



Couchbase

Architecture and Administration Basics

Workshop Day 1 - Labs



1

Installation & Configuration

Installation - Swappiness



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
```



Installation - Firewall

- 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 5.0



- Download the installation package from a browser or wget:
 - <https://www.couchbase.com/downloads>
 - `wget https://packages.couchbase.com/releases/5.0.0/couchbase-server-enterprise-5.0.0-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 'WorkshopCouchbase > Settings' page open. On the left, a sidebar menu includes Dashboard, Servers, Buckets, Indexes, Search, Query, XDCR, Security, Settings, and Logs. The 'Buckets' item is currently selected. In the main content area, there is a section titled 'Available Samples' with three checkboxes: beer-sample, gamesim-sample, and travel-sample, where travel-sample is checked. A 'Load Sample Data' button is located below this section. To the right, there is a 'Sample buckets' section with text about provisioning sample buckets and a note that sample buckets (like all buckets in Couchbase Server 5.0+) can only be provisioned once. Below this is an 'Installed Samples' section showing 'none'. An 'Add New User' dialog box is overlaid on the page. It contains fields for 'Authentication Domain' (radio buttons for Couchbase and External, with Couchbase selected), 'Username' (couchbase), 'Full Name (optional)' (Workshop User), 'Password' (redacted), 'Verify Password' (redacted), and 'Roles' (checkboxes for Admin and Cluster Admin, with Cluster Admin selected). At the bottom of the dialog are 'Cancel' and 'Save' buttons.

- 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
```



2

Testing Installation

Testing the Installation - REST API



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 - Telnet

- 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
- Create an ephemeral moxi bucket & check connectivity with Telnet.
 - couchbase-cli bucket-create -c <IP>:8091 --username Administrator \
--password couchbase --bucket test --bucket-type couchbase \
--bucket-port 11252 --bucket-ramsize 128
 - sudo yum install telnet
 - telnet <IP host> 11252

```
[couchbase@localhost bin]$ telnet 192.168.56.102 11252
Trying 192.168.56.102...
Connected to 192.168.56.102.
Escape character is '^]'.
```

Testing the Installation - Telnet



- Retrieve some statistics of the default bucket

`stats`

- Set a new key with value (set \$key \$flags \$exptime \$numbytes \$value)

```
set test_key 0 300 4  
<Enter>  
data
```

- Get the key.

```
get test_key
```

- Quit

```
quit
```

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 \Rightarrow 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>



3

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

Name
test

Memory Quota in megabytes per server node
128 MB

Bucket Type
 Couchbase Memcached Ephemeral

Advanced bucket settings

[Cancel](#) [Save Changes](#)



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

- 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"/> Look Up ID
ID	content sample
Documents are retrieved from ephemeral buckets by using the id lookup.	



4

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"}}}
```

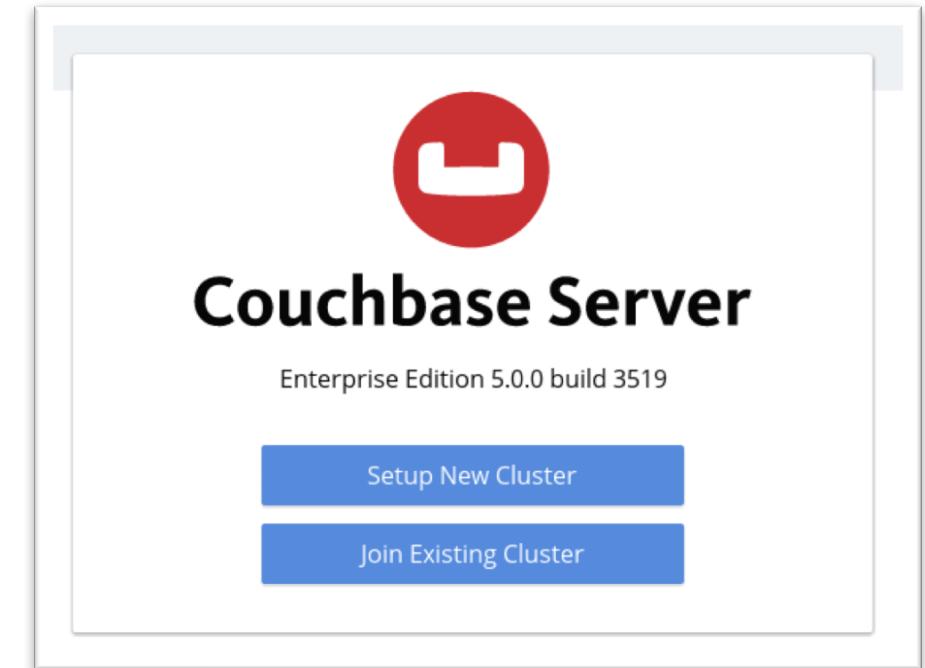


Cluster Operations: Start a New Cluster with Docker



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. At the top, there is a navigation bar with tabs: Cluster, Software Updates, Auto-Failover, Email Alerts, Auto-Compaction, and Sample Buckets (with a dropdown arrow). Below the navigation bar, there 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." Under the message, there are two sections: "Available Samples" and "Installed Samples". The "Available Samples" section lists three options: beer-sample, gamesim-sample, and travel-sample, with travel-sample checked. The "Installed Samples" section shows 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	
172.17.0.2	Group 1	data fulltext index query	3.89%	58.9%	0%	60.7MB	10.5 K/10.5 K	Statistics
172.17.0.3	Group 1	data fulltext 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

Rebalance

Failover

Cluster Operations: Recover from a Failure



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

A message at the bottom says: "Node failed-over | Not taking traffic | REMOVAL pending rebalance". Another message below it says: "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 present.

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

- Check the containers are not anymore running

```
sudo docker ps
```



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



5

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. In the 'Roles' section, under 'Bucket Roles', the 'Bucket Admin' option is selected, and the 'travel-sample' checkbox is checked. Other options like 'all [*]', 'test', and 'Bucket Full Access' are available but not selected. Under 'Data Roles', options like 'Data Backup', 'Data DCP Reader', 'Data Monitoring', 'Data Reader', and 'Data Writer' are listed. At the bottom right of the dialog are 'Cancel' and 'Save' buttons.

<https://developer.couchbase.com/documentation/server/current/security/concepts-rba-for-apps.html>

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. Monitoring these events is essential for any secured environment 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.

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

```
cbbbackupmgr 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

```
cbbbackupmgr 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

XDCR: Replicate a Bucket



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": "1-14f33c01fd1f00000000000000002000000",
4   "expiration": 0,
5   "flags": 33554432
6 }
```

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

Thank you



Couchbase