Considerations for using {"no":"SQL"} technology on your next IT project

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(艾克摩 曹理)

Abstract

Over the past few years, we have seen the emergence and growth in NoSQL technology. This has attracted interest from organizations looking to solve new business problems. There are also examples of how this technology has been used to bring practical and commercial benefits to some organizations. However, since it is still an emerging technology, careful consideration is required in **finding the relevant developer skills** and **choosing the right product**. This presentation will discuss these issues in greater detail. In particular, it will focus on some of the leading NoSQL products and discuss their architectures and suitability for different problems

Agenda

In a packed program ...

- Introduction
- Market analysis
- NoSQL
- Security and vulnerability
- Polyglot persistence
- Benchmarks and performance
- BI/Analytics
- NoSQL alternatives
- Summary
- Resources

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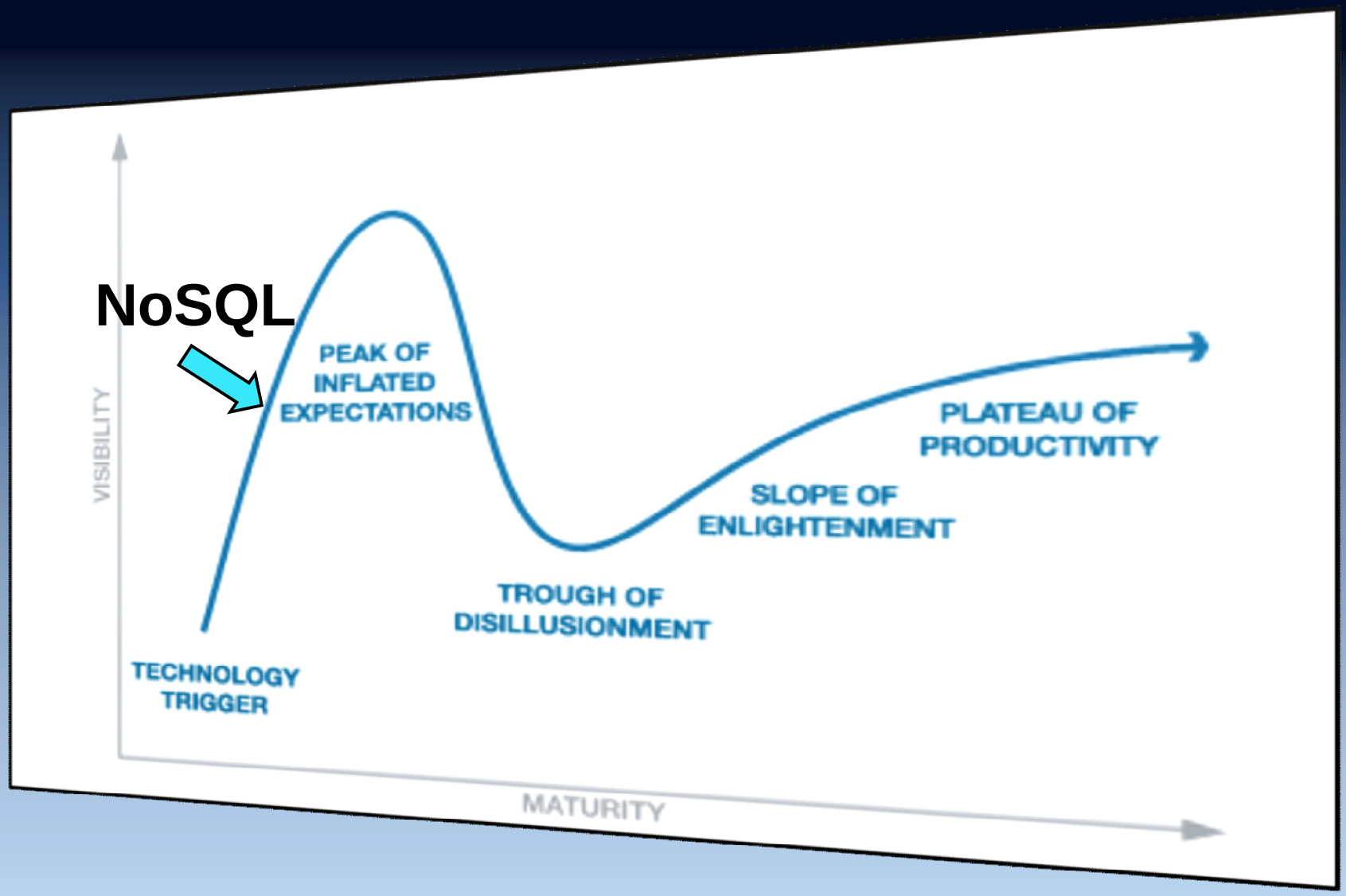
Introduction

