HP

Couchbase

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Introduction

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Introduction

You've just launched your new web application, and by happy accident, it's gone viral and your usage has exploded from the few thousand users you originally expected to hundreds of thousands. If you are lucky, it will expand to millions within a few days.

With a little further planning, you may have decided to employ some kind of caching layer that allows you to store information in the RAM of your servers so that you don't have to make so many queries to the database for information that hasn't changed.

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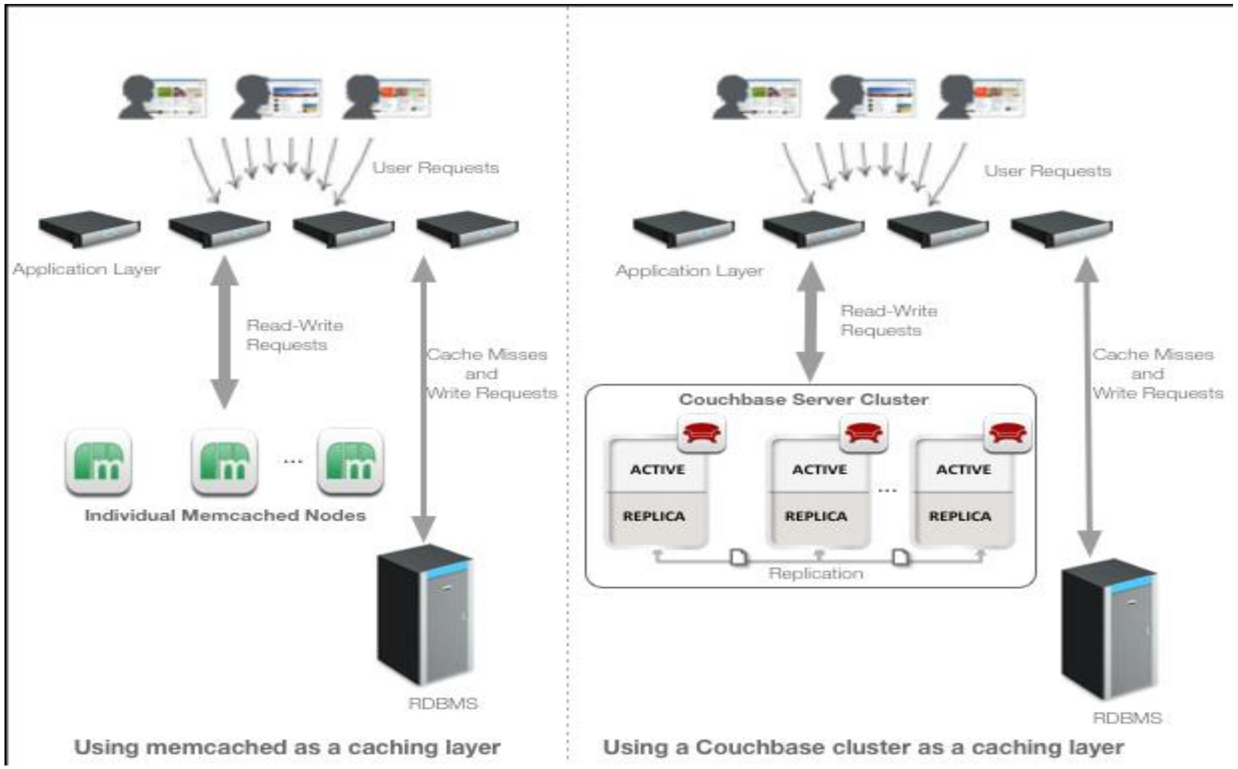
Couchbase Server

- Caching layer
- built-in distribution system that doesn't require changes to your application


User Requests
Application Layer
Read-Write Requests
Cache Misses and Write Requests
Individual Memcached Nodes
RDBMS
Using memcached as a caching layer
User Requests
Application Layer
Read-Write Requests
Couchbase Server Cluster
ACTIVE
REPLICA
Replication
Cache Misses and Write Requests
RDBMS
Using a Couchbase cluster as a caching layer

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Couchbase Server

Couchbase Server addresses many of these problems. It has a caching layer built in, and a built-in distribution system that doesn’t require changes to your application. You can also expand your database system on the fly, without taking your application down, changing the configuration, or restarting it.

Introducing Couchbase Server

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Couchbase Server

NoSQL Document Database

Couchbase Open Source Project

- Leading NoSQL database project focused on distributed database technology and surrounding ecosystem

- Supports both key-value and document-oriented use cases

- All components are available under the Apache 2.0 Public License

- Obtained as packaged software in both enterprise and community editions.

Couchbase
Open Source Project

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Couchbase Server

- Couchbase Server is a distributed, document-based database that is part of the NoSQL database movement. Couchbase Server is a persistent database that leverages an integrated RAM caching layer, enabling it to support very fast create, store, update, and retrieval operations.

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Couchbase Server

Easy Scalability

Grow cluster without application changes, without downtime with a single click

Consistent High Performance

Consistent sub-millisecond read and write response times with consistent high throughput

Always On 24x365

No downtime for software upgrades, hardware maintenance, etc.

Flexible Data Model

JSON document model with no fixed schema.

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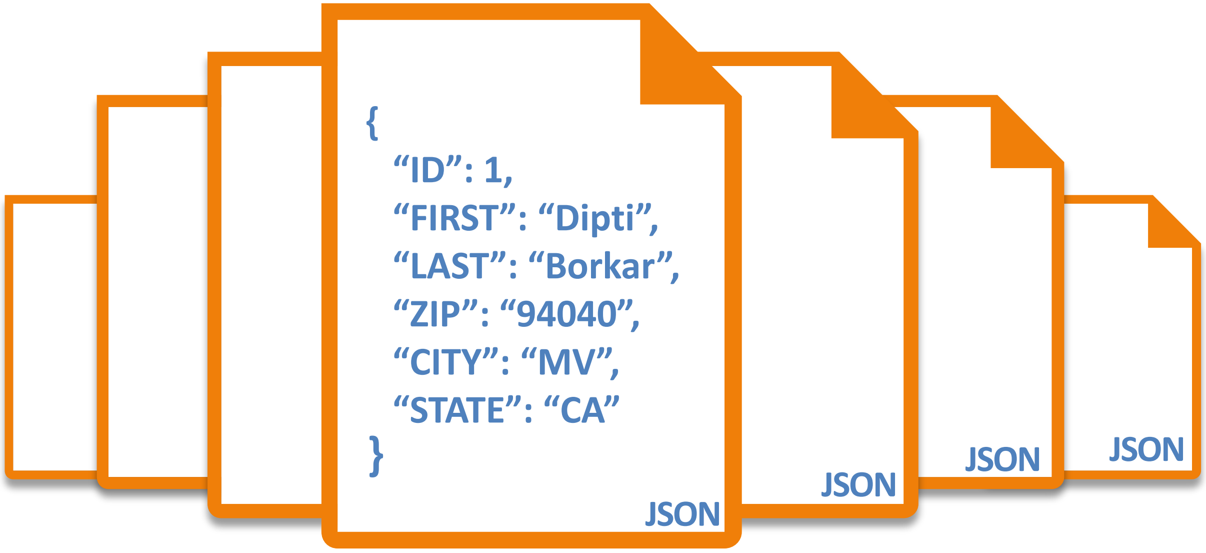
Flexible Data Model



```
{
  "ID": 1,
  "FIRST": "Dipti",
  "LAST": "Borkar",
  "ZIP": "94040",
  "CITY": "MV",
  "STATE": "CA"
}
```

