

# JMX and Cassandra

Understanding tooling for advanced operations

THE LAST PICKLE

# Hi, I'm Nate.

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Co-Founder, CTO  
The Last Pickle

Apache Cassandra PMC member  
User since 2009 (v0.4)

~~Austin, Texas~~ Wellington, NZ

TLP: not just "Aaron and Nate"



Lots of information  
in the next 30 minutes



# JMX and Cassandra

- 1.** Tools
- 2.** Visibility and exploration
- 3.** Operations and invocation
- 4.** Access controls

# 1. Summary of the tools



Tools:

nodetool

mx4j

jmxsh|jmxterm

jconsole

Nodetool: the cruise line of cluster administration



# output of nodetool help (87 commands)

```
usage: nodetool [(-u <username> | --username <username>)]
                [(-pw <password> | --password <password>)] [(-h <host> | --host <host>)]
                [(-p <port> | --port <port>)]
                [(-pwf <passwordFilePath> | --password-file <passwordFilePath>)] <command>
                [<args>]

The most commonly used nodetool commands are:
assassinate      Forcefully remove a dead node without re-replicating any data. Use as a last resort if you cannot removenode
bootstrap        Monitor/manage node's bootstrap process
cleanup          Triggers the immediate cleanup of keys no longer belonging to a node. By default, clean all keyspaces
clearsnapshot    Remove the snapshot with the given name from the given keyspaces. If no snapshotName is specified we will remove all snapshots
compact          Force a (major) compaction on one or more tables
compactionhistory Print history of compaction
compactionstats  Print statistics on compactions
decommission     Decommission the *node I am connecting to*
describecluster Print the name, snitch, partitioner and schema version of a cluster
describering     Shows the token ranges info of a given keyspace
disableautocompaction Disable autocompaction for the given keyspace and table
disablebackup    Disable incremental backup
disablebinary   Disable native transport (binary protocol)
disablegossip   Disable gossip (effectively marking the node down)
disablehandoff  Disable storing hinted handoffs
disablehintsfordc Disable hints for a data center
disablethrift   Disable thrift server
drain           Drain the node (stop accepting writes and flush all tables)
enableautocompaction Enable autocompaction for the given keyspace and table
enablebackup    Enable incremental backup
enablebinary   Reenable native transport (binary protocol)
enablegossip   Reenable gossip
enablehandoff  Reenable future hints storing on the current node
enablehintsfordc Enable hints for a data center that was previously disabled
enablethrift   Reenable thrift server
failuredetector Shows the failure detector information for the cluster
flush           Flush one or more tables
gcstats         Print GC Statistics
getcompactionthreshold Print min and max compaction thresholds for a given table
getcompactionthroughput Print the MB/s throughput cap for compaction in the system
getendpoints    Print the end points that owns the key
getinterdcstreamthroughput Print the Mb/s throughput cap for inter-datacenter streaming in the system
getlogginglevels Get the runtime logging levels
getsstables     Print the sstable filenames that own the key
getstreamthroughput Print the Mb/s throughput cap for streaming in the system
gettraceprobability Print the current trace probability value
gossipinfo      Shows the gossip information for the cluster
help            Display help information
info            Print node information (uptime, load, ...)
invalidatecountercache Invalidate the counter cache
invalidatekeycache Invalidate the key cache
invalidaterowcache Invalidate the row cache
join            Join the ring
listsnapshots   Lists all the snapshots along with the size on disk and true size.
move            Move node on the token ring to a new token
netstats        Print network information on provided host (connecting node by default)
pausehandoff   Pause hints delivery process
proxyhistograms Print statistic histograms for network operations
rangekeysample  Shows the sampled keys held across all keyspaces
rebuild         Rebuild data by streaming from other nodes (similarly to bootstrap)
rebuild_index   A full rebuild of native secondary indexes for a given table
refresh         Load newly placed SSTables to the system without restart
refreshsizeestimates Refresh system.size_estimates
reloadtriggers  Reload trigger classes
removenode      Show status of current node removal, force completion of pending removal or remove provided ID
repair          Repair one or more tables
replaybatchlog  Kick off batchlog replay and wait for finish
resetlocalschema Reset node's local schema and resync
resumehandoff  Resume hints delivery process
ring            Print information about the token ring
scrub           Scrub (rebuild SSTables for) one or more tables
setcachecapacity Set global key, row, and counter cache capacities (in MB units)
setcachekeystosave Set number of keys saved by each cache for faster post-restart warmup. 0 to disable
setcompactionthreshold Set min and max compaction thresholds for a given table
setcompactionthroughput Set the MB/s throughput cap for compaction in the system, or 0 to disable throttling
sethintedhandoffthrottlekb Set hinted handoff throttle in kb per second, per delivery thread.
setinterdcstreamthroughput Set the Mb/s throughput cap for inter-datacenter streaming in the system, or 0 to disable throttling
setlogginglevel  Set the log level threshold for a given class. If both class and level are empty/null, it will reset to the initial configuration
setstreamthroughput Set the Mb/s throughput cap for streaming in the system, or 0 to disable throttling
settraceprobability Sets the probability for tracing any given request to value. 0 disables, 1 enables for all requests, 0 is the default
snapshot        Take a snapshot of specified keyspaces or a snapshot of the specified table
status           Print cluster information (state, load, IDs, ...)
statusbackup    Status of incremental backup
statusbinary   Status of native transport (binary protocol)
statusgossip   Status of gossip
statushandoff  Status of storing future hints on the current node
statusthrift   Status of thrift server
stop             Stop compaction
stopdaemon     Stop cassandra daemon
tablehistograms Print statistic histograms for a given table
tablestats     Print statistics on tables
toppartitions  Sample and print the most active partitions for a given column family
tpstats         Print usage statistics of thread pools
truncatehints  Truncate all hints on the local node, or truncate hints for the endpoint(s) specified.
upgradesstables Rewrite SSTables (for the requested tables) that are not on the current version (thus upgrading them to said current version)
verify          Verify (check data checksum for) one or more tables
version         Print cassandra version
```

See 'nodetool help <command>' for more information on a specific command.

# nodetool commands: info

```
ID : fed6dd09-667c-4cc5-b66a-85a1cbce1b58
Gossip active : true
Thrift active : false
Native Transport active: true
Load : 219.97 KB
Generation No : 1473125362
Uptime (seconds) : 28802
Heap Memory (MB) : 86.96 / 495.00
Off Heap Memory (MB) : 0.00
Data Center : datacenter1
Rack : rack1
Exceptions : 0
Key Cache : entries 27, size 2.15 KB, capacity 24 MB, 274 hits, 313 requests, 0.875 recent hit rate, 14400 save period in seconds
Row Cache : entries 0, size 0 bytes, capacity 0 bytes, 0 hits, 0 requests, NaN recent hit rate, 0 save period in seconds
Counter Cache : entries 0, size 0 bytes, capacity 12 MB, 0 hits, 0 requests, NaN recent hit rate, 7200 save period in seconds
Token : -9223372036854775808
```

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tip: nodetool setcachecapacity <key> <row> <counter>

# nodetool commands: compactionstats

```
$ nodetool compactionstats -H
pending tasks: 2101
      id          type      keyspace   table    completed    total   progress
d14fc600-6e3f-11e6-a01c-8bcd0e93c44  Compaction  ads       ad_events  742.58 MB  4.1 TB  0.02%
Active compaction remaining time : 37h18m47s
```

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# nodetool commands: tablestats

```
Keyspace: jmx_adventure
  Read Count: 19
  Read Latency: 0.3552105263157895 ms.
  Write Count: 3
  Write Latency: 0.17766666666666667 ms.
  Pending Flushes: 0
    Table: account_event
    SSTable count: 1
    Space used (live): 5326
    Space used (total): 5326
    Space used by snapshots (total): 0
    Off heap memory used (total): 51
    SSTable Compression Ratio: 0.6517241379310345
    Number of keys (estimate): 3
    Memtable cell count: 0
    Memtable data size: 0
    Memtable off heap memory used: 0
    Memtable switch count: 1
    Local read count: 19
    Local read latency: 0.386 ms
    Local write count: 3
    Local write latency: 0.207 ms
    Pending flushes: 0
    Bloom filter false positives: 0
    Bloom filter false ratio: 0.00000
    Bloom filter space used: 16
    Bloom filter off heap memory used: 8
    Index summary off heap memory used: 27
    Compression metadata off heap memory used: 16
    Compacted partition minimum bytes: 51
    Compacted partition maximum bytes: 149
    Compacted partition mean bytes: 104
    Average live cells per slice (last five minutes): 2.263157894736842
    Maximum live cells per slice (last five minutes): 3
    Average tombstones per slice (last five minutes): 1.0
    Maximum tombstones per slice (last five minutes): 1
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Number of keys (estimate): 3

Memtable cell count: 0

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index summary usage

memtable usage

read and write latency

partition size

tombstones per read

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**Memtable data size: 122**

**Memtable off heap memory used: 96**

**Memtable switch count: 1**

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Number of keys (estimate): 3

Memtable cell count: 0

Memtable data size: 0

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Memtable switch count: 1

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# nodetool commands: tablehistograms

```
$ nodetool tablehistograms jmx_adventure account_event
```

```
jmx_adventure/account_event histograms
```

Percentile	SSTables	Write Latency (micros)	Read Latency (micros)	Partition Size (bytes)	Cell Count
50%	1.00	263.21	315.85	103	1
75%	2.00	315.85	545.79	149	1
95%	2.00	315.85	1131.75	149	1
98%	2.00	315.85	1131.75	149	1
99%	2.00	315.85	1131.75	149	1
Min	1.00	35.43	152.32	51	0
Max	2.00	315.85	1131.75	149	1

# nodetool commands: proxyhistograms

```
$ nodetool proxyhistograms
```

```
proxy histograms
```

Percentile	Read Latency (micros)	Write Latency (micros)	Range Latency (micros)
50%	454.83	1131.75	1629.72
75%	785.94	12108.97	8409.01
95%	4866.32	12108.97	20924.30
98%	129557.75	12108.97	20924.30
99%	129557.75	12108.97	20924.30
Min	219.34	315.85	943.13
Max	129557.75	12108.97	20924.30

JMX on the HTTP

mx4j

# JMX on the HTTP

broken in 3.x

## JMX on the HTTP

when it does work, it looks like this (2.2.7 and below):

MX4J/Http Adaptor		MX4J	
JMX Management Console			
Server view	MBean view	Timers	Monitors
<b>MBean By Domain:</b>		<b>Filters:</b> <input type="text"/>	<input type="button" value="Query"/>
<b>Domain: ch.qos.logback.classic</b>			
ch.qos.logback.classic.Name=>default,Type=>ch.qos.logback.classic.JmxJmxConfigurator	ch.qos.logback.classic.JmxJmxConfigurator	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
<b>Domain: com.sun.management</b>			
com.sun.management:type=DiagnosticCommand	sun.management.DiagnosticCommandImpl	Diagnostic Commands	<input type="button" value="Unregister"/>
com.sun.management:type=HotSpotDiagnostic	sun.management.HotSpotDiagnostic	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
<b>Domain: java.lang</b>			
java.lang:type=ClassLoading	sun.management.ClassLoadingImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=Compilation	sun.management.CompilationImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=GarbageCollector,name=ConcurrentMarkSweep	sun.management.GarbageCollectorImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=GarbageCollector,name=ParNew	sun.management.GarbageCollectorImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=Memory	sun.management.MemoryImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=MemoryManager,name=CodeCacheManager	sun.management.MemoryManagerImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=MemoryManager,name=Metaspace Manager	sun.management.MemoryManagerImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=MemoryPool,name=CMS Old Gen	sun.management.MemoryPoolImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=MemoryPool,name=Code Cache	sun.management.MemoryPoolImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=MemoryPool,name=Compressed Class Space	sun.management.MemoryPoolImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=MemoryPool,name=Metaspace	sun.management.MemoryPoolImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=MemoryPool,name=Per Eden Space	sun.management.MemoryPoolImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=MemoryPool,name=Per Survivor Space	sun.management.MemoryPoolImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=OperatingSystem	sun.management.OperatingSystemImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=Runtime	sun.management.RuntimeImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.lang:type=Threading	sun.management.ThreadImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
<b>Domain: java.nio</b>			
java.nio:type=BufferPool,name=direct	sun.management.ManagementFactoryHelper\$1	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
java.nio:type=BufferPool,name=mapped	sun.management.ManagementFactoryHelper\$1	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
<b>Domain: java.util.logging</b>			
java.util.logging:type=Logging	sun.management.ManagementFactoryHelper\$PlatformLoggingImpl	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
<b>Domain: JMImplementation</b>			
JMImplementation:type=MBeanServerDelegate	javax.management.MBeanServerDelegate	Represents the MBean server from the management point of view.	<input type="button" value="Unregister"/>
<b>Domain: org.apache.cassandra.auth</b>			
org.apache.cassandra.auth:type=PermissionsCache	org.apache.cassandra.auth.PermissionsCache	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
<b>Domain: org.apache.cassandra.db</b>			
org.apache.cassandra.db:type=BatchlogManager	org.apache.cassandra.db.BatchlogManager	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=BlacklistedDirectories	org.apache.cassandra.db.BlacklistedDirectories	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=Caches	org.apache.cassandra.service.CacheService	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamily:type=system_auth.columnfamily->resource_role_permissions_index	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamilies:type=system_auth.columnfamily->role_members	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamily:type=system_auth.columnfamily->role_permissions	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamilies:type=system_auth.columnfamily->roles	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamilies:type=system_distributed.columnfamily->parent_repair_history	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamilies:type=system_distributed.columnfamily->repair_history	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamilies:type=system_traces.columnfamily->events	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamilies:type=system_traces.columnfamily->sessions	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamilies:type=system_traces.columnfamily->available_ranges	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamilies:type=system_traces.columnfamily->batches	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamilies:type=system_traces.columnfamily->compaction_history	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamilies:type=system_traces.columnfamily->compactions_in_progress	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamilies:type=system_traces.columnfamily->hints	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>
org.apache.cassandra.db:type=ColumnFamilies:type=system_traces.columnfamily->IndexInfo	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	<input type="button" value="Unregister"/>

# JMX on the HTTP

when it does work, it looks like this:

The screenshot shows the MX4J/Http Adaptor JMX Management Console interface. The top navigation bar includes links for Server view, MBean view, Timers, Monitors, Relations, MLet, and About. The main content area displays a hierarchical list of MBeans categorized by domain. A search bar at the top right allows users to filter results.

Domain	MBean Type	Description	Action	
ch.qos.logback.classic	ch.qos.logback.classic.Name=default,Type=ch.qos.logback.classic.JmxJndiConfigurator	Information on the management interface of the MBean	Unregister	
com.sun.management	com.sun.management:type=DiagnosticCommand	Diagnostic Commands	Unregister	
com.sun.management	com.sun.management:type=HotSpotDiagnostic	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=ClassLoading	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=Concurrent	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=GarbageCollector,name=ConcurrentMarkSweep	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=GarbageCollector,name=ParNew	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=Memory	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=MemoryManager,name=CodeCacheManager	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=MemoryManager,name=Metaspace_Manager	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=MemoryPool,name=CMS Old Gen	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=MemoryPool,name=Code Cache	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=MemoryPool,name=Compressed Class Space	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=MemoryPool,name=Metaspace	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=MemoryPool,name=Par Eden Space	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=MemoryPool,name=Par Survivor Space	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=OperatingSystem	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=Runtime	Information on the management interface of the MBean	Unregister	
java.lang	java.lang:type=Threading	Information on the management interface of the MBean	Unregister	
java.nio	java.nio:type=BufferPool,name=direct	Information on the management interface of the MBean	Unregister	
java.nio	java.nio:type=BufferPool,name=mapped	Information on the management interface of the MBean	Unregister	
java.util.logging	java.util.logging:type=Logging	sun.management.ManagementFactory\$PlatformLoggingImpl	Information on the management interface of the MBean	Unregister
JMImplementation	JMImplementation:type=MBeanServerDelegate	javax.management.MBeanServerDelegate	Represents the MBean server from the management point of view.	Unregister
org.apache.cassandra.auth	org.apache.cassandra.auth:type=PermissionsCache	org.apache.cassandra.auth.PermissionsCache	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=BatchlogManager	org.apache.cassandra.db.BatchlogManager	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=BlacklistedDirectories	org.apache.cassandra.db.BlacklistedDirectories	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=Caches	org.apache.cassandra.service.CacheService	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_auth,columnfamily=resource_role_permissions_Index	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_auth,columnfamily=role_members	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_auth,columnfamily=role_permissions	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_auth,columnfamily=roles	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_distributed,columnfamily=parent_repair_history	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_distributed,columnfamily=repair_history	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_traces,columnfamily=events	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_traces,columnfamily=sessions	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_columnfamily=available_ranges	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_columnfamily=batchlog	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_columnfamily=compaction_history	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_columnfamily=compactions_in_progress	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_columnfamily=hints	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister
org.apache.cassandra.db	org.apache.cassandra.db:type=ColumnFamilies,keystore=system_columnfamily=indexinfo	org.apache.cassandra.db.ColumnFamilyStore	Information on the management interface of the MBean	Unregister

# JMX on the HTTP (with JSON!)

## via Jolokia

```
{  
  - request: {  
      mbean: "org.apache.cassandra.metrics:name=Latency,scope=Read,type=ClientRequest",  
      type: "read"  
    },  
  - value: {  
      StdDev: 129952.14283925197,  
      75thPercentile: 129557.75,  
      Mean: 129557.75,  
      98thPercentile: 129557.75,  
      RateUnit: "events/second",  
      95thPercentile: 129557.75,  
      99thPercentile: 129557.75,  
      Max: 129557.75,  
      Count: 1,  
      FiveMinuteRate: 0.001844701935204127,  
      50thPercentile: 129557.75,  
      MeanRate: 0.005130477217002129,  
      Min: 107964.793,  
      OneMinuteRate: 0.0008653395709915322,  
      DurationUnit: "microseconds",  
      999thPercentile: 129557.75,  
      FifteenMinuteRate: 0.000912232469559705  
    },  
  timestamp: 1473125557,  
  status: 200  
}
```

<https://jolokia.org/>

# JMX on the HTTP (with JSON!)

## via Jolokia

```
{  
  - request: {  
      mbean: "org.apache.cassandra.metrics:name=Latency,op=Request",  
      type: "read"  
    },  
  - value: {  
      StdDev: 129952.14283925197,  
      75thPercentile: 129557.75  
      Mean: 129557.75,  
      98thPercentile:  
      RateUnit:  
      95thPercentile:  
      Min:  
      OneMinuteRate: 0.001844701935204127,  
      99thPercentile: 129557.75,  
      FifteenMinuteRate: 0.005130477217002129,  
      Max:  
      MeanRate: 0.0008653395709915322,  
      DurationUnit: "microseconds",  
      999thPercentile: 129557.75,  
      FifteenMinuteRate: 0.000912232469559705  
    },  
  timestamp: 1473125557,  
  status: 200  
}
```

JSON: it's ok.

<https://jolokia.org/>

# JMX on the HTTP (with JSON!) via Jolokia

1. download: `jolokia-jvm-1.3.4-agent.jar`
2. place in: `$CASSANDRA_HOME/lib`
3. in `cassandra-env.sh`, add: `JVM_OPTS="$JVM_OPTS -javaagent:$CASSANDRA_HOME/lib/jolokia-jvm-1.3.4-agent.jar"`

<http://search.maven.org/remotecontent?filepath=org/jolokia/jolokia-jvm/1.3.4/jolokia-jvm-1.3.4-agent.jar>

## JMX on the command line

jmxsh  
jmxterm

<https://github.com/davr/jmxsh>

<http://wiki.cyclopsgroup.org/jmxterm/download.html>

# JMX on the command line



jmxterm  
Almost identical!

<https://github.com/davr/jmxsh>

<http://wiki.cyclopsgroup.org/jmxterm/download.html>

# JMX on the command line



<https://github.com/davr/jmxsh>

<http://wiki.cyclopsgroup.org/jmxterm/download.html>

# JMX on the command line

```
$ java -jar $HOME/services/jmxterm-1.0-alpha-4-uber.jar -l 127.0.0.1:7200
Welcome to JMX terminal. Type "help" for available commands.
$>bean org.apache.cassandra.net:type=MessagingService
#bean is set to org.apache.cassandra.net:type=MessagingService
$>get TimeoutsPerHost
#mbean = org.apache.cassandra.net:type=MessagingService:
TimeoutsPerHost = {
  127.0.0.1 = 0;
  127.0.0.3 = 0;
};
```

## JMX on the command line

```
$ java -jar $HOME/services/jmxterm-1.0-alpha-4-uber.jar -l 127.0.0.1:7200
```

```
Welcome to JMX terminal. Type "help" for available commands.
```

```
$>bean org.apache.cassandra.net:type=MessagingService  
#bean is set to org.apache.cassandra.net:type=MessagingService  
$>get TimeoutsPerHost  
#mbean = org.apache.cassandra.net:type=MessagingService:  
TimeoutsPerHost = {  
    127.0.0.1 = 0;  
    127.0.0.3 = 0;  
};
```

## JMX on the command line

```
$ java -jar $HOME/services/jmxterm-1.0-alpha-4-uber.jar -l 127.0.0.1:7200
Welcome to JMX terminal. Type "help" for available commands.

