



Couchbase

Architecture and Administration Basics

Workshop Day 1 - Labs



1

Installation & Configuration



Perform the following steps in order install Couchbase Server on CentOS 7.x

- Disable Swappiness

```
# Set the value for the running system
sudo sh -c 'echo 0 > /proc/sys/vm/swappiness'

# Backup sysctl.conf
sudo cp -p /etc/sysctl.conf /etc/sysctl.conf.`date +%Y%m%d-%H:%M`

# This disables it permanently
# Set the value in /etc/sysctl.conf so it stays after reboot.
sudo sh -c 'echo "" >> /etc/sysctl.conf'
sudo sh -c 'echo "#Set swappiness to 0 to avoid swapping" >> /etc/sysctl.conf'
sudo sh -c 'echo "vm.swappiness = 0" >> /etc/sysctl.conf'
reboot
```



- Disable the Linux Firewall

- May be configured in a production environment regarding
<http://developer.couchbase.com/documentation/server/current/install/install-ports.html>

```
## Run as root or sudo
# Check the state
systemctl status firewalld

# Stop it
systemctl stop firewalld

# Disable it
systemctl disable firewalld
```

Installation – Download Couchbase 6.0



- Download the installation package from a browser or wget:
 - <https://www.couchbase.com/downloads>
 - `wget https://packages.couchbase.com/releases/6.0.0/couchbase-server-enterprise-6.0.0-centos7.x86_64.rpm`
- (Optional) SCP the .rpm to your local machine and then ‘scp’ the file to VMs.
 - `scp ${downloaded package}.rpm couchbase@://<public hostname of your VM>/home/couchbase/Downloads/`
 - `pscp C:\Downloads\$${downloaded package}.rpm couchbase@://<public hostname of your VM>/home/couchbase/Downloads/`
- Perform the installation by using RPM
 - `sudo rpm --install ${downloaded package}.rpm`
- Open the Web UI Wizard
 - `http://<public hostname of your VM>:8091`



Couchbase Server

Enterprise Edition 5.0.0 build 3519

[Setup New Cluster](#)

[Join Existing Cluster](#)

Installation (password = couchbase)



Couchbase > New Cluster

Cluster Name
WorkshopCouchbase

Create Admin Username
Administrator

Create Password
.....

Confirm Password
.....|

[< Back](#) [Next: Accept Terms](#)

Installation



Couchbase > New Cluster / Configure

Host Name / IP Address Usually localhost or similar
192.168.56.102

Data Disk Path Path cannot be changed after setup
/opt/couchbase/var/lib/couchbase/data
Free: 14 GB

Indexes Disk Path Path cannot be changed after setup
/opt/couchbase/var/lib/couchbase/index
Free: 14 GB

Couchbase Memory Quotas Per service / per node

<input checked="" type="checkbox"/> Data Service	512	MB
<input checked="" type="checkbox"/> Index Service	512	MB
<input checked="" type="checkbox"/> Search Service	303	MB
<input checked="" type="checkbox"/> Query Service	-----	

TOTAL QUOTA 1327MB

RAM Available 3790MB Max Allowed Quota 3032MB

Index Storage Setting
 Standard Global Secondary
 Memory-Optimized ⓘ

Enable software update notifications in the web console

< Back Save & Finish

- **Hostname:** Your public IP or localhost.
- **Data Disk Path:** /opt/couchbase/var/lib/couchbase/**data**
- **Indexes Disk Path:** /opt/couchbase/var/lib/couchbase/**index**
- **Data Service:** 1024Mo
- **Index Service:** 512Mo
- **Search Service:** 256Mo
- **Index Storage Setting:** Standard Global Secondary (Plasma)

Installation – Sample buckets



- Perform further steps in the Wizard
 - Add the travel-sample bucket
 - Edit the Travel-Sample configuration and remove the replicas.
 - Create an Administrator in Settings.
User: couchbase
Password: couchbase
 - Browse the UI and check Statistics. (while travel-sample is loading)

The screenshot shows the Couchbase UI with the following details:

- Settings Page:** The main navigation bar includes Cluster, Software, and Settings. The left sidebar lists Dashboard, Servers, Buckets, Indexes, Search, Query, XDCR, Security, Settings, and Logs. The Buckets section is currently selected. A sub-section titled "Available Samples" shows three options: beer-sample, gamesim-sample, and travel-sample, with travel-sample checked. A "Load Sample Data" button is present.
- Add New User Dialog:** An overlay dialog titled "Add New User" contains fields for Authentication Domain (set to Couchbase), Username (couchbase), Full Name (optional, set to Workshop User), Password, Verify Password, and Roles. Under Roles, the "Cluster Admin" checkbox is checked and highlighted with a green checkmark. Buttons for "Cancel" and "Save" are at the bottom right.