- No need to worry about the database when changing your application
- Records can have different structures, there is no fixed schema
- Allows painless data model changes for rapid application development

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Features

JSON support

Indexing and Querying

N1QL

Incremental Map Reduce

Cross data center replication

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Couchbase features

- JSON support – natively stored as json, when you build an app, there is not conversion required. New doc viewing , editing capability.
- Indexing and querying – look inside your json, build views and query for a key, for ranges or to aggregate data
- Incremental mapreduce – powers indexing. Build complex views over your data. Great for real-time analytics
- N1QL – Couchbase query language [Nickel]
- XDCR – replicate information from one cluster to another cluster

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Additional Couchbase Server Features

Built-in clustering – All nodes equal

Data replication with auto-failover

Zero-downtime maintenance

Built-in managed cached

Append-only storage layer

Online compaction

Monitoring and admin API & UI

SDK for a variety of languages

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Additional Couchbase Server Features

- All nodes are equal, single node type, easy to scale your cluster. No single point of failover
- Every node manages some active data and some replica data.
- Data is distributed across the cluster and hence the load is also uniformly distributed using auto sharding.
- We have a fixed number of shards that a key get hashed to. 1024 shards, distributed across the cluster.
- Replication within the cluster for high availability. Number of replicas are configurable with upto 3 replicas.
- With auto-failover or manual failover, replica information is immediately promoted to active
- Add multiple nodes at a time to grow and shrink your cluster.

Couchbase Architecture

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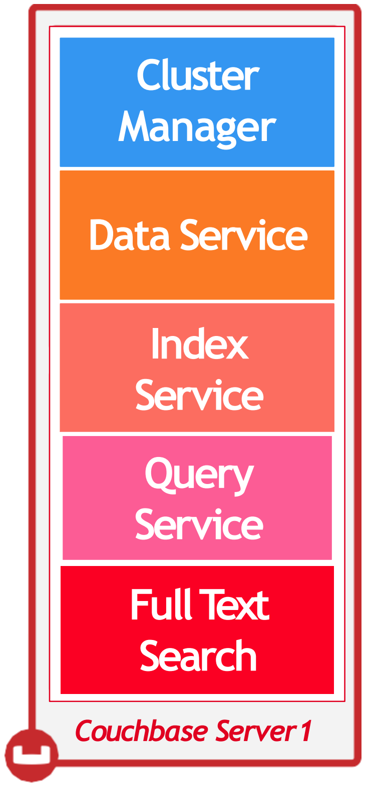
Choice of Services



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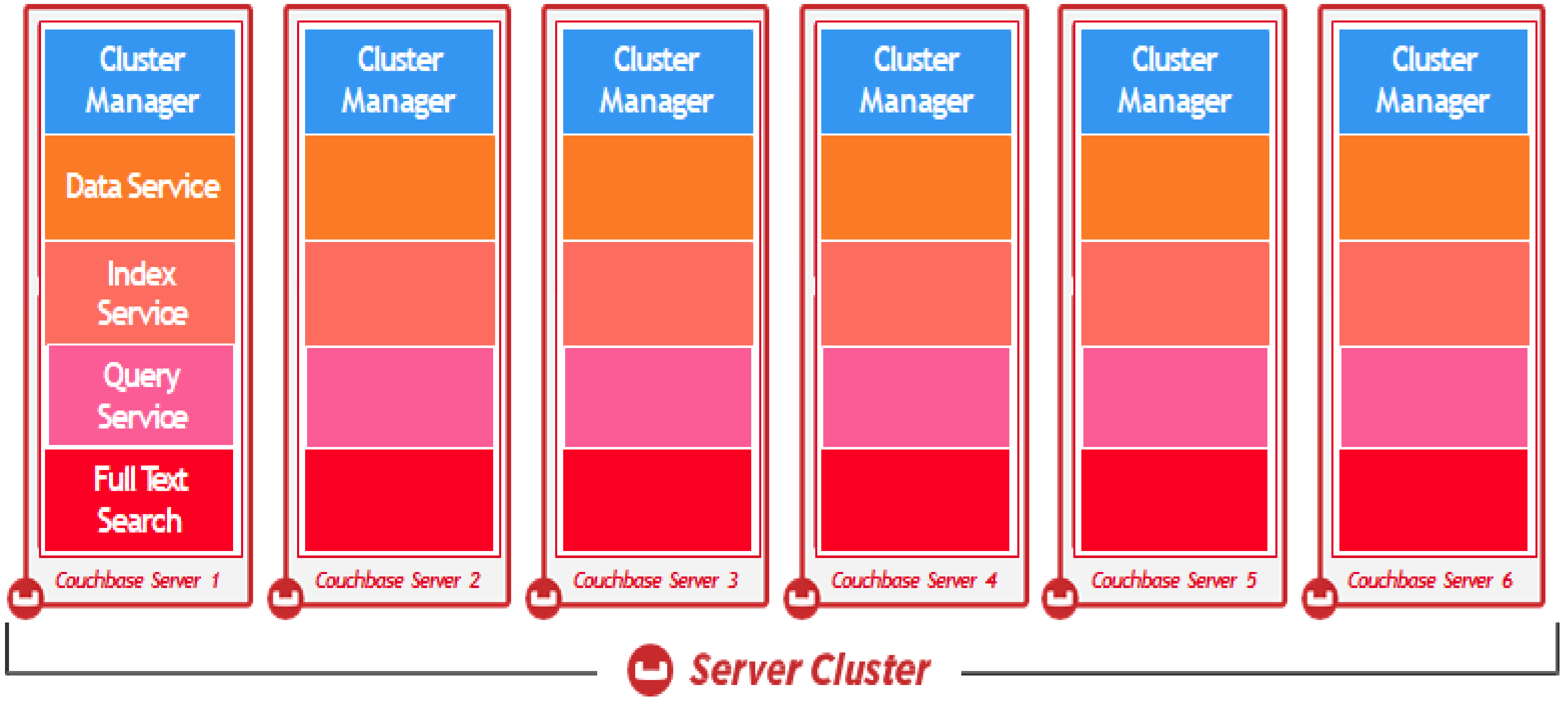
Choice of Services