$>bean org.apache.cassandra.net:type=MessagingService
#bean is set to org.apache.cassandra.net:type=MessagingService
$>get TimeoutsPerHost
#mbean = org.apache.cassandra.net:type=MessagingService:
TimeoutsPerHost = {
  127.0.0.1 = 0;
  127.0.0.3 = 0;
};
```

## JMX on the command line

```
$ java -jar $HOME/services/jmxterm-1.0-alpha-4-uber.jar -l 127.0.0.1:7200
Welcome to JMX terminal. Type "help" for available commands.
$>bean org.apache.cassandra.net:type=MessagingService
#bean is set to org.apache.cassandra.net:type=MessagingService
$>get TimeoutsPerHost
#mbean = org.apache.cassandra.net:type=MessagingService:
TimeoutsPerHost = {
  127.0.0.1 = 0;
  127.0.0.3 = 0;
};
```

## JMX on the command line

```
$ echo "set -b org.apache.cassandra.db:type=CompactionManager \  
MaximumCompactorThreads 6" | \  
java -jar jmxterm-1.0-alpha-4-uber.jar -l 172.17.41.232:7199 \  
&& \  
echo "set -b org.apache.cassandra.db:type=CompactionManager \  
CoreCompactorThreads 6" | \  
java -jar jmxterm-1.0-alpha-4-uber.jar -l 172.17.41.232:7199
```

setting compaction threads in one shot

# JMX on the command line

```
$ echo "set -b org.apache.cassandra.compaction.  
MaximumCompactorThreads=6" | \  
java -jar jmxterm-1.0-alpha-4-uber.jar -l 172.17.41.232:7199 \  
&& \  
echo "set -b org.apache.cassandra.db:type=CompactionManager \\  
CoreCompactionManagerThreads=6" | \  
java -jar jmxterm-1.0-alpha-4-uber.jar -l 172.17.41.232:7199
```

just echo and 'pipe'

setting compaction threads in one shot

# JMX on the command line: general syntax

```
$>bean org.apache.cassandra.db:type=BatchlogManager
#bean is set to org.apache.cassandra.db:type=BatchlogManager
$>info
#mbean = org.apache.cassandra.db:type=BatchlogManager
#class name = org.apache.cassandra.batchlog.BatchlogManager
# attributes
%0 - TotalBatchesReplayed (long, r)
# operations
%0 - int countAllBatches()
%1 - void forceBatchlogReplay()
#there's no notifications
$>get TotalBatchesReplayed
#mbean = org.apache.cassandra.db:type=BatchlogManager:
TotalBatchesReplayed = 0;

$>run countAllBatches
#calling operation countAllBatches of mbean org.apache.cassandra.db:type=BatchlogManager
#operation returns:
0
```

# JMX on the command line: general syntax

```
$>bean org.apache.cassandra.db:type=BatchlogManager
```

```
#bean is set to org.apache.cassandra.db:type=BatchlogManager
```

```
$>info
```

```
#mbean = org.apache.cassandra.db:type=BatchlogManager
```

```
#class name = org.apache.cassandra.batchlog.BatchlogManager
```

```
# attributes
```

```
  %0 - TotalBatchesReplayed (long, r)
```

```
# operations
```

```
  %0 - int countAllBatches()
```

```
  %1 - void forceBatchlogReplay()
```

```
#there's no notifications
```

```
$>get TotalBatchesReplayed
```

```
#mbean = org.apache.cassandra.db:type=BatchlogManager:
```

```
TotalBatchesReplayed = 0;
```

```
$>run countAllBatches
```

```
#calling operation countAllBatches of mbean org.apache.cassandra.db:type=BatchlogManager
```

```
#operation returns:
```

```
0
```

Set the bean

# JMX on the command line: general syntax

```
$>bean org.apache.cassandra.db:type=BatchlogManager  
#bean is set to org.apache.cassandra.db:type=BatchlogManager
```

```
$>info
```

```
#mbean = org.apache.cassandra.db:type=BatchlogManager  
#class name = org.apache.cassandra.batchlog.BatchlogManager  
# attributes  
%0 - TotalBatchesReplayed (long, r)  
# operations  
%0 - int countAllBatches()  
%1 - void forceBatchlogReplay()  
#there's no notifications
```

```
$>get TotalBatchesReplayed  
#mbean = org.apache.cassandra.db:type=BatchlogManager:  
TotalBatchesReplayed = 0;
```

```
$>run countAllBatches  
#calling operation countAllBatches of mbean org.apache.cassandra.db:type=BatchlogManager  
#operation returns:  
0
```

'info' for what is available

# JMX on the command line: general syntax

```
$>bean org.apache.cassandra.db:type=BatchlogManager  
#bean is set to org.apache.cassandra.db:type=BatchlogManager  
$>info  
#mbean = org.apache.cassandra.db:type=BatchlogManager  
#class name = org.apache.cassandra.batchlog.BatchlogManager  
# attributes  
%0 - TotalBatchesReplayed (long, r)  
# operations  
%0 - int countAllBatches()  
%1 - void forceBatchlogReplay()  
#there's no notifications
```

## \$>**get TotalBatchesReplayed**

```
#mbean = org.apache.cassandra.db:type=BatchlogManager:  
TotalBatchesReplayed = 0;
```

```
$>run countAllBatches  
#calling operation countAllBatches of mbean org.apache.cassandra.db:type=BatchlogManager  
#operation returns:  
0
```

'get' an attribute

# JMX on the command line: general syntax

```
$>bean org.apache.cassandra.db:type=BatchlogManager  
#bean is set to org.apache.cassandra.db:type=BatchlogManager  
$>info  
#mbean = org.apache.cassandra.db:type=BatchlogManager  
#class name = org.apache.cassandra.batchlog.BatchlogManager  
# attributes  
%0 - TotalBatchesReplayed (long, r)  
# operations  
%0 - int countAllBatches()  
%1 - void forceBatchlogReplay()  
#there's no notifications  
$>get TotalBatchesReplayed  
#mbean = org.apache.cassandra.db:type=BatchlogManager:  
TotalBatchesReplayed = 0;
```

**\$>run countAllBatches**

```
#calling operation countAllBatches of mbean org.apache.cassandra.db:type=BatchlogManager  
#operation returns:  
0
```

'run' an operation

# JMX on JConsole

The screenshot shows the JConsole interface with the 'Operations' section of the 'StorageService' class selected. The left sidebar lists various service components, and the main panel displays the available operations for the selected class.

**Operation invocation**

- void deliverHints ( p1 String )
- java.util.List<String> getTokens ( p1 String )
- int forceKeyspaceCleanup ( p1 int, p2 String, p3 String )
- int forceKeyspaceCleanup ( p1 String, p2 String[] )
- int scrub ( p1 boolean, p2 boolean, p3 String )
- int scrub ( p1 boolean, p2 boolean, p3 boolean )
- int . . .

# JMX on JConsole

The screenshot shows the JConsole interface with the 'Operations' node selected under the 'StorageService' tree. The right panel displays the 'Operation invocation' table.

	Method	Parameters
void	deliverHints	( p1 String )
java.util.List	getTokens	( p1 String )
int	forceKeyspaceCleanup	( p1 0 , p2 String , p3 )
int	forceKeyspaceCleanup	( p1 String , p2 String[] )
int	scrub	( p1 true , p2 true , p3 String )
int	scrub	( p1 true , p2 true , p3 true )
int		

The operation 'forceKeyspaceCleanup' with parameters '( p1 String , p2 String[] )' is highlighted with a green border.

Note: Complex-type (like arrays) are grayed out

# JMX on JConsole



Note: Complex-type (like arrays) are grayed out

# JMX on JConsole

The screenshot shows the JConsole interface with the 'MBeans' tab selected. On the left, a tree view lists various MBeans, with 'StorageService' expanded. Under 'Attributes', several items are listed: GossipRunning, RPCServerRunning, Joined, StreamThroughputMbPerSec, InterDCStreamThroughput, TokenToEndpointMap, LocalHostId, HostIdMap, EndpointToHostId, HostIdToEndpoint, LoadString, LoadMap, Tokens, ReleaseVersion, and SchemaVersion. The 'ObjectName' attribute of the 'StorageService' MBean is highlighted with a green box. On the right, two tables provide detailed information about the MBean. The first table, 'MBeanInfo', has columns 'Name' and 'Value'. It includes rows for 'Info:' (highlighted in yellow), 'ObjectName' (value: org.apache.cassandra.db:type=StorageService), 'ClassName' (value: org.apache.cassandra.service.StorageService), 'Description' (value: Information on the management interface of the MBean), and 'Constructor-0:' (highlighted in yellow). The second table, 'Descriptor', also has columns 'Name' and 'Value'. It includes rows for 'Info:' (highlighted in yellow), 'immutableInfo' (value: true), 'interfaceClassName' (value: org.apache.cassandra.service.StorageServiceMBean), and 'mxbean' (value: false).

Name	Value
Info:	
ObjectName	org.apache.cassandra.db:type=StorageService
ClassName	org.apache.cassandra.service.StorageService
Description	Information on the management interface of the MBean
Constructor-0:	
Name	org.apache.cassandra.service.StorageService
Description	Public constructor of the MBean

Name	Value
Info:	
immutableInfo	true
interfaceClassName	org.apache.cassandra.service.StorageServiceMBean
mxbean	false

Getting object name and attributes for CLI invocation

# A note about remote connections

# cassandra-env.sh

using LOCAL\_JMX="no"

```
280 # Specifies the default port over which Cassandra will be available for
281 # JMX connections.
282 # For security reasons, you should not expose this port to the internet. Firewall it if needed.
283 JMX_PORT="7199"

284

285 if [ "$LOCAL_JMX" = "yes" ]; then
286     JVM_OPTS="$JVM_OPTS -Dcassandra.jmx.local.port=$JMX_PORT -XX:+DisableExplicitGC"
287 else
288     JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.port=$JMX_PORT"
289     JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.rmi.port=$JMX_PORT"
290     JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.ssl=false"
291     JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.authenticate=true"
292     JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.password.file=/etc/cassandra/jmxremote.password"
```

# cassandra-env.sh

using LOCAL\_JMX="no"

```
280 # Specifies the default port over which Cassandra will be available for
281 # JMX connections.
282 # For security reasons, you should not expose this port to the internet. Firewall it if needed.
283 JMX_PORT="7199"

