



# Couchbase

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Function Design  
Document  
COUCHBASE-SHERLOCK

**2<sup>nd</sup> Index Tooling Metric  
Support + Query Metric  
support**

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1. Index Metrics
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## Revision and Signoff History

Doc Version#	CRM Fusion	Date	Reviewer	Comments
1.0	Sherlock	Nov 11, 2014	Sean Frogner	Original Creation
1.1	Sherlock	12/17/2014	Sean Frogner	Update per John Liang/Siri Input
1.2	Sherlock	12/19/2014	Sean Frogner	Added per Dave and Alk feedback
1.3	Sherlock	12/24/2014	Sean Frogner	Added N1QL and Cluster Wide Metrics
1.4	Sherlock	1/5/2015	Sean Frogner	Updated: Node Level Metrics. Changed to same navigation and context pattern. Added RAM Quota and Auto-Compaction settings

1.5	Sherlock	1/8/2015	Sean Frogner	Added Cihan Index Metrics. Added Advanced setting.
1.6	Sherlock	1/14/2015	Sean Frogner	Re-organized 2i Metrics to be Index only. Added some pieces to RAM Quota. Added visualization for holistic view on indexes. Moved Cluster wide metrics out of the spec.
1.7	Sherlock	1/16/2015	Sean Frogner	Query updates and Index modifications

## Request Details

Main Release	Sherlock	Sean Frogner	Sriram Melkote, John Liang, Aliaksey Kandratsenka

## Executive Summary

### Product Request Overview

With the introduction of 2<sup>nd</sup> Indexes need tooling support via the UI and CLI/Rest interfaces add and drop indexes. Additionally the ability to look at metrics concerning the 2<sup>nd</sup> index nodes.

Primary uses cases for this new capability.

1) Index on a secondary attribute that's not the Primary Key. Example

User Profile (Use Case)

UserID = PK

Email Address = Secondary Attribute

User should be able to find there profile based on the email address if they had forgotten there User Id.

2) Programmatic access to 2<sup>nd</sup> indexes.

Ability to programmatically create a secondary index to use in an Index Query.

In Sherlock we will provide Index level metrics to assist the Administrator with indexes.

## Requirements

#	Feature	Priority
1	Index Metrics	1
2	Index RAM Quota and Compaction and Internal settings	1
3	Index Level Metrics	1
4	Index Metrics added to Server Resources and Summary Metrics	1
5	Index Visualizer	1
6	Query Metrics	1
7	Node Level Query Metrics in console	1
8	RAM availability visualization graph	2
9	Cluster Wide Metrics Query	2

## 1. Index Metrics

### Counter Metrics

1.1. Support Following Index Metrics in Administrative Console.

#### System wide Stats

- 1.1.1. CPU Utilization % (top)
- 1.1.2. # Index Connections (bottom section)
- 1.1.3. Indexes in RAM (bottom section)
- 1.1.4. Free Index RAM - Difference between allocated RAM vs used RAM (bottom)
- 1.1.5. Index on Disk (bottom)
- 1.1.6. Index Data (bottom)
- 1.1.7. Index Fragmentation % (bottom)
- 1.1.8. Index Scans/sec (bottom)
- 1.1.9. Total Disk Size (Should we add index to pre-existing metric)
- 1.1.10. Index writes/sec

#### Index Stats

- 1.1.11. Index Scans/sec
- 1.1.12. Total Size - Disk GB
- 1.1.13. Total Size – Data GB
- 1.1.14. Total Items Remaining Count – items pending to be indexed
- 1.1.15. Drain Rate Items/sec – items being indexed per sec
- 1.1.16. Total Items Count
- 1.1.17. Avg Item Size
- 1.1.18. % Fragmentation
- 1.1.19. Requests/sec
- 1.1.20. Bytes returned/sec
- 1.1.21. Minor/Major page faults
- 1.1.22. 8091 port requests/sec
- 1.1.23. Avg Scan Latency
- 1.1.24. Avg Working Set

## 2. Index RAM Quota and Compaction and Internal Settings

2.1. Ability to set RAM Quota for Index service type

# CONFIGURE SERVER

Step 1 of 5

## Configure Disk Storage

Databases Path: /opt/couchbase/var/lib/couchbase/data

Free: 16 GB

Indices Path: /opt/couchbase/var/lib/couchbase/data

Free: 16 GB

Hint: if you use this server in a production, use different file systems for databases and indices.

## Configure Server Hostname

Hostname: 127.0.0.1

## Join Cluster / Start new Cluster

If you want to add this server to an existing Couchbase Cluster, select "Join a cluster now". Alternatively, you may create a new Couchbase Cluster by selecting "Start a new cluster".

If you start a new cluster the "Per Server RAM Quota" you set below will define the amount of RAM each server provides to the Couchbase Cluster. This value will be inherited by all servers subsequently joining the cluster, so please set appropriately.

☒ Start a new cluster.

Services [What's this?](#) RAM Available: 1877 MB

☒ Data
 

Per Server RAM Quota: 1126 MB (256 MB — 1501 MB)

☒ Index
 

Per Server RAM Quota: 256 MB ( 1 MB - 375 MB)

☒ Query

Next

- 2.1.1. RAM Quota is Required if designate node to serve as Index node.
- 2.1.2. Recommended setting

Per Server RAM Quota: 256 MB ( 1 MB - 375 MB)

(1MB - 375 MB) section is dynamic. It computed

Services	<a href="#">What's this?</a>	RAM Available:	1877 MB
<input checked="" type="checkbox"/> Data	Per Server RAM Quota: <input type="text" value="1126"/> MB (256 MB — 1501 MB)		
<input checked="" type="checkbox"/> Index	Per Server RAM Quota: <input type="text" value="256"/> MB ( 1 MB - 375 MB)		

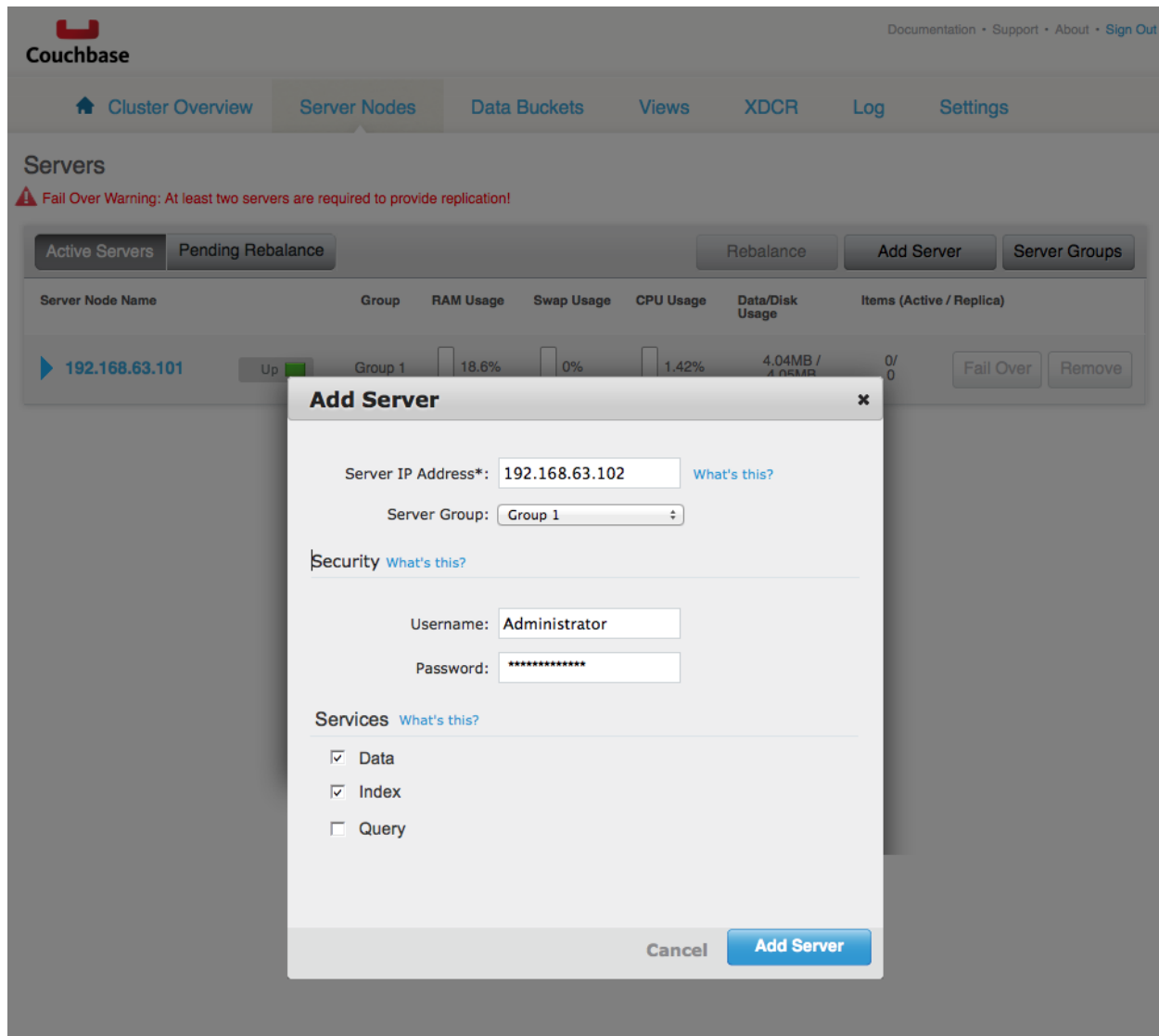
Data assigned 1126 of 1501.

