text/html; charset=utf-8");`
 - `registerType("xhtml", "application/xhtml+xml", "xhtml");`
 - `registerType("xml", "application/xml", "text/xml", "application/x-xml");`
 - `registerType("js", "text/javascript", "application/javascript", "application/x-javascript");`
 - `registerType("css", "text/css");`
 - `registerType("ics", "text/calendar");`
 - `registerType("csv", "text/csv");`
 - `registerType("rss", "application/rss+xml");`
 - `registerType("atom", "application/atom+xml");`
 - `registerType("yaml", "application/x-yaml", "text/yaml");`
 - `registerType("multipart_form", "multipart/form-data");`
 - `registerType("url_encoded_form", "application/x-www-form-urlencoded");`
 - `registerType("json", "application/json", "text/x-json");`

Prospects List Function Output

- http://127.0.0.1:5984/prospects/_design/prospects/_list/listView/getWithEmailAddress?format=html

	Name	Email	Telephone	School	Position	Sport
Save	Jeffrey Best	jeffreyb@travelplaces.co.uk	01903 832851	Podium College for Delinquent Hackers		Fly Fishing
Save	Dr. Jonathan Cunningham	jonathanc@travelplaces.co.uk		SofLuc Tutors	Senior Tutor	Fly Fishing
Save	Ken Ramkeesoon	kenr@travelplaces.co.uk	01234 567890	School of Persuasion	Chief Inquisitor	Fly Fishing
Save	Sean Heather	seanh@travelplaces.co.uk		Sussex Cricket Academy	Batting Coach	Cricket
Save	Stylios Moschos	styliosm@travelplaces.co.uk	01903 832851	School of Fish	Course Leader	Fly Fishing
Save						

Show Functions

- `function(doc, req) {...}`
 - Operates on a specified document (and, optionally, revision).
 - Document in `doc`.
 - Request details in `req`.
 - Simplest transformation mechanism.

Show Function Example

```
function(doc,req) {  
  if ( doc.emailAddress ) {  
    var s = '<tr>'  
    s += '<td>' + doc.school + '</td>';  
    s += '<td>' + doc.name + '</td>';  
    s += '<td>' + doc.position + '</td>';  
    s += '<td>' + doc.emailAddress + '</td>';  
    s += '</tr>\n';  
    return s;  
  }  
}
```

Another Show Example

http://localhost:5984/cctracker/_design/cctracker/_show/createPayment/d1a5082773d3a8d329bc1daae2007bf2

```
-<soapenv:Envelope>
  <soapenv:Header/>
  -<soapenv:Body>
    -<cdm:CreatePayment>
      <cdm:Product>CREDIT123</cdm:Product>
      <cdm:PlatformId>0123-456789</cdm:PlatformId>
      <cdm:Username>test</cdm:Username>
      <cdm>Password>password</cdm>Password>
      <cdm:OrgId>Travel Places WS Limited</cdm:OrgId>
      <cdm:Amount>1200</cdm:Amount>
    -<cdm:UserDefinedFields>
      -<cdm:UserDefinedField>
        <cdm:FieldName>UDF1</cdm:FieldName>
        <cdm:ValueAsString>1/1/2017</cdm:ValueAsString>
      </cdm:UserDefinedField>
      -<cdm:UserDefinedField>
        <cdm:FieldName>UDF2</cdm:FieldName>
        <cdm:ValueAsString>stafftravel2017</cdm:ValueAsString>
      </cdm:UserDefinedField>
      -<cdm:UserDefinedField>
        <cdm:FieldName>UDF3</cdm:FieldName>
        <cdm:ValueAsString>stafftravel</cdm:ValueAsString>
      </cdm:UserDefinedField>
```

The Prospects Proof of Concept



TRAVEL PLACES

Prospects

[Add Prospect](#)

Name	Email	Telephone	School	Position	Sport/Subject	Currently Tours?	Tours Where?	Heard of TP?	Where Heard of TP?	Can Contact?		
Jeffrey Best	jeffreymb@travelplaces.co.uk	01903 832851	Podium College for Delinquent Hackers		Fly Fishing	true	Canada	true	Graffiti	true	Edit Prospect	Remove Prospect
Dr. Jonathan Cunningham	jonathanc@travelplaces.co.uk		SofLuc Tutors	Senior Tutor	Fly Fishing	true		true	Facebook	true	Edit Prospect	Remove Prospect
Ken Ramkeesoon	kenr@travelplaces.co.uk	01234 567890	School of Persuasion	Chief Inquisitor	Fly Fishing	true		true		true	Edit Prospect	Remove Prospect
Sean Heather	seanh@travelplaces.co.uk		Sussex Cricket Academy	Batting Coach	Cricket	true		true	LinkedIn	true	Edit Prospect	Remove Prospect
Stylios Moschos	styliosm@travelplaces.co.uk	01903 832851	School of Fish	Course Leader	Fly Fishing	true	Brazil	true		true	Edit Prospect	Remove Prospect

