

Programming with the OSS 'Cloud Stack'

- Mike Amundsen
Principal API Architect
Layer 7 Technologies
- @mamund

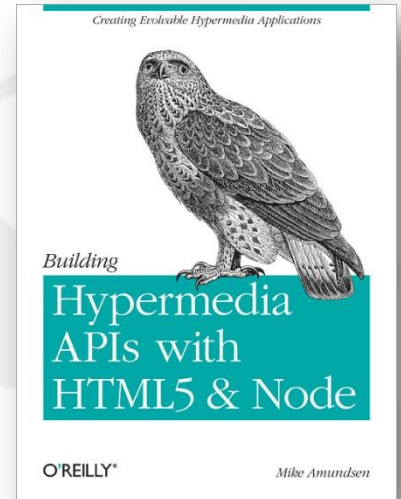
Preliminaries

- Mike Amundsen
- Web Architect, Author, Presenter
- Software Explorer
- Principal API Architect, Layer 7 Technologies



Last Project

- **Building Hypermedia APIs w/ HTML5 & Node (November 2011)**
- Methodology for writing/maintaining business-level APIs in the cloud.
- Real solutions for real use-cases.
- Three Servers, Six Clients, 200+ pages.



Next Project

- **Programming the Web w/ HTML5 & Node** (*November 2012?*)
- User's Manual for Cloud-based developers.
- I put myself on a six month diet of Chromebook-only development
- Design, code, source control, collaborate, test, & deploy
- All from the Chromebook, all to the cloud.

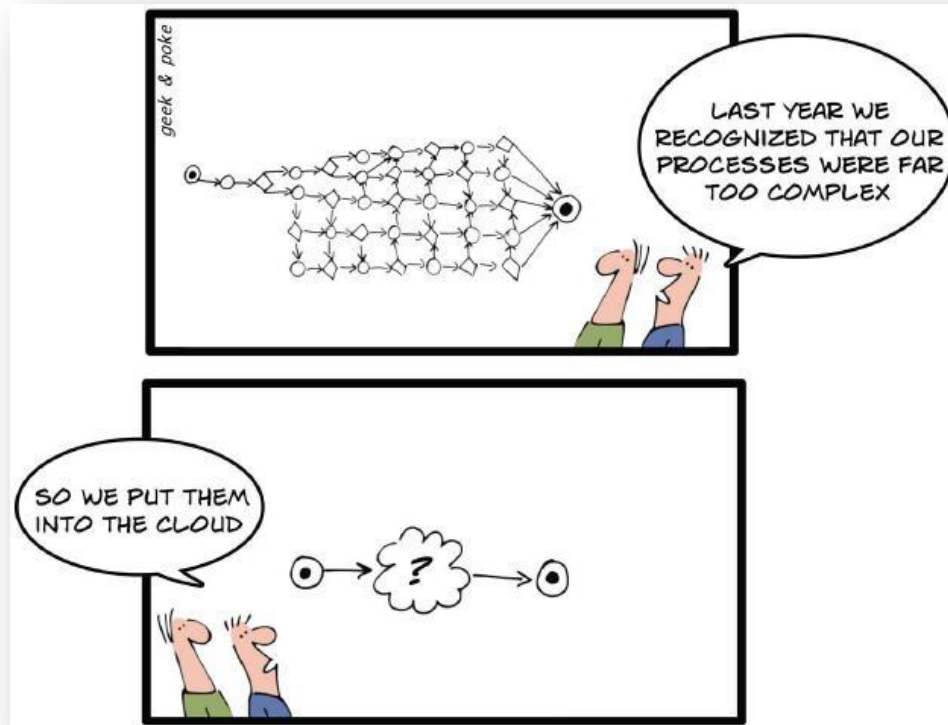


Goals today – “the ‘future’ of programming”

- Define some terms
 - Open source, cloud stack, etc.
- Explore “cloud programming”
 - Standards, lifecycle, etc.
- View sample products available today
 - Coding, testing, data, deployment, etc.







For the cloud!

Where is this coming from?



Start-up experience



Reducing operational costs/barriers

Small biz experience



Maintaining agility/flexibility

“Mobile-ism”



Availability anywhere/anytime

“Hipster-ism”



Keeping up w/ the cool kids

Where is this coming from?

- Start-up experience
 - Reducing operational costs/barriers
- Small Biz experience
 - Maintaining agility/flexibility
- Mobil-ism
 - Availability anywhere/anytime
- “Hipster-ism”
 - Keeping up w/ cool new toys



Let's look into "the future"



First some definitions...

Open Source

- **“Open source** is a philosophy or pragmatic methodology that promotes free redistribution and access to an end product's design and implementation details.” - Wikipedia



Cloud

- **“Cloud computing** is a metaphor used by Technology or IT Services companies for the delivery of computing requirements as a service to a heterogeneous community of end-recipients.” – Wikipedia



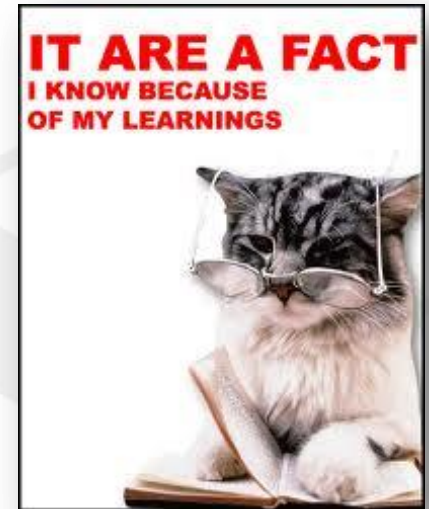
Stack

- “In computing, a **solution stack** is a set of software subsystems or components needed to deliver a fully functional *solution*, e.g. a product or service.” – Wikipedia



Open Source Cloud Stack

- Free distribution and access to ...
computing requirements as a service ...
to deliver a fully functional solution.



And the functional solution is...

Programming

- **“Computer programming** is the process of designing, writing, testing, debugging, and maintaining the source code of computer programs.”
– Wikipedia



Let's also throw in...

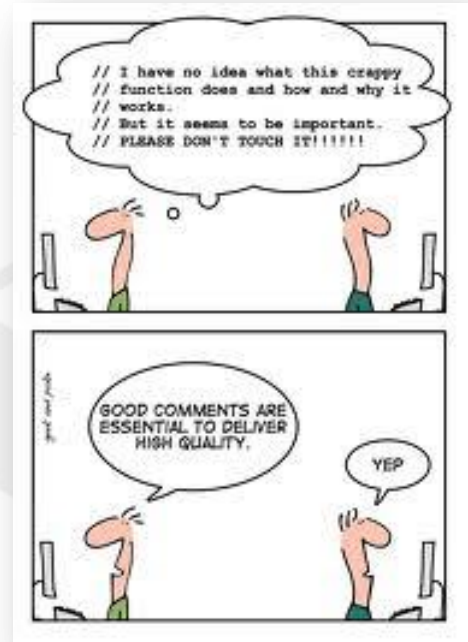
Data

- “**Data as a service** is based on the concept that the data can be provided on demand to the user regardless of geographic or organizational separation of provider and consumer.” - Wikipedia



Version Control

- “A **distributed version control** system (DVCS) keeps track of software revisions and allows many developers to work on a given project without necessarily being connected to a common network.” – Wikipedia



Deployment

- “**Software deployment** is all of the activities that make a software system available for use.” – Wikipedia



So, in a nutshell we want...

The following open source services

- Data
- Programming
- Version Control
- Debugging/Testing
- Deployment



But from a browser;



**But from a browser;
cuz it's 2012, dude!**



Let's write some code...



Let's write some code...



Programming w/ Cloud9IDE

The image displays two overlapping screenshots of the Cloud9 IDE interface. The background screenshot shows the user's dashboard for 'mamund' on the 'c9.io' platform. The dashboard includes a 'Your Account' section with a 'CREATE NEW PROJECT' button, a 'Quick Search' bar, and a list of 'MY PROJECTS' such as 'alps', 'amundsen-npm-test', 'async-list', 'azuro-examples', 'building-hypermedia-apis', 'c9-book', 'c9book_c9-hello-web', 'caps', and 'collection-json'. A 'YOUR RECENT ACTIVITY' section lists various actions like cloning and removing projects. Below this, there are 'ADD-ON SERVICES' for GitHub and Bitbucket.