- Check that Couchbase Server has started.

```
sudo systemctl status couchbase-server
```

#Note & Optional: How to stop & start Couchbase on Centos 7.

```
sudo systemctl stop couchbase-server  
sudo systemctl start couchbase-server
```

- Set up the command line environment in the Path.

```
export PATH=$PATH:$HOME/bin:/opt/couchbase/bin
```



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Testing Installation



Perform the following steps with the REST API

- Check some statistics

- Cluster Status:

`http://<Your Public IP>:8091/nodeStatuses`

`curl -u ${admin user}:${password} http://${Your Public IP}:8091/nodeStatuses | jq`

- System Statistics:

`http://<Your Public IP>:8091/pools`

- Cluster Details:

`http://<Your Public IP>:8091/pools/default`

- Bucket Monitoring:

`http://<Your Public IP>:8091/pools/default/buckets/travel-sample`

- Tasks running:

`http://<Your Public IP>:8091/pools/default/tasks`

- Performance on Queries:

`http://<Your Public IP>:8093/admin/vitals`

- Statistics on Indexes (check storage mode):

`http://<Your Public IP>:9102/stats`

- *Install a plug-in in Browser to format JSON*
Ex: Beautiful JSON {J}
- *Install a CLI plug-in to format JSON*
Ex: yum install jq



Perform the following steps in order to test your installation

- List the nodes & buckets of your current cluster

- couchbase-cli server-list --cluster=\${ip}:8091 -u=\${admin user} -p=\${password}
- couchbase-cli bucket-list --cluster=\${ip}:8091 -u=\${admin user} -p=\${password}

- Investigate the data and index directory

```
# You should see approximately 1030 files in this directory.  
# So one file per vBucket + some extra files.  
sudo ls -al /opt/couchbase/var/lib/couchbase/data/travel-sample
```

```
#List index files  
sudo ls -al /opt/couchbase/var/lib/couchbase/index/@2i/...
```

Testing the Installation – Exploring Bucket Files



- Get some data & info from a vBucket file (here vbucket = 0)
 - `couch_dbdump /opt/couchbase/var/lib/couchbase/data/travel-sample/0.couch.1`
 - `couch_dbinfo /opt/couchbase/var/lib/couchbase/data/travel-sample/0.couch.1`

Testing the Installation – Cbworkloadgen



- Generate a workload on the bucket “test”

```
cd /opt/couchbase/bin
```

- Generate a workload with cbworkloadgen

- 50% write & 50% read ($r = \%$ of write workload => 1 means 100% writes, 0 means 100% reads)
- Size = 100 bytes
- Number of items = 500 000
- Number of threads = 2
- Json documents

```
cbworkloadgen -n <IP>:8091 -u Administrator -p couchbase -b test -i 250000 -r .5  
-s 100 -t 2 -j
```

- Observe the Metrics on the UI.

<https://developer.couchbase.com/documentation/server/current/cli/cbworkloadgen-tool.html>



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Buckets Operations

Edit a Bucket



Perform the following steps in order to edit a bucket

- Open the Web Admin UI and go to the ‘Buckets’ tab

<http://<public hostname of your VM>:8091>

Edit Bucket Settings X

Name
test

Memory Quota in megabytes per server node
128 MB

other buckets (100 MB) this bucket (128 MB) remaining (796 MB)

Bucket Type
 Couchbase Memcached Ephemeral

Advanced bucket settings

Cancel Save Changes

- Edit the bucket ‘test’ and configure the following:
 - Update the Memory quota to 256 MB RAM
 - Enable one Replica (Why do you get a Warning?)
 - Enable Flush
- Insert a new document in the bucket & search for it from the UI with .

Create a document in the Bucket



Perform the following steps in order to add a document

- Open the Web Admin UI and go to the Buckets.
 - Insert a new document in the bucket (check the Metadata)

- Search for it with the name of the key.

<input type="text" value="test"/> ▼	<input type="text" value="Document ID"/>	<button>Look Up ID</button>
ID	content sample	
Documents are retrieved from ephemeral buckets by using the id lookup.		



