

Year	System/ Paper	Scale to 1000s	Primary Index	Secondary Indexes	Transactions	Joins/ Analytics	Integrity Constraints	Views	Language/ Algebra	Data model	my label
1971	RDBMS	0	✓	✓	✓	✓	✓	✓	✓	tables	sql-like
2003	memcached	✓	✓	0	0	0	0	0	0	key-val	nosql
2004	MapReduce	✓	0	0	0	✓	0	0	0	key-val	batch
2005	CouchDB	✓	✓	✓	record	MR	0	✓	0	document	nosql
2006	BigTable (Hbase)	✓	✓	✓	record	compat. w/MR	/	0	0	ext. record	nosql
2007	MongoDB	✓	✓	✓	EC, record	0	0	0	0	document	nosql
2007	Dynamo	✓	✓	0	0	0	0	0	0	key-val	nosql
2008	Pig	✓	0	0	0	✓	/	0	✓	tables	sql-like
2008	HIVE	✓	0	0	0	✓	✓	0	✓	tables	sql-like
2008	Cassandra	✓	✓	✓	EC, record	0	✓	✓	0	key-val	nosql
2009	Voldemort	✓	✓	0	EC, record	0	0	0	0	key-val	nosql
2009	Riak	✓	✓	✓	EC, record	MR	0			key-val	nosql
2010	Dremel	✓	0	0	0	/	✓	0	✓	tables	sql-like
2011	Megastore	✓	✓	✓	entity groups	0	/	0	/	tables	nosql
2011	Tenzing	✓	0	0	0	0	✓	✓	✓	tables	sql-like
2011	Spark/Shark	✓	0	0	0	✓	✓	0	✓	tables	sql-like
2012	Spanner	✓	✓	✓	✓	?	✓	✓	✓	tables	sql-like
2012	Accumulo	✓	✓	✓	record	compat. w/MR	/	0	0	ext. record	nosql
2013	Impala	✓	0	0	0	✓	✓	0	✓	tables	sql-like

CouchDB: Data Model

- Document-oriented
 - Document = set of key/value pairs
 - Ex:

```
{  
  "Subject": "I like Plankton"
```

```
  "Author": "Rusty"
```

```
  "PostedDate": "5/23/2006"
```

```
  "Tags": ["plankton", "baseball", "decisions"]
```

```
  "Body": "I decided today that I don't like baseball. I like plankton."  
}
```

CouchDB: Updates

- Full Consistency within a document
- Lock-free concurrency
 - Optimistic – attempts to edit dirty data fail
- No multi-row transactions
 - Transaction: Sequence of related updates
 - Entire sequence considered ACID

CouchDB: Views

```
"_id": "_design/company",
"_rev": "12345",
"language": "javascript",
"views":
{
  "all": {
    "map": "function(doc) {if (doc.Type=='customer') emit(null, doc) }"
  },

  "by_lastname": {
    "map": "function(doc) {if (doc.Type=='customer') emit(doc.LastName, doc) }"
  },

  "total_purchases": {
    "map": "function(doc) {
      if (doc.Type=='purchase')
        emit(doc.Customer, doc.Amount)
    }",
    "reduce": "function(keys, values) { return sum(values) }"
  }
}
```

CouchDB “Joins”

- View Collation

```
function(doc) {  
  if (doc.type == "post") {  
    emit([doc._id, 0], doc);  
  } else if (doc.type == "comment") {  
    emit([doc.post, 1], doc);  
  }  
}
```

`my_view?startkey=["some_post_id"]&endkey=["some_post_id", 2]`