The foreground screenshot shows the Cloud9 IDE editor for a project named 'building-hypermedia-apis'. The interface includes a 'Project Files' sidebar with a tree view showing folders like 'collection_data.sh', 'design-doc.json', 'app.js', 'collection.js', 'couchdb', 'nodesjs', 'collection', 'cmd-line-app', 'public', 'test', 'views', 'app.js', 'maze', and 'microblog', along with a 'README' file. The main editor area displays JavaScript code for an Express.js application with a CouchDB database. The code includes module dependencies, Express.js setup, and database connection logic. A 'git' terminal window is open at the bottom, showing a list of git commands: add, bisect, branch, checkout, clone, commit, diff, fetch, grep, init, log, merge, mv, and rm.

```
1 /* 2001-07-25 (mca) : collection+json */
2 /* Designing Hypermedia APIs by Mike Amundsen (2011) */
3
4 /**
5  * Module dependencies.
6  */
7
8 // For express
9 var express = require('express');
10 var app = module.exports = express.createServer();
11
12 // For couch
13 var cradle = require('cradle');
14 var host = 'https://remote-couchdb-server.com';
15 var port = 443;
16 var credentials = {username: 'xxx', password: 'xxx'};
17 var local=true;
18 var db;
19 if(local===true) {
20   db = new(cradle.Connection()).database('html5-microblog');
21 }
22 else {
23   db = new(cradle.Connection)(host, port, {auth: credentials}).database('html5-microblog');
24 }
25
26 // global data
27 var contentType = 'text/html';
```


Create a Project

Create a New Project

Project name:

Who will have access to this project? Anyone Only the people I specify (Premium feature)

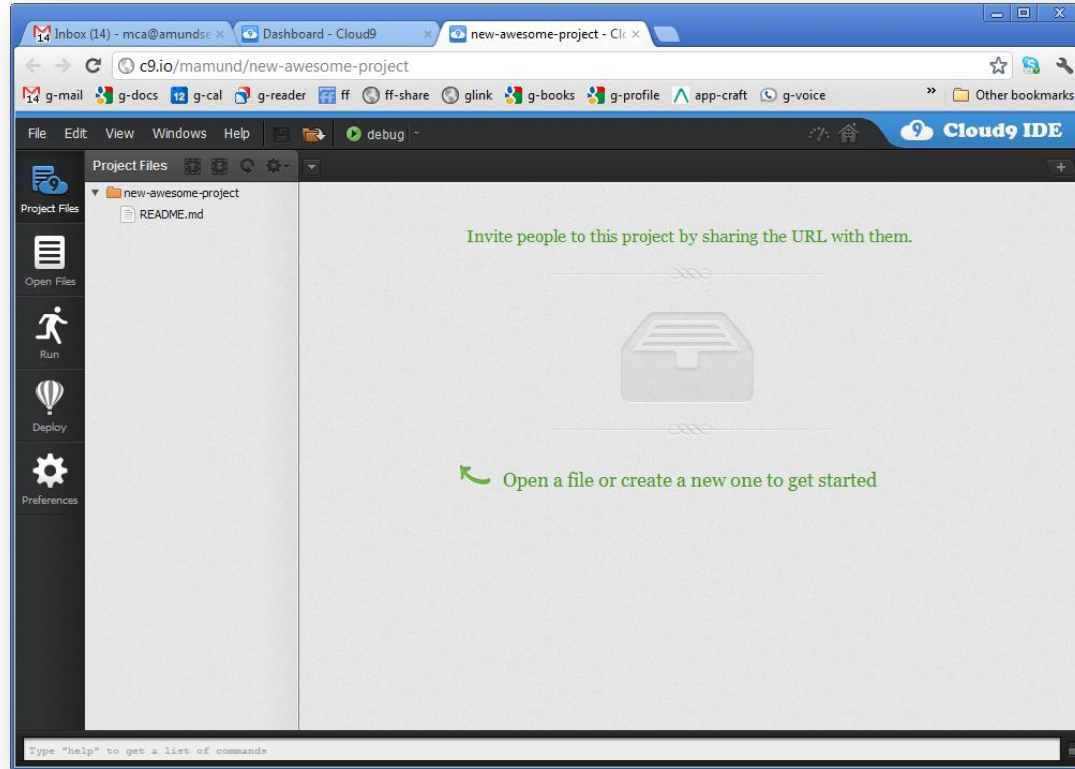
Project type:

Git Mercurial FTP Dropbox * coming soon

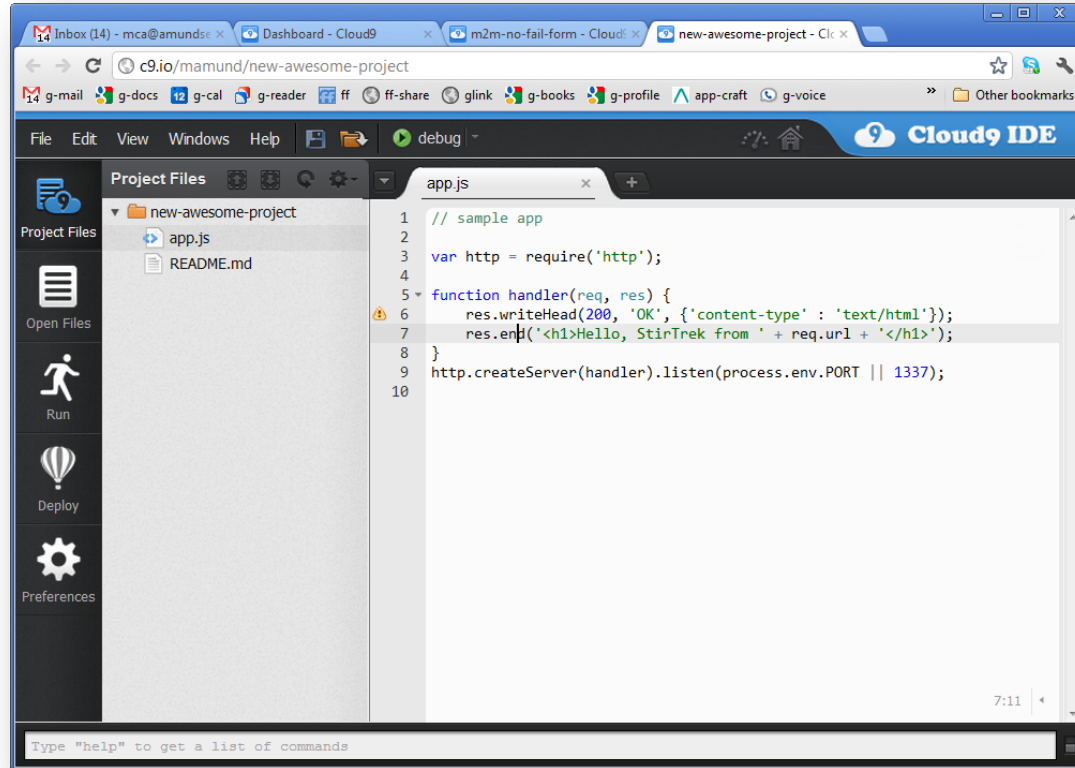
Shared Development Server
Run your hosted environment on one of our powerful and flexible shared servers. Free of charge!

Your Dedicated Dev Server
Get your own Private Run Environment with full shell access and no security restrictions

Open for Editing



Code a simple Web server

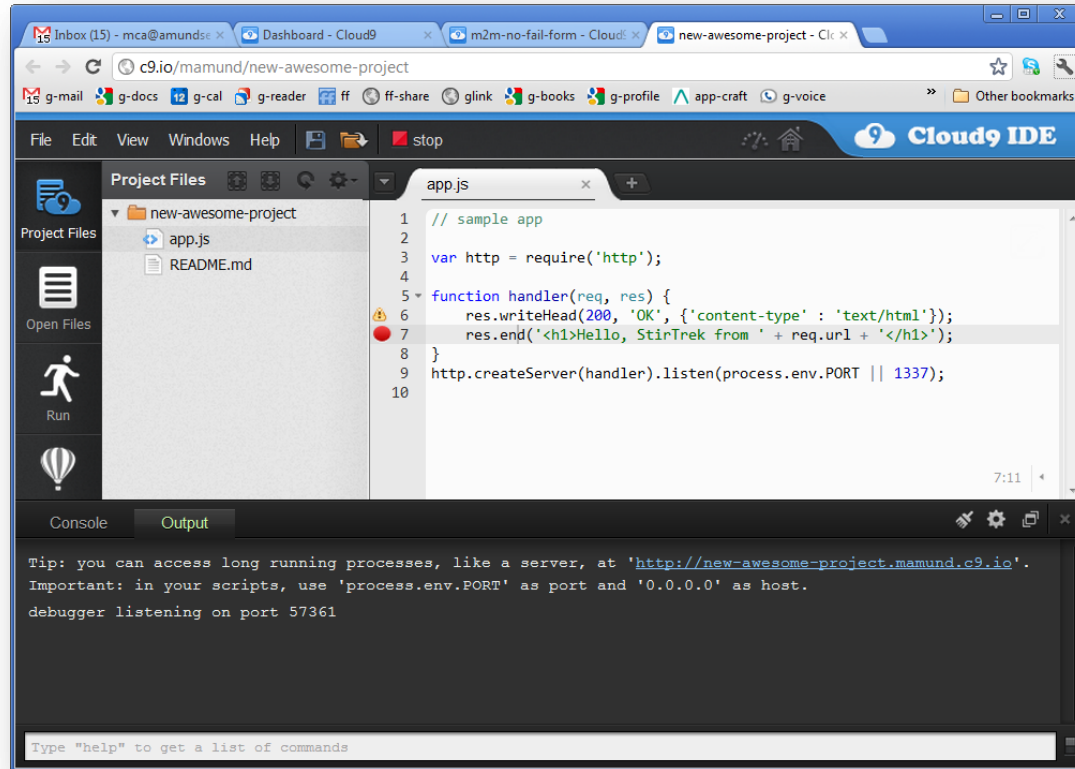


The screenshot shows the Cloud9 IDE interface. The browser window at the top displays the URL `c9.io/mamund/new-awesome-project`. The IDE's left sidebar contains a 'Project Files' view showing a folder named 'new-awesome-project' with files 'app.js' and 'README.md'. Below this are icons for 'Open Files', 'Run', 'Deploy', and 'Preferences'. The main editor area shows the code for `app.js`:

```
1 // sample app
2
3 var http = require('http');
4
5 function handler(req, res) {
6   res.writeHead(200, 'OK', {'content-type': 'text/html'});
7   res.end('<h1>Hello, StirTrek from ' + req.url + '</h1>');
8 }
9 http.createServer(handler).listen(process.env.PORT || 1337);
10
```

The status bar at the bottom indicates the time is 7:11 and provides a prompt: 'Type "help" to get a list of commands'.