284

285 if [ "$LOCAL_JMX" = "yes" ]; then
286     JVM_OPTS="$JVM_OPTS -Dcassandra.jmx.local.port=$JMX_PORT -XX:+DisableExplicitGC"
287 else
288     JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.port=$JMX_PORT"
289     JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.rmi.port=$JMX_PORT"
290     JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.ssl=false"
291     JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.authenticate=true"
292     JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.password.file=/etc/cassandra/jmxremote.password"
```

false

not there by default

## 2. Visibility and exploration



org.apache.cassandra.metrics.\*

(Hopefully you saw Alain's monitoring talk)

troubleshooting cluster communication



# cluster communication

The screenshot shows a Java monitoring interface with several tabs at the top: Overview, Memory, Threads, Classes, VM Summary, and MBeans. The MBeans tab is selected. On the left, a tree view lists various MBeans, with `org.apache.cassandra.net.MessagingService` expanded and its `Attributes` sub-node selected. The main pane displays a table titled "Attribute values" with two columns: "Name" and "Value". The table contains the following data:

Name	Value
DroppedMessages	{READ=0, RANGE_SLICE=0, _TRACE=}
GossipMessageCompletedTasks	{127.0.0.3=40775, 127.0.0.2=47356}
GossipMessageDroppedTasks	{127.0.0.3=0, 127.0.0.2=0, 127.0.0.1}
GossipMessagePendingTasks	{127.0.0.3=0, 127.0.0.2=0, 127.0.0.1}
LargeMessageCompletedTasks	{127.0.0.3=0, 127.0.0.2=0, 127.0.0.1}
LargeMessageDroppedTasks	{127.0.0.3=0, 127.0.0.2=0, 127.0.0.1}
LargeMessagePendingTasks	{127.0.0.3=0, 127.0.0.2=0, 127.0.0.1}
SmallMessageCompletedTasks	{127.0.0.3=17, 127.0.0.2=15, 127.0.0.1}
SmallMessageDroppedTasks	{127.0.0.3=0, 127.0.0.2=0, 127.0.0.1}
SmallMessagePendingTasks	{127.0.0.3=0, 127.0.0.2=0, 127.0.0.1}
TimeoutsPerHost	{127.0.0.3=0, 127.0.0.2=0, 127.0.0.1}
TotalTimeouts	0

Looking at small vs. large tasks (>64k) provides an idea of network efficiency

# cluster communication

The screenshot shows the JConsole interface with the 'MBeans' tab selected. On the left, a tree view lists various Java packages and their sub-components, including 'com.sun.management', 'java.lang', 'java.nio', 'java.util.logging', 'jmx4perl', 'jolokia', 'org.apache.cassandra.aut', 'org.apache.cassandra.db', 'org.apache.cassandra.hin', 'org.apache.cassandra.inte', 'org.apache.cassandra.me', and 'org.apache.cassandra.net'. Under 'org.apache.cassandra.net', there are three nodes: 'FailureDetector', 'Gossiper', and 'MessagingService'. The 'FailureDetector' node is expanded, showing 'Attributes' (which is highlighted with a blue border) and 'Operations'. To the right of the tree view is a table titled 'Attribute values' with two columns: 'Name' and 'Value'. The table contains the following data:

Name	Value
AllEndpointStates	/127.0.0.1 generation:1473125362 heartbea
DownEndpointCount	0
PhiConvictThreshold	8.0
PhiValues	javax.management.openmbean.TabularDataSu
SimpleStates	{/127.0.0.2=UP, /127.0.0.1=UP, /127.0.0.3=UF}
UpEndpointCount	3

what does this node think of the others?

# cluster communication

The screenshot shows the JMX UI interface with the 'Metrics' tab selected. On the left, a tree view lists various Java packages and components, with 'org.apache.cassandra.net' expanded to show 'FailureDetector' and its sub-options: 'Attributes' (which is currently selected), 'Operations', 'Gossiper', 'MessagingService', and 'StreamManager'. The main panel displays 'Attribute values' for the selected component. It includes a table with columns 'Name' and 'Value'. The table rows are:

AllEndpointStates	/127.0.0.1 generation:1473125362 heartbeat:832
DownEndpointCount	0
PhiConvictThreshold	8.0

Below this table is a 'Composite Data Navigation' section with buttons for '<<', '<', and '>'.

Further down, there is another table for 'PhiValues' with columns 'Name' and 'Value'. The table rows are:

Endpoint	/127.0.0.2
PHI	0.6352531478547404

At the bottom of the main panel, there is a table for 'SimpleStates' with columns 'Name' and 'Value'. The table rows are:

UpEndpointCount	{/127.0.0.2=UP, /127.0.0.1=UP, /127.0.0.3=UP}
	3

A green box highlights the 'PhiValues' section.

Click the value to see PhiValues for other nodes

# Commitlog efficiency: waiting on commit

The screenshot shows a JMX interface with a tree view on the left and a table view on the right. The tree view under 'org.apache.cassandra.metrics' includes 'BufferPool', 'CQL', 'Cache', 'Client', 'ClientRequest', 'ColumnFamily', 'CommitLog' (which is expanded), 'CompletedTasks', 'PendingTasks', 'TotalCommitLogSize' (which is also expanded), 'Attributes' (which is selected and highlighted in blue), 'Operations', 'WaitingOnCommit', 'WaitingOnSegmentAI', 'Compaction', and 'Connection'. The table view on the right is titled 'Attribute values' and has columns 'Name' and 'Value'. It contains one row for 'TotalCommitLogSize' with a value of '67108864'. A large red arrow points from the text above towards this value.

Name	Value
TotalCommitLogSize	67108864

If this stays close to commitlog\_size\_in\_mb  
there are bigger issues

# Commitlog efficiency: waiting on commit

The screenshot shows the Java Mission Control interface with the 'Metrics' tab selected. On the left, a tree view displays various metrics categories under 'org.apache.cassandra.metrics'. A green box highlights the 'WaitingOnCommit' node under 'CommitLog'. Within 'WaitingOnCommit', a blue box highlights the 'Attributes' node. The main panel on the right is titled 'Attribute values' and lists the following data:

Name	Value
50thPercentile	0.0
75thPercentile	0.0
95thPercentile	0.0
98thPercentile	0.0
999thPercentile	0.0
99thPercentile	0.0
Count	0
DurationUnit	microseconds
FifteenMinuteRate	0.0
FiveMinuteRate	0.0
Max	0.0
Mean	NaN
MeanRate	0.0
Min	0.0
OneMinuteRate	0.0
RateUnit	events/second
StdDev	NaN

A 'Refresh' button is located at the bottom right of the attribute table.

# Commitlog efficiency: waiting on commit

The screenshot shows a JMX interface for monitoring Cassandra metrics. The left sidebar lists metric categories under 'org.apache.cassandra.metrics'. A green box highlights the 'WaitingOnSync' attribute under the 'CommitLog' category. The main panel displays 'Attribute values' in a table format.

Name	Value
50thPercentile	0.0
75thPercentile	0.0
95thPercentile	0.0
98thPercentile	0.0
999thPercentile	0.0
99thPercentile	0.0
Count	NaN
DurationUnit	seconds
FifteenMinutesRate	0.0
OneMinuteRate	0.0
RateUnit	events/second
StdDev	NaN

If this is high, you need to tune

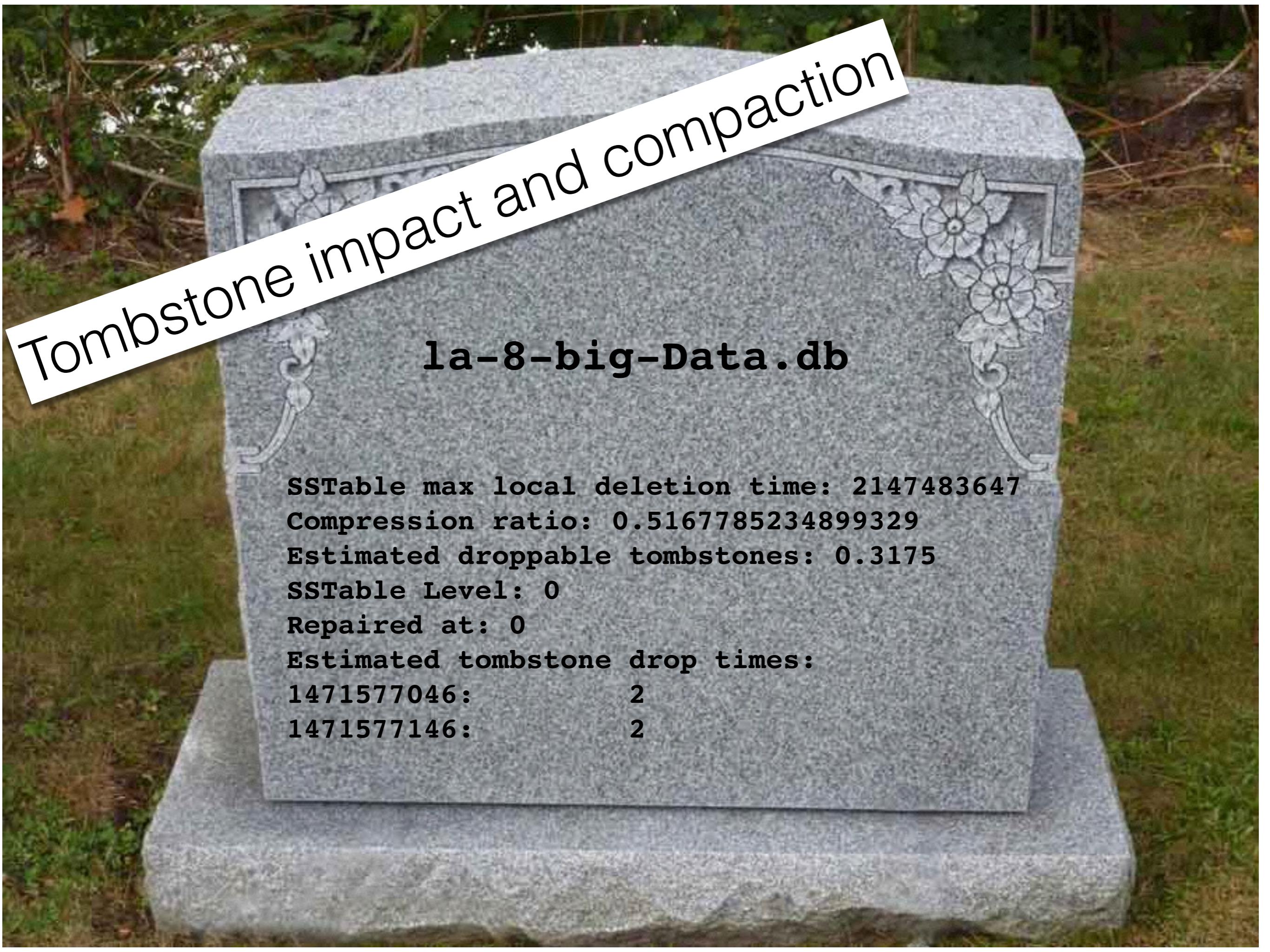
Time spent waiting for sync. This will climb if sync is lagging sync interval

# Commitlog efficiency: segment allocation

The screenshot shows the JMX Metrics interface with the 'Metrics' tab selected. On the left, a tree view displays various metrics categories under 'org.apache.cassandra.metrics'. A green box highlights the 'WaitingOnSegmentAlloc' node, which has three sub-nodes: 'Attributes' (selected), 'Operations', and 'Operations'. On the right, a table titled 'Attribute values' lists the following data:

Name	Value
50thPercentile	89970.66
75thPercentile	107964.792
95thPercentile	107964.792
98thPercentile	107964.792
999thPercentile	107964.792
99thPercentile	107964.792
Count	2
DurationUnit	microseconds
FifteenMinuteRate	4.831083434303891E-16
FiveMinuteRate	7.047151875106937E-46
Max	107964.792
Mean	98967.726
MeanRate	6.46737838706382E-5
Min	74975.551
OneMinuteRate	6.789349890089895E-225
RateUnit	events/second
StdDev	99268.99830117785

time spent waiting on segment allocation



Tombstone impact and compaction

## la-8-big-Data.db

SSTable max local deletion time: 2147483647  
Compression ratio: 0.5167785234899329  
Estimated droppable tombstones: 0.3175  
SSTable Level: 0  
Repaired at: 0  
Estimated tombstone drop times:  
1471577046: 2  
1471577146: 2

Tomb

Go see Alain's other talk  
`compaction'

## la-8-big-Data.db

SSTable max local deletion time: 2147483647

Compression ratio: 0.5167785234899329

Estimated droppable tombstones: 0.3175

SSTable Level: 0

Repaired at: 0

Estimated tombstone drop times:

1471577046: 2

1471577146: 2

Tomb

action

Or just read his blog:

<http://thelastpickle.com/blog/2016/07/27/about-deletes-and-tombstones.html>

la-8-big-Data.db

SSTable max local deletion time: 2147483647

Compression ratio: 0.5167785234899329

Estimated droppable tombstones: 0.3175

SSTable Level: 0

Repaired at: 0

Estimated tombstone drop times:

1471577046: 2

1471577146: 2

# droppable tombstone ratio

Screenshot of the JMX UI showing the 'MBeans' tab selected. The left sidebar lists various MBeans under 'Tables' (e.g., jmx\_adventure, comp\_demo). The 'comp\_demo' table has its 'Attributes' section selected. The 'Attribute values' table shows the following data:

Name	Value
AutoCompactionDisabled	false
BuiltIndexes	[]
ColumnFamilyName	comp_demo
CompactionParameters	{max_threshold=32, min_threshold=2, tombstone_com...
CompactionParametersJson	{"max_threshold": "32", "min_threshold": "2", "tombstone_com..."}
CompressionParameters	{chunk_length_in_kb=64, class=org.apache.cassandra.i...
CrcCheckChance	

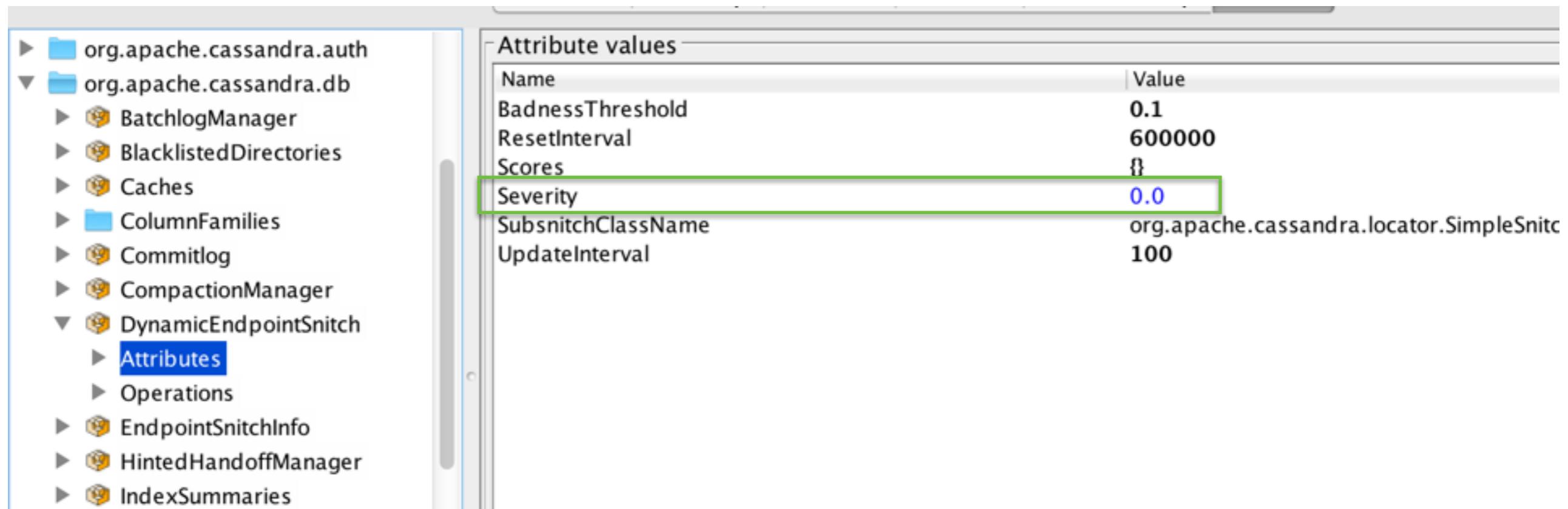
A chart titled 'DroppableTombstoneRatio' is displayed, showing a single data series that spikes from 0.00 to approximately 0.16 at 12:05. The Y-axis ranges from 0.00 to 0.20. The X-axis shows the time 12:05. A 'Discard chart' button is visible at the bottom right of the chart area.

clicking on the value provides a handy chart!

### 3. Useful management incantations



# Routing client requests away



The screenshot shows a configuration interface for Apache Cassandra. On the left, there is a tree view of module structures:

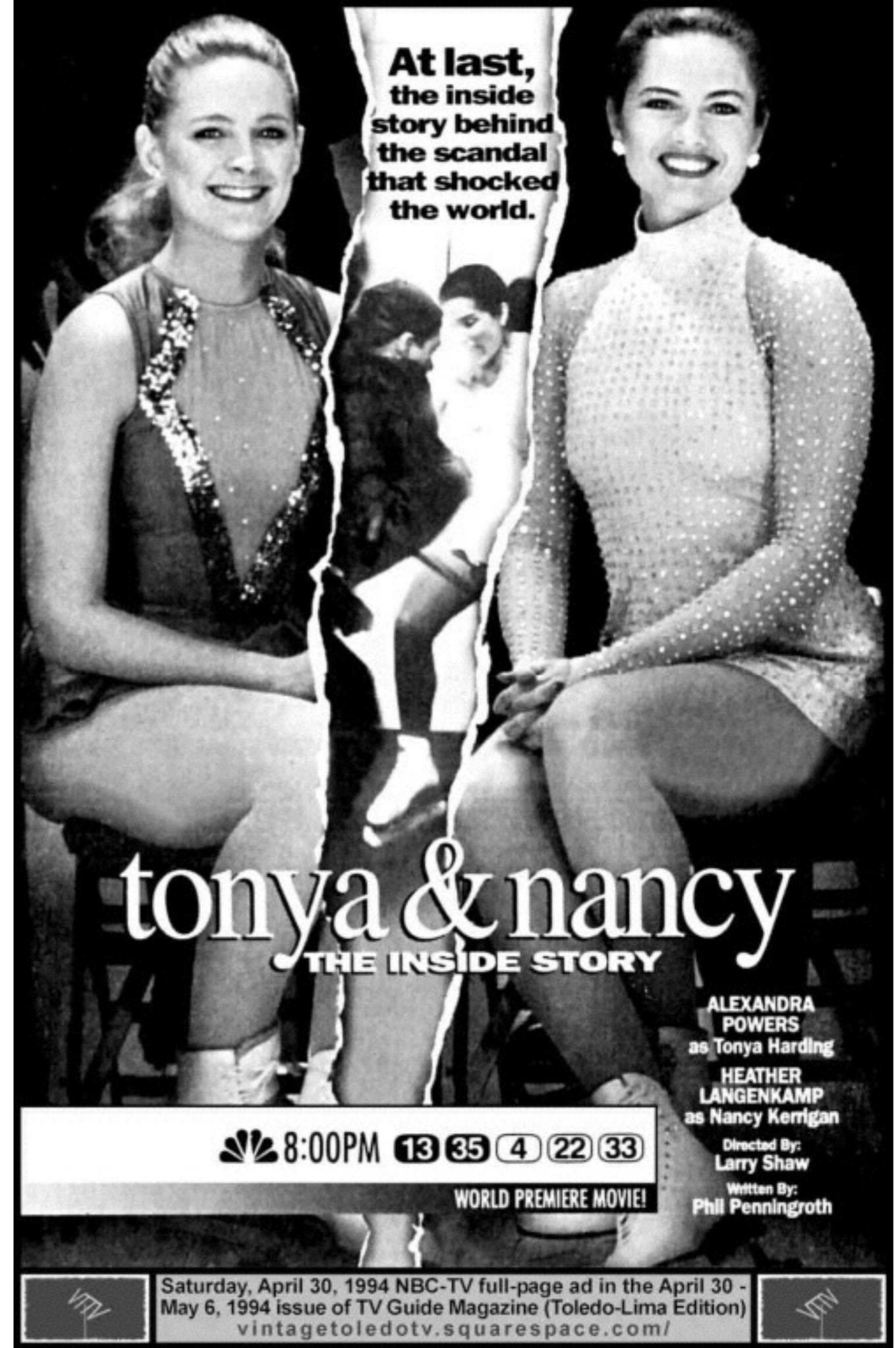
- org.apache.cassandra.auth
- org.apache.cassandra.db
  - BatchlogManager
  - BlacklistedDirectories
  - Caches
  - ColumnFamilies
  - Commitlog
  - CompactionManager
- DynamicEndpointSnitch
  - Attributes (highlighted with a blue border)
  - Operations
- EndpointSnitchInfo
- HintedHandoffManager
- IndexSummaries

On the right, a table titled "Attribute values" displays configuration settings:

Name	Value
BadnessThreshold	0.1
ResetInterval	600000
Scores	{}
Severity	0.0
SubsnitchClassName	org.apache.cassandra.locator.SimpleSnitc
UpdateInterval	100

Set to '50.0' for routing away requests

Figuring out if DynamicSnitch  
is **kneecapping** you



[https://issues.apache.org/jira/browse/  
CASSANDRA-6908](https://issues.apache.org/jira/browse/CASSANDRA-6908)

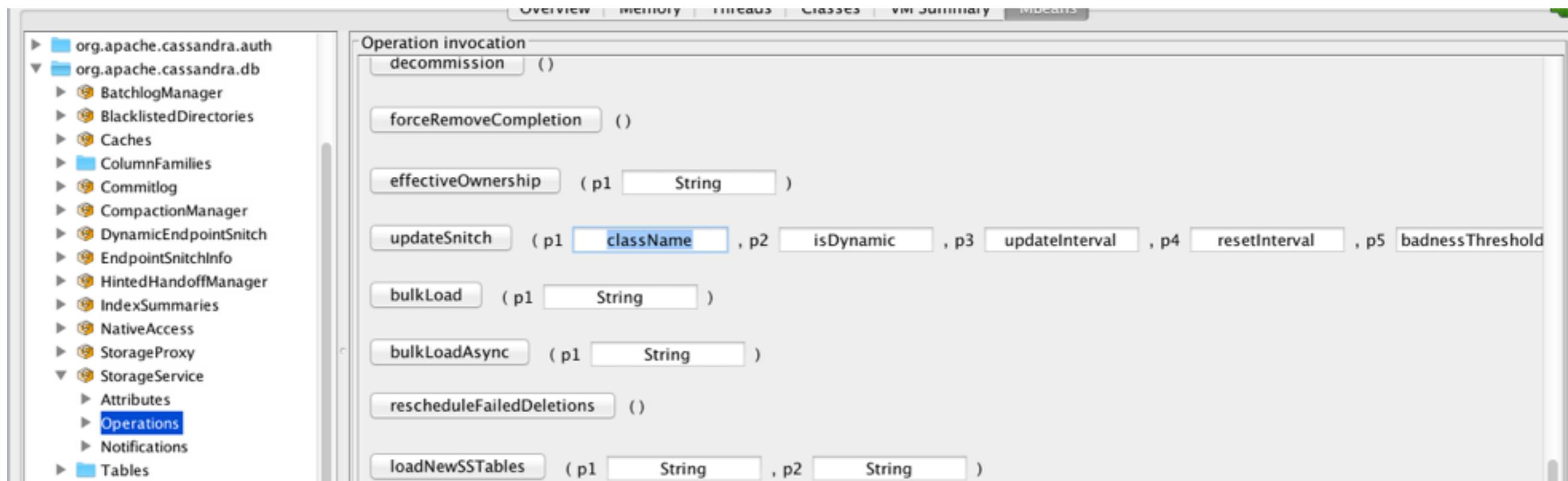
# DynamicSnitch: ouch!

