Features of key data services in IBM Bluemix PaaS

After you complete this section, you should understand:

The features of the following data services in IBM Bluemix PaaS:

- Cloudant NoSQL DB
- dashDB
- Time Series Database

Cloudant NoSQL service

A fully managed NoSQL database as a service

database with RESTful API

Can spread data across data centers and devices for scale and high availability (HA)

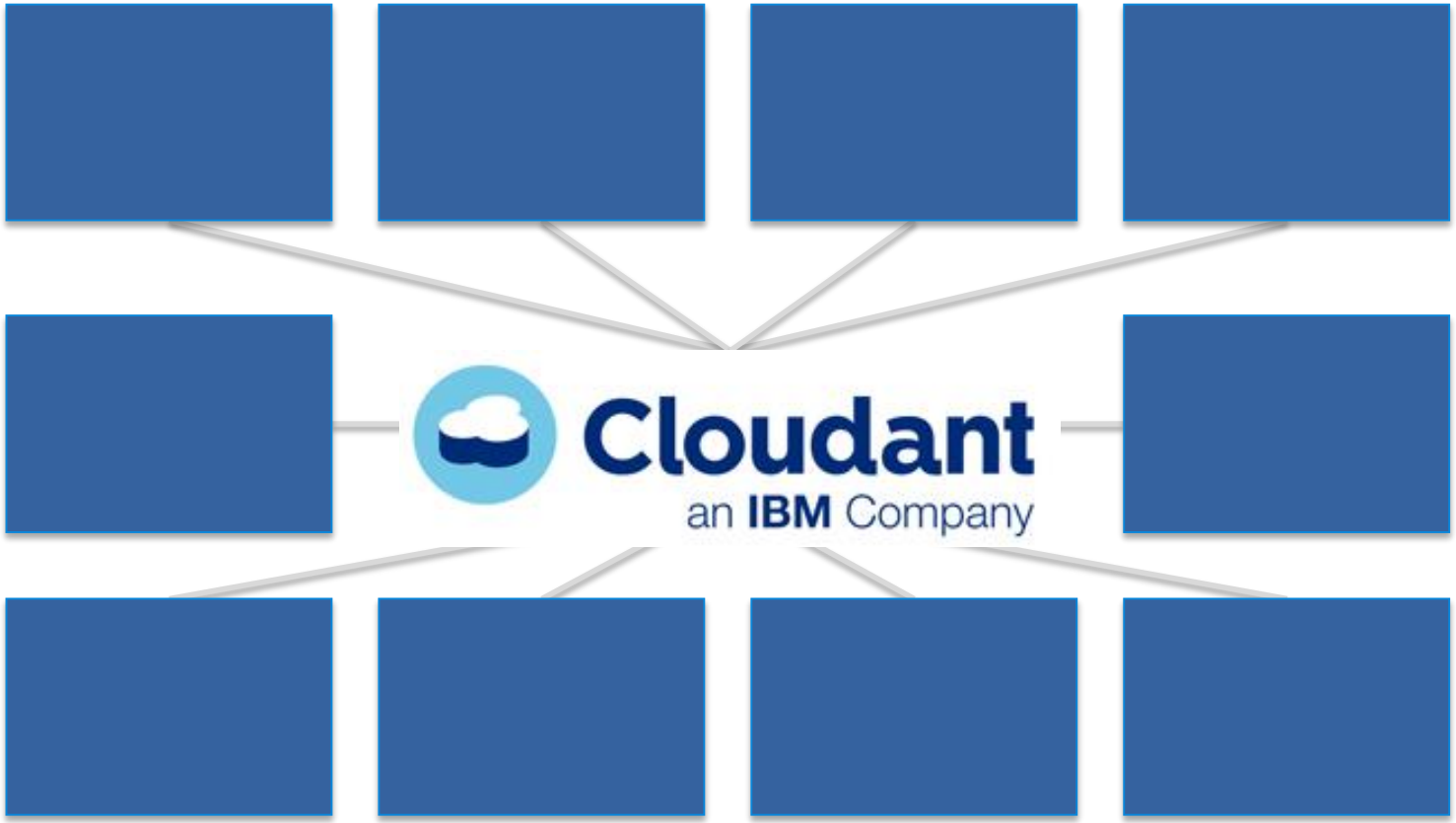
Ideal for apps that require:

- Massive, elastic scalability
- High availability
- Geo-location services
- Full-text search
- Occasionally connected users

Cloudant
an IBM® Company

Build More. Grow More. Sleep More.