Fire up a VM for debugging

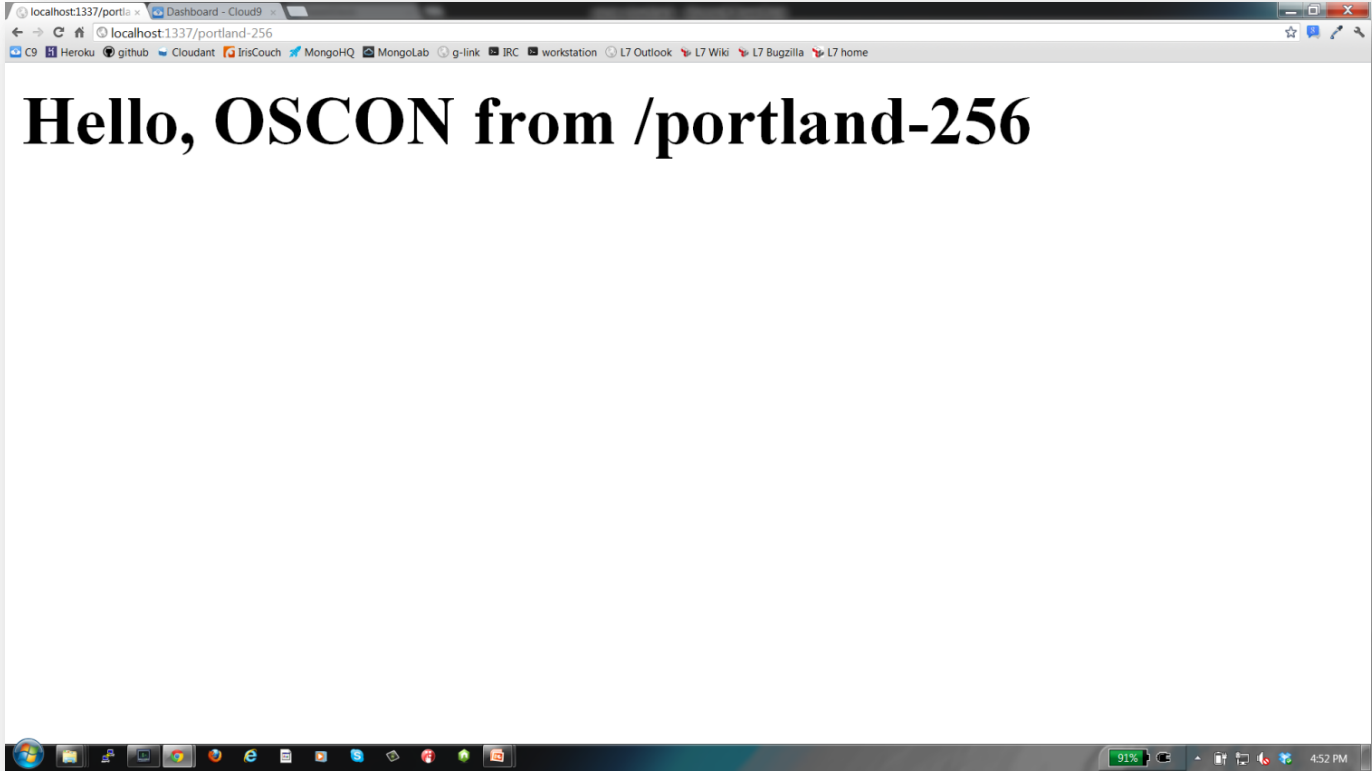


The screenshot displays the Cloud9 IDE interface. At the top, a browser window shows the URL `c9.io/mamund/new-awesome-project`. The IDE's menu bar includes File, Edit, View, Windows, Help, and a stop button. The left sidebar shows the Project Files view with a tree structure containing `new-awesome-project`, `app.js`, and `README.md`. The main editor area shows the content of `app.js` with a red line marker on line 7. The console at the bottom shows the following output:

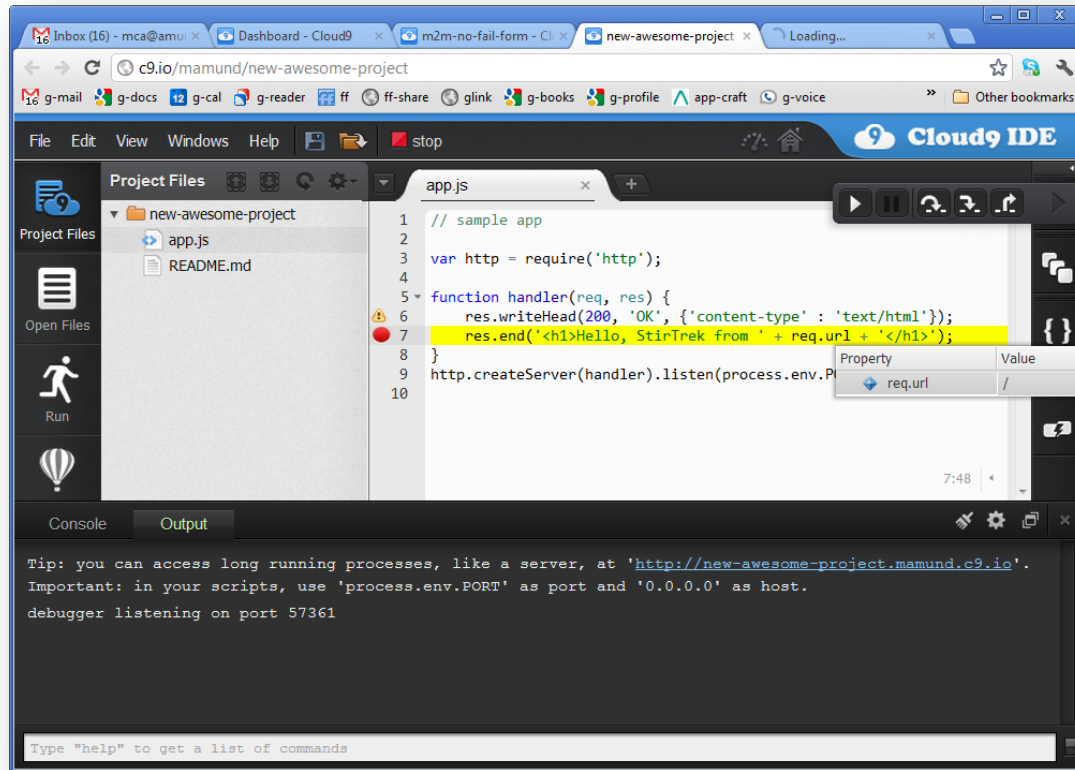
```
Tip: you can access long running processes, like a server, at 'http://new-awesome-project.mamund.c9.io'.
Important: in your scripts, use 'process.env.PORT' as port and '0.0.0.0' as host.
debugger listening on port 57361
```

A command prompt at the bottom of the console shows the text: `Type "help" to get a list of commands`.

Run instance in your browser



Set breakpoints, inspect vals, etc.