The CCTracker Proof of Concept

Credit and Debit Card Payment Tracker

Welcome [jeffb!](#) [Logout?](#)

jeffb

Date of Travel:	<input type="text"/>	To:	<input type="text"/>
Event Code:	<input type="text"/>		
Client Account Code:	<input type="text"/>	Client Purchase Order Number:	<input type="text"/>
Reason Code:	<input type="text"/>		
Supplier:	<input type="text"/>		
Booking Reference:	<input type="text"/>		
Supply Details:	<input type="text"/>		
Routing:	<input type="text"/>	Pax:	<input type="text"/>
Hotel Name:	<input type="text"/>	Number of Rooms:	<input type="text"/>
Commission Expected:	<input type="text"/>	Percentage	
Local Currency Amount:	<input type="text"/>		
Min Amount	<input type="text"/>	GBP Amount (Estimate):	<input type="text"/>
Extra Charges Allowed:	<input type="text"/>	Max Amount	<input type="text"/>
Start Date:	<input type="text"/>	EndDate:	<input type="text"/>

Recent Payments

14/1/2017 GENTRAV17UK BOA V BA UK MEL/XDBX/LGW BEST/JEFFREYMR GBP 1450.00 No 14/1/2017 28/1/2017
1/1/2017 gentrav17uk BOA V BA UK LHR/XSIN/MEL BEST/JEFFREYMR GBP 1200 1/1/2017 1/1/2017

To Do: Add pagination.

Security





















- The Admin Party
- admin Users
- _users
- roles

Who Uses CouchDB?

- BBC (2009)
 - The BBC is building a new environment that allows cost-effective building of dynamic content platforms. A key component of the new RESTful service-based platform is a Key Value store - an API which uses 32 CouchDB storage nodes in two datacentres. We have a Java/Tomcat API which handles SSL-based user authorisation and sharding, independent (of each other) CouchDB nodes which are replicated with (replication mapped nodes) between our datacentres. We can also show results from a load/stress/soak test to see what - on our servers - is the long-term maximum throughput of an individual node.

Rank			DBMS	Database Model	Score		
Mar 2016	Feb 2016	Mar 2015			Mar 2016	Feb 2016	Mar 2015
1.	1.	1.	Oracle	Relational DBMS	1472.01	-4.13	+2.93
2.	2.	2.	MySQL	Relational DBMS	1347.71	+26.59	+86.62
3.	3.	3.	Microsoft SQL Server	Relational DBMS	1136.49	-13.73	-28.31
4.	4.	4.	MongoDB	Document store	305.33	-0.27	+30.32
5.	5.	5.	PostgreSQL	Relational DBMS	299.62	+10.97	+35.19
6.	6.	6.	DB2	Relational DBMS	187.94	-6.55	-10.91
7.	7.	7.	Microsoft Access	Relational DBMS	135.03	+1.95	-6.66
8.	8.	8.	Cassandra	Wide column store	130.33	-1.43	+23.02
9.	10.	10.	Redis	Key-value store	106.22	+4.14	+9.17
10.	9.	9.	SQLite	Relational DBMS	105.77	-1.01	+4.06
11.	12.	15.	Elasticsearch	Search engine	80.17	+2.33	+21.24
12.	11.	11.	SAP Adaptive Server	Relational DBMS	76.64	-3.39	-8.72
13.	13.	13.	Teradata	Relational DBMS	74.07	+0.69	+1.29
14.	14.	12.	Solr	Search engine	69.37	-2.91	-12.52
15.	16.	14.	HBase	Wide column store	52.41	+0.39	-8.32
16.	15.	17.	Hive	Relational DBMS	50.51	-2.26	+11.18
17.	17.	16.	FileMaker	Relational DBMS	47.93	+0.90	-4.41
18.	18.	19.	Splunk	Search engine	43.73	+0.90	+8.01
19.	19.	21.	SAP HANA	Relational DBMS	39.99	+1.91	+7.82
20.	21.	23.	Neo4j	Graph DBMS	32.36	+0.07	+4.73
21.	20.	18.	Informix	Relational DBMS	31.87	-1.15	-5.95
22.	23.	25.	MariaDB	Relational DBMS	29.88	+1.11	+7.79
23.	22.	20.	Memcached	Key-value store	29.24	+0.31	-6.27
24.	24.	24.	Couchbase	Document store	25.80	+0.41	+2.62
25.	25.	22.	CouchDB	Document store	23.38	-0.16	-4.53

DB-Engine Document Store Rankings Only...

Rank			DBMS	Database Model	Score		
Mar 2016	Feb 2016	Mar 2015			Mar 2016	Feb 2016	Mar 2015
1.	1.	1.	MongoDB 	Document store	305.33	-0.27	+30.32
2.	2.	 3.	Couchbase 	Document store	25.80	+0.41	+2.62
3.	3.	 2.	CouchDB	Document store	23.38	-0.16	-4.53
4.	4.	4.	Amazon DynamoDB 	Multi-model 	22.23	+0.42	+7.35
5.	5.	5.	MarkLogic	Multi-model 	9.36	+0.04	-0.94
6.	6.	 9.	OrientDB	Multi-model 	6.66	+0.24	+3.39
7.	 8.	 12.	RethinkDB	Document store	5.14	+0.33	+3.79
8.	 7.	 6.	RavenDB	Document store	5.06	+0.12	-1.53
9.	9.	 7.	Cloudant	Document store	4.63	+0.15	+0.82
10.	10.	 8.	GemFire	Document store	3.84	-0.03	+0.38
11.	11.	 10.	Virtuoso	Multi-model 	2.82	-0.17	-0.00
12.	 14.	 14.	PouchDB	Document store	2.17	+0.24	+1.32
13.	13.	 18.	Microsoft Azure DocumentDB	Document store	2.17	+0.04	+1.47

Thank You

That was a brief introduction to CouchDB,
Futon, CouchApp and couchapp web
applications.

Jeff Best

Travel Places (WS) Limited