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Cluster Operations

Cluster Operations: Start a Cluster with Docker



Perform the following steps:

- Stop the local Couchbase instance again. (At each VM restart also)

```
sudo systemctl stop couchbase-server
```

- Start 3 Docker containers with Couchbase already installed.

```
sudo docker run -d --name couchbase-1 -p 8091-8094:8091-8094\  
-p 11210-11211:11210-11211 couchbase
```

```
sudo docker run -d --name couchbase-2 couchbase  
sudo docker run -d --name couchbase-3 couchbase
```

- Get the IP of your first node with Docker.

```
sudo docker inspect couchbase-$i | grep IPAddress
```



Couchbase Docker Repository:
https://hub.docker.com/_/couchbase/

Cluster Operations: Start a Cluster with Docker



Perform the following steps:

- Check you can access the Couchbase CLI

```
sudo docker exec -it couchbase-1 bin/bash
```

- Test if all nodes are reachable

```
curl http://<IP couchbase-1>:8091/pools  
curl http://<IP couchbase-2>:8091/pools  
curl http://<IP couchbase-3>:8091/pools
```

- You should get something like:

```
{"isAdminCreds":true,"isROAdminCreds":false,"isEnterprise":true,"pools":[],"settings":[],"uuid":[],"implementationVersion":"5.0.0-3519-enterprise","componentsVersion":{"lhttpc":"1.3.0","os_mon":"2.2.14","public_key":"0.21","asn1":"2.0.4","kernel":"2.16.4","ale":"5.0.0-3519-enterprise","inets":"5.9.8","ns_server":"5.0.0-3519-enterprise","crypto":"3.2","ssl":"5.3.3","sasl":"2.3.4","stdlib":"1.19.4"}}}
```

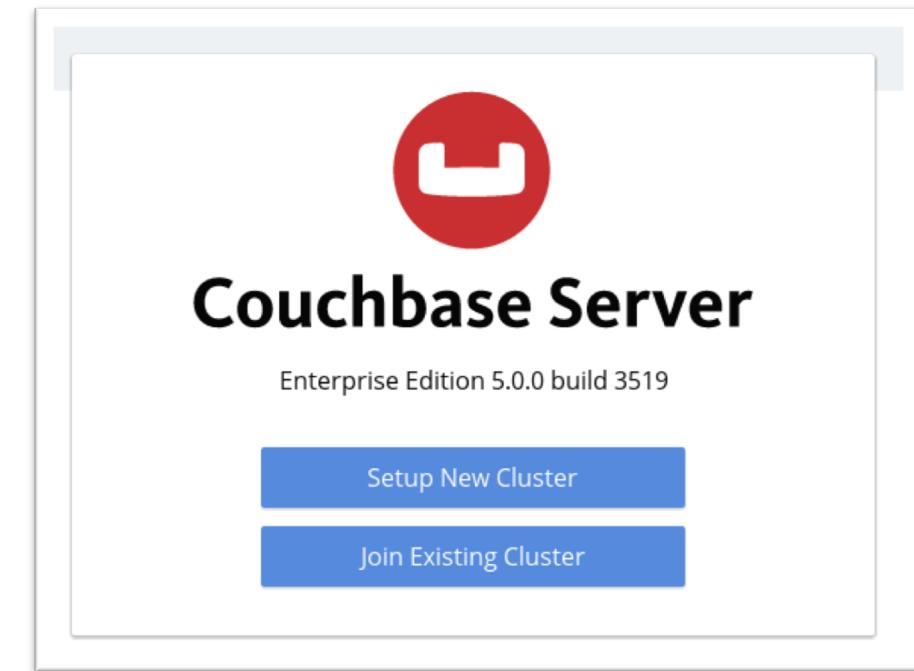


Cluster Operations: Start a New Cluster with Docker



Perform the following steps:

- Setup a **New Cluster** via the UI
 - ClusterName = Cluster_3_Nodes
 - User: Administrator (pwd = couchbase)
 - HostName = <IP couchbase-1>
(You get the IP with docker inspect and it should 172.17.0.2)
 - RAM Data Service = 1024 MB
 - RAM Index Service = 256 MB
 - RAM FTS Service = 256 MB



- Load the travel-sample bucket.
Settings => Sample buckets.

The screenshot shows the "Sample Buckets" section of the Couchbase Server UI. It includes a navigation bar with tabs: Cluster, Software Updates, Auto-Failover, Email Alerts, Auto-Compaction, and Sample Buckets. Below the navigation bar is a message: "Sample buckets contain example data and Couchbase views. You can provision one or more sample buckets to help you discover the power of Couchbase Server." A note in red text states: "Sample buckets (like all buckets in Couchbase Server 5.0+) can only be accessed by a user with privileges for that bucket." On the left, there's a "Available Samples" list with checkboxes for beer-sample, gamesim-sample, and travel-sample, where travel-sample is checked. On the right, there's an "Installed Samples" list with the entry "none". At the bottom is a blue "Load Sample Data" button.