The screenshot shows the Cloud9 IDE interface. The top navigation bar includes 'File', 'Edit', 'View', 'Windows', 'Help', and a 'stop' button. The 'Project Files' sidebar on the left shows a project named 'new-awesome-project' containing 'app.js' and 'README.md'. The main editor displays the code for 'app.js' with a red breakpoint set on line 7. The code is as follows:

```
1 // sample app
2
3 var http = require('http');
4
5 function handler(req, res) {
6   res.writeHead(200, 'OK', {'content-type': 'text/html'});
7   res.end('<h1>Hello, StirTrek from ' + req.url + '</h1>');
8 }
9 http.createServer(handler).listen(process.env.PORT || 3000);
10
```

A tooltip is visible over the breakpoint, showing the following table:

Property	Value
req.url	/

The bottom console area shows the following output:

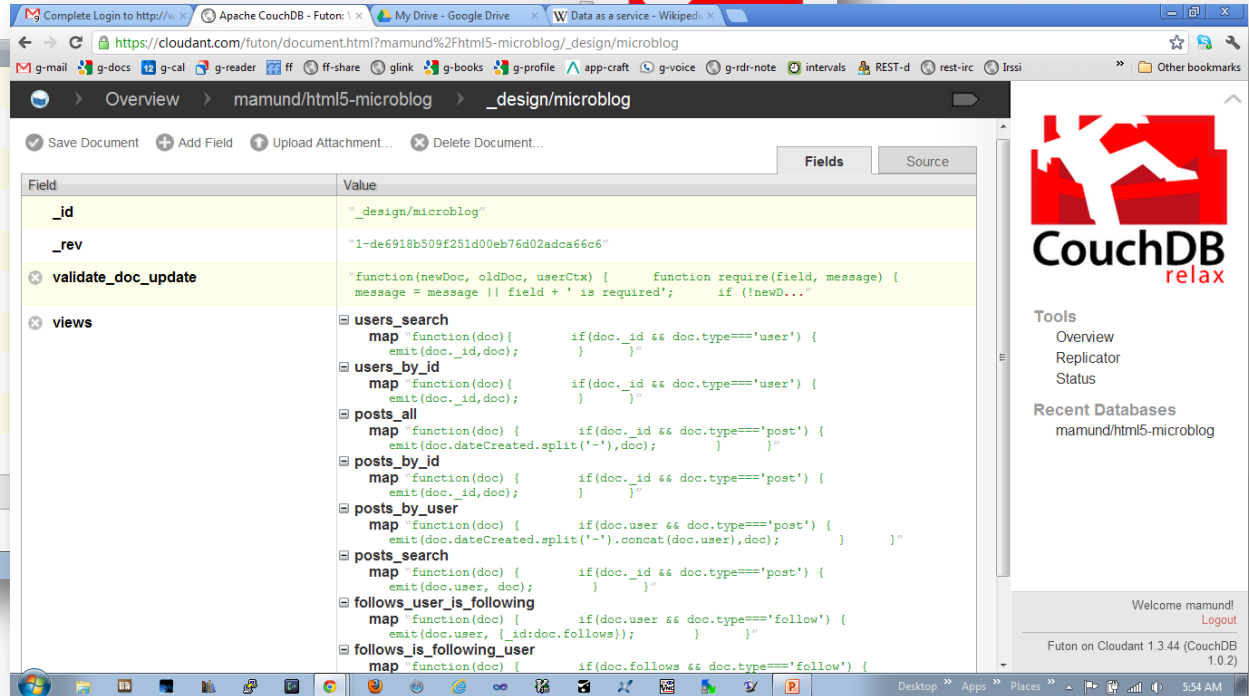
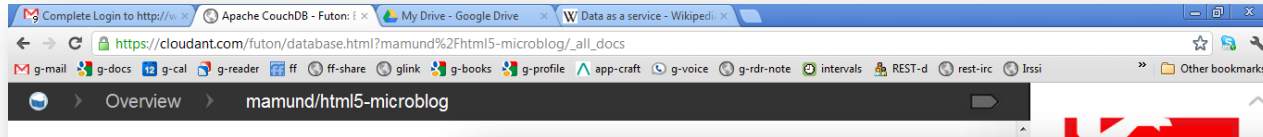
```
Tip: you can access long running processes, like a server, at 'http://new-awesome-project.mamund.c9.io'.
Important: in your scripts, use 'process.env.PORT' as port and '0.0.0.0' as host.
debugger listening on port 57361
```

A command prompt at the bottom of the console contains the text: "Type 'help' to get a list of commands".

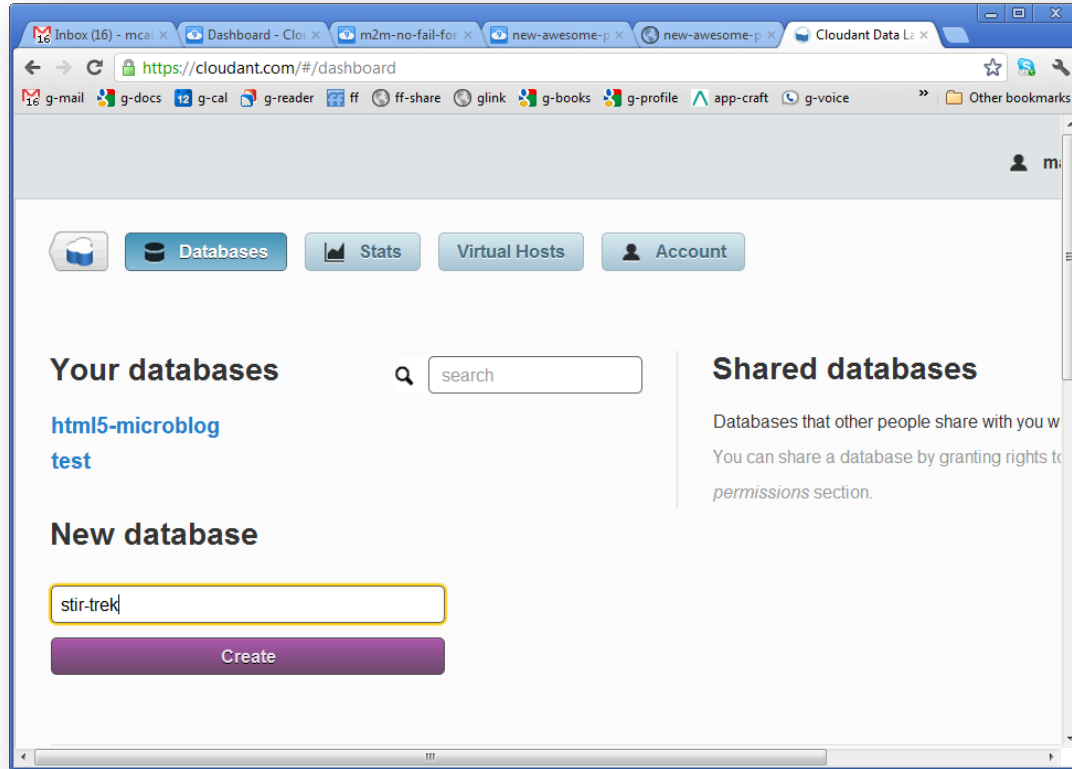
Let's manage some data...