```
$>get Scores
#mbean = org.apache.cassandra.db:type=DynamicEndpointSnitch:
Scores = {
    /10.10.20.31 = 2.244811534881592;
    /10.10.20.30 = 0.5457598567008972;
    /10.10.20.37 = 2.7038445472717285;
    /10.10.20.36 = 3.0801687240600586;
    /10.10.20.39 = 6.231578826904297;
    /10.10.20.38 = 3.1578946113586426;
    /10.10.20.33 = 12.003381729125977;
    /10.10.20.32 = 3.348876476287842;
    /10.10.20.35 = 1.5086206197738647;
    /10.10.20.34 = 4.9235992431640625;
    /10.20.1.46 = 2.621400833129883;
    /10.20.1.44 = 1.3118916749954224;
    /10.20.1.45 = 1.6884760856628418;
    /10.30.50.62 = 2.4780631123519523;
    /10.30.50.63 = 2.3196894221189543;
    /10.30.50.61 = 1.2922532529365727;
    /10.20.1.50 = 7.66961669921875;
    /10.20.1.48 = 1.686340570449829;
    /10.30.50.68 = 0.9854942156774241;
    /10.20.8.81 = 0.7212558388710022;
    /10.30.50.78 = 2.4760895589502847;
    /10.30.50.79 = 1.2857443196017568;
    /10.30.50.76 = 0.7804878048780488;
    /10.30.50.77 = 1.8351790061811122;
    /10.20.1.102 = 2.4894514083862305;
    /10.20.1.103 = 0.5889776945114136;
    /10.20.1.106 = 0.8040626645088196;
    /10.20.1.104 = 1.4327855110168457;
    /10.20.1.105 = 0.75789475440979;
};
```

most common with real fast hardware

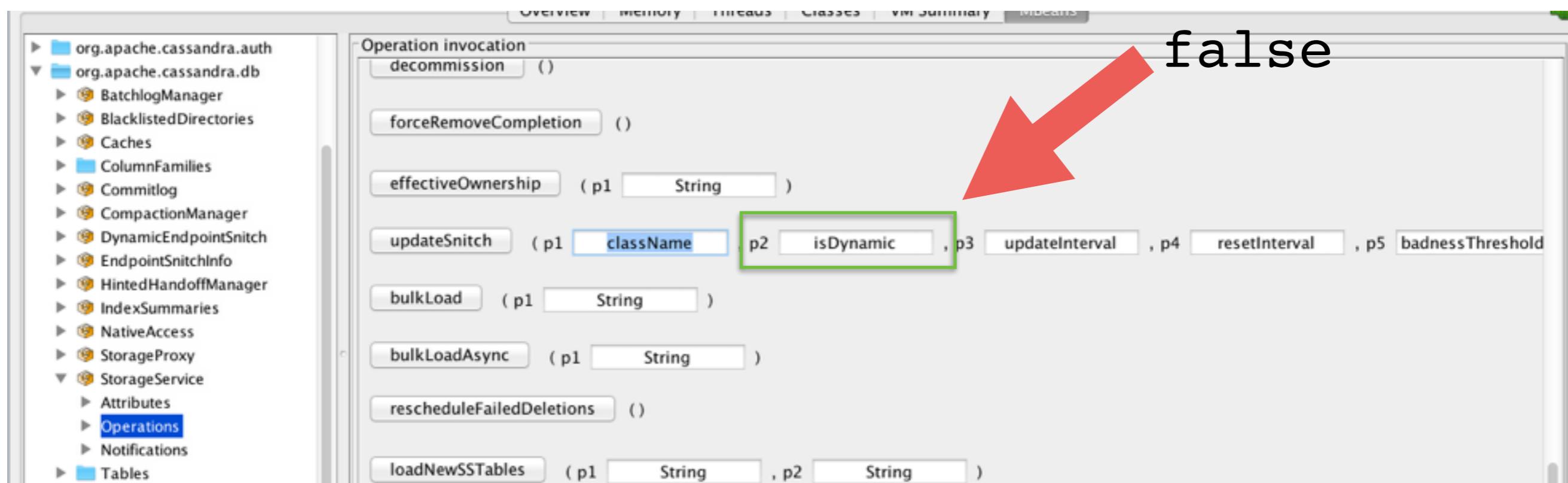
- dramatic fluctuations
- 22x difference!

# DynamicSnitch: disabling



Turn it off via StorageService#updateSnitch:  
GossipingPropertyFileSnitch, false, 0, 0, 0

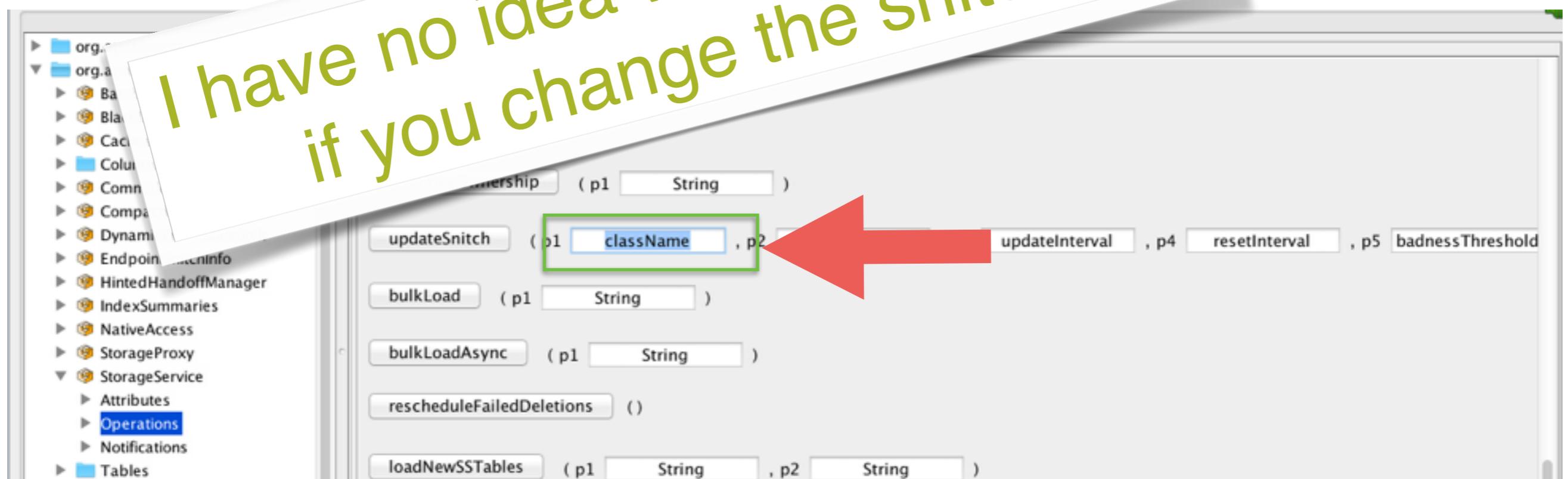
# DynamicSnitch: disabling



Turn it off via StorageService#updateSnitch:  
GossipingPropertyFileSnitch, false, 0, 0, 0

## DynamicSnitch

I have no idea what will happen  
if you change the snitch



Turn it off via StorageService#updateSnitch:  
**GossipingPropertyFileSnitch, false, 0, 0, 0**

# Controlling Compaction



# CompactionManager: compaction throttling++

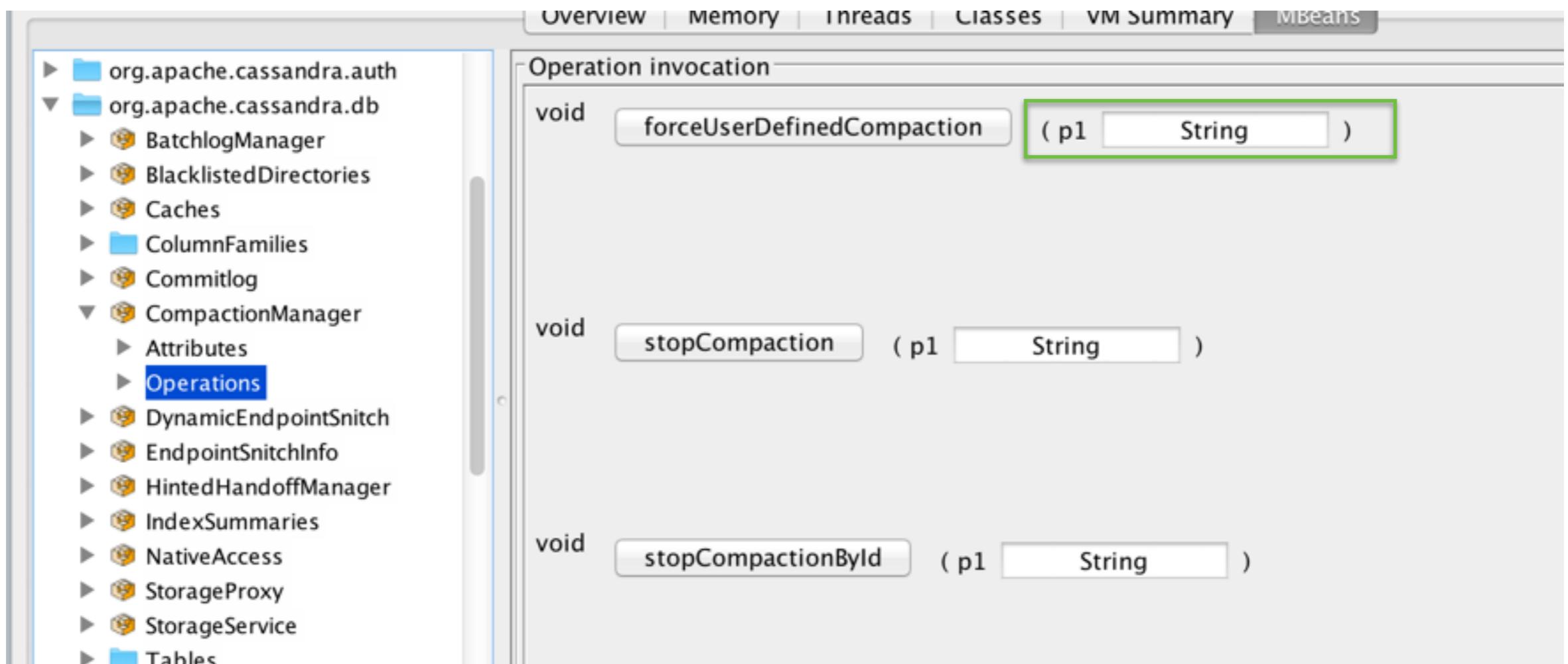
The screenshot shows a JMX interface with the 'Mbeans' tab selected. On the left, there's a tree view of MBeans under 'org.apache.cassandra'. The 'CompactionManager' node is expanded, and its 'Attributes' child is selected. On the right, a table titled 'Attribute values' lists several attributes with their current values:

Name	Value
CompactionHistory	javax.management.openmbean.TabularDataSupport
CompactionSummary	[]
Compactions	[]
CoreCompactorThreads	2
CoreValidationThreads	1
MaximumCompactorThreads	2
MaximumValidatorThreads	2147483647

- MaximumCompactorThreads (change this first!!!)
- CoreCompactorThreads

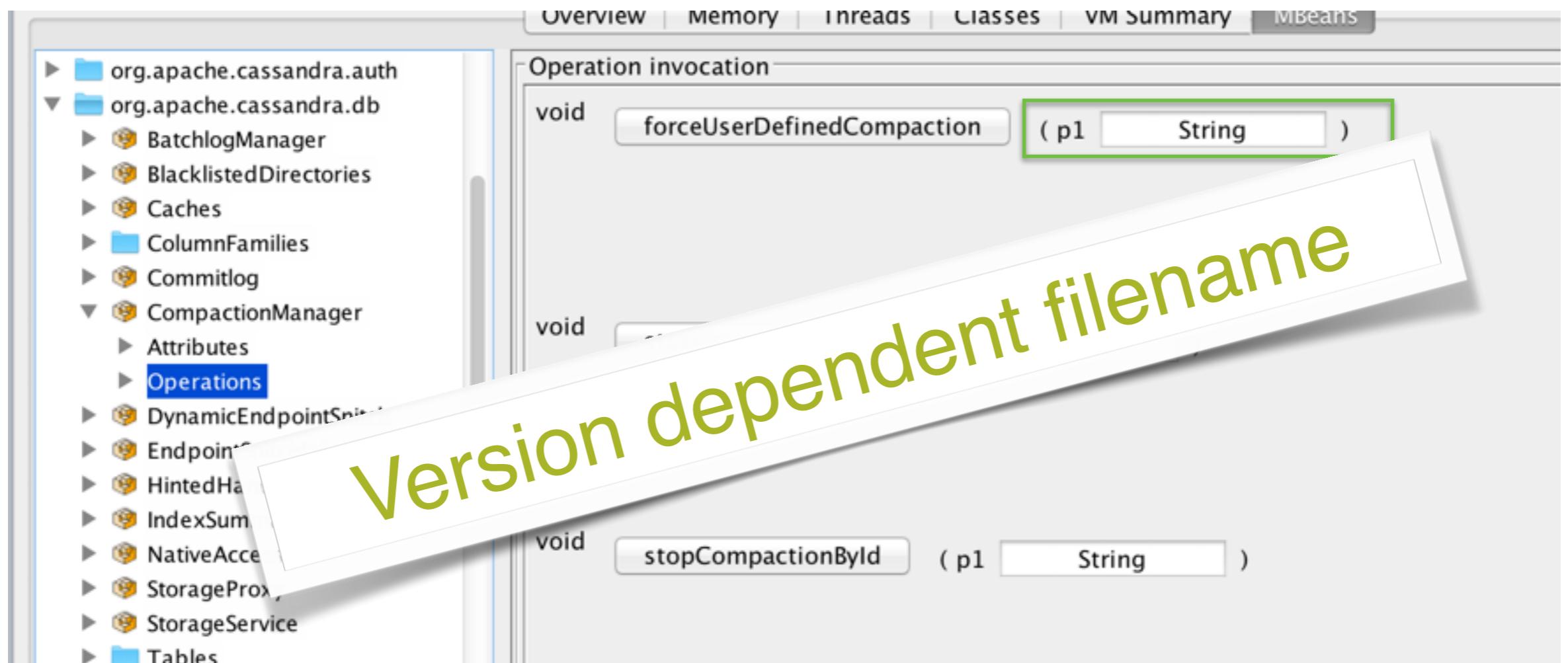
(tip: see jmxtterm example from earlier for CLI invocation)

# CompactionManager: compact a set of stables



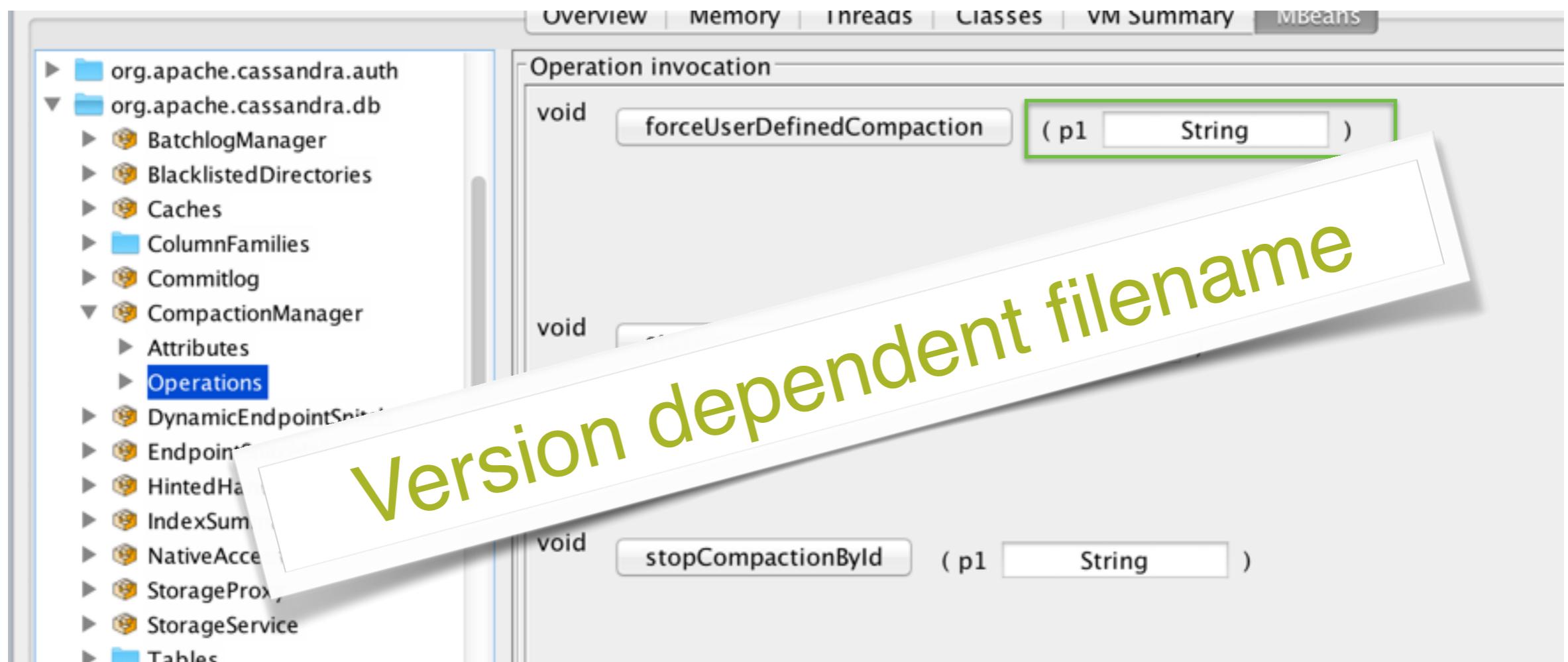
one or more "\*-Data.db" files, comma-delimited

# CompactionManager: compact a set of stables



jmx\_adventure/account-7029d8406d8411e6b3678b7e928ec63e/mb-2-big-Data.db

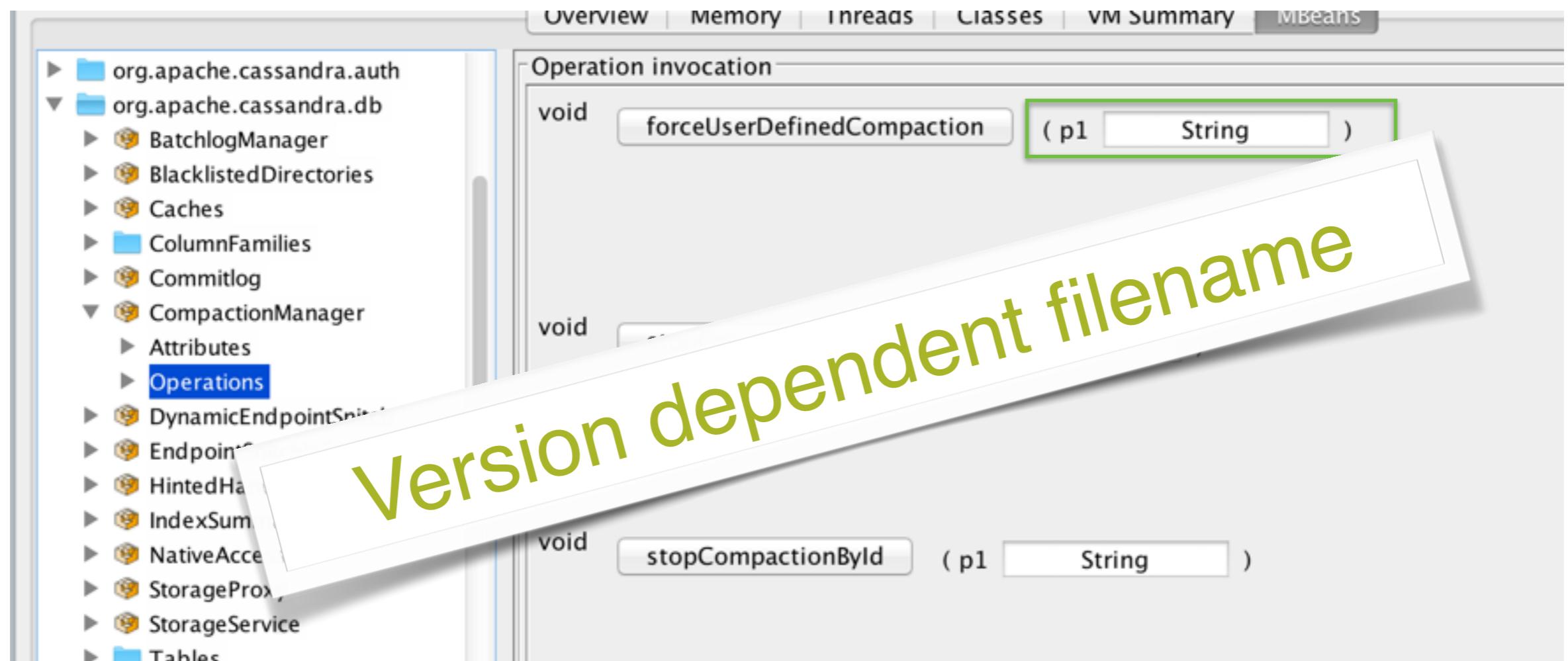
# CompactionManager: compact a set of stables



jmx\_adventure/account-7029d8406d8411e6b3678b7e928ec63e/mb-2-big-Data.db

keyspace

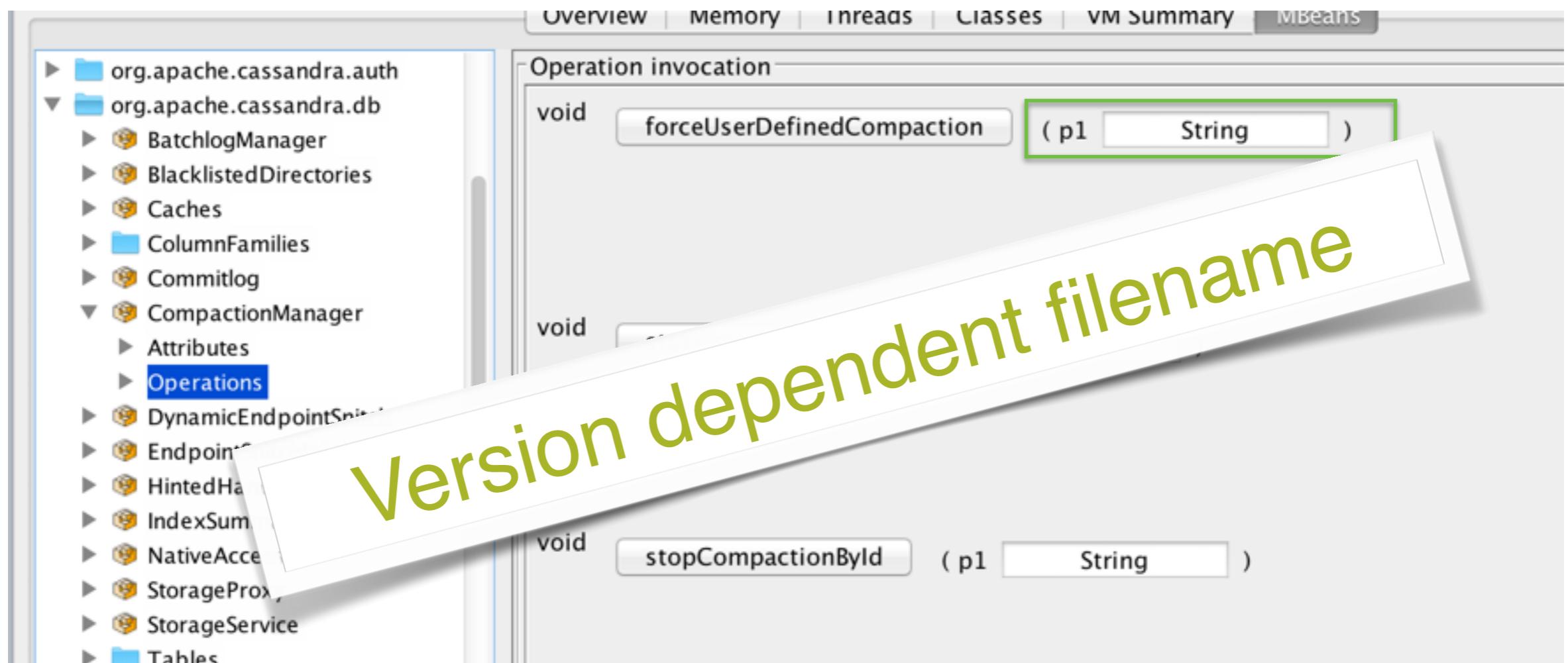
# CompactionManager: compact a set of stables



jmx\_adventure/account-7029d8406d8411e6b3678b7e928ec63e/mb-2-big-Data.db

table + version UUID

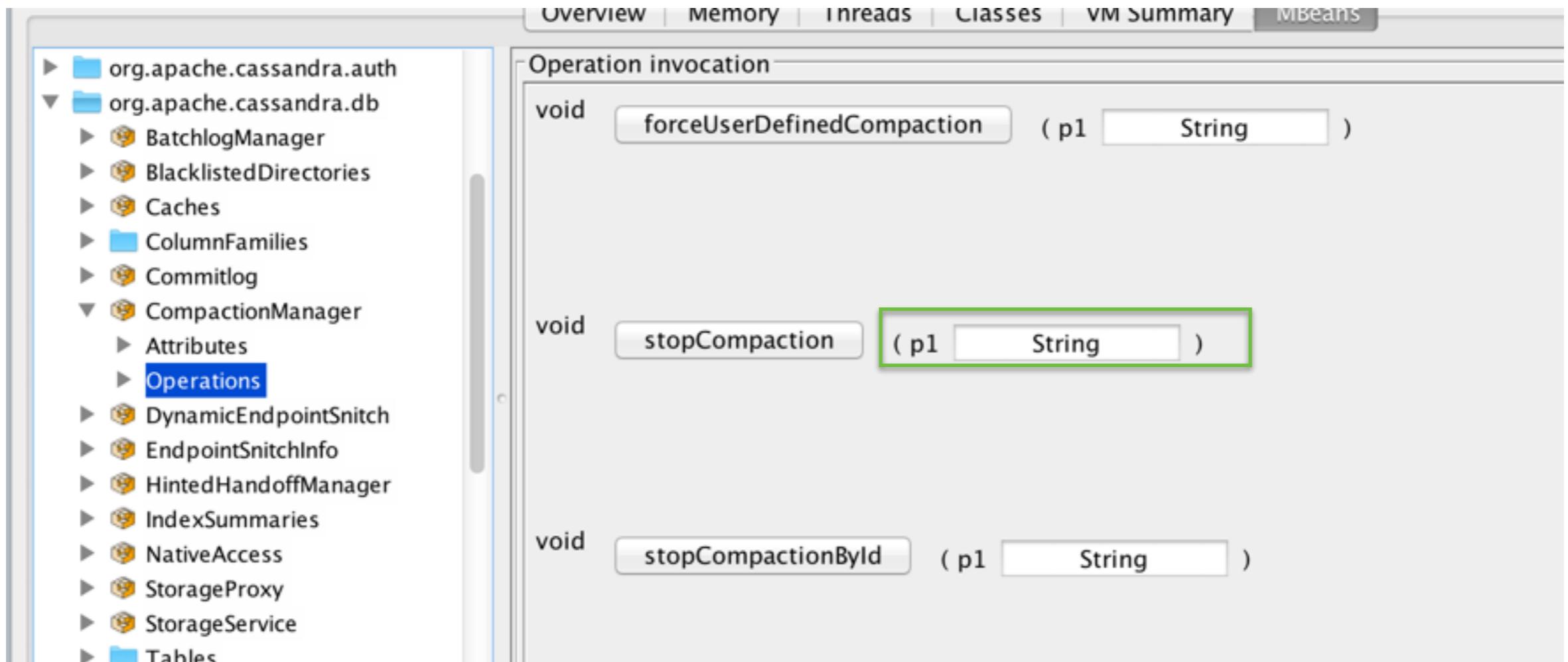
# CompactionManager: compact a set of stables



jmx\_adventure/account-7029d8406d8411e6b3678b7e928ec63e/mb-2-big-Data.db

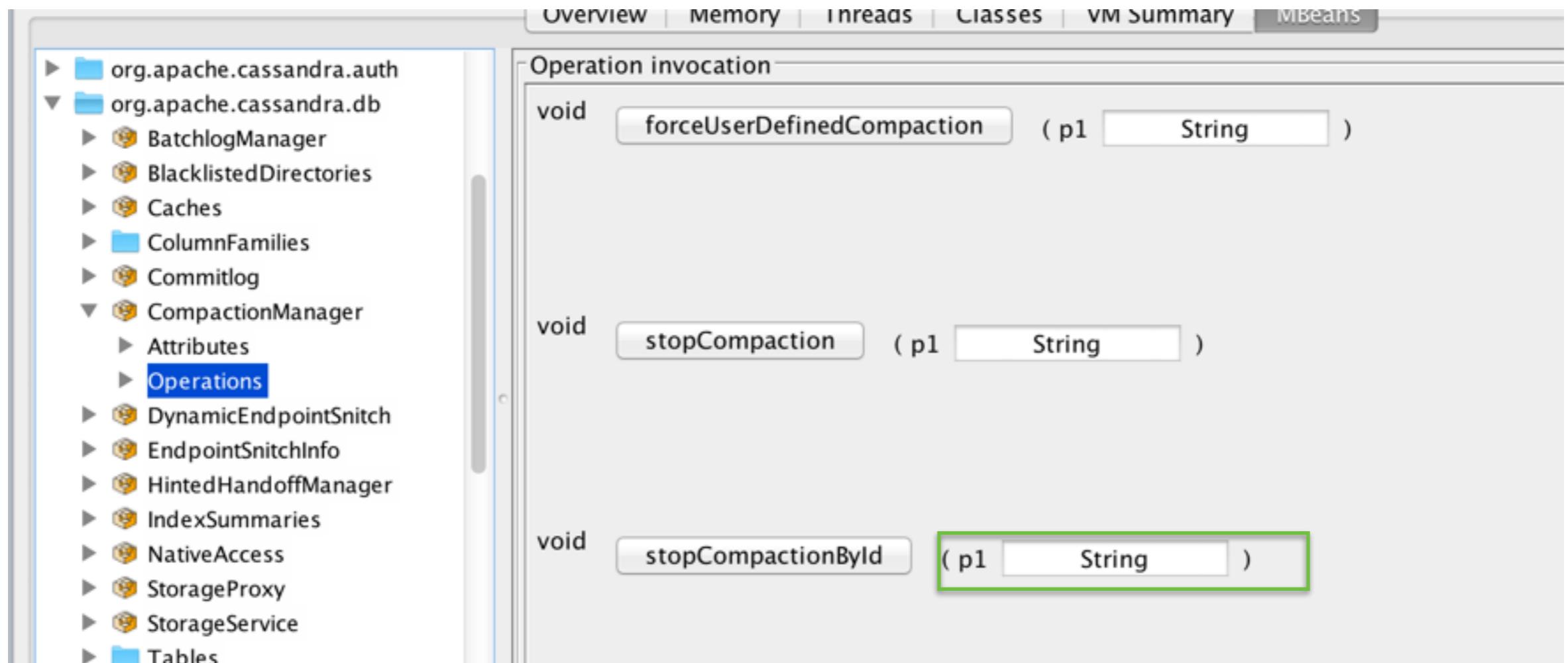
data file

# CompactionManager: stop compaction



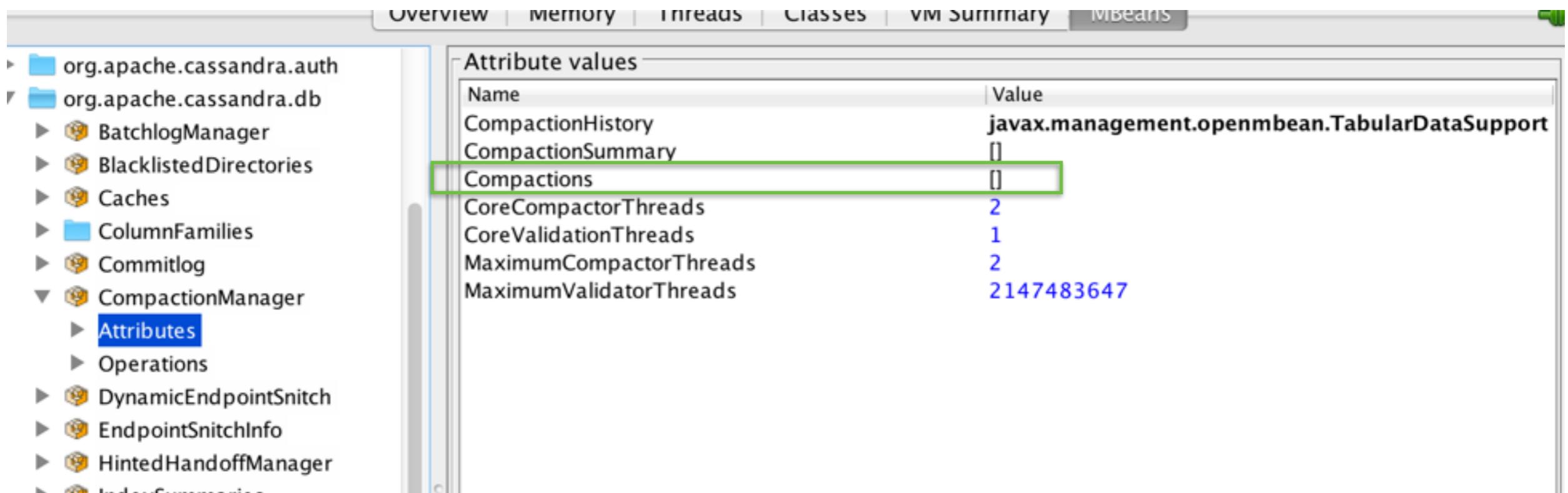
type of compaction, most commonly:  
COMPACTION, VALIDATION, ANTI\_COMPACTION, INDEX\_SUMMARY

# CompactionManager: stop compaction



Compaction identifier of active compaction

# CompactionManager: stop compaction



The screenshot shows the JMX MBeans interface with the 'Mbeans' tab selected. On the left, a tree view shows various MBean categories under 'org.apache.cassandra'. The 'CompactionManager' node is expanded, and its 'Attributes' section is selected. On the right, a table titled 'Attribute values' lists the following attributes and their values:

Name	Value
CompactionHistory	javax.management.openmbean.TabularDataSupport
CompactionSummary	[]
Compactions	[]
CoreCompactorThreads	2
CoreValidationThreads	1
MaximumCompactorThreads	2
MaximumValidatorThreads	2147483647

Find the identifier of active compactions here  
(or nodetool compactionstats)

# Update compaction strategy

The screenshot shows the JMX interface for managing a Cassandra database. On the left, a tree view lists various MBeans, including 'jolokia', 'org.apache.cassandra.auth', 'org.apache.cassandra.db' (which is expanded to show 'BatchlogManager', 'BlacklistedDirectories', 'Caches'), 'ColumnFamilies' (expanded to show 'jmx\_adventure' which contains 'account', 'account\_event', 'sandwich', and 'system'), and 'system'. The right panel displays 'Attribute values' for the 'CompactionParametersJson' attribute of the 'org.apache.cassandra.db' MBean. A green box highlights the 'CompactionParametersJson' row, which contains the JSON value: `{"max_threshold": "32", "min_threshold": "4", "class": "org.apache.cassandra.io.compress.LZ4Compressor", "chunk_length_in_kb": 64}`. Other attributes listed include 'AutoCompactionDisabled' (false), 'BuiltIndexes' (empty list), 'ColumnFamilyName' (account), 'CompactionParameters' (32), 'CompressionParameters' (64), 'CrcCheckChance' (0.0), 'DroppableTombstoneRatio' (0.0), 'MaximumCompactionThreshold' (32), 'MinimumCompactionThreshold' (4), 'SSTableCountPerLevel' (0), 'TableName' (account), and 'UnleveledSSTables' (0).

Name	Value
AutoCompactionDisabled	false
BuiltIndexes	[]
ColumnFamilyName	account
CompactionParameters	{max_threshold=32, min_threshold=4, class=org.apache.cassandra.io.compress.LZ4Compressor}
CompactionParametersJson	{"max_threshold": "32", "min_threshold": "4", "class": "org.apache.cassandra.io.compress.LZ4Compressor", "chunk_length_in_kb": 64}
CompressionParameters	{chunk_length_in_kb=64, class=org.apache.cassandra.io.compress.LZ4Compressor}
CrcCheckChance	0.0
DroppableTombstoneRatio	0.0
MaximumCompactionThreshold	32
MinimumCompactionThreshold	4
SSTableCountPerLevel	0
TableName	account
UnleveledSSTables	0

CompactionParametersJson: Editable JSON

# Update compaction strategy



# CompactionParametersJson: Editable JSON

A photograph showing a row of dogs sitting on a sidewalk, facing away from the camera towards a building. Each dog has a large, shallow metal bowl filled with food in front of it. The dogs are of various breeds and colors, including black, brown, and tan. In the foreground, the back of a person's legs and feet are visible as they stand near the bowls.

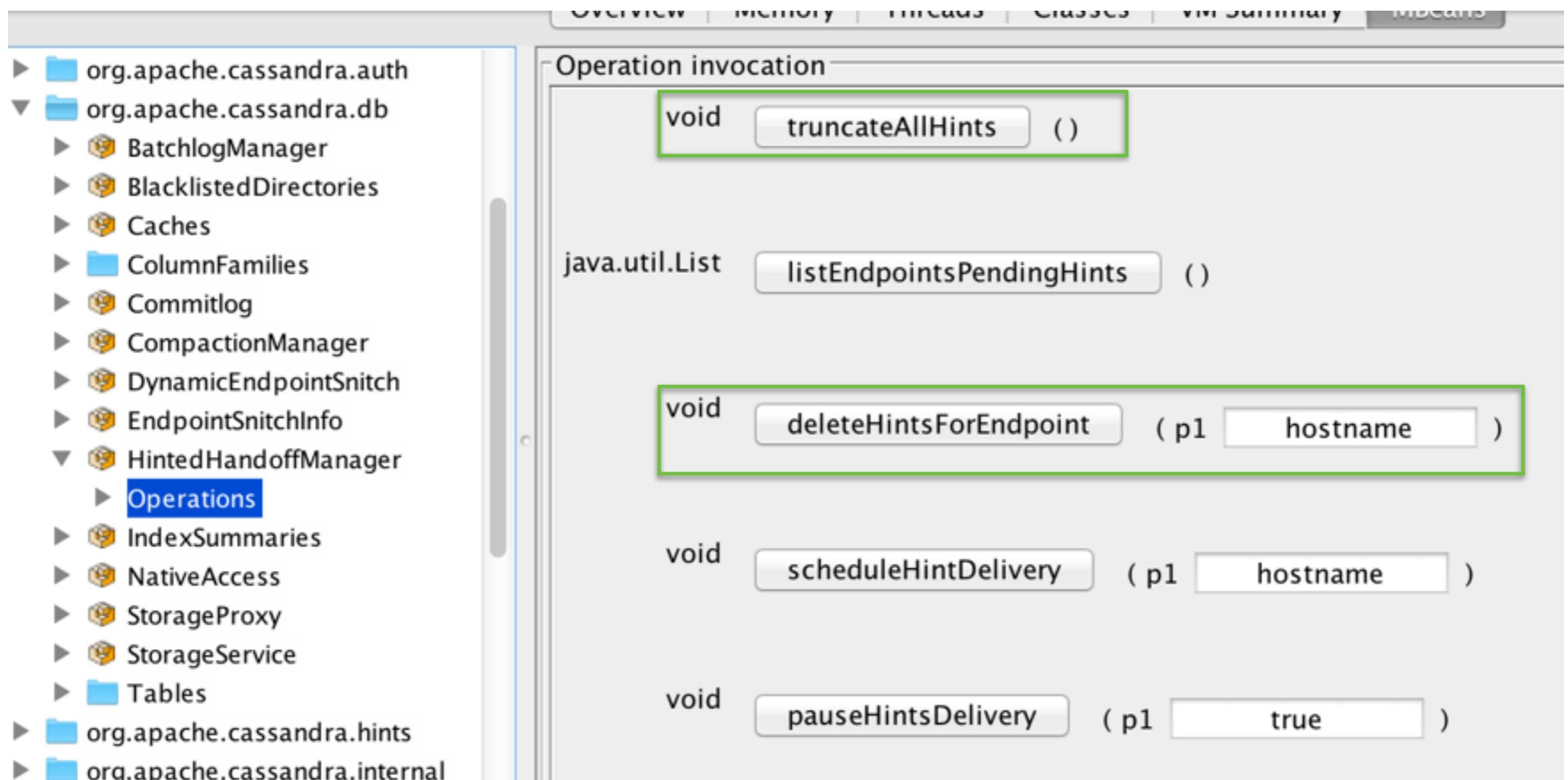
Managing hinted handoff

# HintedHandoffManager

The screenshot shows the JVisualVM application interface with the 'Hints' tab selected. On the left, a tree view displays package structure and classes, with 'org.apache.cassandra.db.HintedHandoffManager' expanded and its 'Operations' sub-class selected. The main pane shows operation invocation details:

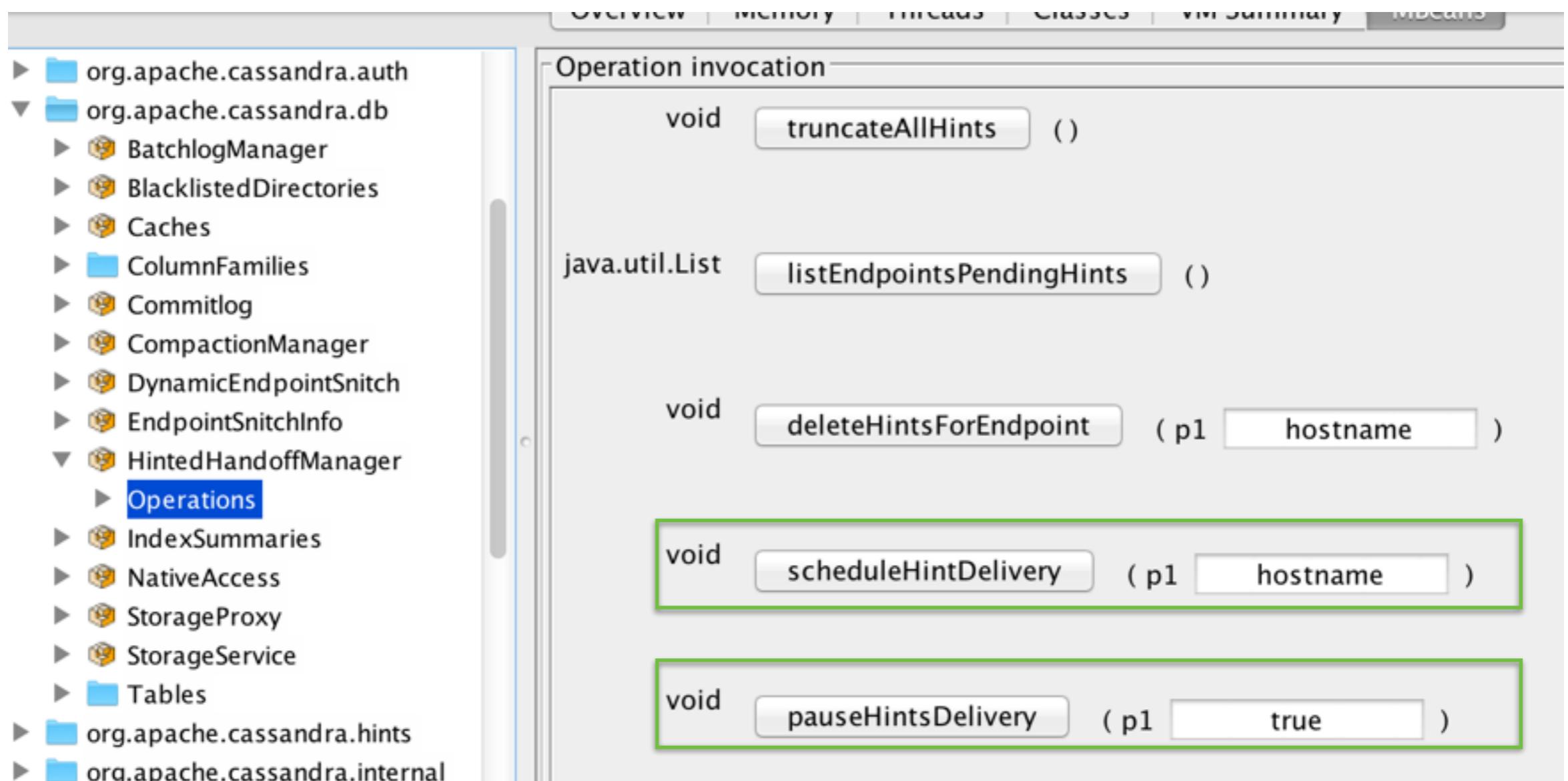
- void `truncateAllHints()`
- java.util.List `listEndpointsPendingHints()`
- void `deleteHintsForEndpoint(p1 hostname)`
- void `scheduleHintDelivery(p1 hostname)`
- void `pauseHintsDelivery(p1 true)`

# HintedHandoffManager



Delete all hints or by host

# HintedHandoffManager



Pause and resume delivery by host

# StorageProxy: Adjust hint delivery settings

The screenshot shows the JMX MBeans interface with the 'MBeans' tab selected. On the left, a tree view lists various MBean categories like Caches, ColumnFamilies, Commitlog, etc., with 'StorageProxy' expanded to show 'Attributes', 'Operations', 'StorageService', 'Tables', and 'org.apache.cassandra.hints'. The 'Attributes' node under StorageProxy is currently selected. To the right, a table titled 'Attribute values' displays the configuration for the StorageProxy MBean. The table has two columns: 'Name' and 'Value'. The 'Value' column contains several large numbers (1000, 5000, 10800000, 1024, -1, 10000) and some boolean values (true, false). The 'SchemaVersions' attribute is shown with a value of {cae93146-18d9-3}.

Name	Value
CasContentionTimeout	1000
CounterWriteRpcTimeout	5000
HintedHandoffDisabledDCs	[]
HintedHandoffEnabled	true
HintsInProgress	0
MaxHintWindow	10800000
MaxHintsInProgress	1024
NativeTransportMaxConcurrentConnections	-1
RangeRpcTimeout	10000
ReadRepairAttempted	2
ReadRepairRepairedBackground	0
ReadRepairRepairedBlocking	0
ReadRpcTimeout	5000
RpcTimeout	10000
SchemaVersions	{cae93146-18d9-3}
TotalHints	0

# StorageProxy: Adjust hint delivery settings

The screenshot shows the JMX MBeans interface with the 'MBeans' tab selected. On the left, a tree view lists various system components: Caches, ColumnFamilies, Commitlog, CompactionManager, DynamicEndpointSnitch, EndpointSnitchInfo, HintedHandoffManager, IndexSummaries, NativeAccess, StorageProxy (selected), Attributes (selected), Operations, StorageService, Tables, and org.apache.cassandra.hints. The 'Attributes' node under 'StorageProxy' is currently selected. On the right, a table titled 'Attribute values' displays configuration parameters. A green box highlights the 'HintedHandoffEnabled' row, which has a value of 'true'. Other visible parameters include CasContentionTimeout (1000), CounterWriteRpcTimeout (5000), HintsInProgress (0), MaxHintWindow (10800000), MaxHintsInProgress (1024), NativeTransportMaxConcurrentConnections (-1), RangeRpcTimeout (10000), ReadRepairAttempted (2), ReadRepairRepairedBackground (0), ReadRepairRepairedBlocking (0), ReadRpcTimeout (5000), RpcTimeout (10000), SchemaVersions ({cae93146-18d9-3}), and TotalHints (0).

Name	Value
CasContentionTimeout	1000
CounterWriteRpcTimeout	5000
HintedHandoffDisabledDCs	[]
<b>HintedHandoffEnabled</b>	<b>true</b>
HintsInProgress	0
MaxHintWindow	10800000
MaxHintsInProgress	1024
NativeTransportMaxConcurrentConnections	-1
RangeRpcTimeout	10000
ReadRepairAttempted	2
ReadRepairRepairedBackground	0
ReadRepairRepairedBlocking	0
ReadRpcTimeout	5000
RpcTimeout	10000
SchemaVersions	{cae93146-18d9-3}
TotalHints	0

On/off switch for hints

# StorageProxy: Adjust hint delivery settings

The screenshot shows the JMX MBeans interface with the 'MBeans' tab selected. On the left, a tree view lists various MBean categories under 'org.apache.cassandra.mbeans'. The 'StorageProxy' node is expanded, and its 'Attributes' sub-node is selected, highlighted with a blue background. The main pane displays a table of attribute values.

Name	Value
CasContentionTimeout	1000
CounterWriteRpcTimeout	5000
HintedHandoffDisabledDCs	[]
HintedHandoffEnabled	true
HintsInProgress	0
<b>MaxHintWindow</b>	<b>10800000</b>
MaxHintsInProgress	1024
NativeTransportMaxConcurrentConnections	-1
RangeRpcTimeout	10000
ReadRepairAttempted	2
ReadRepairRepairedBackground	0
ReadRepairRepairedBlocking	0
ReadRpcTimeout	5000
RpcTimeout	10000
SchemaVersions	{cae93146-18d9-3}
TotalHints	0

How long to keep hints in milliseconds (3 hours by default)

# StorageProxy: Adjust hint delivery settings

The screenshot shows the JMX MBeans interface with the 'MBeans' tab selected. On the left, a tree view lists various MBean categories: Caches, ColumnFamilies, Commitlog, CompactionManager, DynamicEndpointSnitch, EndpointSnitchInfo, HintedHandoffManager, IndexSummaries, NativeAccess, StorageProxy (selected), Attributes (selected), Operations, StorageService, Tables, and org.apache.cassandra.hints. The 'Attributes' node under 'StorageProxy' is highlighted with a blue border. On the right, a table titled 'Attribute values' displays configuration parameters. The 'MaxHintsInProgress' row is highlighted with a green border. The table data is as follows:

Name	Value
CasContentionTimeout	1000
CounterWriteRpcTimeout	5000
HintedHandoffDisabledDCs	[]
HintedHandoffEnabled	true
HintsInProgress	0
MaxHintWindow	10800000
MaxHintsInProgress	1024
NativeTransportMaxConcurrentConnections	-1
RangeRpcTimeout	10000
ReadRepairAttempted	2
ReadRepairRepairedBackground	0
ReadRepairRepairedBlocking	0
ReadRpcTimeout	5000
RpcTimeout	10000
SchemaVersions	{cae93146-18d9-3}
TotalHints	0

How many hints to send at a time

Adjusting operation timeouts



# StorageProxy: Adjust operation timeouts

The screenshot shows the Apache Cassandra configuration interface. On the left, there is a tree view of configuration sections:

- org.apache.cassandra.db
  - BatchlogManager
  - BlacklistedDirectories
  - Caches
  - ColumnFamilies
  - Commitlog
  - CompactionManager
  - DynamicEndpointSnitch
  - EndpointSnitchInfo
  - HintedHandoffManager
  - IndexSummaries
  - NativeAccess
  - StorageProxy
    - Attributes**
    - Operations
    - StorageService
  - Tables
- org.apache.cassandra.hints

On the right, there is a table titled "Attribute values" showing various configuration parameters and their values. One row, "CasContentionTimeout", has a value of "1000" and is highlighted with a green border.

Name	Value
CasContentionTimeout	1000
CounterWriteRpcTimeout	5000
HintedHandoffDisabledDCs	[]
HintedHandoffEnabled	true
HintsInProgress	0
MaxHintWindow	10800000
MaxHintsInProgress	1024
NativeTransportMaxConcurrentConnections	-1
RangeRpcTimeout	10000
ReadRepairAttempted	2
ReadRepairRepairedBackground	0
ReadRepairRepairedBlocking	0
ReadRpcTimeout	5000
RpcTimeout	10000
SchemaVersions	{cae93146-1}
TotalHints	0
TruncateRpcTimeout	60000
WriteRpcTimeout	2000

Amount of time spent in LWT Contention