Cluster Operations: Add the 2nd Node via UI



Perform the following steps:

- Add the 2nd node via the UI with IP of couchbase-2
 - IP from docker inspect on couchbase-2
 - Username = Administrator
 - Password = couchbase
 - Load all Services
- Add Server
- Rebalance.

Add Server Node

Warning: Adding a server to this cluster means any previous Couchbase Server data on that server will be removed.

Hostname/IP Address
172.17.0.3

Username an existing username with admin access to this server
Administrator

Password an existing password with admin access to this server

Services ⓘ
 Data Service
 Index Service
 Search Service
 Query Service

[Cancel](#) [Add Server](#)

Rebalance								
name ▾	group	services	CPU	RAM	swap	disk used	items	
172.17.0.2	Group 1	data full text index query	4.41%	70.7%	0%	77.6MB	15.7 K/15.8 K	Statistics
172.17.0.3	Group 1	data full text index query	4.9%	70.7%	0%	35.1MB	15.8 K/15.7 K	Statistics

Cluster Operations: Add the 3rd node



- On the 3rd node execute the following command
(you can log-in by using docker exec -it couchbase-3 /bin/bash)

```
/opt/couchbase/bin/couchbase-cli server-add --server-add=<IP couchbase-3>
--server-add-username=Administrator --server-add-password=couchbase
--group-name="Group 1" --cluster=<IP couchbase-1>:8091
--user=Administrator --password=couchbase
```

- Don't forget to rebalance!
 - Perform the Rebalance again via the UI
 - BTW: The CLI command 'couchbase-cli rebalance' can be used to invoke it from the command line
 - Which Service role was enabled on the 3rd node?
- *Optional: To remove node 3 from the cluster (to be added back after)*

```
couchbase-cli rebalance -c <IP couchbase-1>:8091 --server-remove=<IP couchbase-3>
--user=${admin user} --password=${password}
```

Cluster Operations: Auto-Failover



Perform the following steps:

- Enable Auto-Failover in the Cluster to 15s
- Stop couchbase service on Node 3 to simulate a failure.

```
sudo docker stop couchbase-3
```

Cluster Software Updates Auto-Failover

Enable auto-failover
Timeout in seconds ⓘ
15

Enable auto-reprovisioning (Ephemeral Buckets only)

Max Concurrent Nodes
1

Save

- Monitor the console on the tab Servers. (Is the bucket 100% available?)

name	group	services	CPU	RAM	swap	disk used	items	Rebalance
172.17.0.2	Group 1	data full text index query	3.89%	58.9%	0%	60.7MB	10.5 K/10.5 K	Statistics
172.17.0.3	Group 1	data full text index query	5.74%	58.8%	0%	29.4MB	10.4 K/10.5 K	Statistics
172.17.0.4	Group 1	data	0%	72.6%	0%	21.4MB	10.5 K/10.5 K	

Node unresponsive | Not taking traffic | FAILOVER to activate available replicas

Failover



Perform the following steps:

- Restart the failing node

```
sudo docker start couchbase-3
```

- Monitor the UI “Servers” tab.
- Couchbase should be back as reachable.
- You have 2 options:
 - Full Recovery (Erase RAM and restore from replicas)
 - Delta Recovery (Compare and recover mutations which happened after failures.)
- Rebalance

The screenshot shows the Couchbase Server UI under the "Servers" tab. A banner at the top indicates "A server was automatically failed over." with a "RESET QUOTA" button. The table lists three nodes: 172.17.0.2 (Group 1), 172.17.0.3 (Group 1), and 172.17.0.4 (Group 1). Node 172.17.0.4 is highlighted in red and labeled "Node failed-over | Not taking traffic | REMOVAL pending rebalance". A message at the bottom states "This server is now reachable. Do you want to add it back to the cluster on the next rebalance?". Buttons for "Add Back: Full Recovery" and "Add Back: Delta Recovery" are visible.

name	group	services	CPU	RAM	swap	disk used	items	Actions
172.17.0.2	Group 1	[data, full text, index, query]	41.5%	39.5%	0%	---	0/0	Statistics
172.17.0.3	Group 1	[data, full text, index, query]	22.9%	41.5%	0%	---	0/0	Statistics
172.17.0.4	Group 1	[data]	0%	---	---	---	0/0	Rebalance

Node failed-over | Not taking traffic | REMOVAL pending rebalance

This server is now reachable. Do you want to add it back to the cluster on the next rebalance?