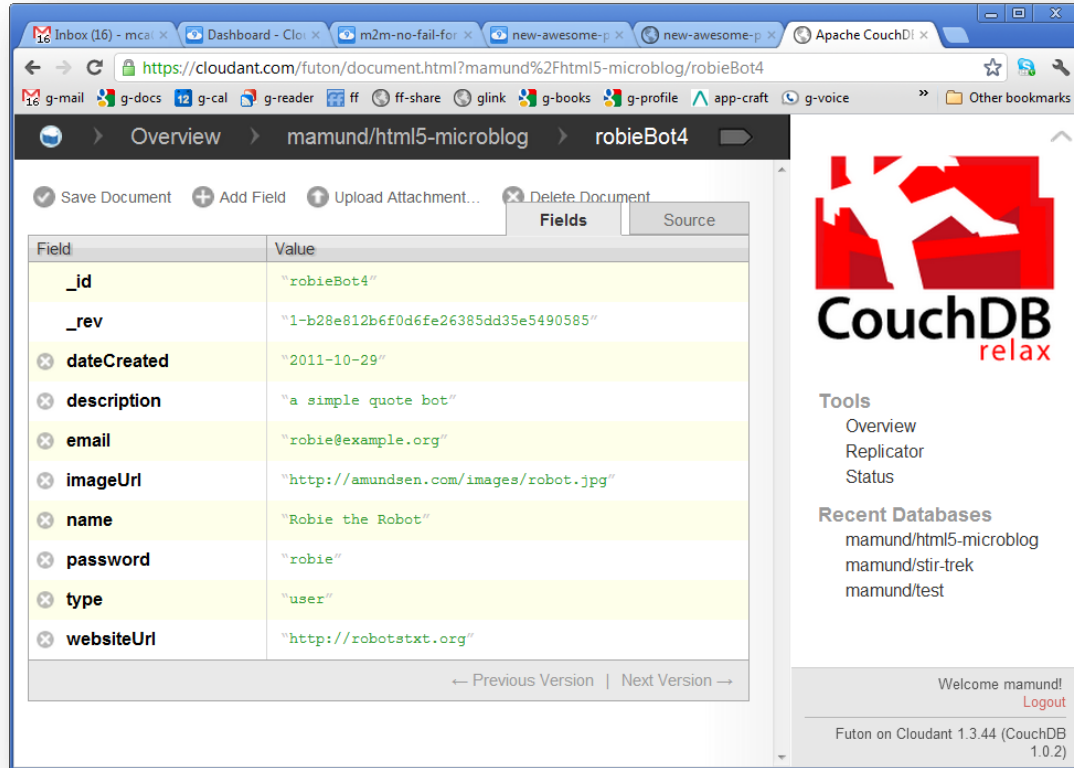
Data w/ CouchDB



Create a Database



User Documents

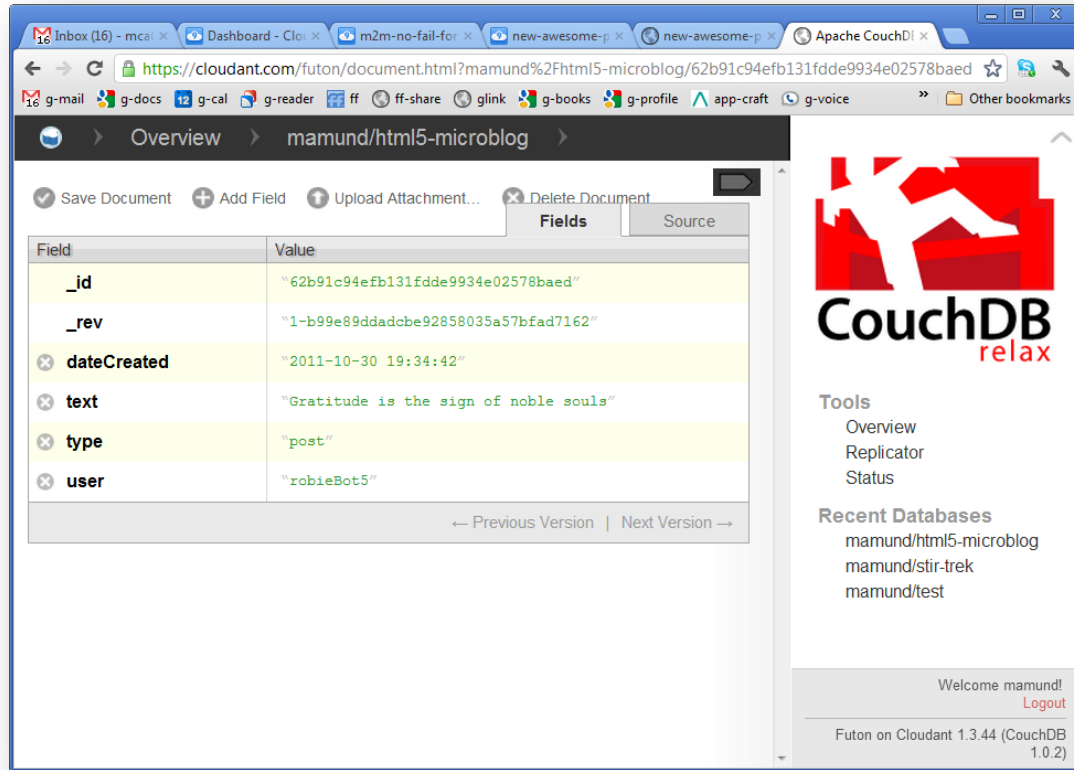


The screenshot shows the Apache CouchDB Futon interface. The browser address bar displays the URL: `https://cloudant.com/futon/document.html?mamund%2Fhtml5-microblog/robieBot4`. The breadcrumb navigation shows the path: Overview > mamund/html5-microblog > robieBot4. The document is displayed in a table format with the following fields and values:

Field	Value
<code>_id</code>	"robieBot4"
<code>_rev</code>	"1-b28e812b6f0d6fe26385dd35e5490585"
<code>dateCreated</code>	"2011-10-29"
<code>description</code>	"a simple quote bot"
<code>email</code>	"robie@example.org"
<code>imageUrl</code>	"http://amundsen.com/images/robot.jpg"
<code>name</code>	"Robie the Robot"
<code>password</code>	"robie"
<code>type</code>	"user"
<code>websiteUrl</code>	"http://robotstxt.org"

On the right side of the interface, there is a CouchDB logo with the text "CouchDB relax" and a "Tools" section containing links for Overview, Replicator, and Status. Below that, the "Recent Databases" section lists: mamund/html5-microblog, mamund/stir-trek, and mamund/test. At the bottom right, there is a "Welcome mamund!" message with a "Logout" link and the version information: "Futon on Cloudant 1.3.44 (CouchDB 1.0.2)".

Message Documents



The screenshot shows the Apache CouchDB Futon interface in a web browser. The URL is <https://cloudant.com/futon/document.html?mamund%2Fhtml5-microblog/62b91c94efb131fdde9934e02578baed>. The document is titled "mamund/html5-microblog". The interface includes a navigation bar with "Overview" and "mamund/html5-microblog". Below the navigation bar are action buttons: "Save Document", "Add Field", "Upload Attachment...", and "Delete Document". A table displays the document's fields and values:

Field	Value
_id	"62b91c94efb131fdde9934e02578baed"
_rev	"1-b99e09ddad0be92858035a57bfad7162"
dateCreated	"2011-10-30 19:34:42"
text	"Gratitude is the sign of noble souls"
type	"post"
user	"robieBot5"

Below the table are navigation links: "← 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 are "Tools" (Overview, Replicator, Status) and "Recent Databases" (mamund/html5-microblog, mamund/stir-trek, mamund/test). At the bottom right, there is a "Welcome mamund!" message with a "Logout" link and the text "Futon on Cloudant 1.3.44 (CouchDB 1.0.2)".

Searches and Queries

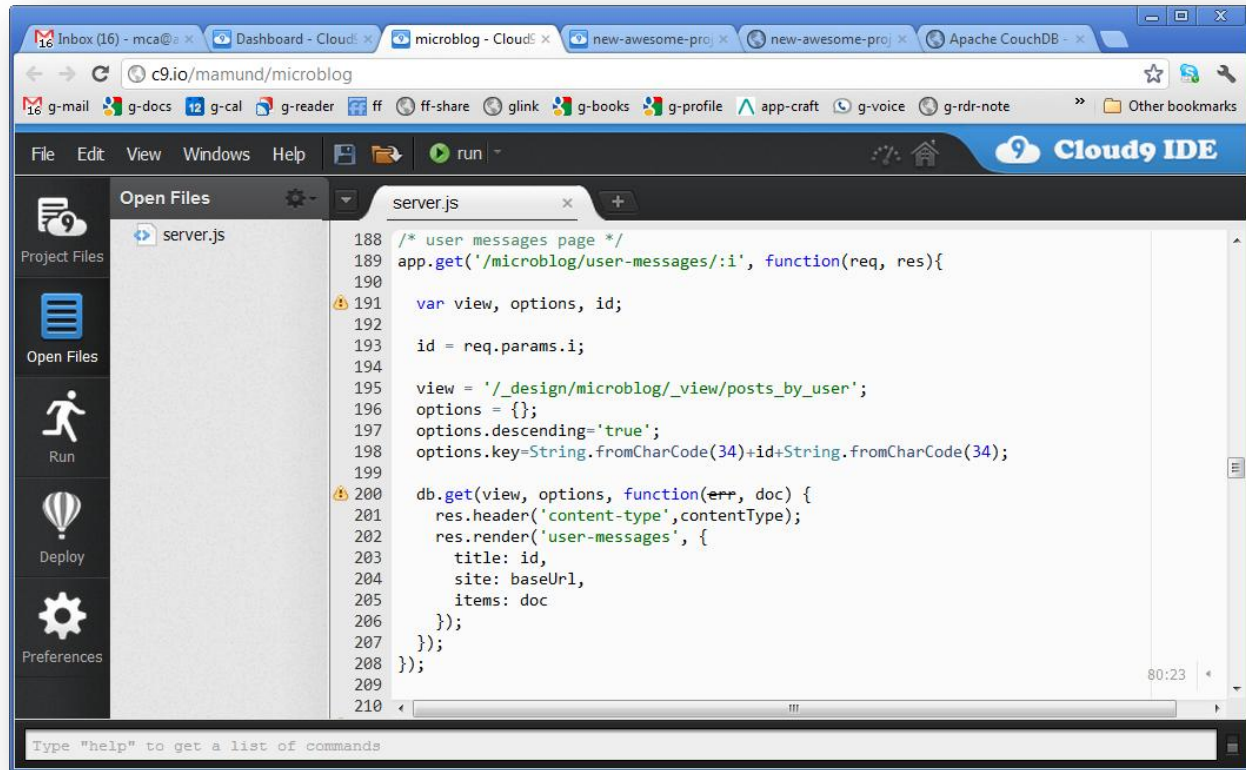
The screenshot shows the Apache CouchDB Futon interface in a browser. The address bar shows the URL: `https://cloudant.com/futon/document.html?mamund%2Fhtml5-microblog/_design/microblog`. The page title is "Overview > mamund/html5-microblog".

At the top, there are buttons for "Save Document", "Add Field", "Upload Attachment...", and "Delete Document". Below these are tabs for "Fields" and "Source".