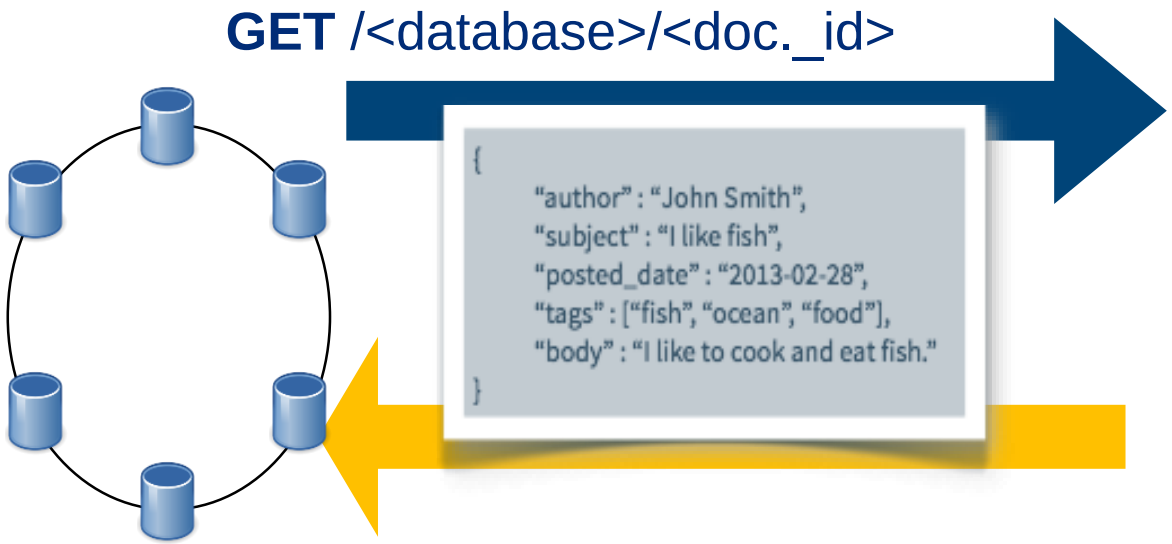
Cloudant DNA



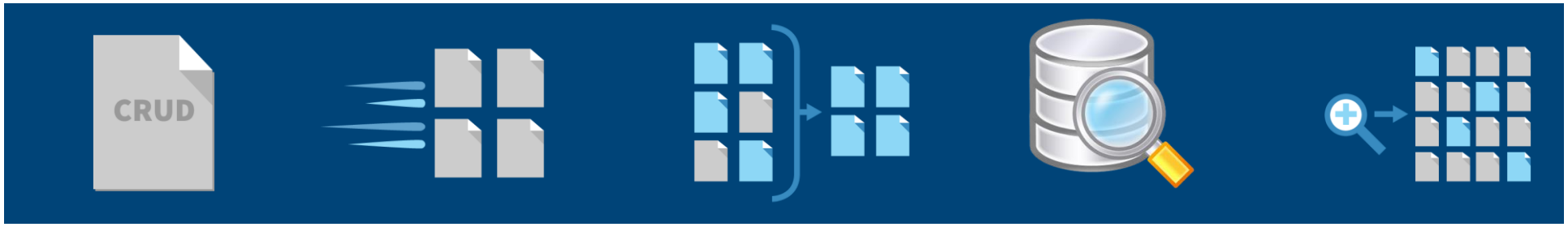
Cloudant combines the **best Open Source technology and thinking** to create the most **scalable**, **flexible**, **always-on DBaaS** for **big mobile** and the **Internet of Things.**

Cloudant HTTP RESTful API

- CRUD operations, document retrieval through indexes, search
- Agnostic to programming language
- Apache CouchDB compatibility



Highlights of the Cloudant API



JSON documents	Primary index	Secondary indexes	Cloudant Query	Search
Create Read Update Delete	Exists for every database out of the box Find docs by their primary key → _id	Built by using MapReduce Use when you need to analyze data Example: count data fields, aggregate or sum results, and so on	Declarative way to define and query indexes More natural interface for those familiar with SQL and Mongo style queries	Built by using Lucene Ad-hoc queries Find documents based on their content

Cloudant documents: _id and _rev

Each document has an _id (ID) field that is unique per database.