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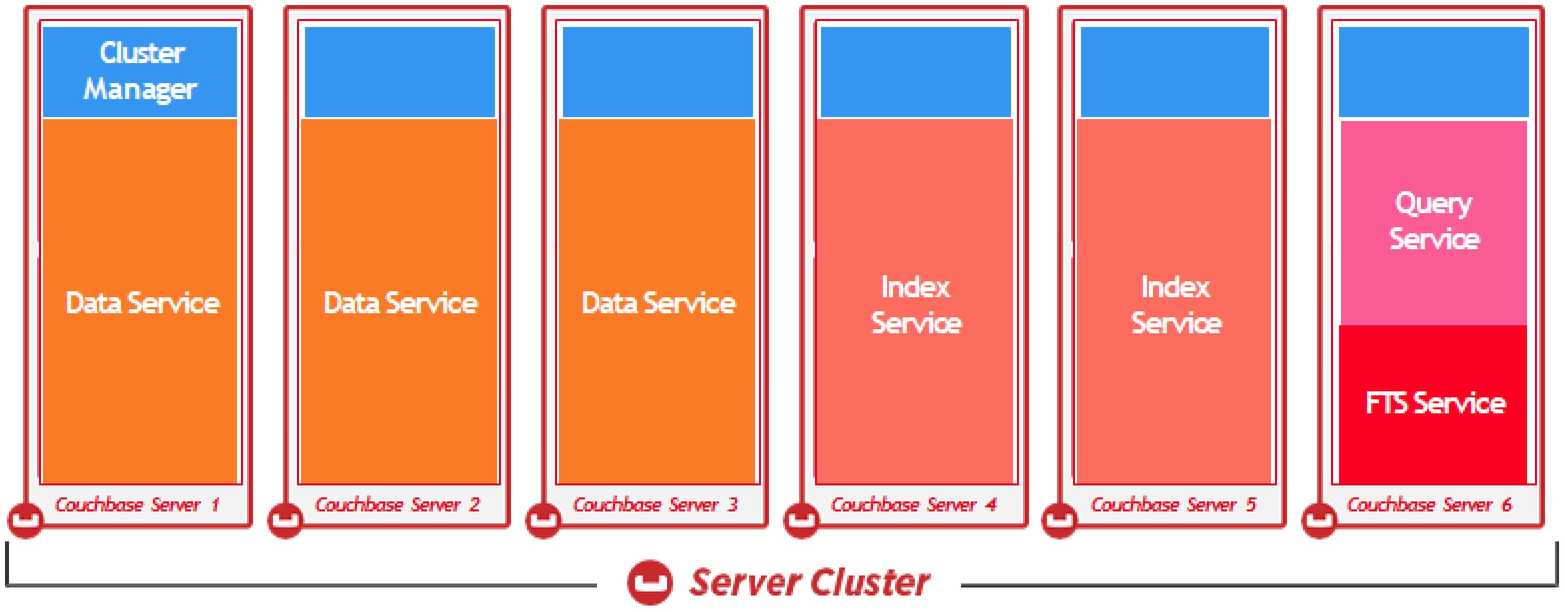
Choice of Services



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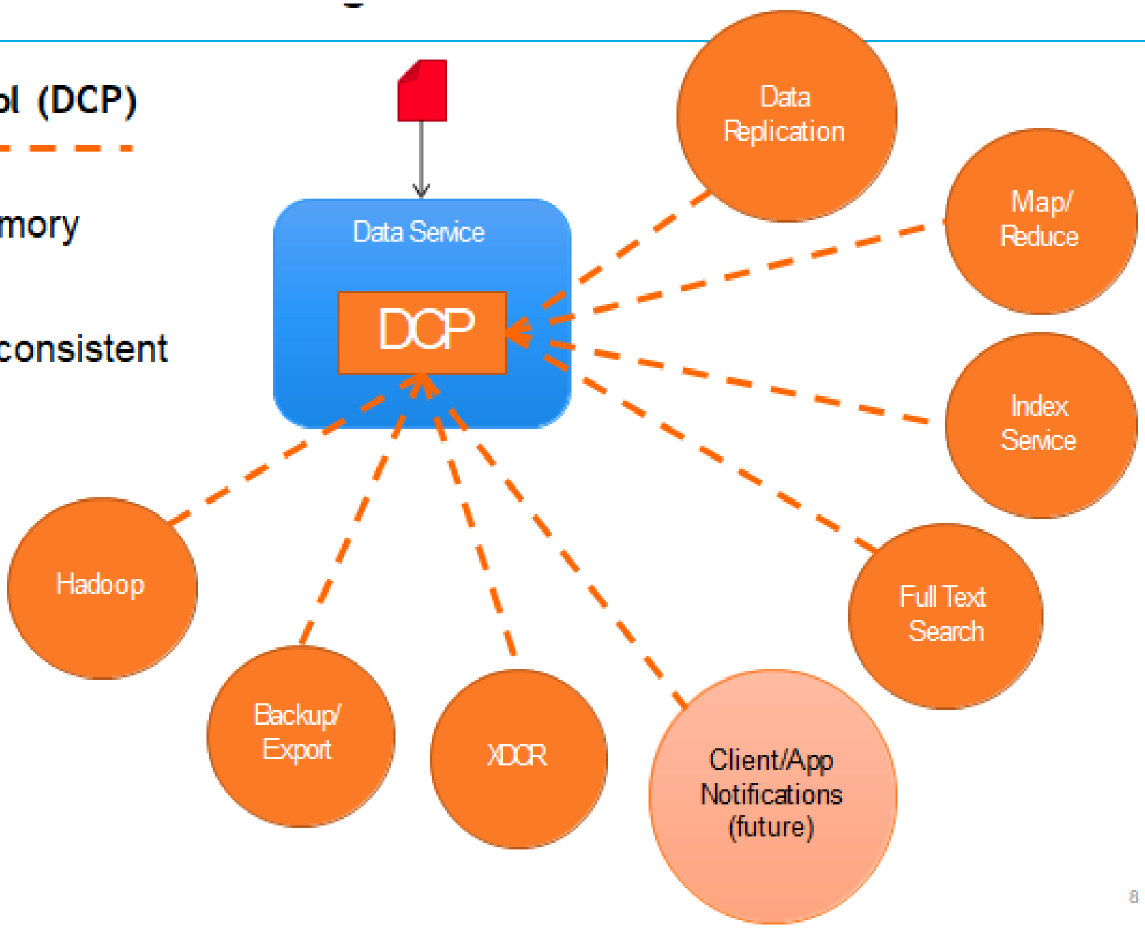
Exceptional Data Streaming

- **Database Change Protocol (DCP)**

- High Performance / In-Memory
- De-Duplication
- Ordered, predictable and consistent
- Restartable



Cluster Manager

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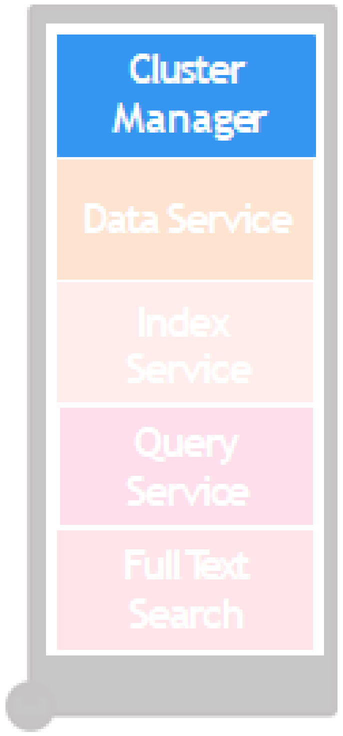
The ClusterManager

The control plane of the server:

- Cluster membership
  - Status & health monitoring
- Service layout
- Data placement
  - Rebalance
  - Failover
- Authentication
- Admin APIs