Field	Value
<code>_id</code>	<code>"_design/microblog"</code>
<code>_rev</code>	<code>"1-de6918b509f251d00eb76d02adca66c6"</code>
<code>validate_doc_update</code>	<pre>"function(newDoc, oldDoc, userCtx) { function require(field, message) { message = message field + ' is required'; if (!newD..."</pre>
<code>views</code>	<pre>users_search map "function(doc) { doc.type==='user' ? { emit(doc._id,doc); } }" users_by_id posts_all map "function(doc) { doc.type==='post' ? { emit(doc.dateCreated.split('-'),doc); } }" posts_by_id posts_by_user posts_search follows_user_is_following follows_is_following_user</pre>

On the right side, there is a CouchDB logo with the text "CouchDB relax". Below it, there is a "Tools" section with links for "Overview", "Replicator", and "Status". There is also a "Recent Databases" section listing "mamund/html5-microblog", "mamund/stir-trek", and "mamund/test". At the bottom right, there is a "Welcome mamund!" message with a "Logout" link. The footer of the interface shows "Futon on Cloudant 1.3.44 (CouchDB 1.0.2)".

Code DB calls from C9 Editor



The screenshot shows the Cloud9 IDE interface with a code editor open to a file named 'server.js'. The code in the editor is as follows:

```
188 /* user messages page */
189 app.get('/microblog/user-messages/:i', function(req, res){
190
191     var view, options, id;
192
193     id = req.params.i;
194
195     view = '/_design/microblog/_view/posts_by_user';
196     options = {};
197     options.descending='true';
198     options.key=String.fromCharCode(34)+id+String.fromCharCode(34);
199
200     db.get(view, options, function(err, doc) {
201         res.header('content-type',contentType);
202         res.render('user-messages', {
203             title: id,
204             site: baseUrl,
205             items: doc
206         });
207     });
208 });
209
210
```

The IDE interface includes a browser window at the top showing 'c9.io/mamund/microblog', a menu bar with 'File', 'Edit', 'View', 'Windows', and 'Help', and a sidebar on the left with icons for 'Open Files', 'Run', 'Deploy', and 'Preferences'. The status bar at the bottom displays the text 'Type "help" to get a list of commands'.

Test results in your VM



The screenshot shows a web browser window with the address bar displaying `localhost:3000/microblog/`. The page title is "Microblog" and it includes navigation links for "Home", "Users", and "Register". Below the title is a "Home" section with a "What's Up?" search bar containing "Submit" and "Reset" buttons. The main content area displays a list of test results, each consisting of a text message, a timestamp, and the user's name. The results are as follows:

- 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
- RT @Steffen: #restfest!!!!11 @ 2011-08-20 12:48:36 by restfestbot
- RT @Erik Mogensen: I'm bummed that I'm not at #restfest. @ 2011-08-20 12:44:02 by restfestbot
- RT @Jon "the Troll" Moore: i am trolling for #restfest retweets @ 2011-08-20 12:43:52 by restfestbot
- RT @Steffen: #restfest!!!!11 @ 2011-08-20 12:43:46 by restfestbot

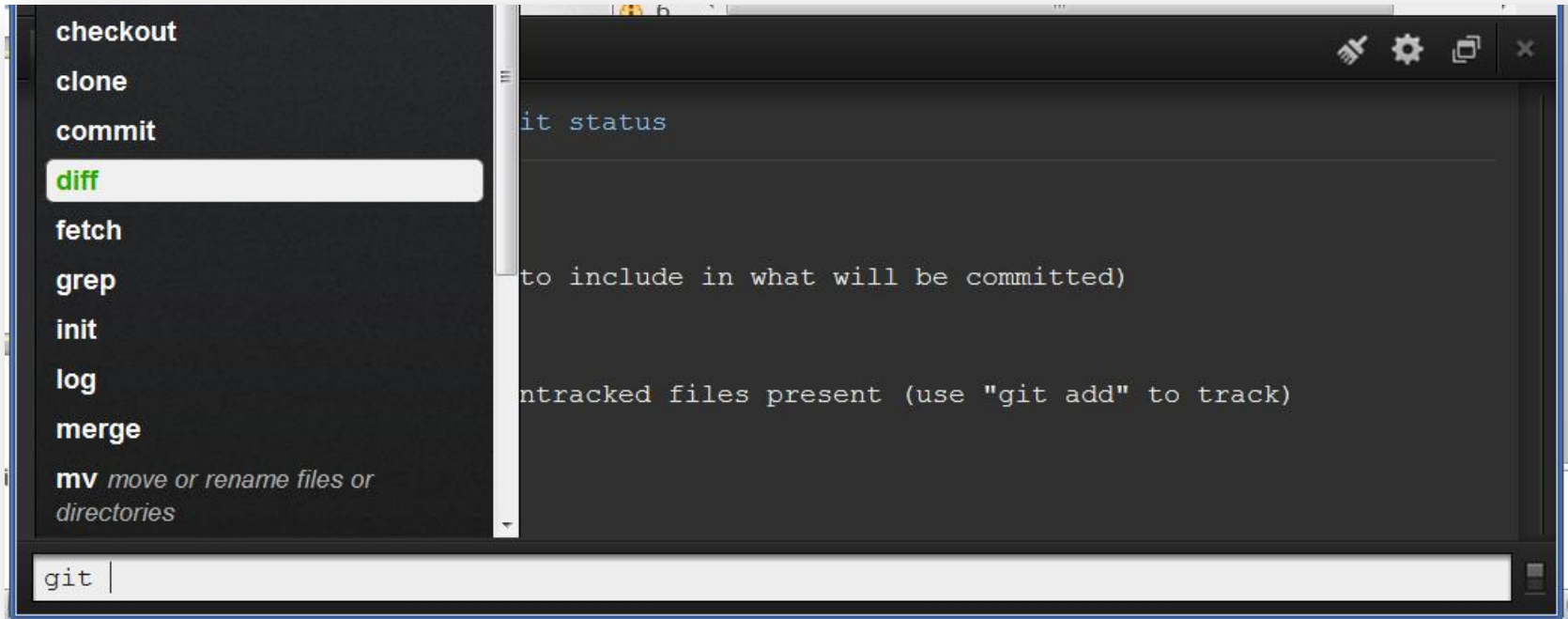
Let's control some versions...



Version Control w/ Github

The screenshot shows a web browser window displaying a GitHub repository page for 'mamund / Building-Hypermedia-APIs'. The browser's address bar shows the URL: `https://github.com/mamund/Building-Hypermedia-APIs/commit/7d0a77af193b8f454d1500f4632b2c82618540cf`. The page header includes the GitHub logo, a search bar, and navigation links for 'Explore', 'Gist', 'Blog', and 'Help'. The repository name 'mamund / Building-Hypermedia-APIs' is prominently displayed, along with statistics: 14 watchers and 22 forks. Below the repository name, there are tabs for 'Code', 'Network', 'Pull Requests (1)', 'Issues (2)', 'Wiki (0)', and 'Graphs'. The 'Commits' tab is selected, showing a commit by 'mamund' from 5 months ago. The commit message is 'collection clean-up'. Below the commit message, it states 'Showing 2 changed files with 20 additions and 21 deletions.' Two files are listed: `nodejs/collection/app.js` (17 changes) and `nodejs/collection/public/javascripts/collection.js` (24 changes). The code diff for `nodejs/collection/app.js` is visible, showing changes to the `site` property in a configuration object. The diff highlights the removal of a site pointing to `localhost:3000/collection/tasks/` and the addition of a site pointing to `localhost:3000/collection/tasks/`. The Windows taskbar at the bottom shows the time as 5:56 AM.

Use git client from C9 editor



The image shows a terminal window in a C9 editor. On the left side, there is a vertical list of git commands: checkout, clone, commit, diff (highlighted in green), fetch, grep, init, log, merge, and mv (with a sub-note: *mv move or rename files or directories*). The main terminal area on the right shows the command `git status` and its output: `to include in what will be committed)` and `untracked files present (use "git add" to track)`. At the bottom of the terminal, there is a prompt `git |`.

Add source files and commit

```
# (use "git add <file>..." to include in what will be committed)
#
# app.js
nothing added to commit but untracked files present (use "git add" to track)
[mamund@cloud9]:/workspace$ git add .

[mamund@cloud9]:/workspace$ git status

# On branch master
# Changes to be committed:
#   (use "git reset HEAD <file>..." to unstage)
#
# new file:   app.js
#
[mamund@cloud9]:/workspace$ git commit -a -m'add app.js'

[master 8017f47] add app.js
1 files changed, 9 insertions(+), 0 deletions(-)
create mode 100644 app.js
```

Push to github to share

```
To git@github.com:mamund/new-awesome-project.git
* [new branch]      master -> master
[mamund@cloud9]:/workspace$ git status

# On branch master
nothing to commit (working directory clean)
```

git|

Call your friends; lets' code!