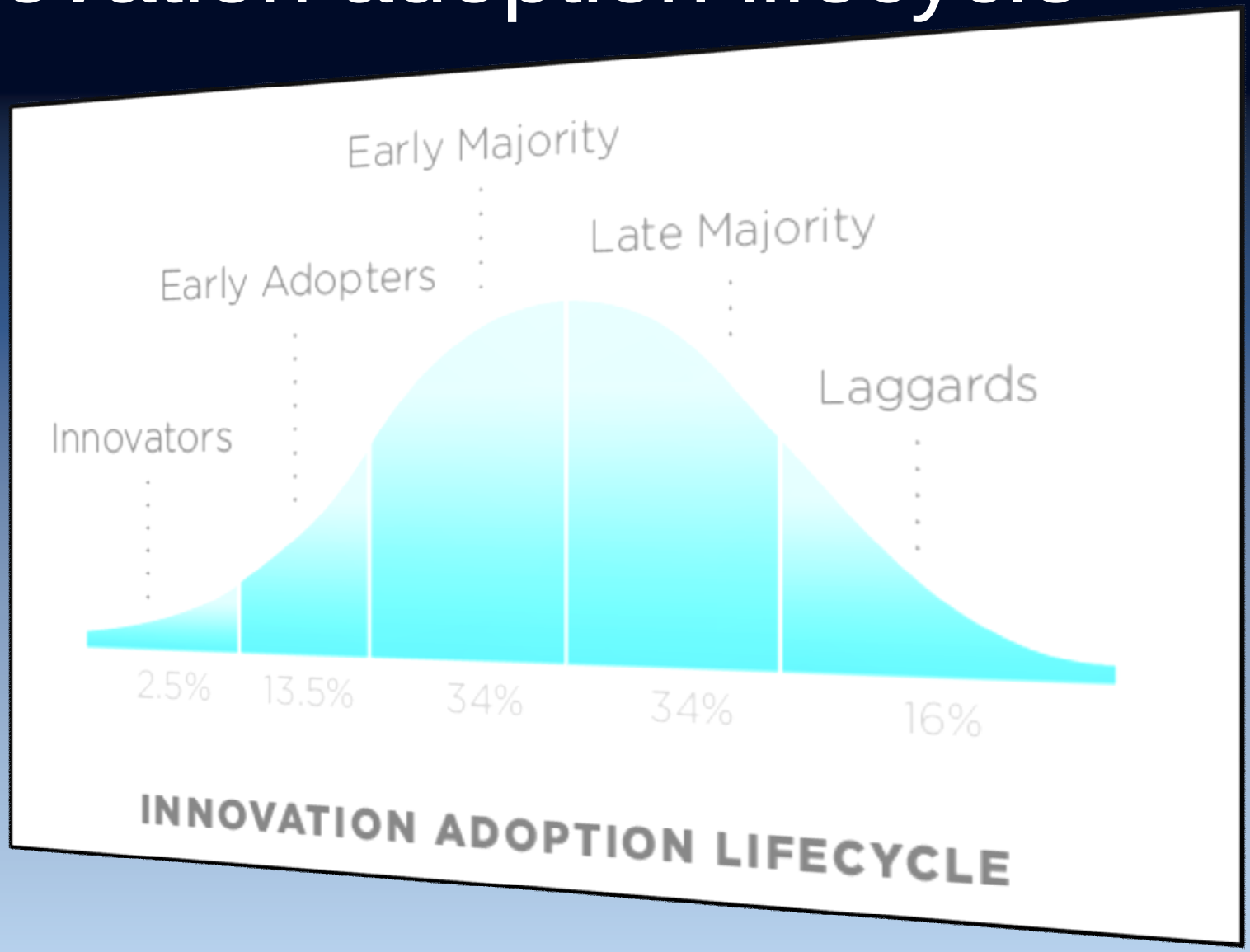
My background

- ~25 years experience in IT
  - Developer (Reuters)
  - Academic (City University)
  - Consultant (Logica)
  - Technical Architect (CA)
  - Senior Architect (Informix)
  - Senior IT Specialist (IBM)
- Broad industry experience
- Worked with various technologies
  - Programming languages
  - IDE
  - Database Systems
- Client-facing roles
  - Developers
  - Senior executives
  - Journalists
- Community outreach
- 10 books, many presentations