375 RAM is available for Index. The label to the right will change to reflect 1MB-375MB.

### 2.1.3. Validation Requirements

2.1.3.1. If Recommend setting is not possible if the user enters a value too low or too high will receive an Error. Error: The available RAM is >0 and <= 375. This is dues

2.1.4. If during initial setup the Administrator does not add an Index Server type the Admin will need to assign for adding the first Index Service Type.



The screenshot shows the Couchbase Server Nodes page. At the top, there's a navigation bar with links: Cluster Overview, Server Nodes (active), Data Buckets, Views, XDCR, Log, and Settings. Below the navigation bar, the 'Servers' section is visible, showing a 'Fail Over Warning: At least two servers are required to provide replication!'. The main table lists server nodes with columns: Server Node Name, Group, RAM Usage, Swap Usage, CPU Usage, Data/Disk Usage, and Items (Active / Replica). A modal dialog titled 'Add Server' is open in the foreground. It contains the following fields and options:

- Server IP Address\*:** 192.168.63.102 (with a 'What's this?' link)
- Server Group:** Group 1 (dropdown menu)
- Security:** (with a 'What's this?' link)
  - Username:** Administrator
  - Password:** (masked with asterisks)
- Services:** (with a 'What's this?' link)
  - ☒ Data
  - ☒ Index
  - ☐ Query

At the bottom of the dialog, there are 'Cancel' and 'Add Server' buttons.

When choosing Index (If this is there first Index Service Type) A region will expand to allow the Admin to set RAM Quota.





The image shows a 'Add Server' dialog box with the following fields and options:

- Server IP Address\*:** 192.168.63.102 (with a 'What's this?' link)
- Server Group:** Group 1 (dropdown menu)
- Security** (with a 'What's this?' link):
  - Username:** Administrator
  - Password:** (masked with asterisks)
- Services** (with a 'What's this?' link):
  - ☒ Data
  - ☒ Index
    - Per Server RAM Quota:** (input field with a red border) MB (1 MB - 375MB)
  - ☐ Query

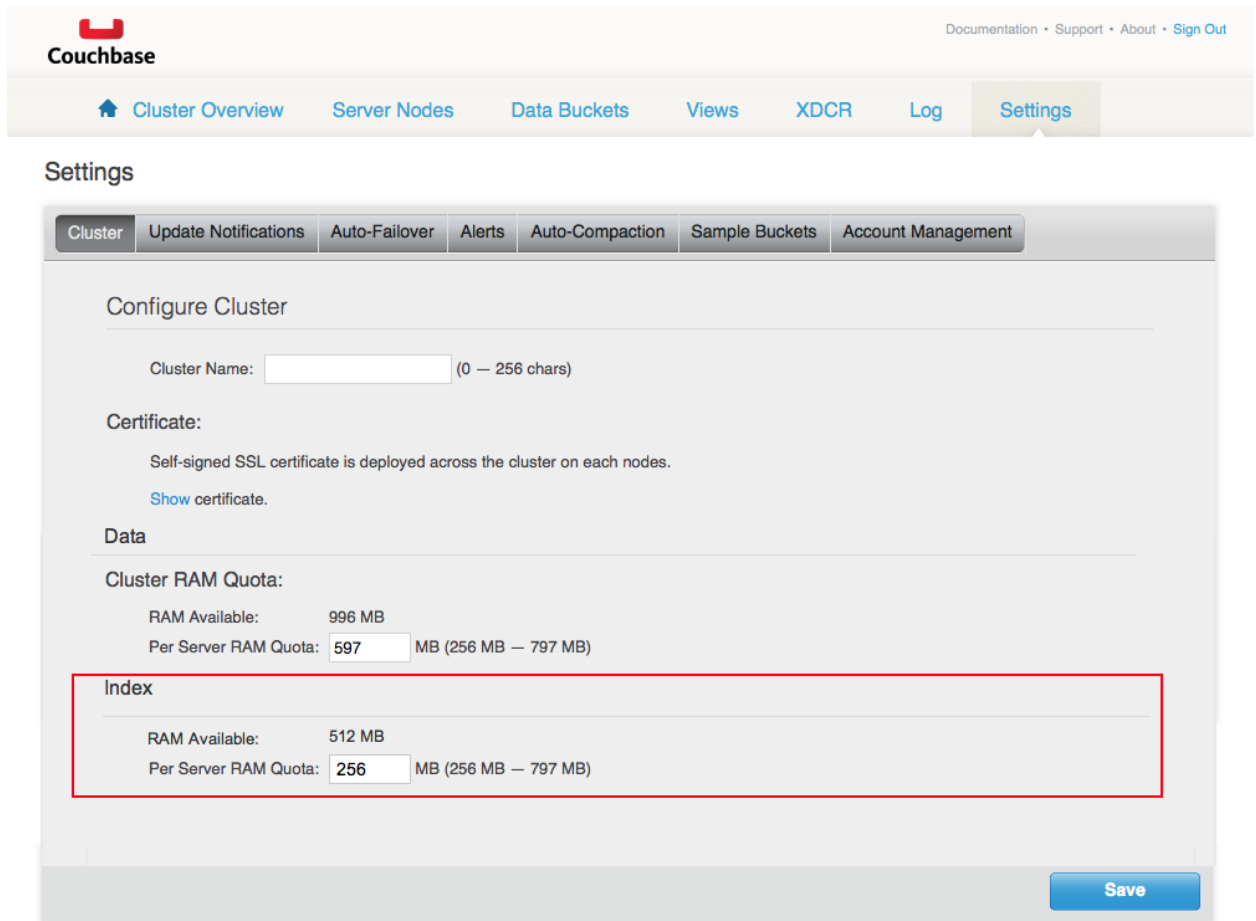
At the bottom are 'Cancel' and 'Add Server' buttons.

If say the KV Quota was assigned 1126 of 1501.

375 RAM is available for Index. The label to the right will change to reflect 1MB-375MB.

2.1.5. Asking for Index RAM Quota will only be prompted once during Add Server flow for subsequent Index nodes. (i.e. If assign 256 MB this would be used all nodes unless changed in Cluster Settings covered in 2.2.