The screenshot shows a web browser window displaying the GitHub repository page for 'mamund/new-awesome-project'. The browser's address bar shows the URL 'https://github.com/mamund/new-awesome-project'. The page header includes the GitHub logo, a search bar, and navigation links for 'Explore', 'Gist', 'Blog', and 'Help'. The repository name 'mamund / new-awesome-project' is prominently displayed, along with action buttons for 'Admin', 'Unwatch', 'Fork', 'Pull Request', and a notification icon. Below the repository name, there are tabs for 'Code', 'Network', 'Pull Requests' (0), 'Issues' (0), 'Wiki' (0), and 'Graphs'. The 'Code' tab is selected, showing a commit history for the 'master' branch. The latest commit is 'add app.js' by 'mamund' 5 minutes ago, with commit hash '8017f478ec'. Below the commit history, there is a table listing the files in the repository:

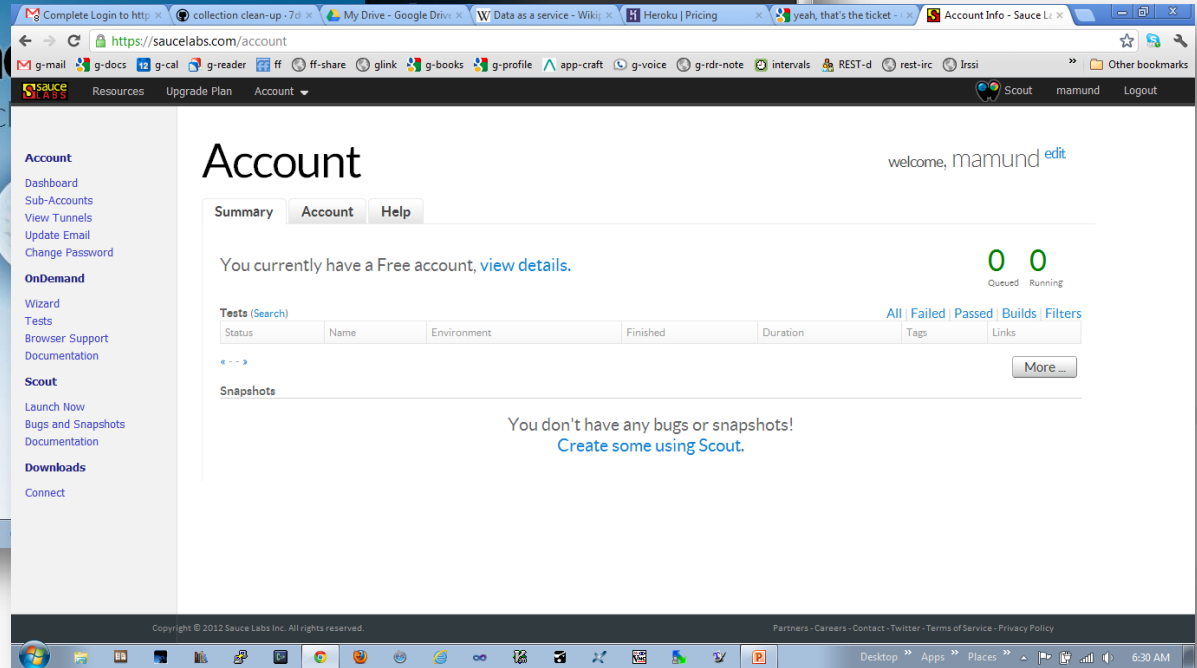
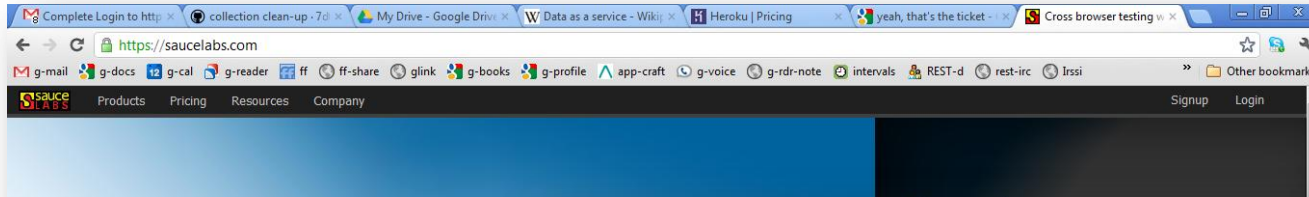
name	age	message	history
README.md	41 minutes ago	initial commit [mamund]	
app.js	5 minutes ago	add app.js [mamund]	

At the bottom of the screenshot, the 'README.md' file is partially visible.

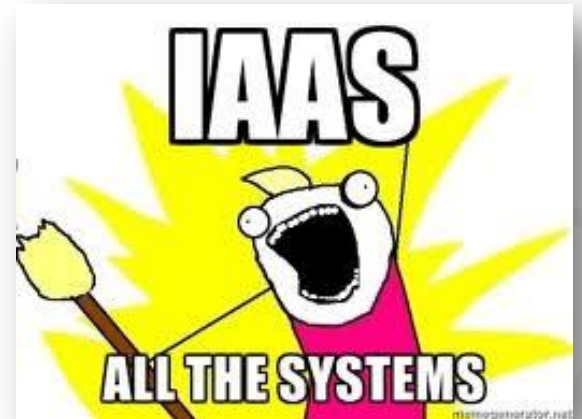
Let's do some testing...



Testing w/ SauceLabs/Selenium



Let's deploy some servers...



Deployment w/ Heroku

The screenshot displays the Heroku dashboard for an application named 'hello-storage'. The interface is dark-themed and includes a navigation bar with links for 'How it Works', 'Pricing', 'Add-ons', 'Dev Center', 'Support', and 'Contact'. The main content area is divided into several sections:

- Forget Servers:** A section with a paper airplane icon and text: 'Agile deployment for Ruby, Node.js, CPython, and Scala. Get up and running in minutes, and deploy instances 100% on your code, and never think about instances, or VMs again. Agile Deployment on Heroku'.
- Resource Summary:** A table showing the estimated monthly cost for various resources:

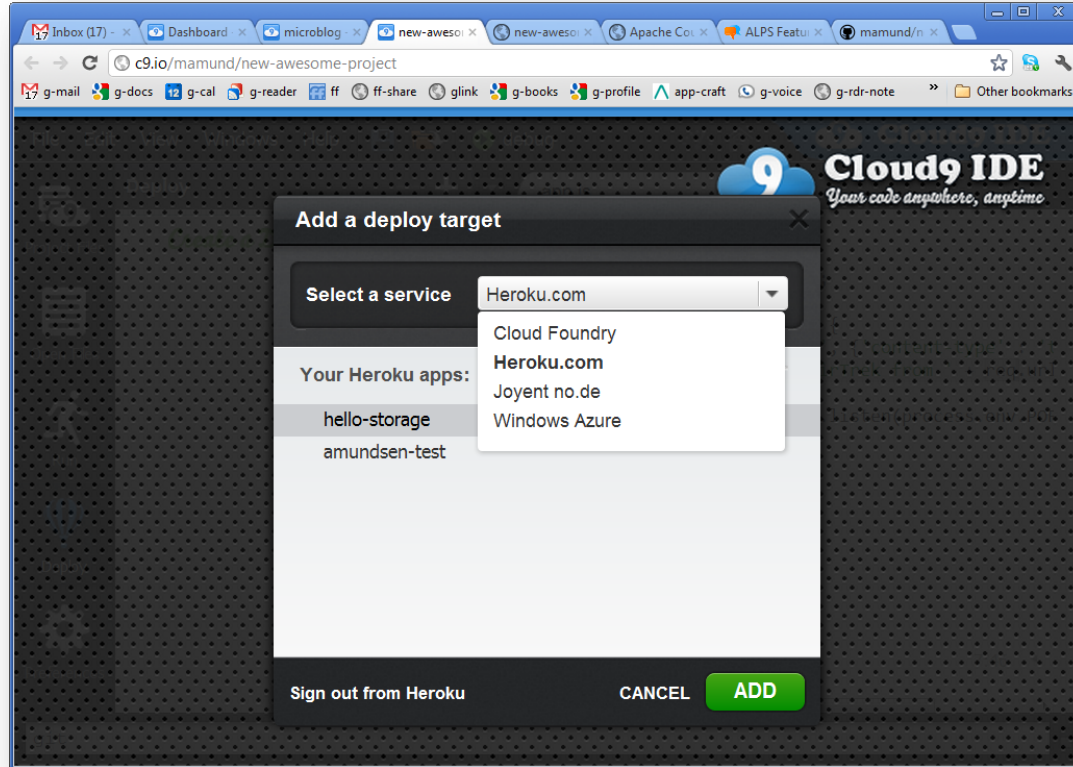
Resource	Cost
Dynos	\$0
Databases	\$0
Add-ons	\$0
Total	\$0
- Web Dynos:** A section with the text: 'Use heroku scale at the command line to adjust your web and worker process concurrency.'
- Shared Database:** A section with a slider for storage capacity, currently set at 5 MB. The cost is \$0. A maximum capacity of 20 GB is indicated.
- Dedicated Databases:** A section with text: 'Dedicated databases are suitable for large-scale production applications. All plans have a 1TB database max. Features include continuous protection, automatic health checks, fork, follow, direct psql access, data clips, and more.'