Gartner hype curve

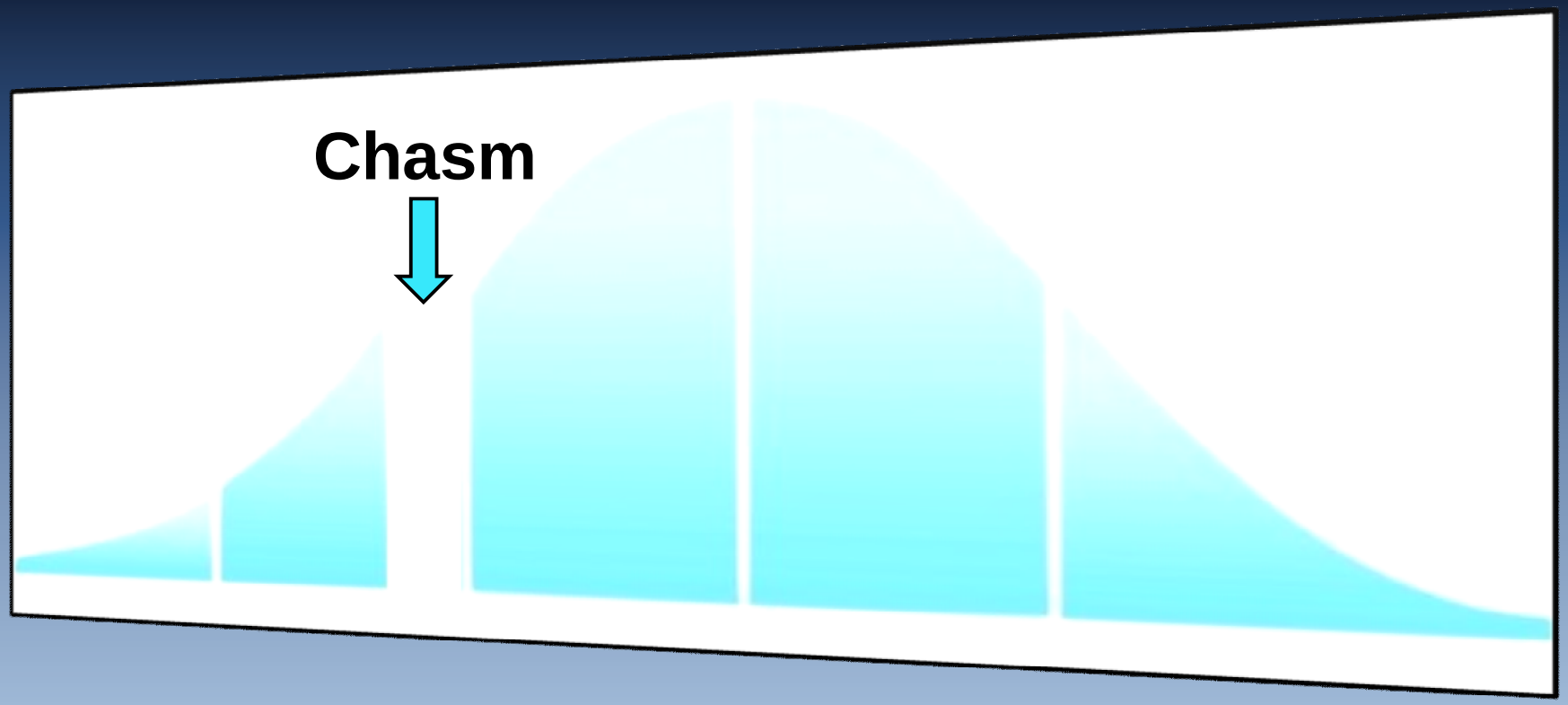


Innovation adoption lifecycle