## 2.2. Cluster Settings



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[Cluster Overview](#) [Server Nodes](#) [Data Buckets](#) [Views](#) [XDCR](#) [Log](#) [Settings](#)

### Settings

**Cluster** Update Notifications Auto-Failover Alerts Auto-Compaction Sample Buckets Account Management

#### Configure Cluster

Cluster Name:  (0 — 256 chars)

**Certificate:**  
Self-signed SSL certificate is deployed across the cluster on each nodes.  
[Show certificate.](#)

**Data**

**Cluster RAM Quota:**  
RAM Available: 996 MB  
Per Server RAM Quota:  MB (256 MB — 797 MB)

**Index**  
RAM Available: 512 MB  
Per Server RAM Quota:  MB (256 MB — 797 MB)

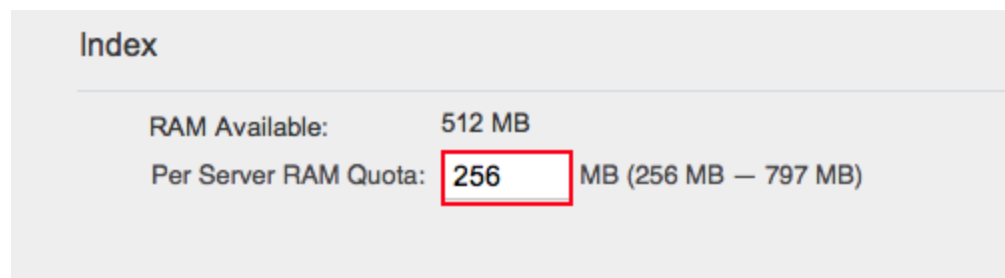
[Save](#)

### 2.2.1. RAM Available

2.2.1.1. Shows physical resources of machines with Index Service type associated minus the aggregate quota.

2.2.2. RAM Quota as Changed. Warning will let use know to navigate to the Index visualizer and will need to restart servers.

Step A. User Changes RAM Quota



**Index**

RAM Available: 512 MB

Per Server RAM Quota:  MB (256 MB — 797 MB)

Step B. User Changes the value

Index

RAM Available: 512 MB  
Per Server RAM Quota:  MB (256 MB — 797 MB)


Warning: You will need to restart the servers running the index service type process. Please go to Index tab for reference.  
You will need to restart the servers from the CLI or Rest Interface for the quota changes to take effect.

Save

### 2.2.3. Warning Message

- 2.2.3.1. Warning: You will need to restart the servers running the index service type process. Please go to the Index tab for reference. You will need to restart the servers from the CLI or Rest Interface for the quota changes to take effect.

#### Step C. Index Tab


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Settings

Cluster
Update Notifications
Auto-Failover
Alerts
Auto-Compaction
Sample Buckets
Account Management
Indexes

Configure Cluster

Cluster Name:  (0 — 256 chars)

Certificate:

Self-signed SSL certificate is deployed across the cluster on each nodes.  
[Show certificate.](#)

Data

Cluster RAM Quota:

RAM Available: 996 MB  
Per Server RAM Quota:  MB (256 MB — 797 MB)

Index

RAM Available: 512 MB  
Per Server RAM Quota:  MB (256 MB — 797 MB)

Warning: You will need to restart the servers running the index service type process. Please go to Index tab for reference.  
You will need to restart the servers from the CLI or Rest Interface for the quota changes to take effect.

Save

#### Step D. Index

## Settings

Cluster
Update Notifications
Auto-Failover
Alerts
Auto-Compaction
Sample Buckets
Account Management
Indexes

### Indexes

Node	Name	Status	Need Restart	RAM Quota
192.168.67.101	LastName	Complete	<input type="checkbox"/>	300
192.168.67.101	FirstName	Complete	<input type="checkbox"/>	300
192.168.67.102	EmailAddress	Complete	<input checked="" type="checkbox"/>	256
192.168.67.102	Street	Complete	<input checked="" type="checkbox"/>	256
192.168.67.102	City	Complete	<input checked="" type="checkbox"/>	256


Save

2.2.4. Column to show whether there is a mismatch to the current RAM Quota and if a change has been made and the server needs a restart to incorporate the change.

2.2.4.1. Need Restart - Boolean value of Y or N.

2.2.4.2. RAM Quota - Numeric Value expressing the current RAM Quota for the servers with the index service type.

## 2.3. Auto-Compaction Settings


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## Settings

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### Auto-Compaction

Auto-Compaction settings trigger the compaction process. The process compacts databases and their respective view indexes when the following conditions are met.

#### Database Fragmentation

Set the database fragmentation level to determine the point when compaction is triggered.

☒ 30 %

☐ MB

#### Index Fragmentation

Set the Index fragmentation level to determine the point when compaction is triggered.

☒ 30 %

☐ MB

#### View Fragmentation

Set the view fragmentation level to determine the point when compaction is triggered.

☒ 30 %

☐ MB

#### Time Interval

☐ Set the time interval for when compaction is allowed to run

Start Time: HH:MM End Time: HH:MM

☐ Abort compaction if run time exceeds the set time interval

☐ Compact Data/View/Index in parallel

#### Metadata Purge Interval

Set the frequency of metadata purge interval: 3 Range 0.04 (1 H) - 60days [What's this?](#)

Save

## 2.4. New Section with divider for Index Fragmentation

### 2.4.1. Defaults to 30%

### 2.4.2. Can assign a MB threshold to start compacting

## 2.5. Time Interval

**Time Interval**

☐ Set the time interval for when compaction is allowed to run

Start Time: HH:MM End Time: HH:MM

☐ Abort compaction if run time exceeds the set time interval

☐ Compact Data/View/Index in parallel

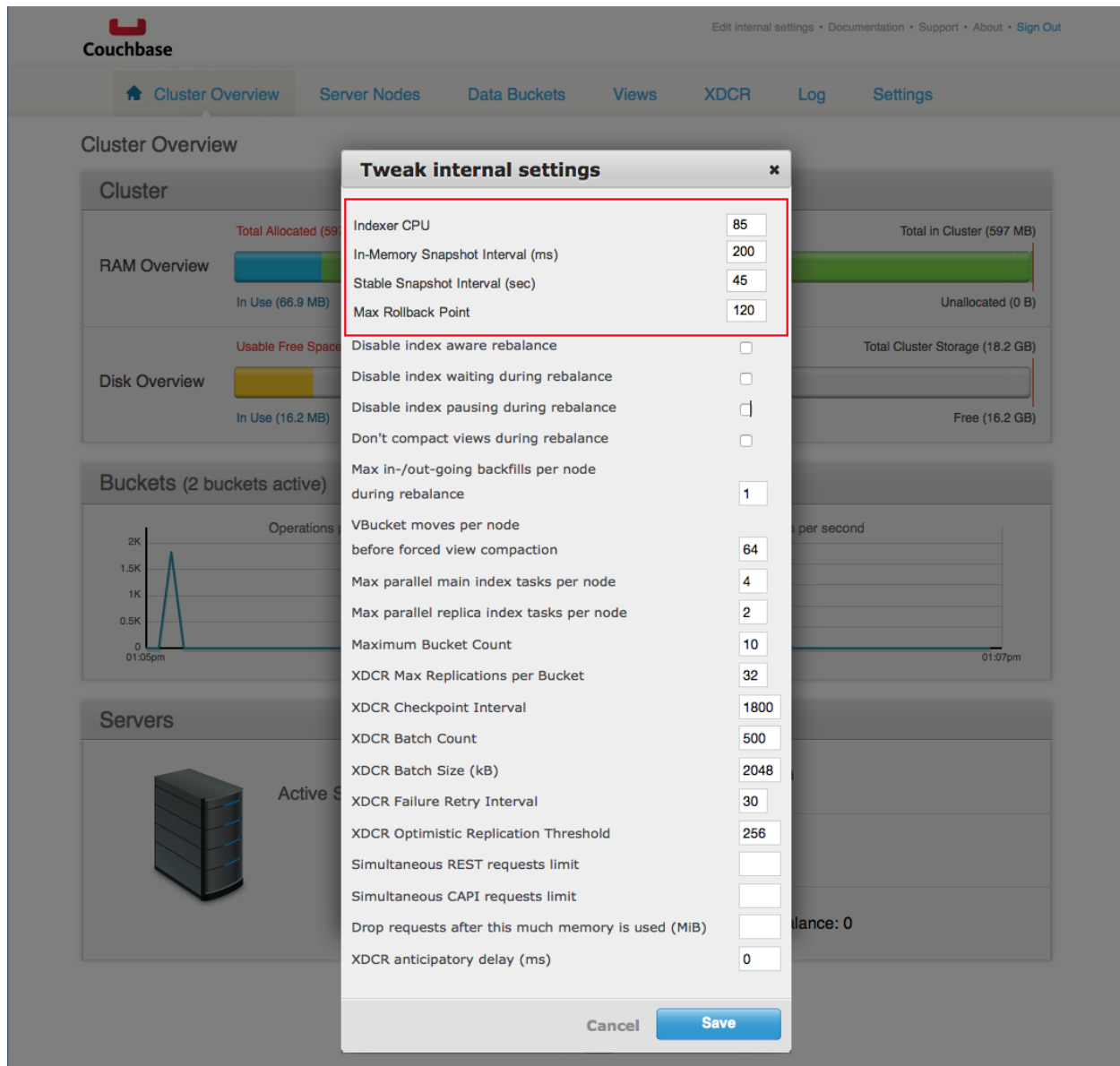
**Metadata Purge Interval**

Set the frequency of metadata purge interval:  Range 0.04 (1 H) - 60days [What's this?](#)