Implemented in Erlang



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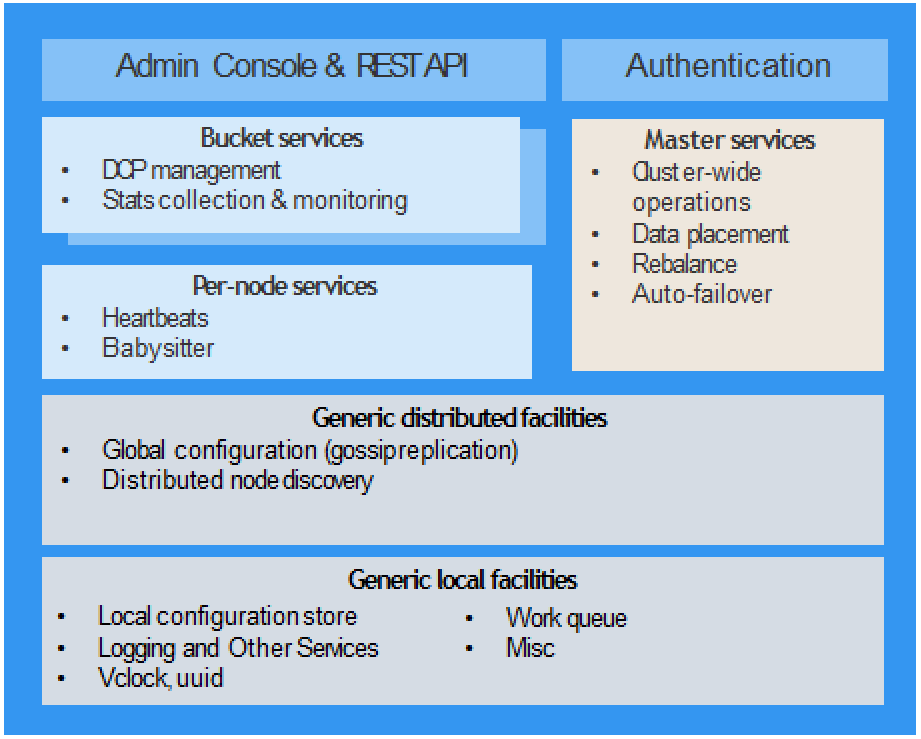

Data Service

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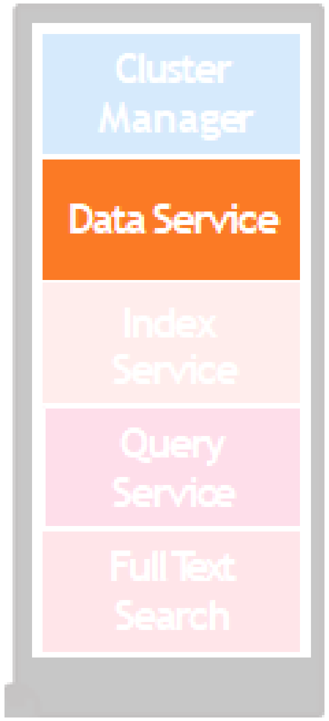
The Data Service

The (low-level) data plane of the server:

- Key/Value access
- Map/Reduce Views [*]

KV-Engine:

- Evolution of memcached; adding persistence, replication, enhanced data access APIs
- Asynchronous networking supports ~10K clients.
- Memory-centric architecture.
- Disk IO performed via background threads.



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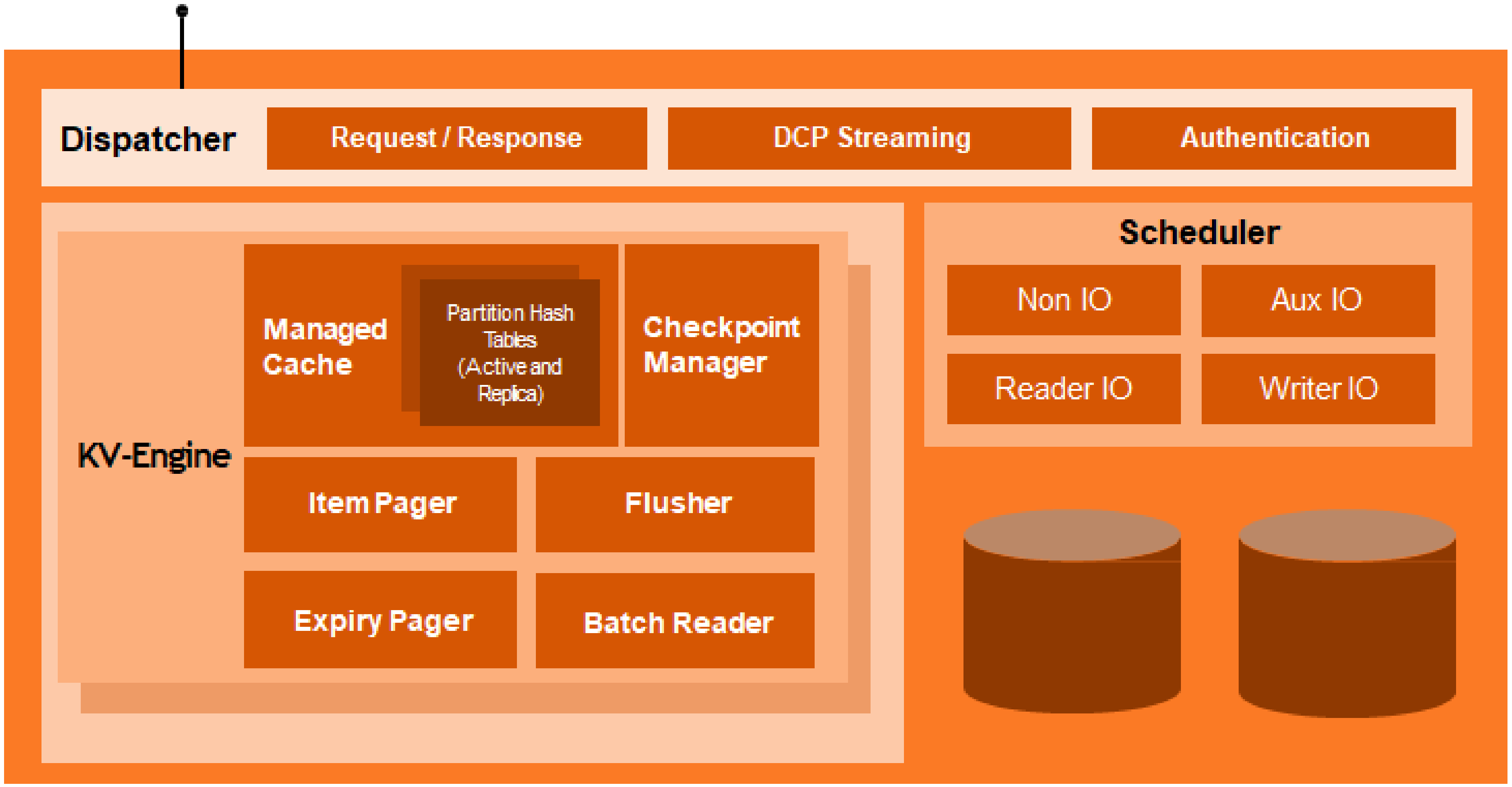
DataService Architecture



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Caching Layer

- includes a built-in caching layer
- acts as a central part of the server
- automatically places items that come into the caching layer into disk queue so that it can write these items to disk.
- the entire process of managing data between the caching layer and data persistence layer is handled entirely by server

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IndexingService

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Indexing and Querying – The basics

- Define materialized views on JSON documents and then query across the data set
- Using views you can define
    - Primary indexes
    - Simple secondary indexes (most common use case)
    - Complex secondary, tertiary and composite indexes
    - Aggregations (reduction)
- Indexes are ***eventually indexed***
- Queries are ***eventually consistent***
- Built using Map/Reduce technology
    - Map and Reduce functions are written in Javascript