Add Back: Full Recovery Add Back: Delta Recovery

Cluster Operations: Stop Couchbase on Docker



Perform the following steps:

- Stop Couchbase on the 3 containers

```
sudo docker stop couchbase-1  
sudo docker stop couchbase-2  
sudo docker stop couchbase-3
```

- Delete the containers

```
sudo docker rm couchbase-1  
sudo docker rm couchbase-2  
sudo docker rm couchbase-3
```

- Check the containers are not anymore running

```
sudo docker ps
```



Couchbase Docker Repository:
https://hub.docker.com/_/couchbase/



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Security

Security: Create a User with limited permissions



Perform the following steps:

- Start Couchbase

```
sudo systemctl start couchbase-server
```

- Create a User with “Bucket Admin” role on travel-sample.
- Logout and Login with the new user.
 - Can you change the settings of test bucket?
- Log back as Administrator.
- Grant more permissions to your user.

```
GRANT Cluster_Admin TO `Ludo`  
SELECT * FROM system:user_info
```

The screenshot shows the 'Add New User' dialog box with the following interface elements:

- Add New User** (Title bar)
- X** (Close button)
- Roles** (Section header)
- Admin
- Cluster Admin
- Read Only Admin
- Bucket Roles** (Section header)
- Bucket Admin** (Section header)
 - all [*] ⓘ
 - test
 - travel-sample
- Bucket Full Access** (Section header)
- Data Roles** (Section header)
 - ▶ Data Backup
 - ▶ Data DCP Reader
 - ▶ Data Monitoring
 - ▶ Data Reader
 - ▶ Data Writer
- Cancel** (Cancel button)
- Save** (Save button)

Security: Enable Auditing



Perform the following steps:

- Enable Auditing in the Security tab
- Perform some Administration tasks
 - Change Auto-Compaction to 20%.
- Check the Audit.log file.

```
{"timestamp": "2017-11-10T17:33:26.373190+01:00", "real_userid": {"source": "internal", "user": "couchbase"}, "auditd_enabled": true, "descriptors_path": "/opt/couchbase/etc/security", "hostname": "localhost.localdomain", "log_path": "/opt/couchbase/var/lib/couchbase/logs", "rotate_interval": 86400, "version": 1, "id": 4096, "name": "configured audit daemon", "description": "loaded configuration file for audit daemon"}
```

Audit Configuration
Auditing keeps track of important admin events and other system events. Monitoring these events is essential for any secured environment. This feature is available in Couchbase.

Enable Auditing

Target Log Directory
`/opt/couchbase/var/lib/couchbase/logs`

Log Rotation Time Interval
1 Days

Save

<https://developer.couchbase.com/documentation/server/current/security/security-auditing.html>



6

Backup & Restore



Perform the following steps in order to backup some data

- Create a target folder

```
cd /tmp  
mkdir cb-backup  
cd /opt/couchbase/bin
```

- Prepare the backup archive

```
/opt/couchbase/bin/cbbackupmgr config --archive /tmp/cb-backup --repo workshop
```

- Backup the data twice and then use the list command to list the increments!

```
cbbackupmgr backup -a /tmp/cb-backup -r workshop -c http://localhost:8091  
-u Administrator -p couchbase
```

```
cbbackupmgr list -archive /tmp/cb-backup --repo workshop
```



Perform the following steps in order to restore some data

- Delete a document in the bucket travel-sample via the UI
- Get the count of document – 31590 (after delete)
- Restore the database.

```
cbbckupmgr list --archive /tmp/cb-backup --repo workshop
```

```
cbbckupmgr restore --archive /tmp/cb-backup --repo workshop -c http://localhost:8091 -u Administrator -p couchbase --start 2017-11-10T18_07_25.462463124+01_00 --end 2017-11-10T18_07_25.462463124+01_00
```

- Does the document come back? => Try again with --force-updates

```
cbbckupmgr restore --archive /tmp/cb-backup --repo workshop -c http://localhost:8091 -u Administrator -p couchbase --start 2017-11-10T18_07_25.462463124+01_00 --end 2017-11-10T18_07_25.462463124+01_00 --force-updates
```



7

XDCR



Let's XDCR the travel-sample bucket to a new bucket "travel-destination"