The Windows taskbar at the bottom shows the time as 6:02 AM and includes icons for various applications and system utilities.

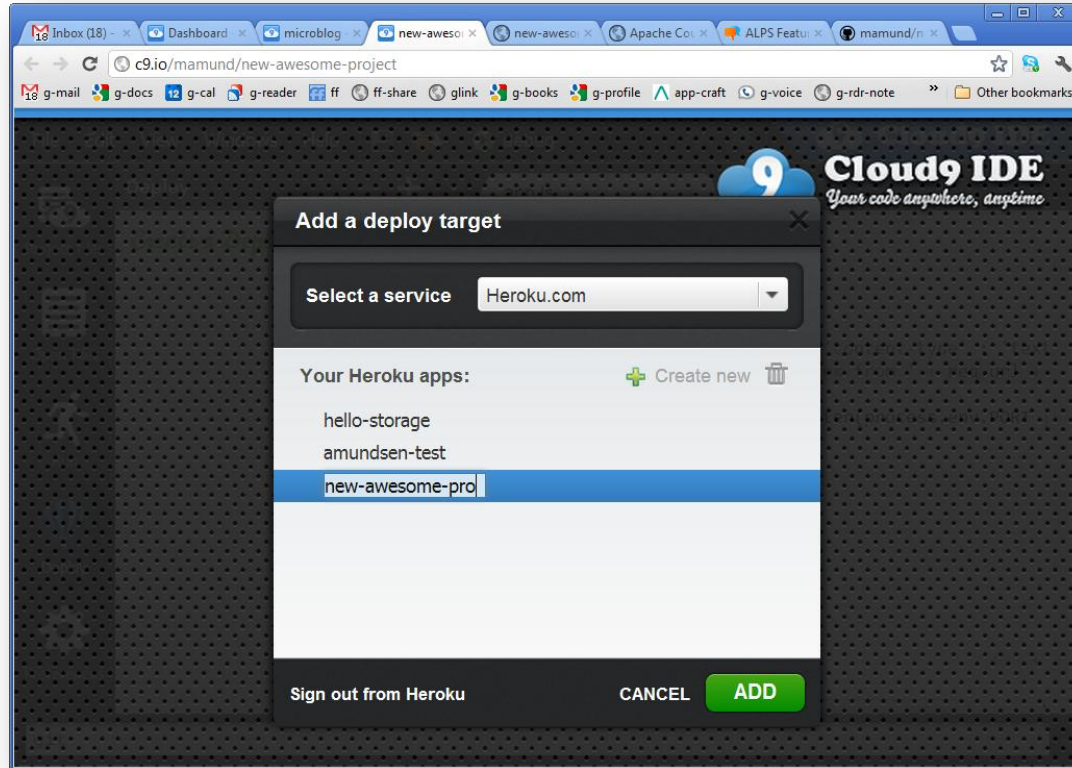
Select Deploy from C9 editor



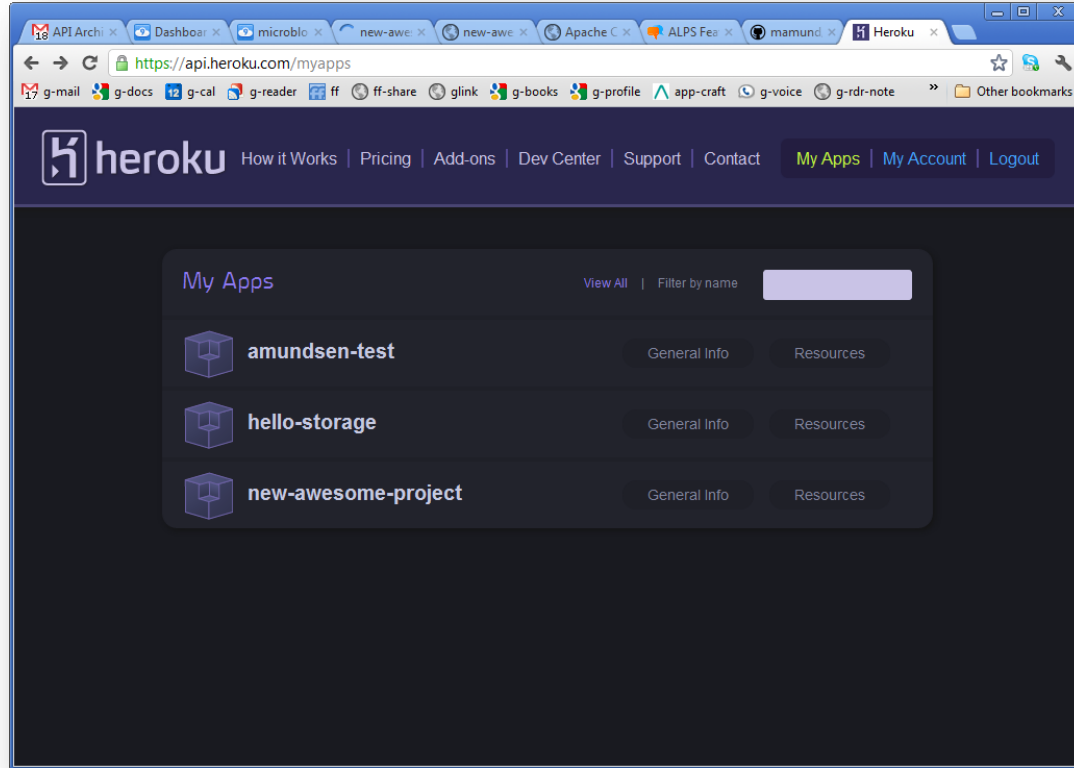
Select target servers



Add a new deployment project



Validate deployment



The screenshot shows a web browser window with the Heroku dashboard. The address bar displays `https://api.heroku.com/myapps`. The navigation menu includes links for [How it Works](#), [Pricing](#), [Add-ons](#), [Dev Center](#), [Support](#), [Contact](#), [My Apps](#), [My Account](#), and [Logout](#). The main content area is titled "My Apps" and features a "View All" link and a "Filter by name" search box. Below this, there is a table of applications:

Application Name	General Info	Resources
amundsen-test	General Info	Resources
hello-storage	General Info	Resources
new-awesome-project	General Info	Resources

Soak in the devops goodness.



The screenshot shows a web browser window with the URL `hello-storage.herokuapp.com`. The page title is "Tasks". Below the title, the date "2012-5-4" is displayed. A list of tasks follows, each with a "Done" button:

- run code
- write code
- read code
- debug code
- hello StirTrek

At the bottom of the list, there is an input field containing the text "something to do" and an "Add" button next to it.

So, in a nutshell, we got...



The following open source services

- **Programming**
Cloud9IDE – <http://c9.io>
- **Data**
CoudchDB – <http://cloudant.com>
- **Version Control**
git – <http://github.com>
- **Debugging/Testing**
selenium – <http://saucelabs.com>
- **Deployment**
heroku.com



All from a browser;



**All from a browser;
cuz it's the future, dude!**



Bottom Line...

- Programming the Cloud while ON the Cloud is here already.
- There are lots of cloud services available; most free to start.
- Many offerings are OSS – you can install and run your own!
- It took me a while to adjust, but soon I preferred it.

- ***But there's one big caveat....***

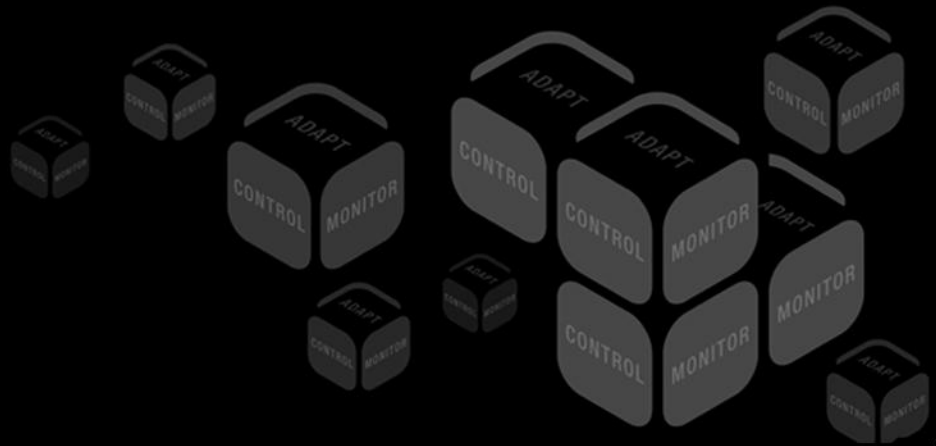


Sorry NO
INTERNET Today

**My advice is to jump right on in,
the water is fine.**



**Come on into the pool you sez.
The water is fine you sez.**



Programming with the OSS 'Cloud Stack'

- Mike Amundsen
Principal API Architect
Layer 7 Technologies
- @mamund