**Save**

2.6. Can compact Data/View and Index in parallel

2.7. Advanced Internal Settings



The screenshot shows the Couchbase Cluster Overview page. A modal dialog titled "Tweak internal settings" is open, displaying various configuration options. The dialog is divided into two columns. The left column lists settings, and the right column shows their current values. A red box highlights the first four settings: Indexer CPU (85), In-Memory Snapshot Interval (ms) (200), Stable Snapshot Interval (sec) (45), and Max Rollback Point (120). Other settings include Disable index aware rebalance, Disable index waiting during rebalance, Disable index pausing during rebalance, Don't compact views during rebalance, Max in-/out-going backfills per node during rebalance (1), VBucket moves per node before forced view compaction (64), Max parallel main index tasks per node (4), Max parallel replica index tasks per node (2), Maximum Bucket Count (10), XDCR Max Replications per Bucket (32), XDCR Checkpoint Interval (1800), XDCR Batch Count (500), XDCR Batch Size (kB) (2048), XDCR Failure Retry Interval (30), XDCR Optimistic Replication Threshold (256), Simultaneous REST requests limit, Simultaneous CAPI requests limit, Drop requests after this much memory is used (MiB), and XDCR anticipatory delay (ms) (0). The dialog has "Cancel" and "Save" buttons at the bottom.

Exposed with ?enableInternalSettings=true

2.8. Indexer CPU

- 2.8.1. Specifies how much CPU indexer can use. If Indexer is co-located with KV, adjusting this value to a lower number would help in better resources for KV.  
Lifecycle: Default All. Changes require restart of all indexers.

## 2.9. In Memory Snapshot Interval (ms)

- 2.9.1. Specifies the frequency of InMemory Snapshots for Scanning. This determines the earliest possibility of a scan seeing the KV data. If rate of mutations is not high,  
increasing this value may allow better batching for forestdb.  
Lifecycle: Default 100ms. Changes require restart of all indexers.

## 2.10. Stable Snapshot Interval (sec)

- Description: Specifies the frequency of Persisted Snapshots for Recovery.  
Lifecycle: Default 30sec. Changes require restart of all indexers.

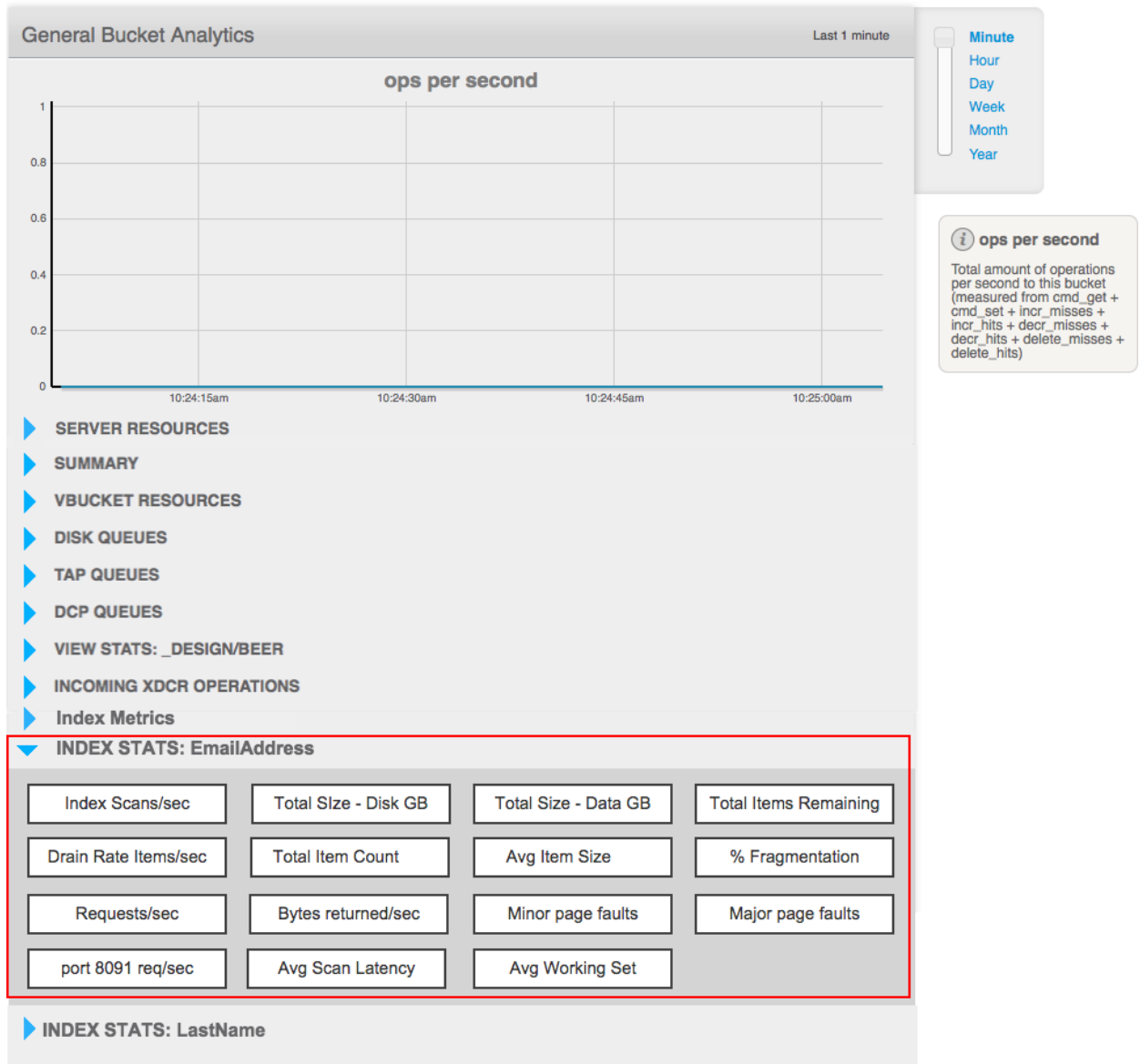
## 2.11. Max Rollback Point

- Description: Specifies the earliest point where rollback can be done. If KV requires  
a rollback beyond this point, indexes will rollback to 0.  
Lifecycle: Default TBD. Changes require restart of all indexers.