- Create a new bucket "travel-destination"
 - RAM Quota = 100MB
 - No Replica
 - Conflict Resolution: Sequence Number
 - Flush: Enable
- Add a remote cluster (the local one)
 - Name of the Cluster: WorkshopCouchbase
 - IP of the local cluster.
- Add replication from "travel-sample" to "travel-destination"
 - Default Settings

Remote Clusters							Add Remote Cluster
name		IP/hostname					
WorkshopCouchbase		192.168.56.102:8091			Delete	Edit	
Ongoing Replications							
bucket	protocol	from	to	filtered	status	when	Add Replication
travel-sample	Version 2	this cluster	bucket "travel-destination" on cluster "WorkshopCouchbase"	No	Replicating		Delete Edit

XDCR: Replicate a Bucket – Update Source



Let's update a document in the source cluster.

- Update 1 document in travel-sample
 - Select 1 document “airline_10”
 - Check the metadata this document.
 - Save the revision (CAS) id.
 - Create a new document in travel-sample
 - ID = airline_XX
 - Check the “airline_10” document in the “travel-destination” bucket.
 - Check the document count on both buckets.
 - Bonus: Play with bi-directional replication.

```
1 {
2   "id": "airline_10",
3   "rev": "1-14f33c01fd1f0000000000000000002000000",
4   "expiration": 0,
5   "flags": 33554432
6 }
```

```
1 {
2   "id": "airline_10",
3   "rev": "2-14f671d35bd200000000000000002000000",
4   "expiration": 0,
5   "flags": 33554432
6 }
```

XDCR: Replicate a Bucket => Filtering on Airlines



Let's XDCR all document with type “airlines” from the travel-sample bucket to a new bucket “airline-destination”

- Create a new bucket “airline-destination”
 - RAM Quota = 100MB
 - No Replica
 - Conflict Resolution: Sequence Number
 - Flush: Enable
- Add replication from “travel-sample” to “airline-destination”
 - Enable **Advance Filtering**.
 - Enter a regular expression “airline*”
 - **Start Replication**
 - Run the **following query** & compare the count with the number of documents in “airline-destination”
SELECT COUNT() FROM `travel-sample` WHERE meta().id LIKE "airline%"*

Remote Clusters								Add Remote Cluster
name		IP/host name						
WorkshopCouchbase		192.168.56.102:8091						Delete Edit
Ongoing Replications								
bucket	protocol	from	to	filtered	status	when		Add Replication
travel-destination	Version 2	this cluster	bucket “travel-sample” on cluster “WorkshopCouchbase”	No	Replicating	■■■		Delete Edit
travel-sample	Version 2	this cluster	bucket “airline-destination” on cluster “WorkshopCouchbase”	Yes	Replicating	■■■		Delete Edit



8 | FTS

FTS: Create a default Index



Let's build the default Index on `travel-sample` bucket.

- Build a new default Index
 - Give index name "idx_default"
 - Select bucket "travel-sample"
 - Create Index
- Observe time to create default index. (~60s)
- Check the size on disk of the default index. (~ 915Mb)
- Search default index & review search results

Name: idx_default Bucket: travel-sample

Type Identifier:
 JSON type field: type
 Doc ID up to separator: delimiter
 Doc ID with regex: regular expression

Type Mappings:
 # default | dynamic

Analyzers
Custom Filters
Advanced

Index Replicas: 0

Create Index Cancel

Full Text Indexes				Add Index
index name	bucket	doc count	indexing progress	
idx_default	travel-sample	31591	100%	
search this index...		Search		
				Delete Clone Edit

Note: Default index are not recommended in a production environment

FTS: Create a custom Index on type = hotel



Let's build a new Index on `travel-sample` bucket.

- Build a new Index
 - Give index name "idx_hotel"
 - Select bucket "travel-sample"
 - Add a Type mapping = hotel (only index specified fields)
 - Disable the default mapping.
 - Add a child mapping on reviews (array)
 - Add a field mapping on content
(only index specified fields and store)
- Observe time to create default index. (~5s)
- Check the size on disk of the default index. (~ 79Mb)
- Search "friendly" in the UI with the hotel index & review search results

Name	Bucket
idx_hotel	travel-sample

Type Identifier

JSON type field: type

Doc ID up to separator: delimiter

Doc ID with regex: regular expression

Type Mappings

hotel | only index specified fields

{} reviews | dynamic

content | text | index | store | include in _all field | include term vectors

default | disabled | dynamic

Bonus: Run the same search with the REST API. (you can find the curl command in the UI)

Thank you



Couchbase