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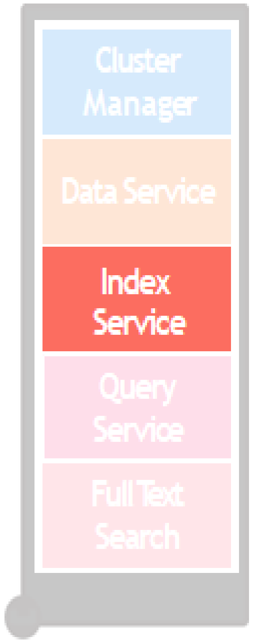
Index Service

Three "indexing" services:

- Incremental Map / Reduce Views
  - Javascript map() & reduce() functions applied to all mutations
  - Supports geo-spatial views
  - Co-located with Data service
- **Global Secondary Indexes** (GSI)
- Full-Text Search – more later

GSI: efficient indexes for secondary lookups and ad-hoc query processing



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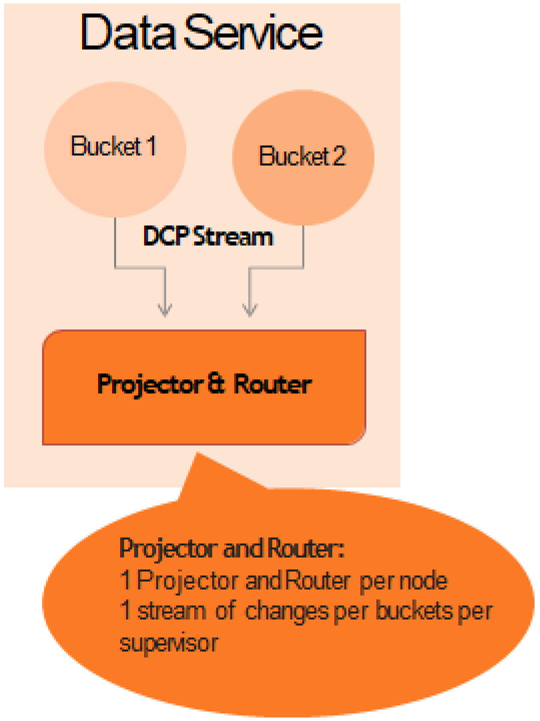
Indexing Service


Data Service
Bucket 1
Bucket 2
DCP Stream
Projector & Router
Projector and Router:
1 Projector and Router per node
1 stream of changes per buckets per supervisor

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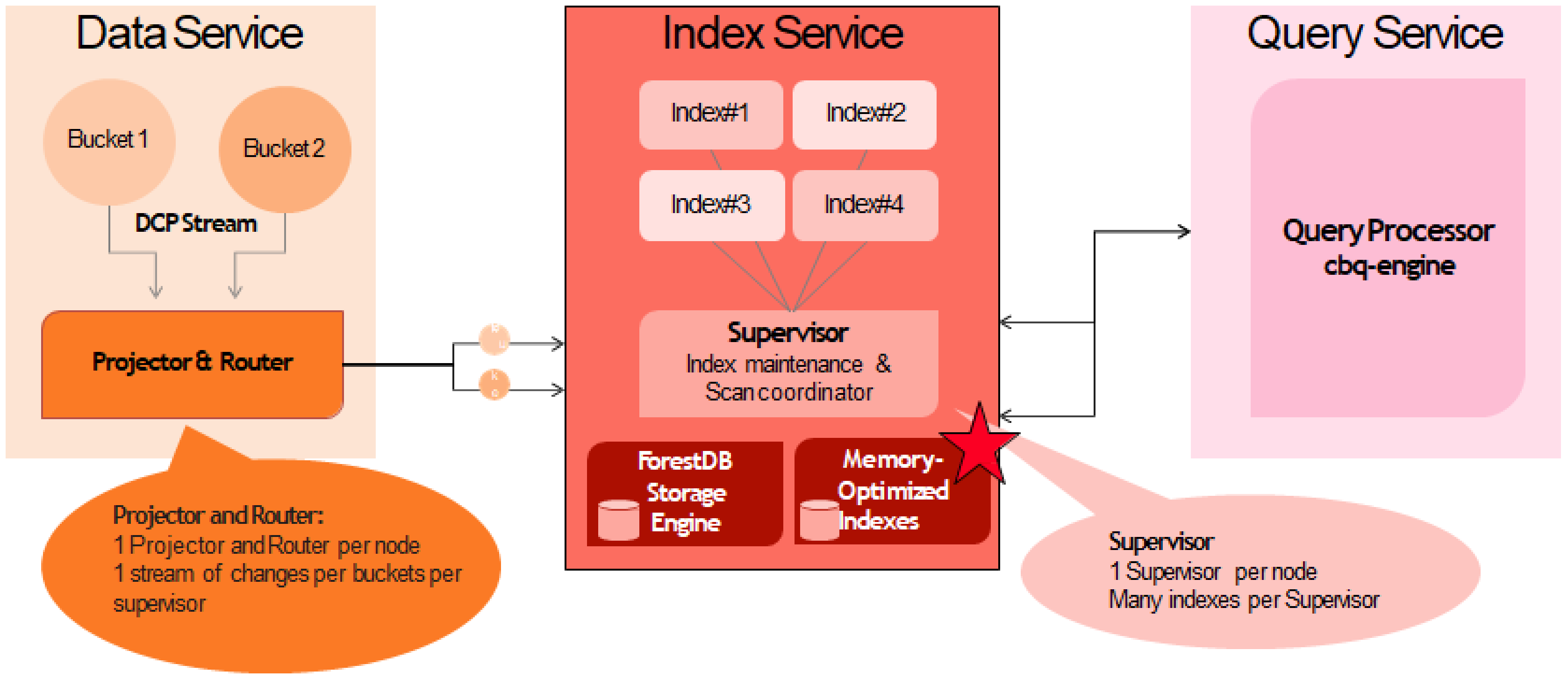
Indexing Service



Query Service

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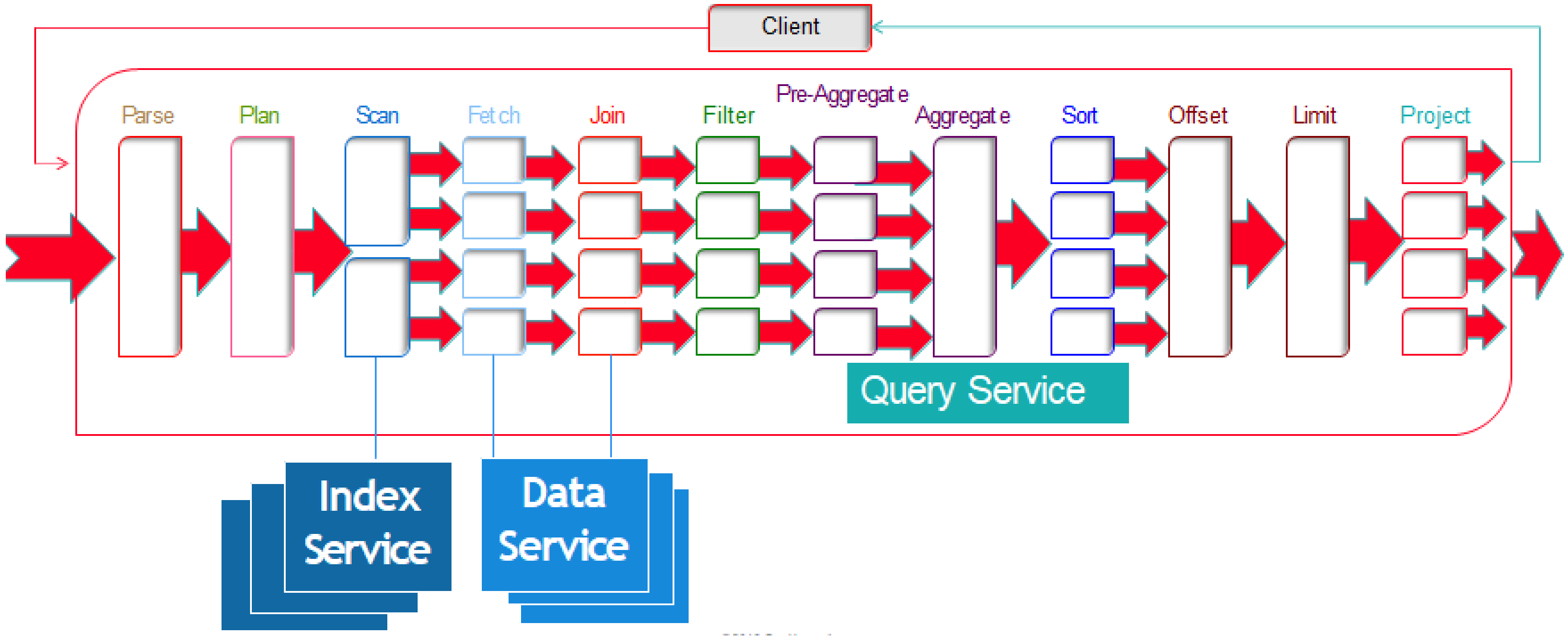
Query Service