- Any string can be supplied as an _id, but it is recommended that you allow Cloudant to generate a UUID (universally unique identifier) for you.

There is also a unique _rev (revision number) field per document.

- This is generated by an md5 hash of the transport representation of the document.
- *N*-prefix reflects the number of times this document has been updated.
- Updates to existing documents must provide the latest _rev value; otherwise, the update request is rejected.

```
_id   7f123e23a328bd50ee123cd35452ae47
_rev   2-3123414209
```

Cloudant API: Returning a single document

HTTP GET with database name and _id of document. For example, to get a document with _id **100** from the **authors** database:

GET https://[username].cloudant.com/authors/100

```
{
  "_id": "100",
  "name": "John Smith",
  "agent": "Mary Reid",
  "telephone":"512-555-1212"
}
```

Cloudant API: Inserting a document (HTTP PUT or POST)

Via **POST:** document _id in document body

POST https://[username].cloudant.com/authors

```
{
  "_id": "101",
 "name": "Mary Smith",
 "agent": "John Reid",
"telephone":"512-555-1212"
}
```

```
{
  "ok": "true",
 "id": "101",
 "rev": "1-0af5e…"
}
```

Via **PUT:** document _id in URL

PUT https://[username].cloudant.com/authors/101

```
{
 "name": "Mary Smith",
 "agent": "John Reid",
"telephone":"512-555-1212"
}
```

```
{
  "ok": "true",
 "id": "101",
 "rev": "1-0af5e…"
}
```

Cloudant API: Updating a document (HTTP PUT or POST)

will fail.

Via **POST:** document _id in document body

POST https://[username].cloudant.com/authors

```
{
  "_id": "101",
  "_rev": "1-0af5e…",
 "name": "Mary Smith",
 "agent": "John Doe",
"telephone":"512-555-1212"
}
```

```
{
  "ok": "true",
 "id": "101",
 "rev": "2-03f5e…"
}
```

Via **PUT:** document _id in URL

PUT https://[username].cloudant.com/authors/101

```
{
  "_rev": "1-0af5e…",
 "name": "Mary Smith",
 "agent": "John Doe",
"telephone":"512-555-1212"
}
```

```
{
  "ok": "true",
 "id": "101",
 "rev": "2-03f5e…"
}
```

Cloudant API: Deleting a document (HTTP DELETE or PUT)

Latest _rev is required or the operation will fail.

Via **DELETE:** document _id and _rev in URL

DELETE https://[username].cloudant.com/authors/101?rev=...

```
{
  "ok": "true",
  "id": "101",
  "rev": "2-03f5e..."
}
```

Via **PUT:** document _id in URL , _rev and

PUT https://[username].cloudant.com/authors/101

```
{
  "_rev": "1-0af5e...",
  "deleted": true
}
```

```
{
  "ok": "true",
  "id": "101",
  "rev": "2-03f5e..."
}
```

Cloudant: Secondary indexes

Cloudant allows the creation of secondary indexes (or views) that use MapReduce to return specific subsets of data.

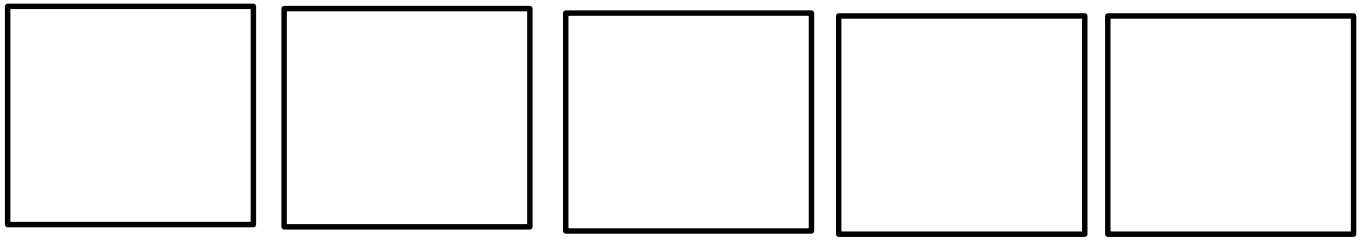
- The Map function returns a list of key-value pairs.
  - This function must be defined for a view.
- The Reduce function reduces the list to a single value per key.
  - This function is optional.