# StorageProxy: Adjust operation timeouts

The screenshot shows the Cassandra configuration interface. On the left, there's a tree view with nodes like 'org.apache.cassandra.db' and 'org.apache.cassandra.hints'. The 'Attributes' node under 'org.apache.cassandra.db' is selected. On the right, a table titled 'Attribute values' lists various configuration options with their current values.

Name	Value
CasContentionTimeout	10800000
CounterWriteRpcTimeout	1024
HintedHandoffDisabledDCs	-1
HintedHandoffEnabled	10000
HintsInProgress	2
MaxHints	0
ReadRepairAttempted	0
ReadRepairRepairedBackground	0
ReadRepairRepairedBlocking	5000
ReadRpcTimeout	10000
RpcTimeout	{cae93146-1}
SchemaVersions	0
TotalHints	60000
TruncateRpcTimeout	2000
WriteRpcTimeout	

A large green watermark reading "See Chris' LWT presentation!" is overlaid across the middle of the screen.

Amount of time spent in LWT Contention

# StorageProxy: Adjust operation timeouts

The screenshot shows the Apache Cassandra configuration interface. On the left, there is a tree view of configuration sections:

- org.apache.cassandra.db
  - BatchlogManager
  - BlacklistedDirectories
  - Caches
  - ColumnFamilies
  - Commitlog
  - CompactionManager
  - DynamicEndpointSnitch
  - EndpointSnitchInfo
  - HintedHandoffManager
  - IndexSummaries
  - NativeAccess
  - StorageProxy
    - Attributes**
    - Operations
    - StorageService
  - Tables
- org.apache.cassandra.hints

On the right, there is a table titled "Attribute values" showing various configuration parameters and their values. The "Attributes" section under StorageProxy is selected. The "CounterWriteRpcTimeout" row is highlighted with a green border.

Name	Value
CasContentionTimeout	1000
<b>CounterWriteRpcTimeout</b>	<b>5000</b>
HintedHandoffDisabledDCs	[]
HintedHandoffEnabled	true
HintsInProgress	0
MaxHintWindow	10800000
MaxHintsInProgress	1024
NativeTransportMaxConcurrentConnections	-1
RangeRpcTimeout	10000
ReadRepairAttempted	2
ReadRepairRepairedBackground	0
ReadRepairRepairedBlocking	0
ReadRpcTimeout	5000
RpcTimeout	10000
SchemaVersions	{cae93146-1}
TotalHints	0
TruncateRpcTimeout	60000
WriteRpcTimeout	2000

timeout for counter writes

# StorageProxy: Adjust operation timeouts

The screenshot shows the Apache Cassandra configuration interface. On the left, there is a tree view of configuration sections:

- org.apache.cassandra.db
  - BatchlogManager
  - BlacklistedDirectories
  - Caches
  - ColumnFamilies
  - Commitlog
  - CompactionManager
  - DynamicEndpointSnitch
  - EndpointSnitchInfo
  - HintedHandoffManager
  - IndexSummaries
  - NativeAccess
  - StorageProxy
    - Attributes**
    - Operations
    - StorageService
  - Tables
- org.apache.cassandra.hints

On the right, under the "Attributes values" heading, is a table showing configuration options and their values. The "RangeRpcTimeout" row is highlighted with a green border.

Name	Value
CasContentionTimeout	1000
CounterWriteRpcTimeout	5000
HintedHandoffDisabledDCs	[]
HintedHandoffEnabled	true
HintsInProgress	0
MaxHintWindow	10800000
MaxHintsInProgress	1024
NativeTransportMaxConcurrentConnections	-1
RangeRpcTimeout	10000
ReadRepairAttempted	2
ReadRepairRepairedBackground	0
ReadRepairRepairedBlocking	0
ReadRpcTimeout	5000
RpcTimeout	10000
SchemaVersions	{cae93146-1}
TotalHints	0
TruncateRpcTimeout	60000
WriteRpcTimeout	2000

Timeout for range queries  
(poorly bounded select statements)

# StorageProxy: Adjust operation timeouts

The screenshot shows the Apache Cassandra configuration interface. On the left, there is a tree view of configuration sections:

- org.apache.cassandra.db
  - BatchlogManager
  - BlacklistedDirectories
  - Caches
  - ColumnFamilies
  - Commitlog
  - CompactionManager
  - DynamicEndpointSnitch
  - EndpointSnitchInfo
  - HintedHandoffManager
  - IndexSummaries
  - NativeAccess
  - StorageProxy
    - Attributes**
    - Operations
    - StorageService
  - Tables
- org.apache.cassandra.hints

On the right, there is a table titled "Attribute values" showing various configuration parameters and their values. The "Attributes" section under StorageProxy is selected. The table has columns "Name" and "Value". One row, "ReadRpcTimeout", is highlighted with a green border.

Name	Value
CasContentionTimeout	1000
CounterWriteRpcTimeout	5000
HintedHandoffDisabledDCs	[]
HintedHandoffEnabled	true
HintsInProgress	0
MaxHintWindow	10800000
MaxHintsInProgress	1024
NativeTransportMaxConcurrentConnections	-1
RangeRpcTimeout	10000
ReadRepairAttempted	2
ReadRepairRepairedBackground	0
ReadRepairRepairedBlocking	0
<b>ReadRpcTimeout</b>	<b>5000</b>
RpcTimeout	10000
SchemaVersions	{cae93146-1}
TotalHints	0
TruncateRpcTimeout	60000
WriteRpcTimeout	2000

Timeout for single read operation

# StorageProxy: Adjust operation timeouts

The screenshot shows the Apache Cassandra configuration interface. On the left, there is a tree view of configuration sections:

- org.apache.cassandra.db
  - BatchlogManager
  - BlacklistedDirectories
  - Caches
  - ColumnFamilies
  - Commitlog
  - CompactionManager
  - DynamicEndpointSnitch
  - EndpointSnitchInfo
  - HintedHandoffManager
  - IndexSummaries
  - NativeAccess
  - StorageProxy
    - Attributes**
    - Operations
    - StorageService
    - Tables
- org.apache.cassandra.hints

On the right, there is a table titled "Attribute values" showing various configuration parameters and their values. The "Attributes" section under StorageProxy is selected. One row, "RpcTimeout", has a value of 10000 and is highlighted with a green border.

Name	Value
CasContentionTimeout	1000
CounterWriteRpcTimeout	5000
HintedHandoffDisabledDCs	[]
HintedHandoffEnabled	true
HintsInProgress	0
MaxHintWindow	10800000
MaxHintsInProgress	1024
NativeTransportMaxConcurrentConnections	-1
RangeRpcTimeout	10000
ReadRepairAttempted	2
ReadRepairRepairedBackground	0
ReadRepairRepairedBlocking	0
ReadRpcTimeout	5000
<b>RpcTimeout</b>	<b>10000</b>
SchemaVersions	{cae93146-1}
TotalHints	0
TruncateRpcTimeout	60000
WriteRpcTimeout	2000

Timeout for other miscellaneous inter-cluster operations

# StorageProxy: Adjust operation timeouts

The screenshot shows the Apache Cassandra configuration interface. On the left, there is a tree view of configuration sections:

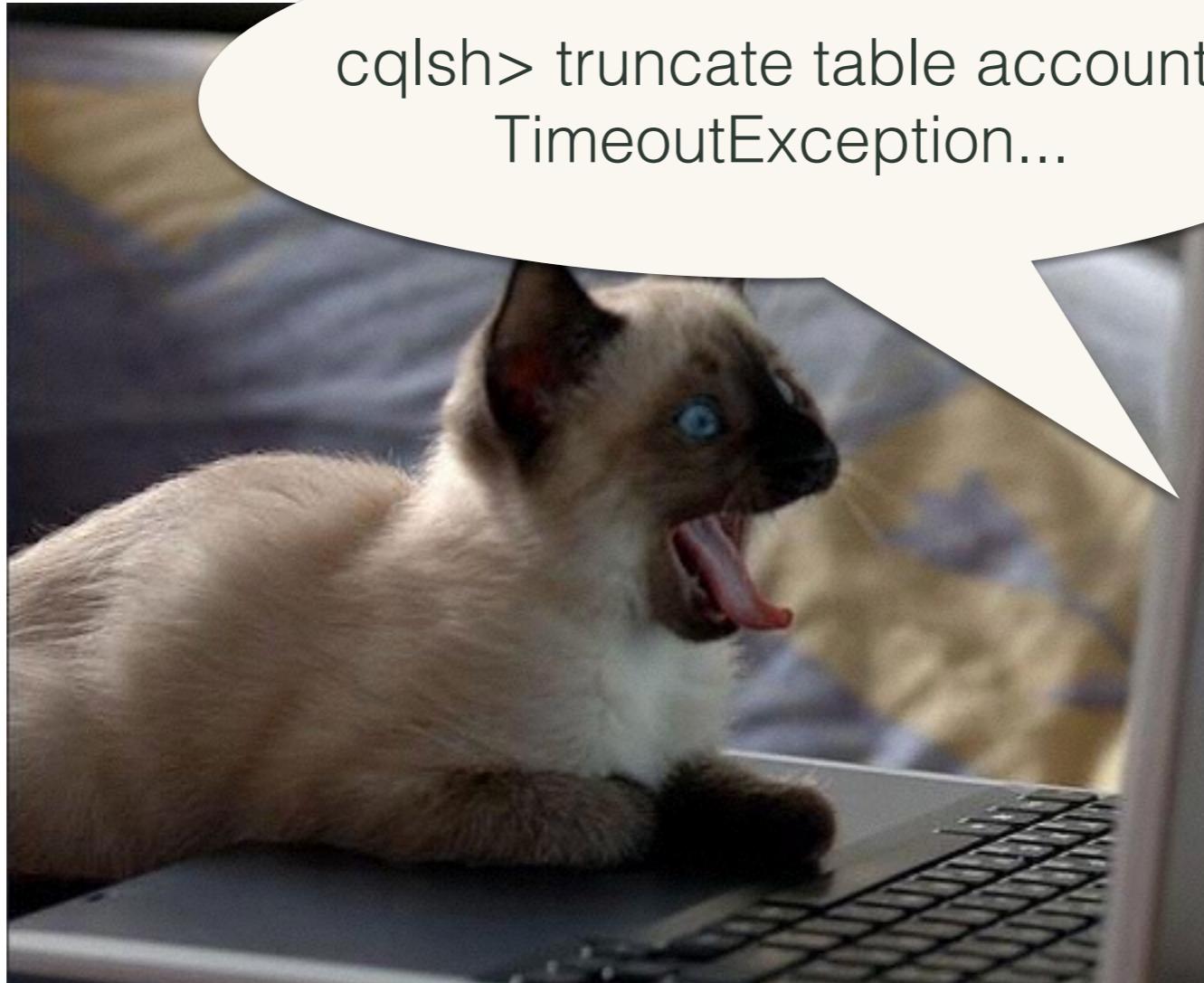
- org.apache.cassandra.db
  - BatchlogManager
  - BlacklistedDirectories
  - Caches
  - ColumnFamilies
  - Commitlog
  - CompactionManager
  - DynamicEndpointSnitch
  - EndpointSnitchInfo
  - HintedHandoffManager
  - IndexSummaries
  - NativeAccess
  - StorageProxy
    - Attributes**
    - Operations
    - StorageService
  - Tables- org.apache.cassandra.hints

On the right, there is a table titled "Attribute values" with columns "Name" and "Value". The table lists various configuration options and their current values. The "Attributes" section under StorageProxy is selected. The "WriteRpcTimeout" row is highlighted with a green border.

Name	Value
CasContentionTimeout	1000
CounterWriteRpcTimeout	5000
HintedHandoffDisabledDCs	[]
HintedHandoffEnabled	true
HintsInProgress	0
MaxHintWindow	10800000
MaxHintsInProgress	1024
NativeTransportMaxConcurrentConnections	-1
RangeRpcTimeout	10000
ReadRepairAttempted	2
ReadRepairRepairedBackground	0
ReadRepairRepairedBlocking	0
ReadRpcTimeout	5000
RpcTimeout	10000
SchemaVersions	{cae93146-1}
TotalHints	0
TruncateRpcTimeout	60000
<b>WriteRpcTimeout</b>	<b>2000</b>

Timeout for write operations

# StorageProxy: Adjust operation timeouts



special shoutout to TruncateRpcTimeout

# StorageProxy: Adjust operation timeouts

The screenshot shows the Apache Cassandra configuration interface. On the left, there is a tree view of configuration sections:

- org.apache.cassandra.db
  - BatchlogManager
  - BlacklistedDirectories
  - Caches
  - ColumnFamilies
  - Commitlog
  - CompactionManager
  - DynamicEndpointSnitch
  - EndpointSnitchInfo
  - HintedHandoffManager
  - IndexSummaries
  - NativeAccess
  - StorageProxy
    - Attributes**
    - Operations
    - StorageService
  - Tables
- org.apache.cassandra.hints

On the right, there is a table titled "Attribute values" showing various configuration options and their values. The "Attributes" section under StorageProxy is selected. The table has two columns: "Name" and "Value". One row, "TruncateRpcTimeout", is highlighted with a green border.

Name	Value
CasContentionTimeout	1000
CounterWriteRpcTimeout	5000
HintedHandoffDisabledDCs	[]
HintedHandoffEnabled	true
HintsInProgress	0
MaxHintWindow	10800000
MaxHintsInProgress	1024
NativeTransportMaxConcurrentConnections	-1
RangeRpcTimeout	10000
ReadRepairAttempted	2
ReadRepairRepairedBackground	0
ReadRepairRepairedBlocking	0
ReadRpcTimeout	5000
RpcTimeout	10000
SchemaVersions	{cae93146-1}
TotalHints	0
<b>TruncateRpcTimeout</b>	<b>60000</b>
WriteRpcTimeout	2000

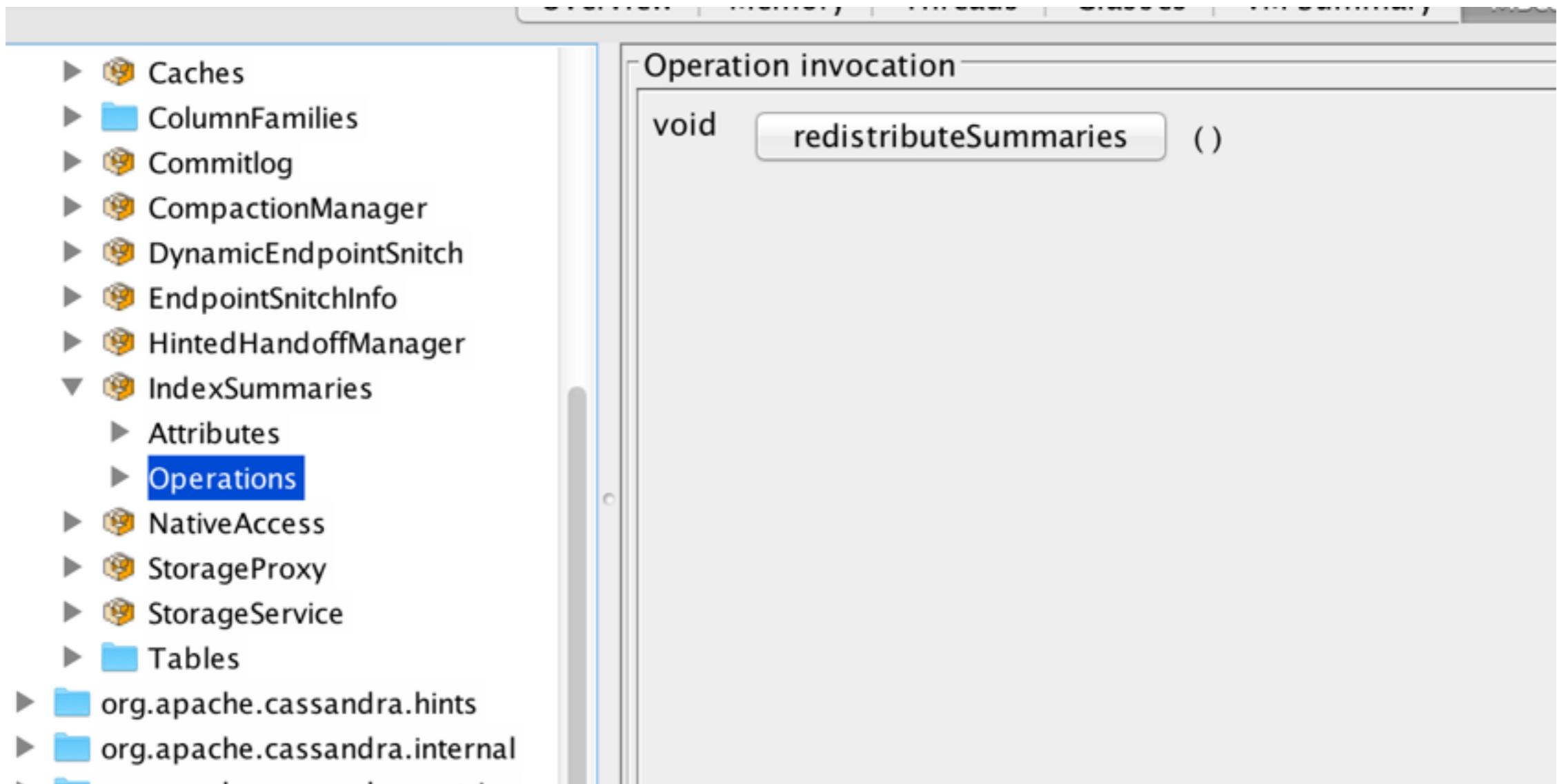
If you truncate, increase this by an order of magnitude

Index sampling and summary



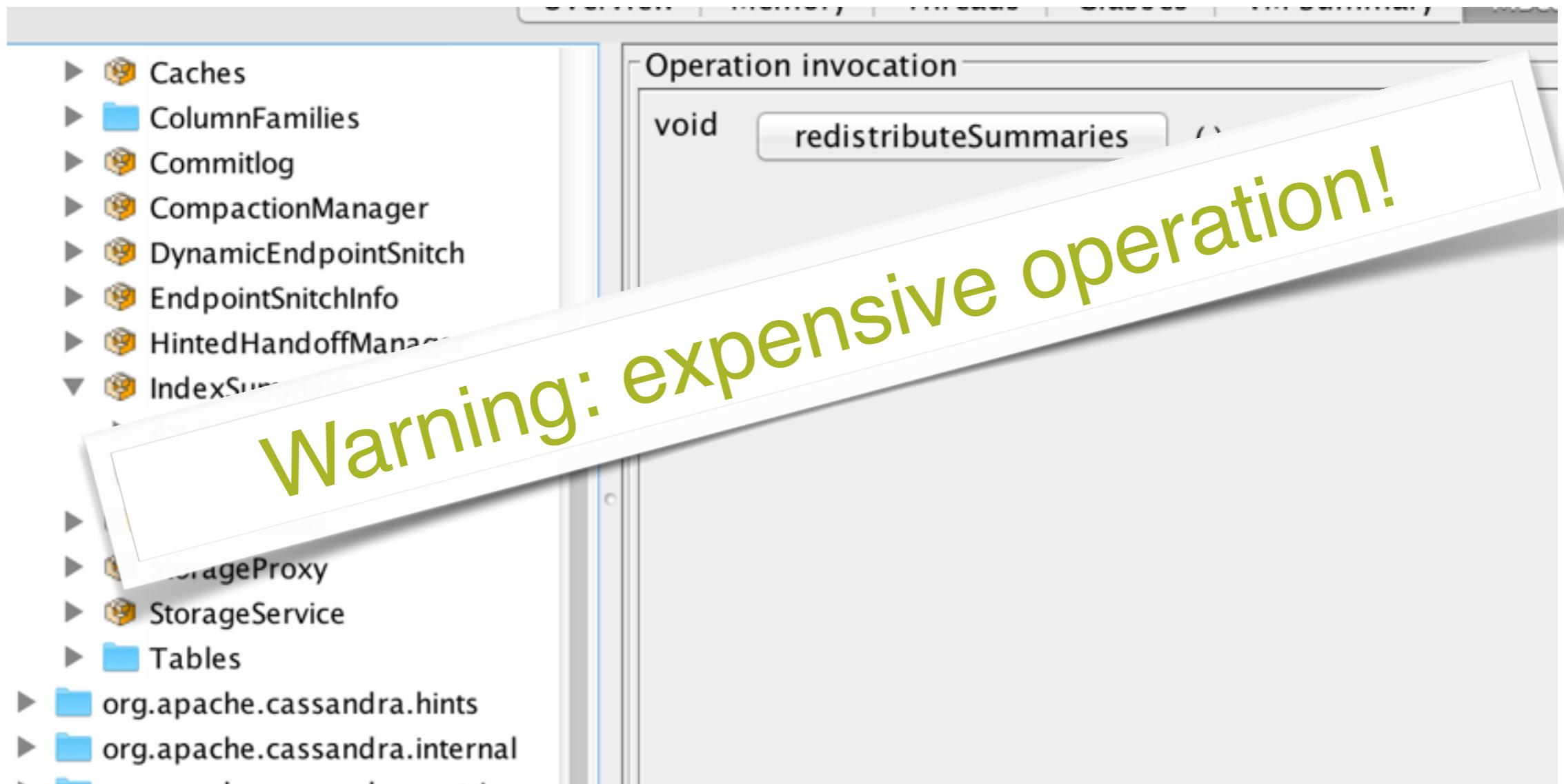
SSTable

# Index summaries



Invoke occasionally on a single node

## Index summaries



Invoke occasionally on a single node

# Index summaries

The screenshot shows a JMX interface with a navigation tree on the left and a table of attribute values on the right.

**Navigation Tree:**

- ▶ BatchlogManager
- ▶ BlacklistedDirectories
- ▶ Caches
- ▶ ColumnFamilies
- ▶ Commitlog
- ▶ CompactionManager
- ▶ DynamicEndpointSnitch
- ▶ EndpointSnitchInfo
- ▶ HintedHandoffManager
- ▼ IndexSummaries
  - ▶ Attributes
  - ▶ Operations
- ▶ NativeAccess
- ▶ StorageProxy
- ▶ StorageService
- ▶ Tables

**Attribute values:**

Name	Value
AverageIndexInterval	128.0
IndexIntervals	{/Users/zznate/.ccm/jmx-adver
MemoryPoolCapacityInMB	24
MemoryPoolSizeInMB	9.307861328125E-4
ResizeIntervalInMinutes	60

watch the metrics for tuning

## Index summaries

Table: account\_event

...

**Index summary off heap memory used: 27732**

...

combine with nodetool tablestats, then adjust:

`min_index_interval, max_index_interval`

StorageService ...miscellaneous, etc



# StorageService: batch size thresholds

Attribute values	
Name	Value
AllDataFileLocations	java.lang.String[1]
BatchSizeFailureThreshold	50
ClusterName	jmx-adventure-3
CommitLogLocation	/Users/zznate/.ccm/jmx-adventure-3/nc
CompactionThroughputMbPerSec	16
CurrentGenerationNumber	1473125362
DrainProgress	Drained 0/0 ColumnFamilies
EndpointToHostId	{127.0.0.3=11b5423e-0edb-4635-939
GossipRunning	true
HintedHandoffThrottleInKB	
HostIdMap	{127.0.0.3=11b5423e-0edb-4635-939
HostIdToEndPoint	{11b5423e-0edb-4635-9398-d83f6ac
IncrementalBackupsEnabled	false
Initialized	true
InterDCStreamThroughputMbPerSec	200
Joined	true
JoiningNodes	[]
Keyspaces	[sandwich, jmx_adventure, system_dist
LeavingNodes	[]
LiveNodes	[127.0.0.1, 127.0.0.2, 127.0.0.3]
LoadMap	{127.0.0.3=193.68 KB, 127.0.0.2=183.1
LoadString	230.26 KB
LocalHostId	fed6dd09-667c-4cc5-b66a-85a1cbce1
LoggingLevel	INFO com.thinkzurwille.thrift-

Size of the largest batch in KB

# StorageService: tombstone thresholds

The screenshot shows the JMX interface for managing a Cassandra node. On the left, a tree view lists various MBean categories under `org.apache.cassandra.db`. The `StorageService` node is expanded, and its `Attributes` child is selected, highlighted with a blue border. The main panel displays a table of attribute values for the selected MBean.

Attribute values	
Name	localhost
LoggingLevels	{ROOT=INFO, com.thinkaurelius.thrift=ERROR}
MovingNodes	[]
NativeTransportRunning	true
NonLocalStrategyKeyspaces	[sandwich, jmx_adventure, system_distrib]
NonSystemKeyspaces	Unavailable
NotificationInfo	javax.management.MBeanNotificationInfo[]
OperationMode	NORMAL
Ownership	{/127.0.0.1=0.333333, /127.0.0.2=0.333333}
PartitionerName	org.apache.cassandra.dht.Murmur3Partitioner
RPCServerRunning	false
ReleaseVersion	3.0.8-SNAPSHOT
RemovalStatus	No token removals in process.
SavedCachesLocation	/Users/zznate/.ccm/jmx-adventure-3/node1
SchemaVersion	cae93146-18d9-3290-a86b-2b7818c822e
SnapshotDetails	{}
Starting	false
StreamThroughputMbPerSec	200
TokenToEndpointMap	{-9223372036854775808=127.0.0.1, -30}
Tokens	[-9223372036854775808]
TombstoneFailureThreshold	100000
TombstoneWarnThreshold	1000
TraceProbability	0.0
UnreachableNodes	[]

A green box highlights the `TombstoneFailureThreshold` and `TombstoneWarnThreshold` rows. Below the table is a `Refresh` button.

Adjust failure and warning to remove log messages

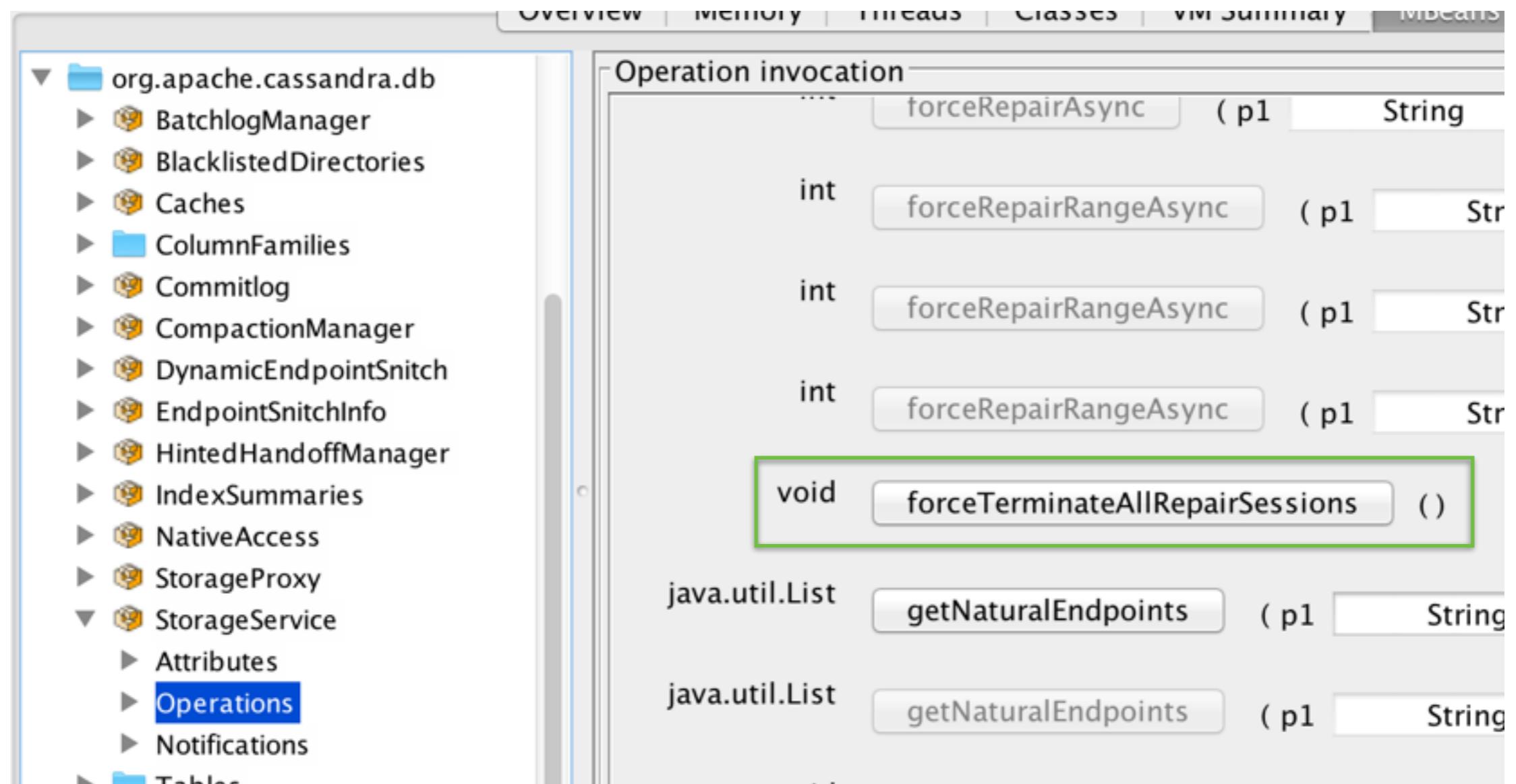
# StorageService: tombstone thresholds

If you adjust these, you have bigger problems

Name	Value
BatchlogManager	BatchlogManager
BlacklistedDirectories	BlacklistedDirectories
Caches	Caches
ColumnFamilies	ColumnFamilies
Commitlog	Commitlog
CompactionManager	CompactionManager
DynamicEndpointSnitch	DynamicEndpointSnitch
EndpointSnitchInfo	EndpointSnitchInfo
Hints	Hints
LocalIota	LocalIota
LoggingLevels	LoggingLevels
MovingNodes	MovingNodes
NativeTransportRunning	NativeTransportRunning
NonLocalStrategyKey	NonLocalStrategyKey
NonSystemTables	NonSystemTables
NativeTransportRunning	NativeTransportRunning
ReleaseVersion	ReleaseVersion
RemovalStatus	RemovalStatus
SavedCachesLocation	SavedCachesLocation
SchemaVersion	SchemaVersion
SnapshotDetails	SnapshotDetails
Starting	Starting
StreamThroughputMbPerSec	StreamThroughputMbPerSec
TokenToEndpointMap	TokenToEndpointMap
Tokens	Tokens
TombstoneFailureThreshold	100000
TombstoneWarnThreshold	1000
TraceProbability	0.0
UnreachableNodes	[]

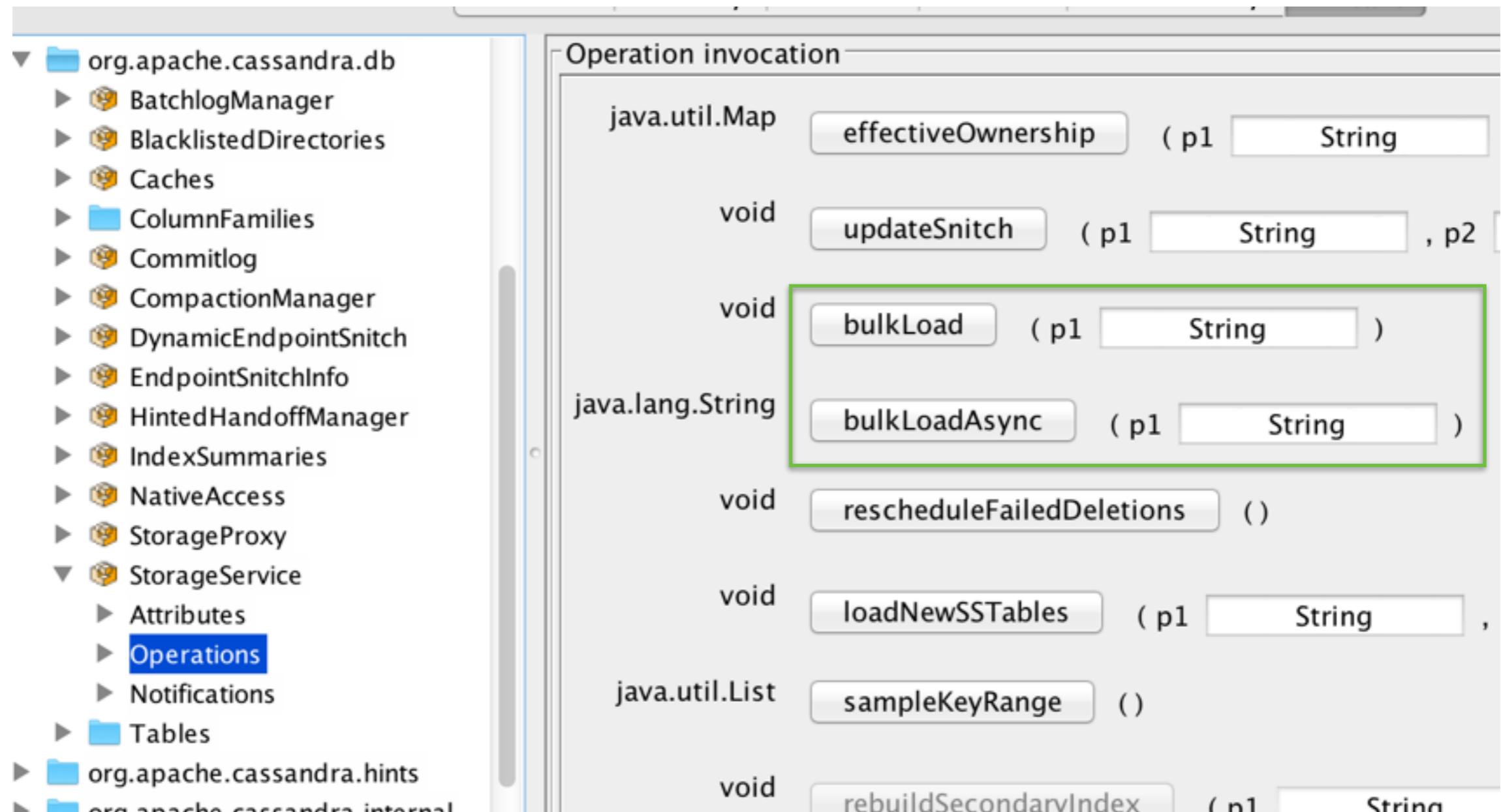
Adjust failure and warning to remove log messages

# force stop repair



Does just what it says.

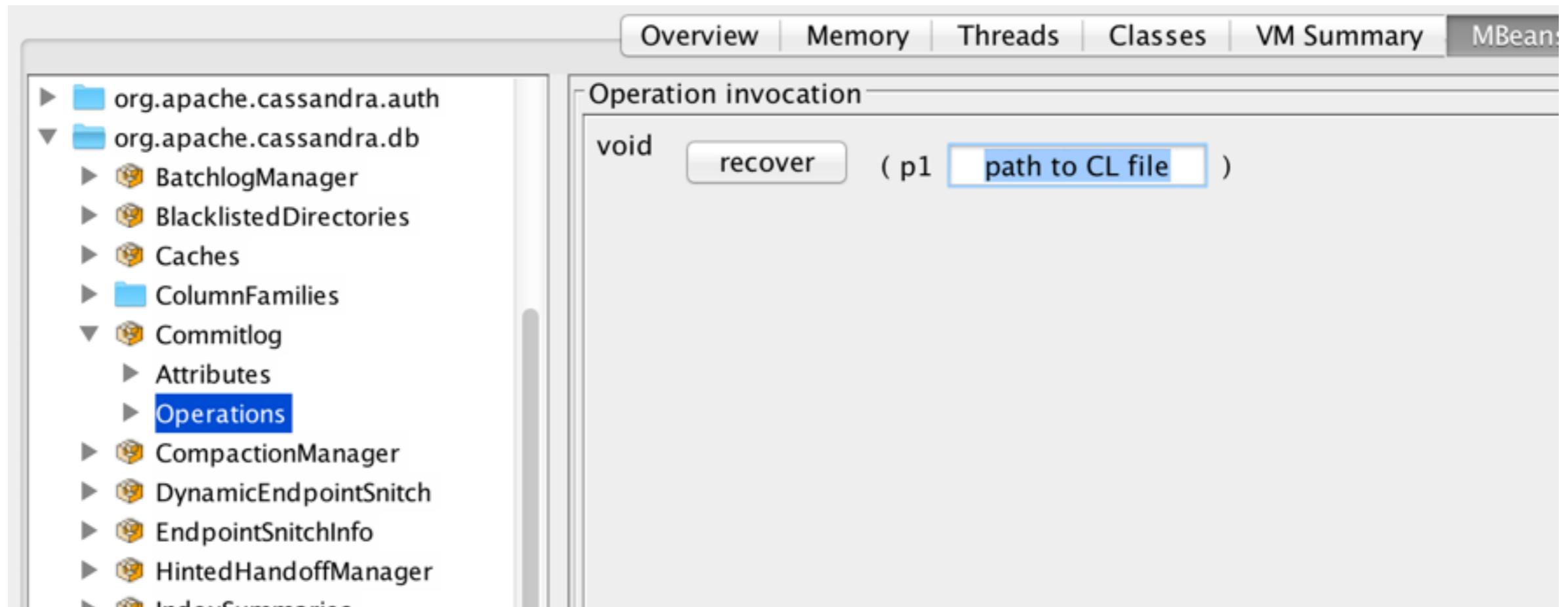
# bulk load (sync and async)



File path as arguments:

`/some/path/${keyspace}/${table}/`

# Recover commit log segments



Helpful for reloading commitlogs from a backup

## 4. Access Control: locking down JMX

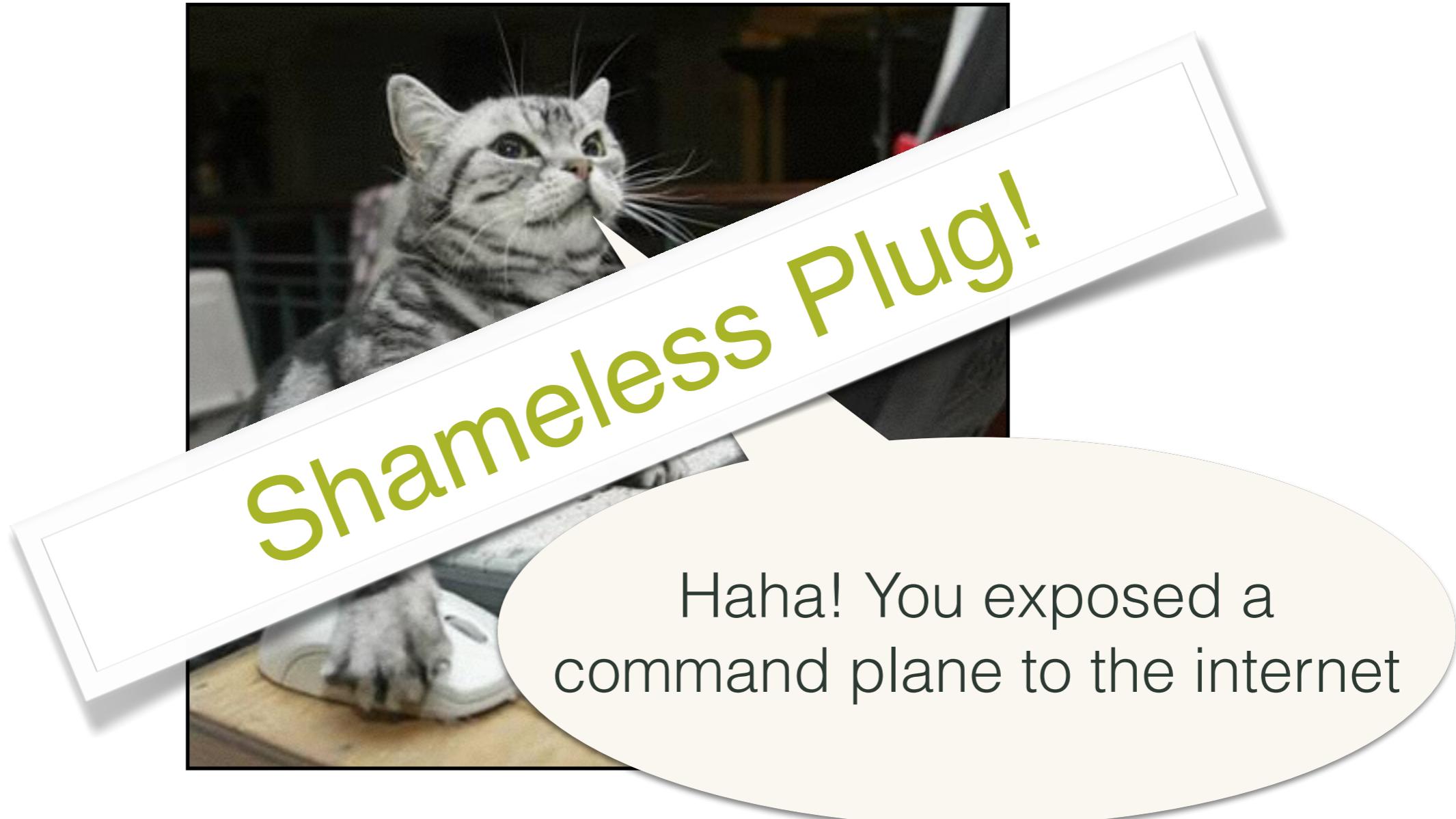