Full TextSearch

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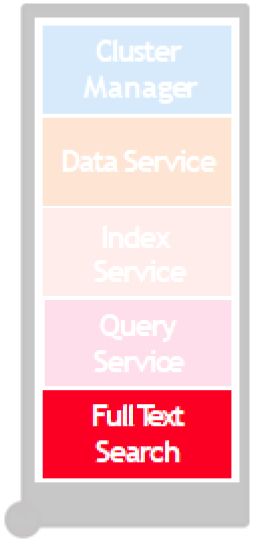
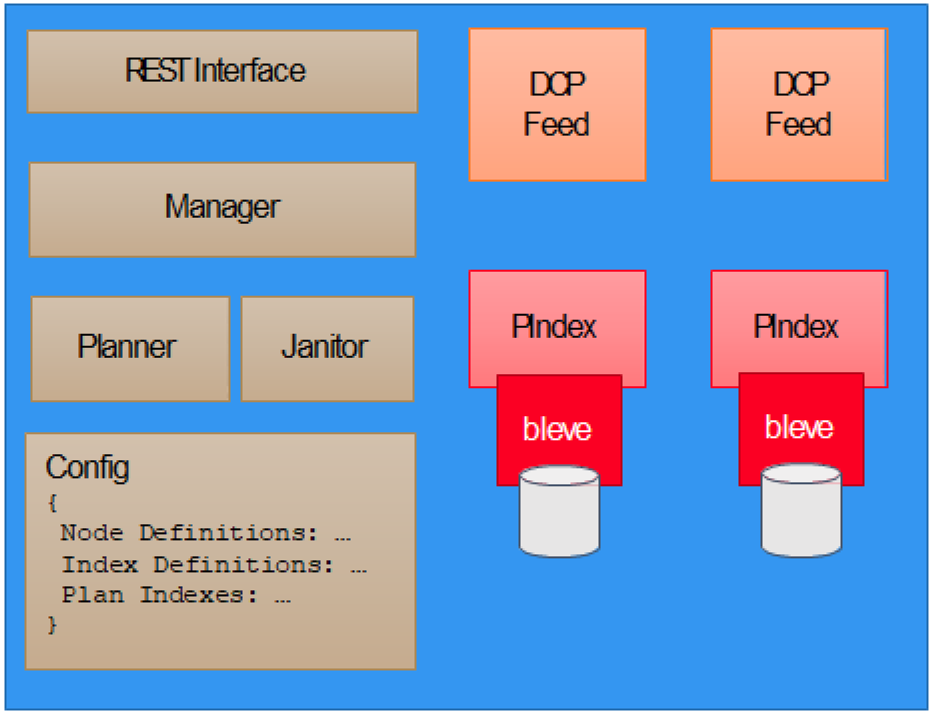
FullText Search

"Googling for your JSON documents"

- Index Fields or Documents
- Lexical Analysis and Stemming
- Flexible Query Capabilities
- Available and Scalable





```
{
 Node Definitions: …
 Index Definitions: …
 Plan Indexes: …
}
```

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Cross Data Center Replication

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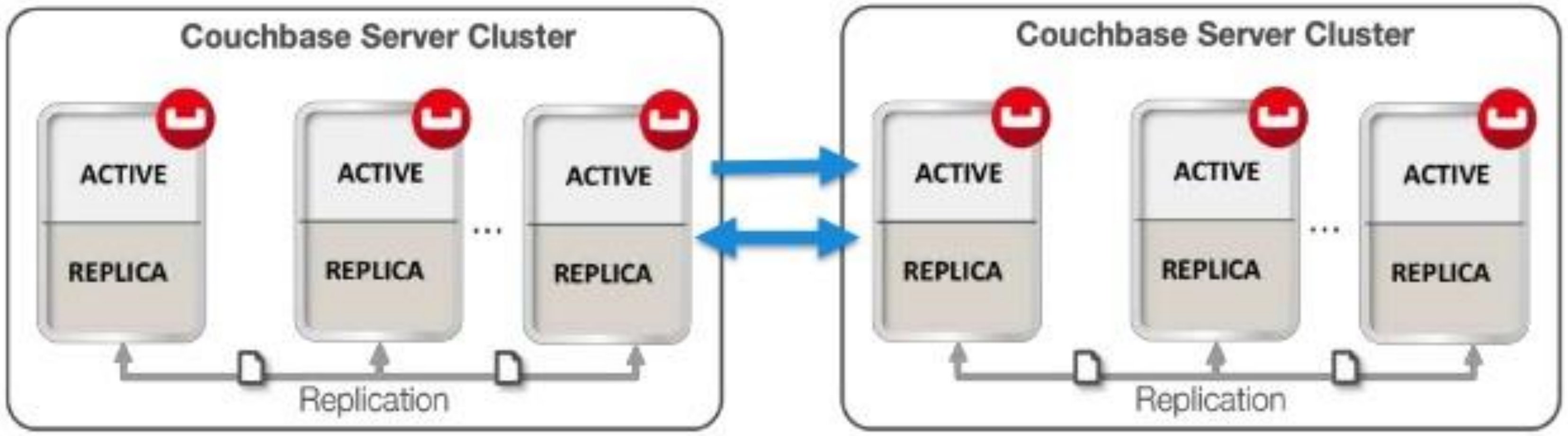
Cross Data Center Replication – The basics

Cross Datacenter Replication (XDCR)

- Unidirectional Replication
- Bidirectional Replication



- Hot spare / Disaster Recovery
- Development/Testing copies

- Datacenter Locality
- Multiple Active Masters

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Cross Data Center Replication – The basics

- Replicate your Couchbase data **across clusters**
- Clusters may be spread across geos
- Configured on a per-bucket (per-database) basis
- Supports unidirectional and bidirectional operation
- Application can read and write from both clusters
    - Active – Active replication
- Replication throughput scales out linearly
- Different from intra-cluster replication

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Couchbase and Traditional RDMS

Couchbase Server	(RDBMS)
Rapidly scalable to millions of users.	Scalable to thousands of users.
Data can be structured, semi-structured, and unstructured	Data must be normalized.
Data can be flexibly stored as JSON documents or binary data. No need to predefine data types.	Data types must be predefined for columns.
Data stored as key-document pairs; well suited for applications which handle rapidly growing lists of elements.	Data stored in tables with fixed relations between tables.
Asynchronous operations and optimistic concurrency enable applications designed for high throughput.	Strict enforcement of data integrity and normalization, with the tradeoff of lower performance and slower response times.