## 3. Index Level Metrics

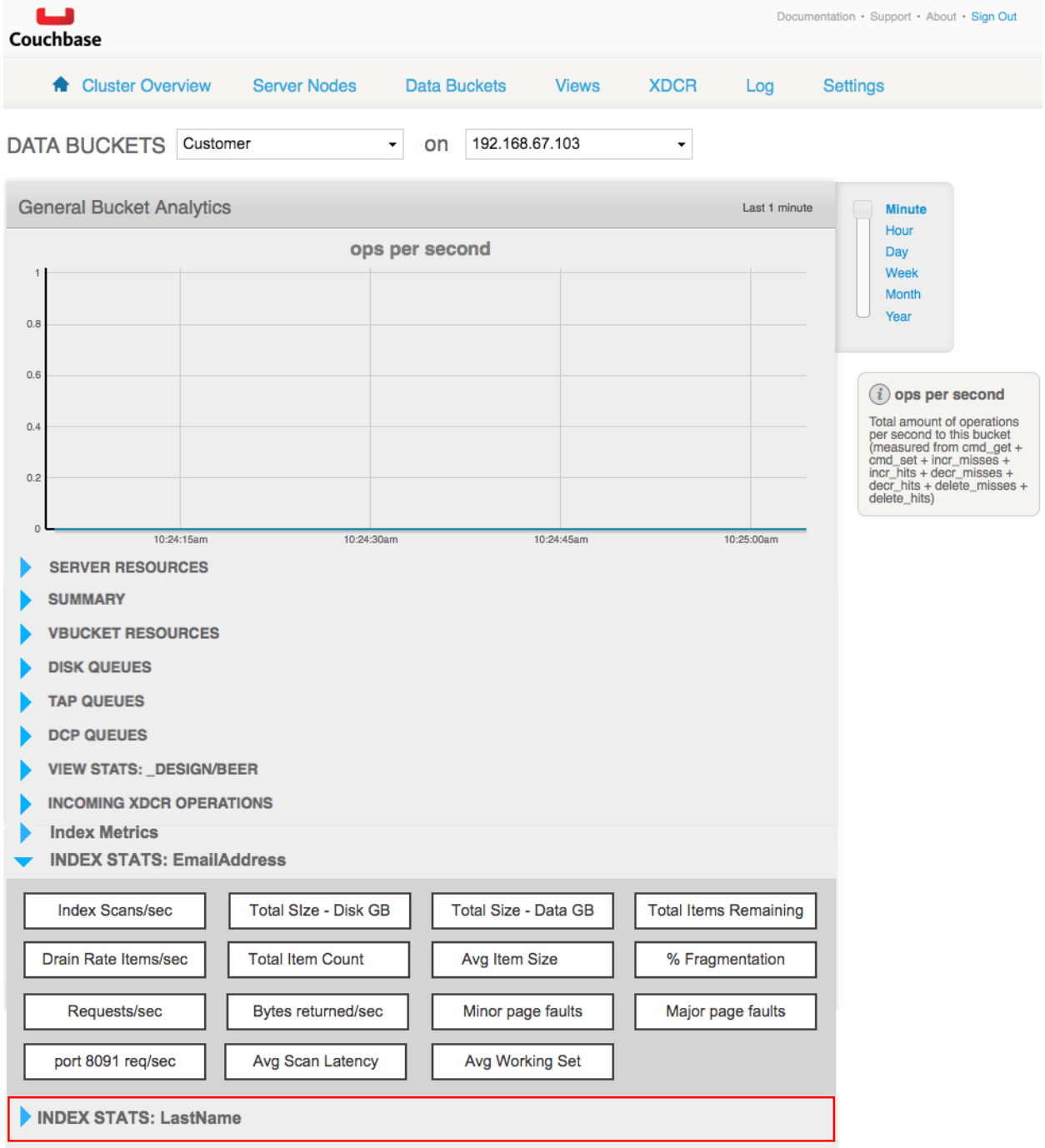
- 3.1. Show Metrics per section 1
- 3.2. Available only for per bucket and per server. Need to be tied to bucket and server.
  - 3.2.1. Will only show indexes metrics tied to the bucket and server you are viewing.
- 3.3. When Indexes are added to a server via N1QL in the command line. In the console an admin will see the following.

DATA BUCKETS Customer on 192.168.67.103



3.4. New Indexes will get new Chevron



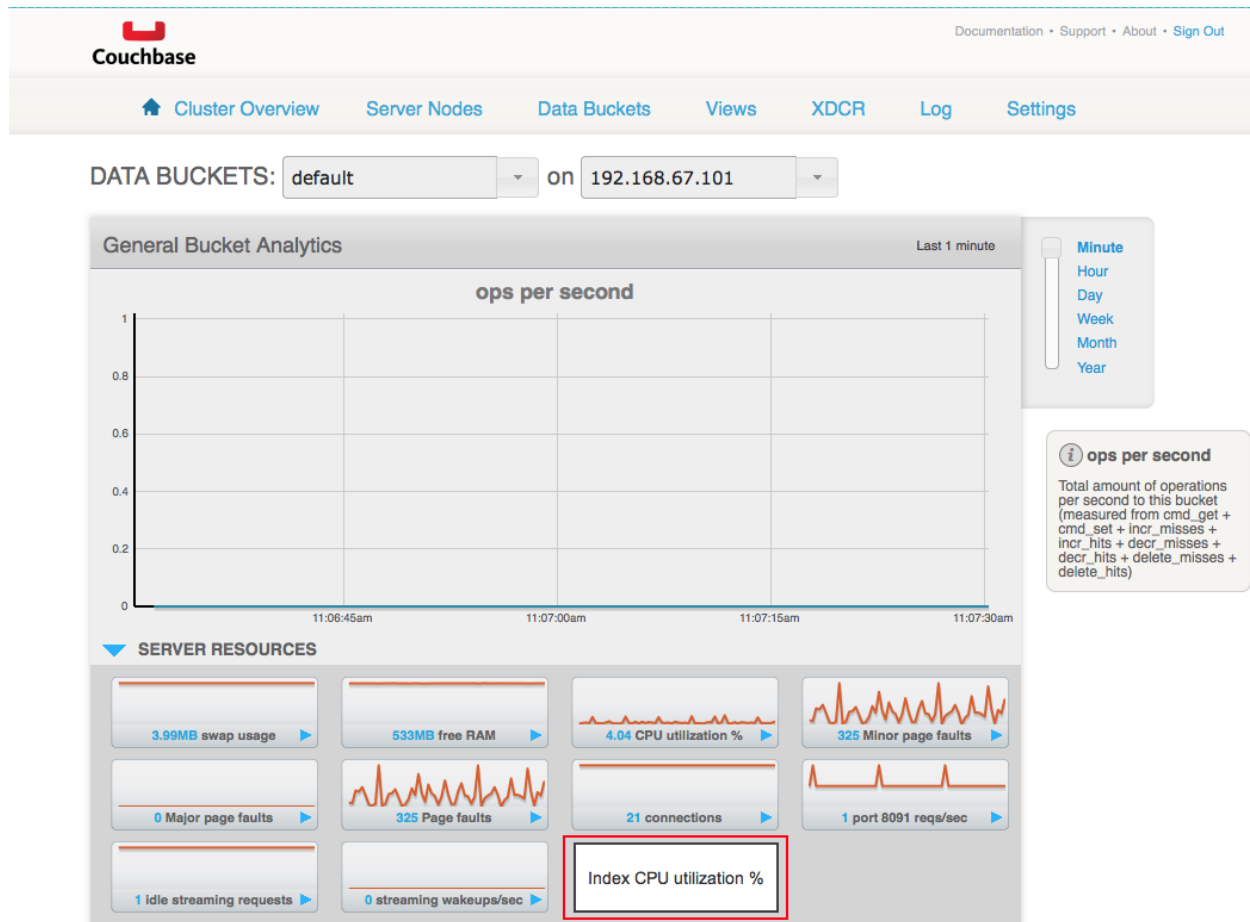


### 3.4.1. Deleted Index will remove

Note, adding, altering and deleting indexes will be done from CLI not the admin console.