```
nmap -Pn -p7199 \  
-oG logs/cass.gnmap 54.88.0.0/14
```



Haha! You exposed a  
command plane to the internet

```
nmap -Pn -p7199 \  
-oG logs/cass.gnmap 54.88.0.0/14
```



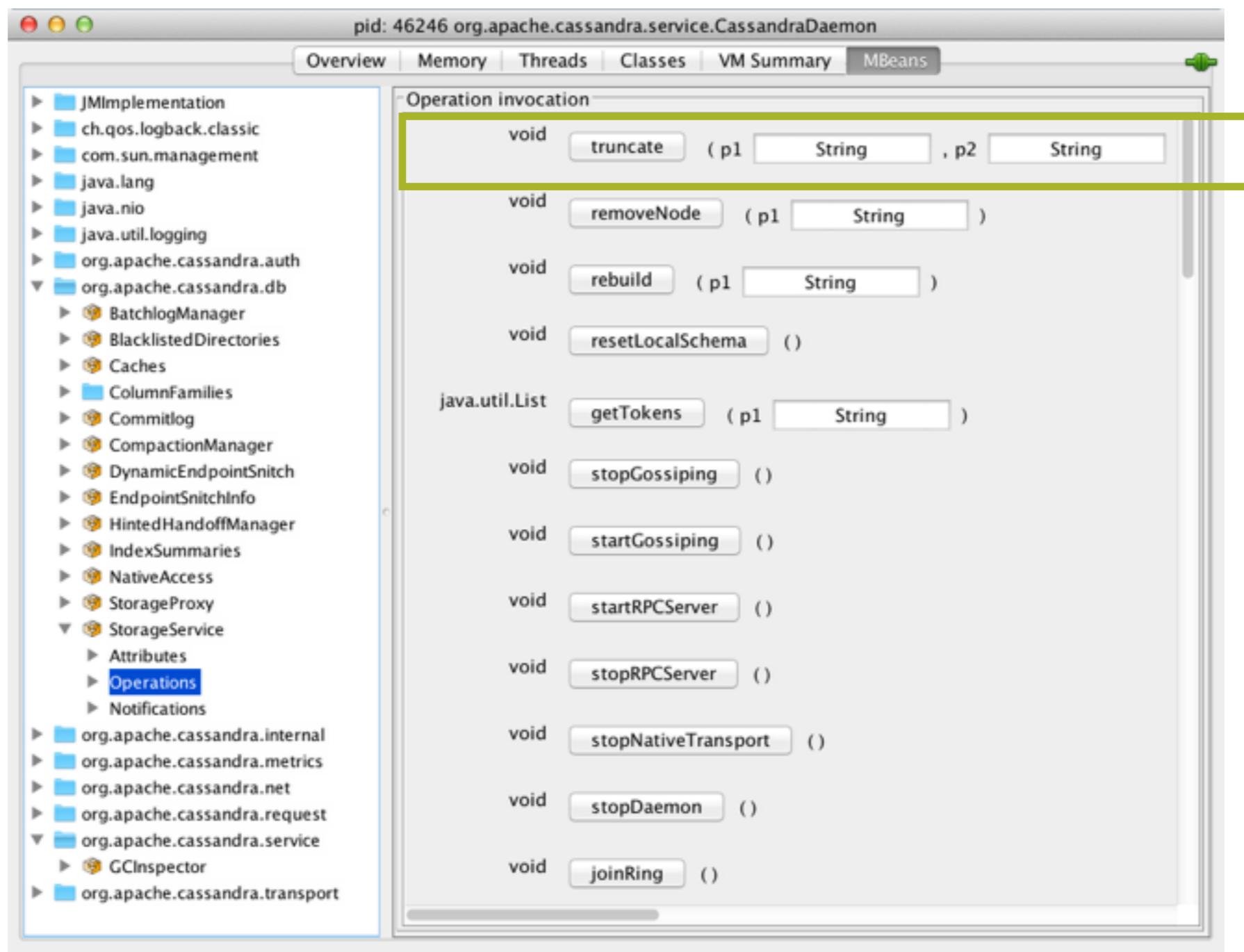
# Why do I need to secure JMX?

# Why do I need to secure JMX?