Couchbase Lite

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Mobile Dev. -Couchbase Lite

- embedded JSON database that can work standalone, in a P2P network, or as a remote endpoint for Couchbase Server.
- Provides native APIs for the iOS and Android platform
- Supports replication with compatible database servers
- Supports low-latency and offline access to data.

Installation

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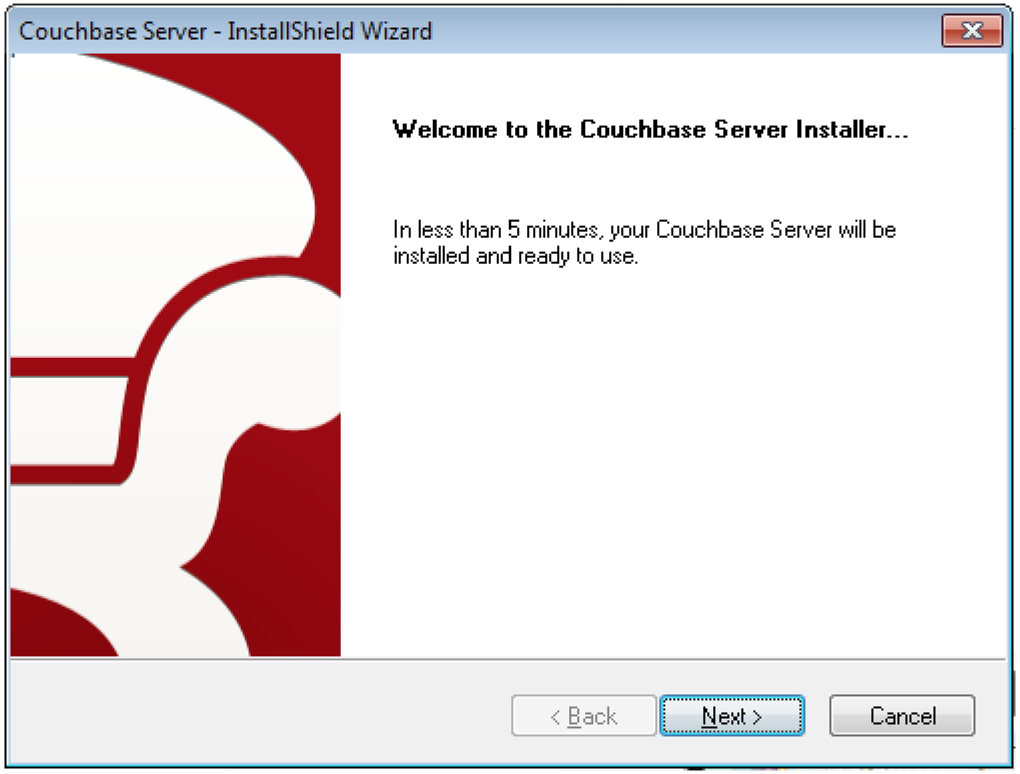
Couchbase: Microsoft Windows Installation



Welcome to the Couchbase Server Installer...

In less than 5 minutes, your Couchbase Server will be installed and ready to use.

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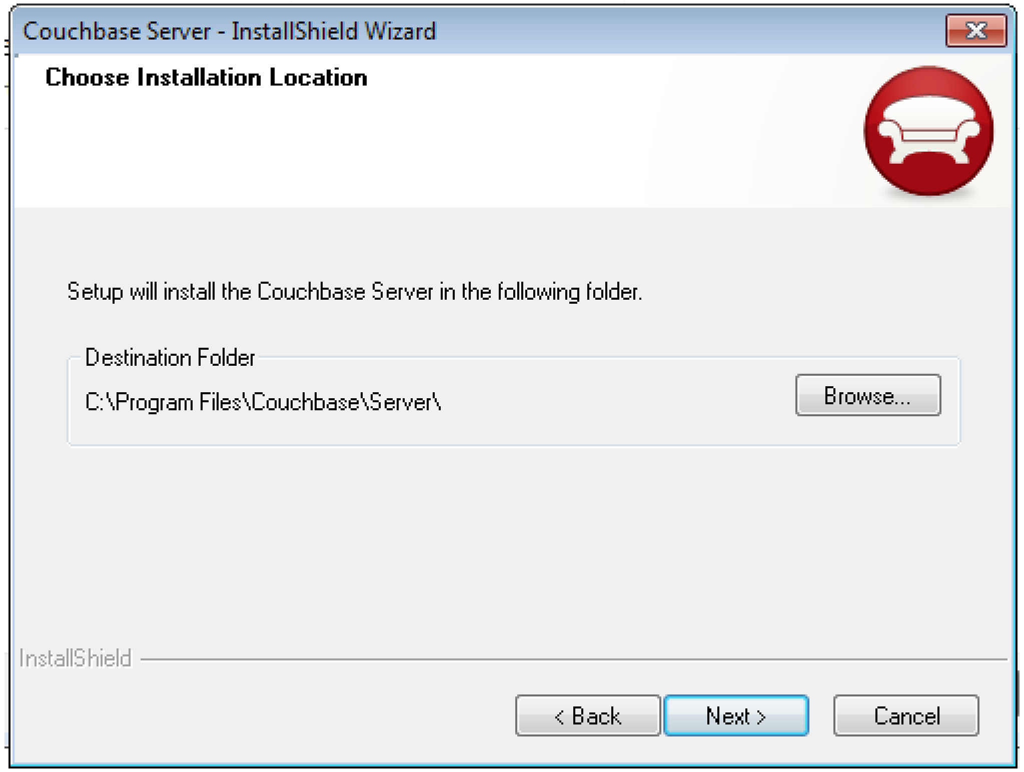
Windows Installation — Location Screen



Couchbase Server - InstallShield Wizard

Choose Installation Location

Setup will install the Couchbase Server in the following folder.