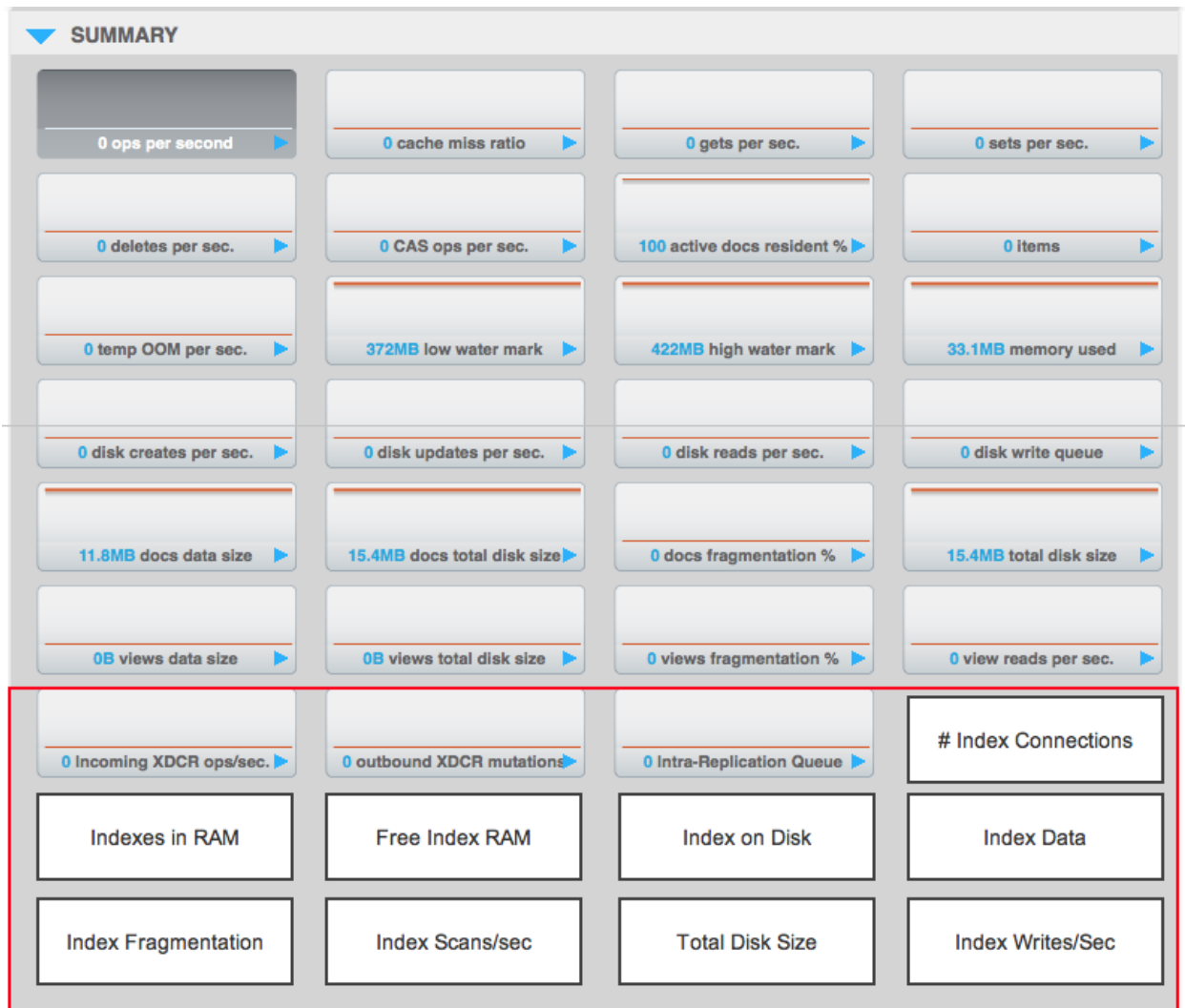
## 4. Index Metrics added to Server Resources and Summary Chevrons

### 4.1. Server Resources Chevron



#### 4.1.1. Metric - Index CPU utilization % (Gauge Metric)

## 4.2. Summary Chevron



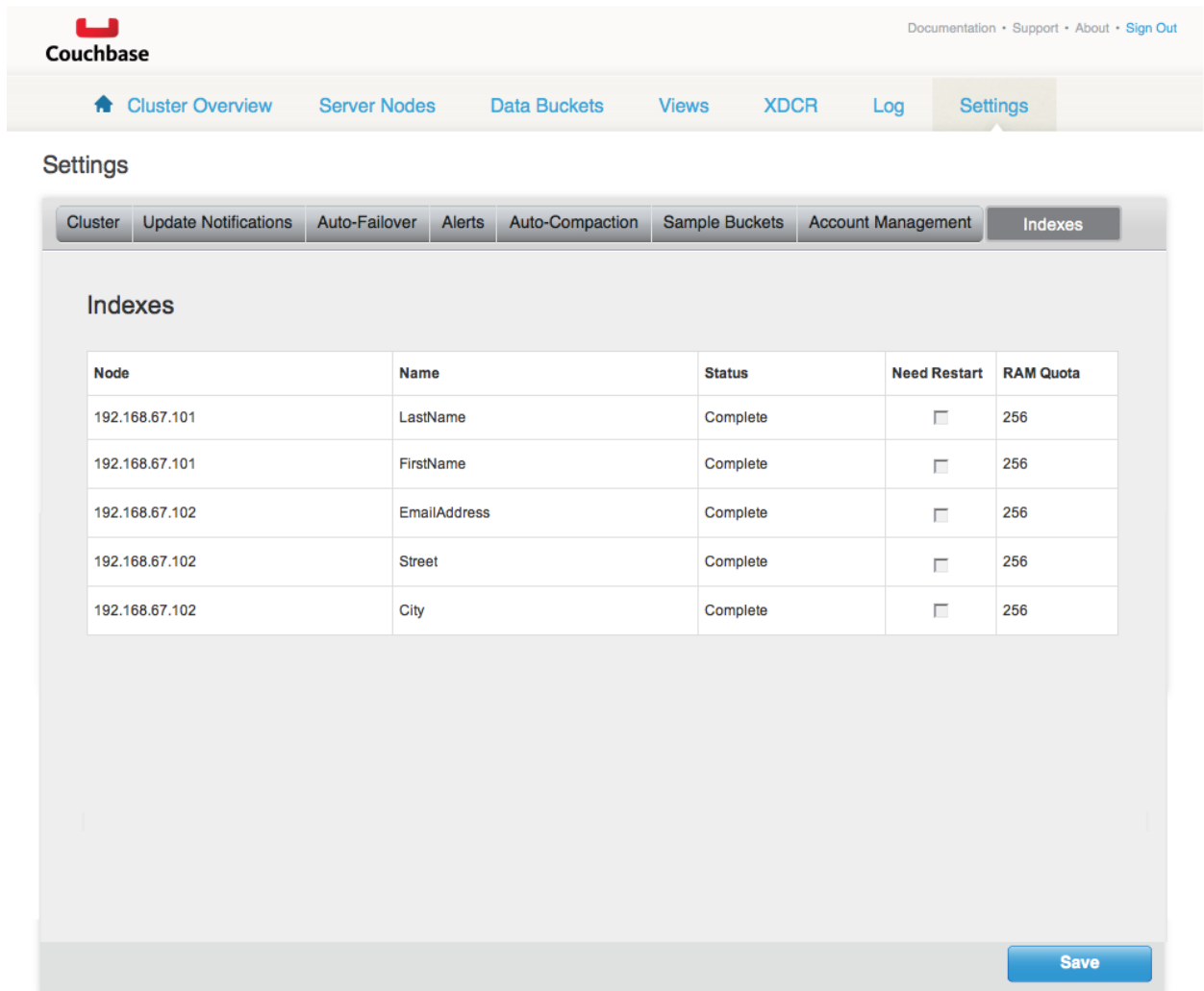
## 4.3. Metrics

- 4.3.1. # Index Connections (Counter)
- 4.3.2. Indexes in RAM (Gauge Metric)
- 4.3.3. Free Index RAM (Counter)
- 4.3.4. Index on Disk (Counter)
- 4.3.5. Index Data (Counter)
- 4.3.6. Index Fragmentation (Gauge Metric)
- 4.3.7. Index/Scans/sec (Gauge Metric)
- 4.3.8. Total Disk Size (Counter)
- 4.3.9. Index Writes/Sec (Gauge Metric)

## 5. Index Visualizer

5.1. Read Only View available from the Cluster Settings

5.2. Shows all indexes tied to buckets and nodes in cluster.



**Indexes**

Node	Name	Status	Need Restart	RAM Quota
192.168.67.101	LastName	Complete	<input type="checkbox"/>	256
192.168.67.101	FirstName	Complete	<input type="checkbox"/>	256
192.168.67.102	EmailAddress	Complete	<input type="checkbox"/>	256
192.168.67.102	Street	Complete	<input type="checkbox"/>	256
192.168.67.102	City	Complete	<input type="checkbox"/>	256