```
StorageService.truncate("your_keyspace", "your_table")
```

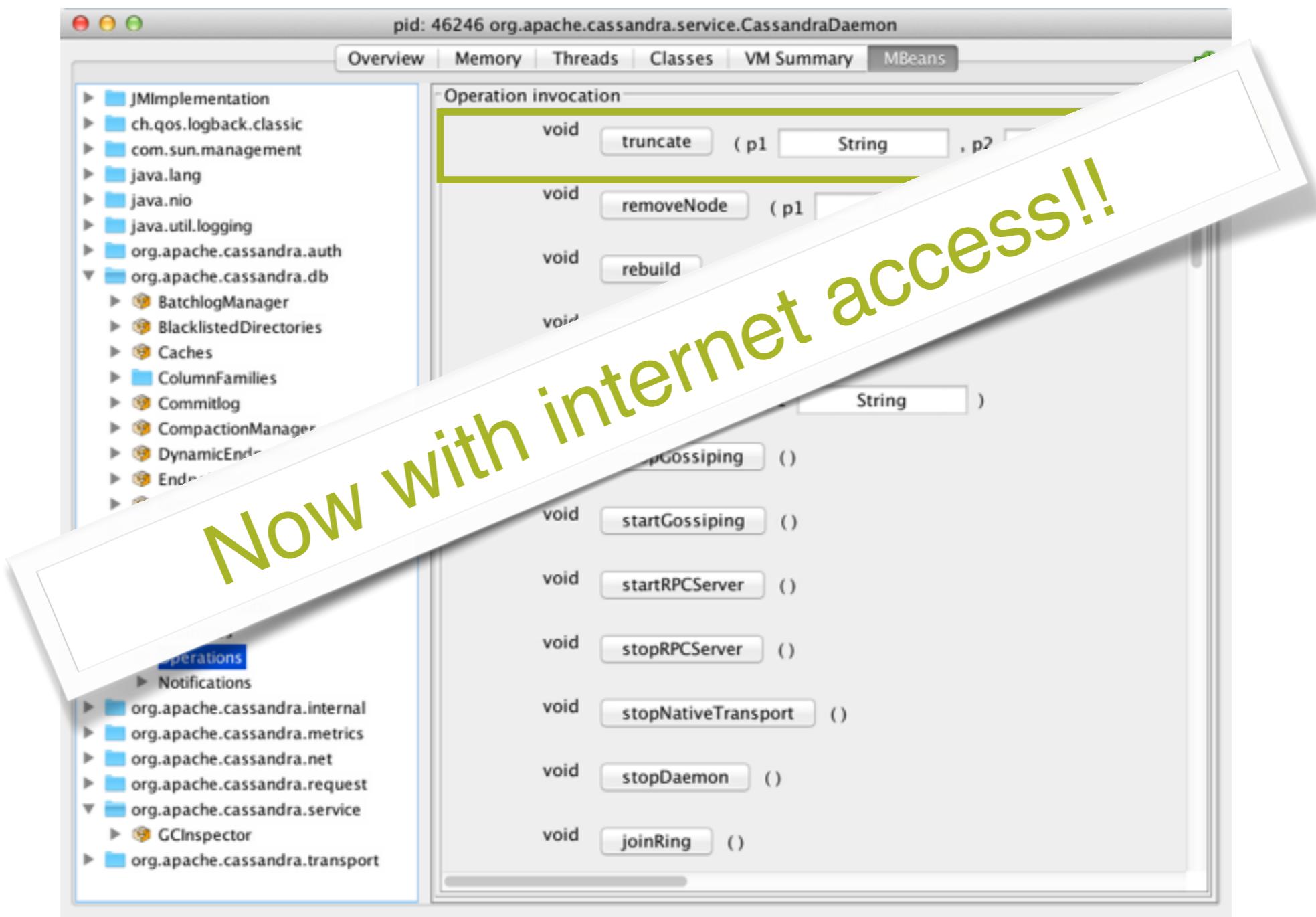
# Why do I need to secure JMX?

`StorageService.truncate("your_keyspace", "your_table")`



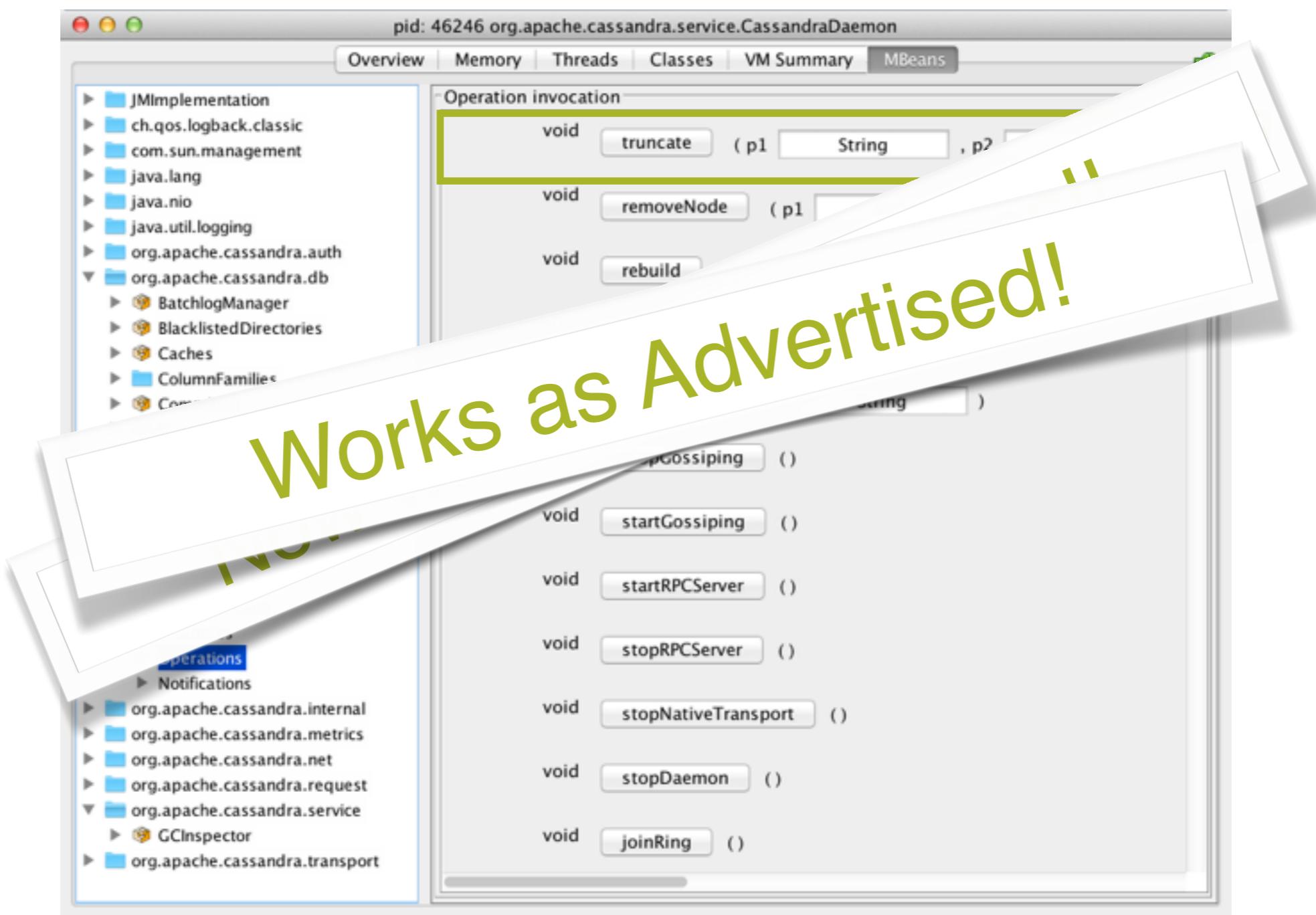
# Why do I need to secure JMX?

`StorageService.truncate("your_keyspace", "your_table")`



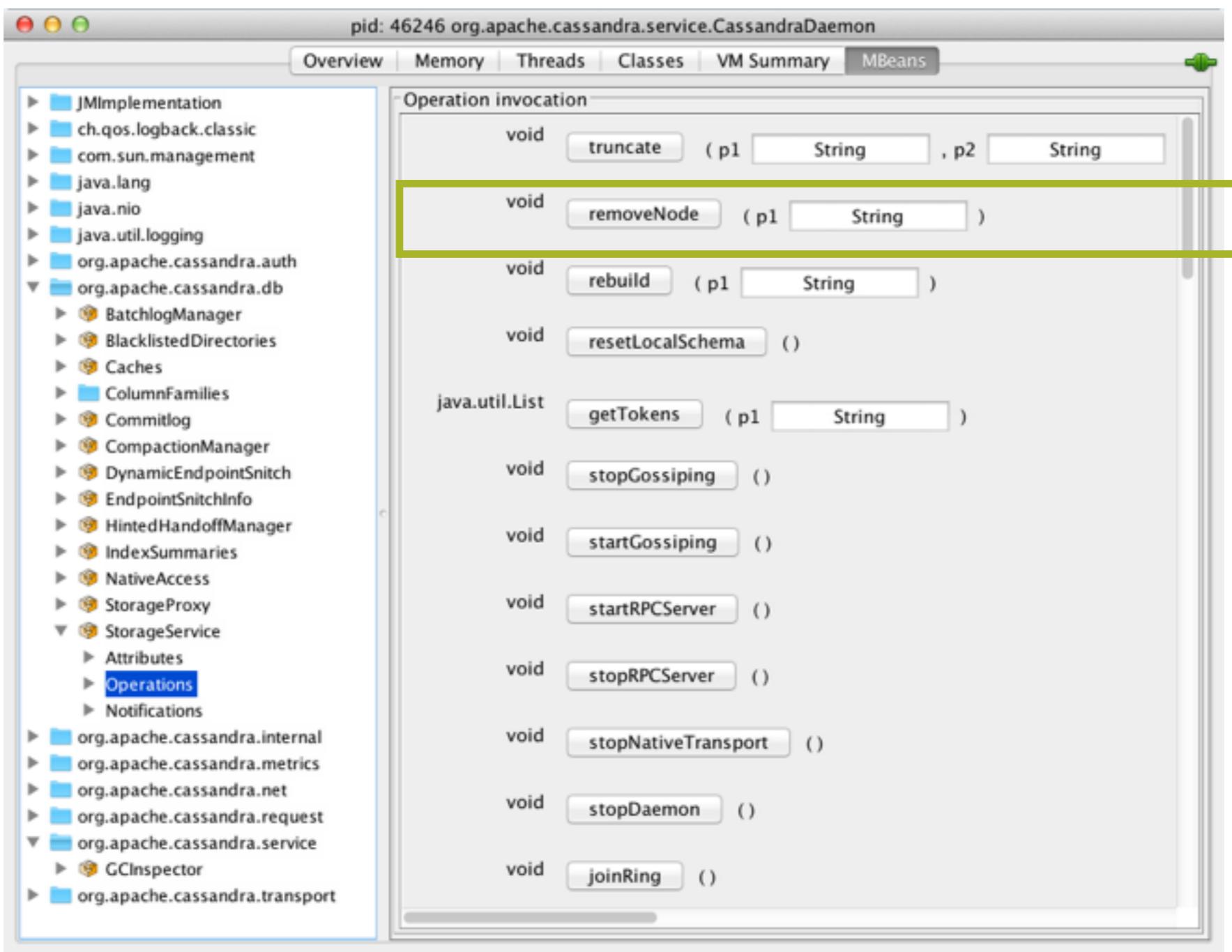
# Why do I need to secure JMX?

StorageService.truncate("your\_keyspace", "your\_table")



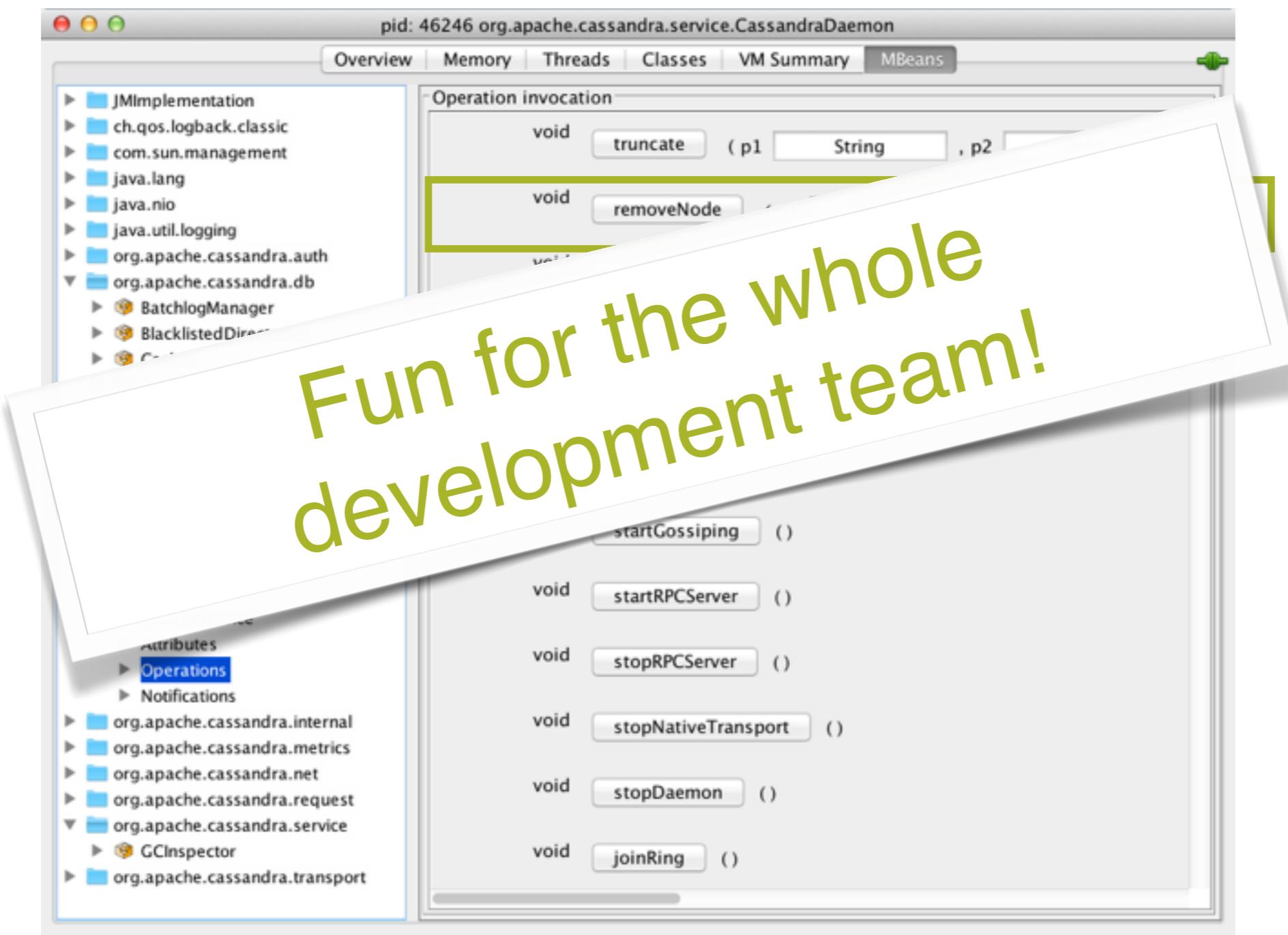
# Why do I need to secure JMX?

`StorageService.removeNode( "coworker_IPADR" )`



# Why do I need to secure JMX?

StorageService.removeNode( "coworker\_IPADR" )



# Securing JMX