Map and Reduce functions for a view are:

- Written in JavaScript
- Stored in special documents called *design documents*

MapReduce function example

A list of cars



A list of car makes and their book values (map function)

Aggregated book value by make (reduce function)

Map results

Key	Value
Audi	5400
Audi	16000
VW	9000
VW	12000
VW	15000

Reduce results

Key	Total Book Value
Audi	21400
VW	36000

Cloudant Query:

Alternative to Map/Reduce secondary views: an index is defined via a JSON body that lists fields to be indexed.

Example:

```
{
     "index": {
        "fields": [“make"]
     },
     “name": “make-index“,
     “type": “json“
}
```

After an index is created, it can be queried using a JSON selector that is conceptually similar to an clause.

Example that returns all documents where the the make is VW with model year 2000 or later:

```
{
     “selector": {
        “make": “VW“,
        “year“: {“$ge“: 2000}
     }
}
```

Two types of indexes:

- JSON
  - Translated into Map/Reduce secondary index under the covers
  - Generally performs better but less flexible
- Text
  - Based on Lucene
  - More flexible can query any fields in any order
- Both types are also stored in *design documents*

Two API endpoints support Cloud Query:

- *_index:* Create/delete indexes
- *_find:* Execute queries against indexes

Cloudant Sync

- Native replication feature that allows you to push database access to mobile devices, remote facilities, sensors, and Internet-enabled devices.
- Enables mobile and distributed apps to scale by replicating and syncing data between multiple readable and writable copies of a database even on mobile iOS and Android devices.
- Simplifies large-scale mobile development by enabling you to create a single local database for every user.
  - Reduces round-trip database requests with the server because when there is no network connection, the app runs off the database on the device.
  - When the network is restored, local data is synced with server.

dashDB

Service	Use case	Free tier (30-day) sizing	Entitled (paid) sizing
dashDB	Data warehousing and accelerated analytics	Includes perpetual free tier up to **1 GB** stored data	Up to 20 GB (entry) Dedicated instances from 64 GB up to 256 GB of data

Stores relational data for querying and advanced analytics

- Data mining
- Predictive analytics
- Geospatial analytics

Powered by IBM BLU Acceleration and Netezza in-database analytics

- IBM BLU Acceleration is fast and simple. It uses dynamic in-memory columnar technology and innovations such as actionable compression to rapidly scan and return relevant data.
- In-database analytic algorithms integrated from Netezza bring simplicity and performance to advanced analytics.

Time Series database

Service	Use case	Free tier (30-day) sizing	Entitled (paid) sizing
Time Series Database	Internet of Things	Includes perpetual free tier up to **1 GB** stored data	**10 GB** stored data per instance

Highly efficient storage, lowering costs for storing massive amounts of time series data in the cloud

Time Series functions (extended SQL) make writing applications much simpler than standard SQL, faster iteration

- Spatial data also handled with highly optimized, built-in functions

Time series offered with a fully functional, enterprise-class relational database framework (Informix)

- Support for both SQL and NoSQL (JSON) within the same database
- Allows for data movement between the two interfaces

Summary: data services in IBM Bluemix PaaS

- Cloudant NoSQL Database service
  - Document-oriented schema-less data store optimized for horizontal scaling
- dashDB service
  - Data warehousing service for relational data, including special types such as geospatial data
  - Analyze data with SQL or advanced built-in analytics-like predictive analytics and data mining, analytics with R, and geospatial analytics
- Time Series Database service
  - Managed data store for time-stamped Internet of Things device data
  - Optimized storage for large volumes and time-based SQL extensions