**Save**

### 5.3. Columns

5.3.1. Node - Logical Name of the Server Node

5.3.2. Name - Name assigned to Index

5.3.3. Status - Status of the Index

5.3.3.1. Complete - Index Built and Available for use

5.3.3.2. Building - Index is being built

5.3.4. Need Restart - If changed RAM Quota in cluster settings. Visual indicator that the Server needs a restart for the Index Service type to pick up the change

5.3.5. RAM Quota - Shows the RAM Quota value assigned to the server in which the index resides.

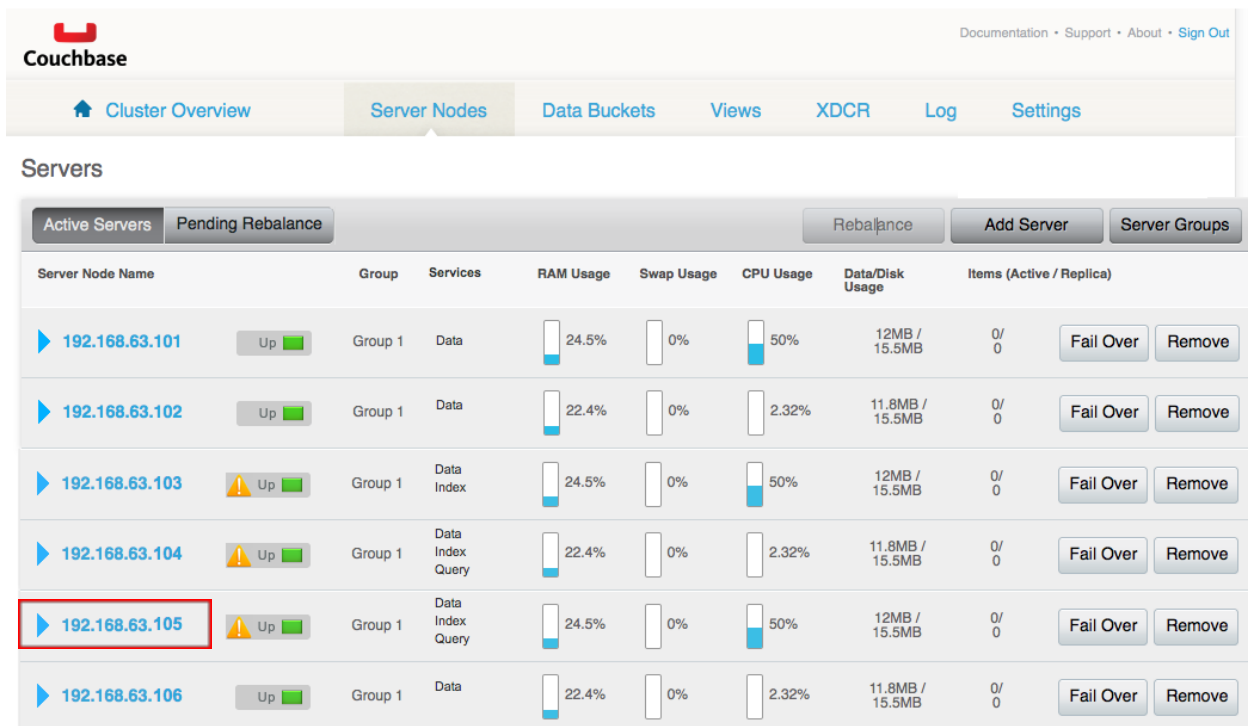
## 6. Query Metrics (Included from Colms McHughs document)

[https://docs.google.com/document/d/1\\_MP5pd5ywBaJw4ZoVnQYOYVVtD-0hPVSInDd2rAgFJI/edit?pli=1#heading=h.r2gyn7tze5q](https://docs.google.com/document/d/1_MP5pd5ywBaJw4ZoVnQYOYVVtD-0hPVSInDd2rAgFJI/edit?pli=1#heading=h.r2gyn7tze5q)

- 6.1. Support Following Query Metrics in Administrative Console.
  - 6.1.1. Requests - Number of requests processed per second
  - 6.1.2. Selects - Number of select statements processed per second
  - 6.1.3. Request Time - End to End time to process a query
  - 6.1.4. Service Time - The time taken to execute a query
  - 6.1.5. Result Count - The number of results (documents) returned by a query
  - 6.1.6. Result Size - The size (in byte) of the data returned by a query
  - 6.1.7. Errors - The number of errors returned by a query
  - 6.1.8. Warnings - The number of warnings returned by a query
  - 6.1.9. Mutations - The number of mutations made by a query
  - 6.1.10. Queries taking longer than 250 millisecond
  - 6.1.11. Queries that take longer than 500 milliseconds
  - 6.1.12. Queries that take more than 1000 milliseconds
  - 6.1.13. Queries that take more than 5000 milliseconds

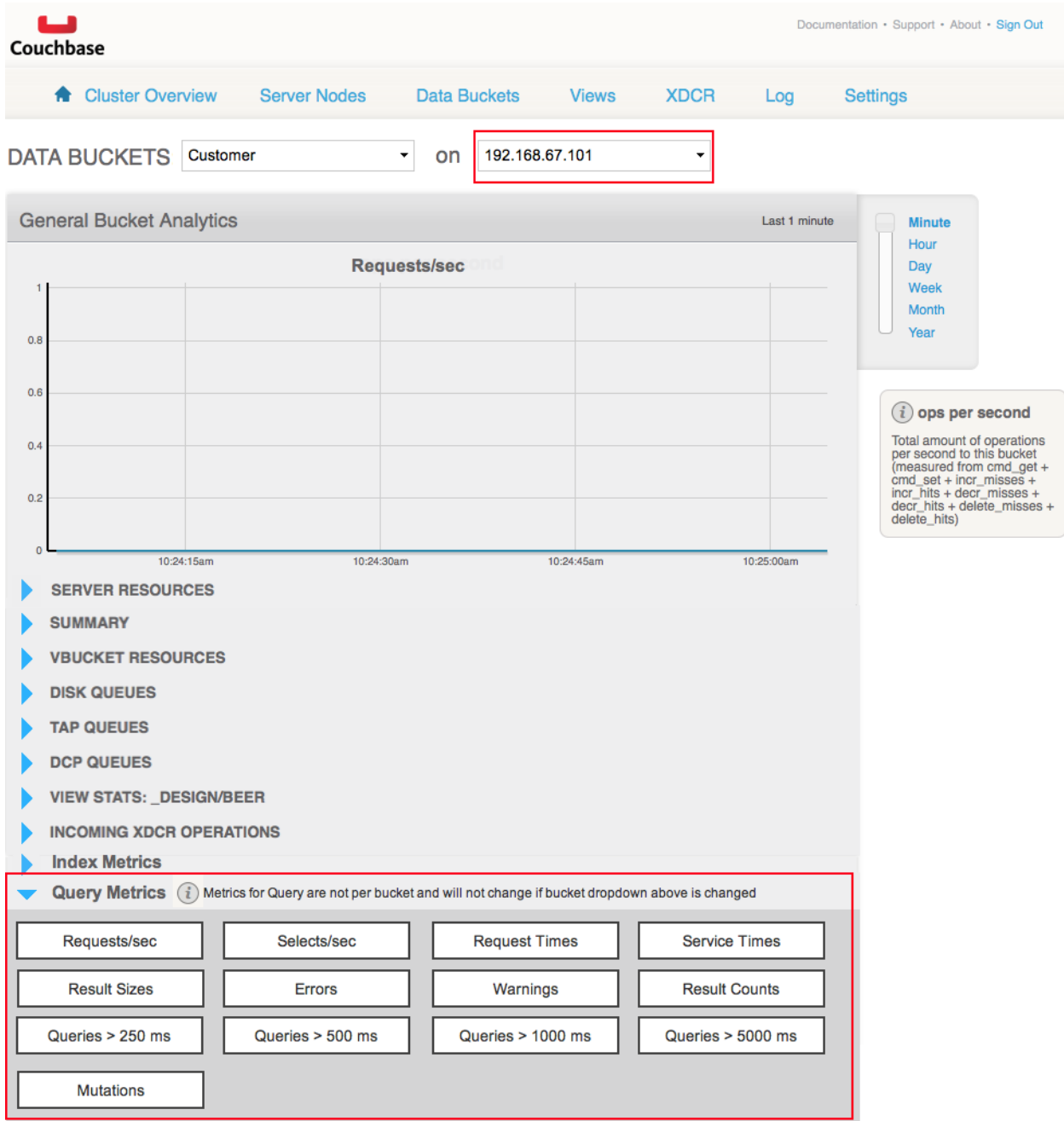
## 7. Node Level Query Metrics in console

Drill into a node this will show you Query stats for this node. This is not performing aggregates and counters per bucket.