```
1 JVM_OPTS="$JVM_OPTS -Djavax.net.ssl.keyStore=/etc/cassandra/server-keystore.jks"
2 JVM_OPTS="$JVM_OPTS -Djavax.net.ssl.keyStorePassword=awesomekeypass"
3 JVM_OPTS="$JVM_OPTS -Djavax.net.ssl.trustStore=/etc/cassandra/server-truststore.jks"
4 JVM_OPTS="$JVM_OPTS -Djavax.net.ssl.trustStorePassword=truststorepass"
5 JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.ssl.need.client.auth=true"
6 JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.registry.ssl=true"
7 JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.ssl.enabled.protocols=TLS"
8 JVM_OPTS="$JVM_OPTS -Dcom.sun.management.jmxremote.ssl.enabled.cipher.suites=[TLS_RSA_WITH_AES_256_CBC_SHA]"
```

SSL setup is like node to node and client to server

# Securing JMX

```
$JAVA_HOME/jre/lib/management/jmxremote.access  
$JAVA_HOME/jre/lib/management/  
jmxremote.password.template
```

JMX Authentication is straightforward  
and well documented

# Securing JMX

```
$JAVA_HOME/jre/lib/management/jmxremote.jar  
$JAVA_HOME/bin/jconsole
```

Now you can:  
nodetool -u admin -pw secret compactionstats

JMX Authentication is straightforward  
and well documented

# Securing JMX

```
$JAVA_HOME/jre/lib/management/jmxremote.jar  
$JAVA_HOME/bin/jconsole
```

Now you can:  
nodetool -u admin -pw secret compactionstats

JMX Authentication is straightforward  
and well documented

**Tip:** -pwf option will read the password from a file

# Securing JMX

\$JAVA\_HOME/jre/lib/management  
RBAC for JMX Authentication and Authorization  
is now supported

JMX Authentication is straightforward  
and well documented

<https://issues.apache.org/jira/browse/CASSANDRA-10091>

# Thanks!

@zznate

THE LAST PICKLE