Destination Folder

C:\Program Files\Couchbase\Server\

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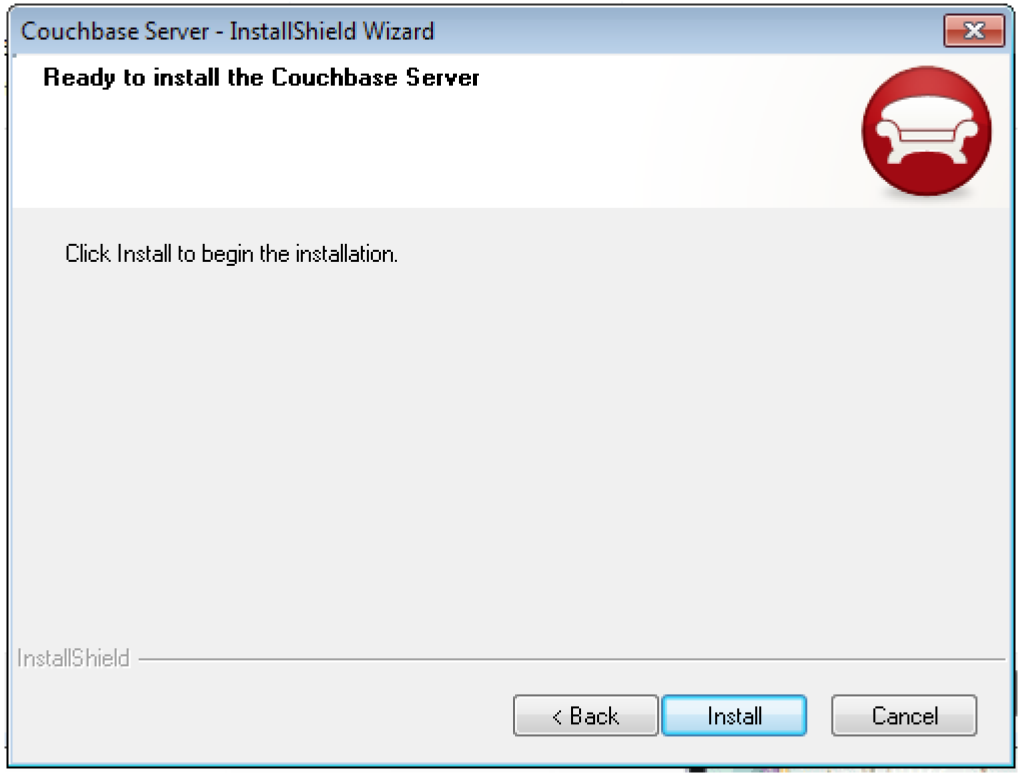
Windows Installation — Ready Screen



Couchbase Server - InstallShield Wizard

Ready to install the Couchbase Server

Click Install to begin the installation.

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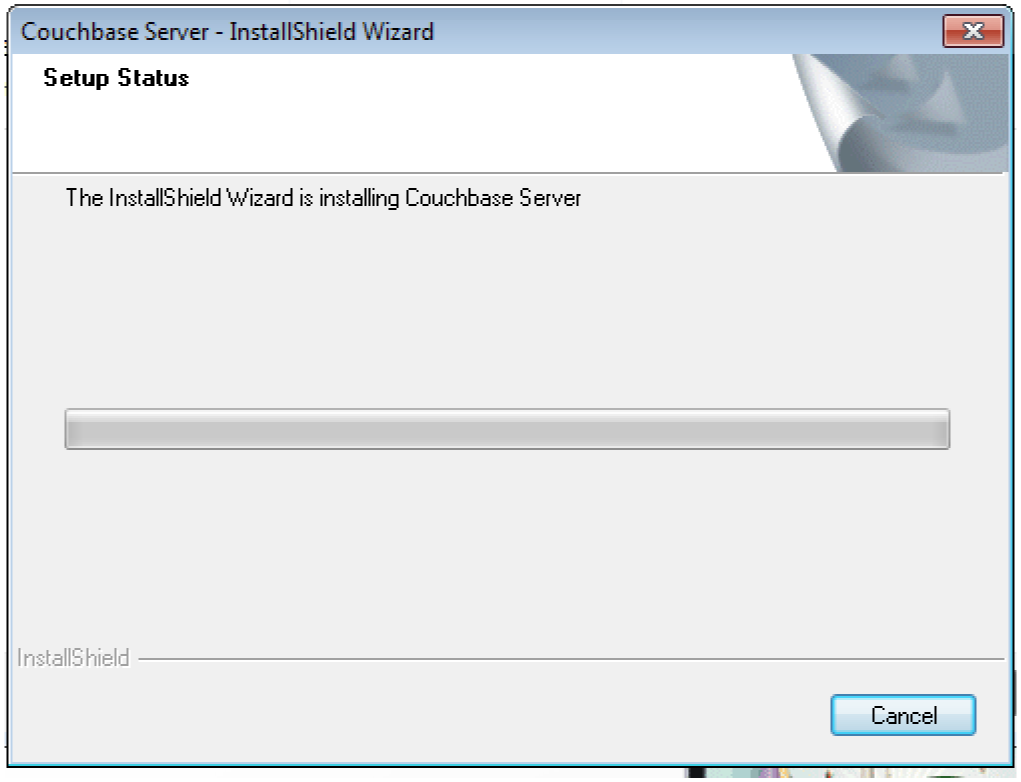
Windows Installation — Progress Screen



Couchbase Server - InstallShield Wizard

Setup Status

The InstallShield Wizard is installing Couchbase Server

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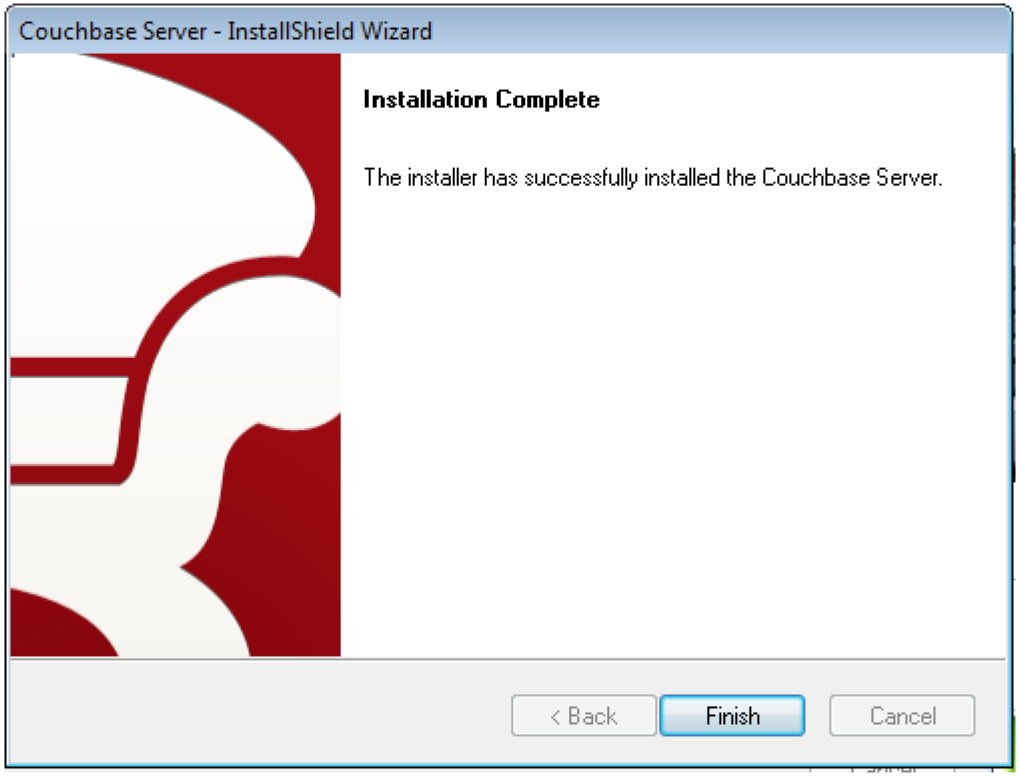
Windows Installation — Completion Screen


Couchbase Server - InstallShield Wizard

Installation Complete

The installer has successfully installed the Couchbase Server.

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Couchbase

- **LAB :**
- RED HAT AND CENTOS INSTALLATION
- COUCHBASE SERVER STARTUP AND SHUTDOWN & TESTING NODES