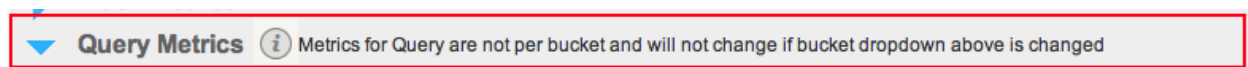
Server Node Name	Group	Services	RAM Usage	Swap Usage	CPU Usage	Data/Disk Usage	Items (Active / Replica)	Fail Over	Remove
192.168.63.101	Group 1	Data	24.5%	0%	50%	12MB / 15.5MB	0 / 0	Fail Over	Remove
192.168.63.102	Group 1	Data	22.4%	0%	2.32%	11.8MB / 15.5MB	0 / 0	Fail Over	Remove
192.168.63.103	Group 1	Data Index	24.5%	0%	50%	12MB / 15.5MB	0 / 0	Fail Over	Remove
192.168.63.104	Group 1	Data Index Query	22.4%	0%	2.32%	11.8MB / 15.5MB	0 / 0	Fail Over	Remove
192.168.63.105	Group 1	Data Index Query	24.5%	0%	50%	12MB / 15.5MB	0 / 0	Fail Over	Remove
192.168.63.106	Group 1	Data	22.4%	0%	2.32%	11.8MB / 15.5MB	0 / 0	Fail Over	Remove

7.1. If the node has Query Type you will see the Query Metric Chevron



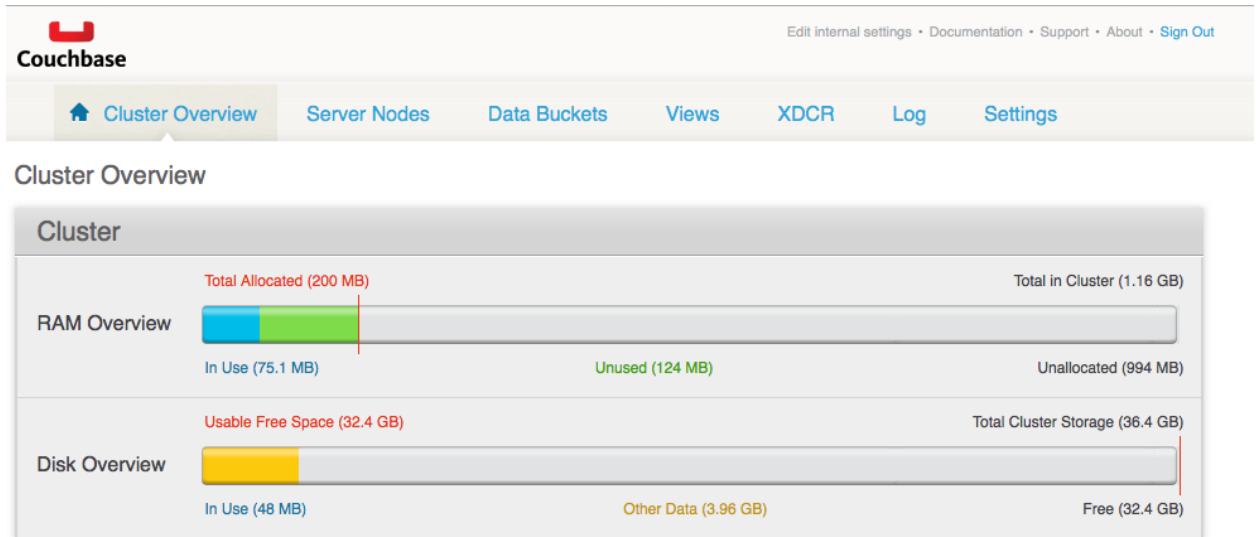
7.2. If the server has Query Service Type the chevron will show so can examine the metrics.

7.3. Information to explain Query Metrics are not per bucket.



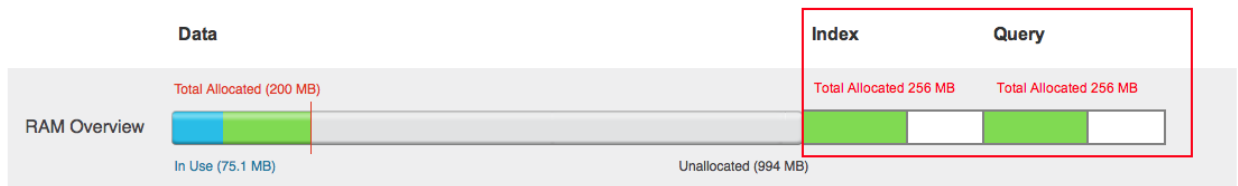
## 8. RAM Availability usage graphic

8.1. Today's Cluster Overview page shows KV RAM availability and usage.



8.2. With Service Types Index and Query would be good to show RAM allocation for their service types within the cluster.

8.3. Add visual for Index and Query in same graph



## 9. Cluster Wide Query Metrics

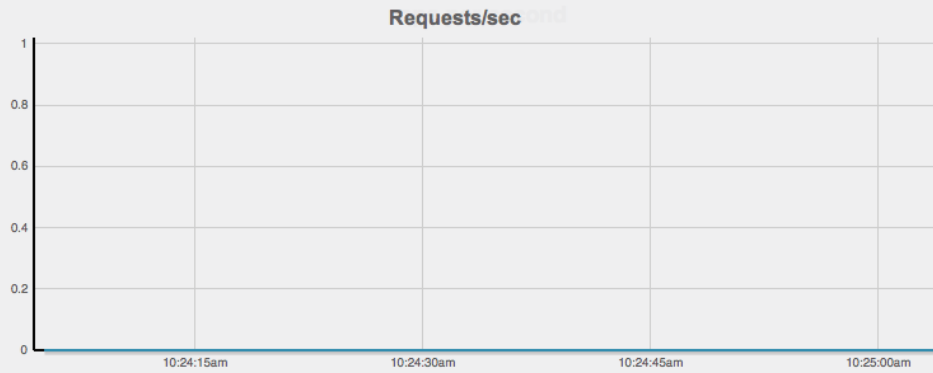
9.1. Ability to choose 'All Buckets'

9.2. Will aggregate Query metrics for all buckets in the cluster.

DATA BUCKETS All Buckets on All Server Nodes (1)

### General Bucket Analytics

Last 1 minute



Minute  
Hour  
Day  
Week  
Month  
Year

#### ops per second

Total amount of operations per second to this bucket (measured from cmd\_get + cmd\_set + incr\_misses + incr\_hits + decr\_misses + decr\_hits + delete\_misses + delete\_hits)

- SERVER RESOURCES
- SUMMARY
- VBUCKET RESOURCES
- DISK QUEUES
- TAP QUEUES
- DCP QUEUES
- VIEW STATS: \_DESIGN/BEER
- INCOMING XDCR OPERATIONS
- Index Metrics

#### Query Metrics

Requests/sec	Selects/sec	Request Times	Service Times
Result Sizes	Errors	Warnings	Result Counts
Queries > 250 ms	Queries > 500 ms	Queries > 1000 ms	Queries > 5000 ms
Mutations			



## Open Issues

ID #	Date Entered	Entered By	Issue	Status

## Future Enhancement Log

ID #	Date Entered	Entered By	Issue	Enhancement Request#	Status