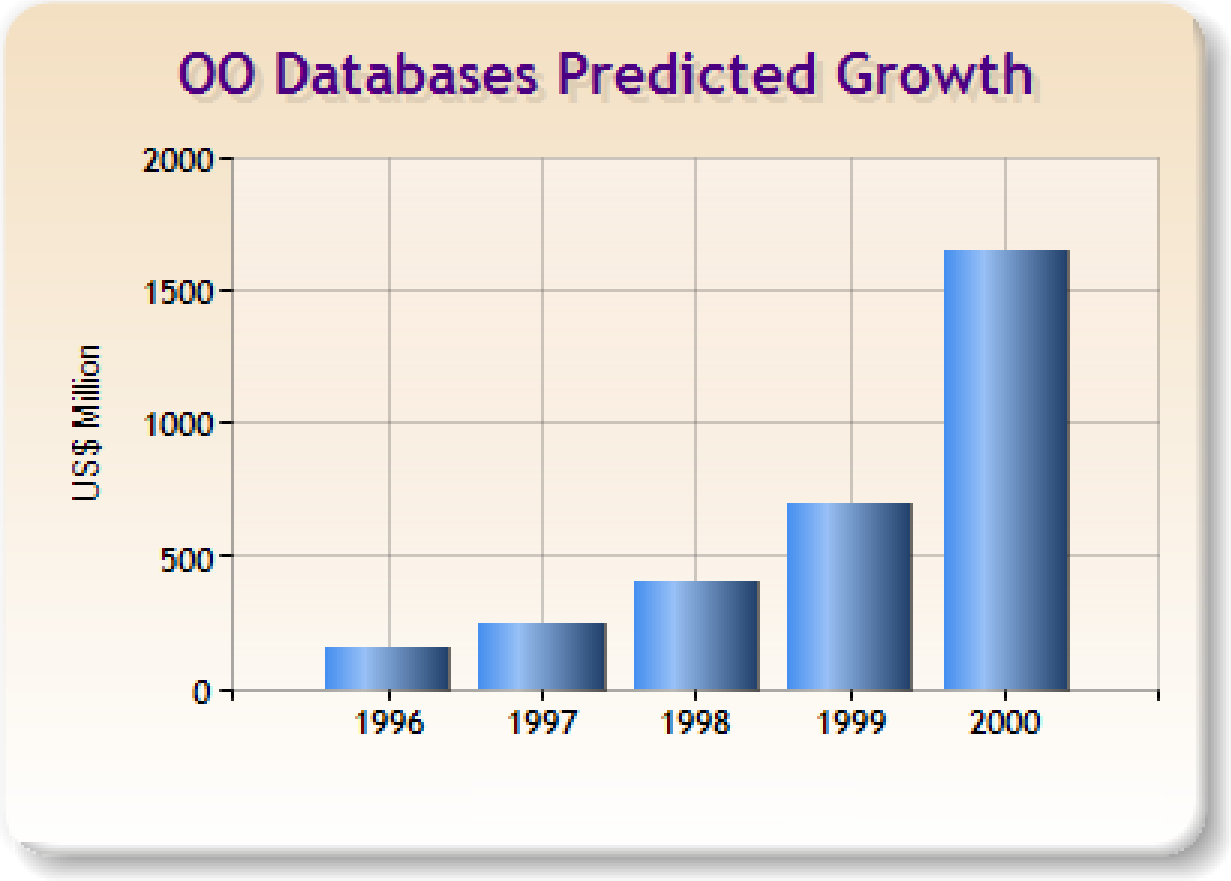


Source: http://en.wikipedia.org/wiki/Technology_adoption_lifecycle

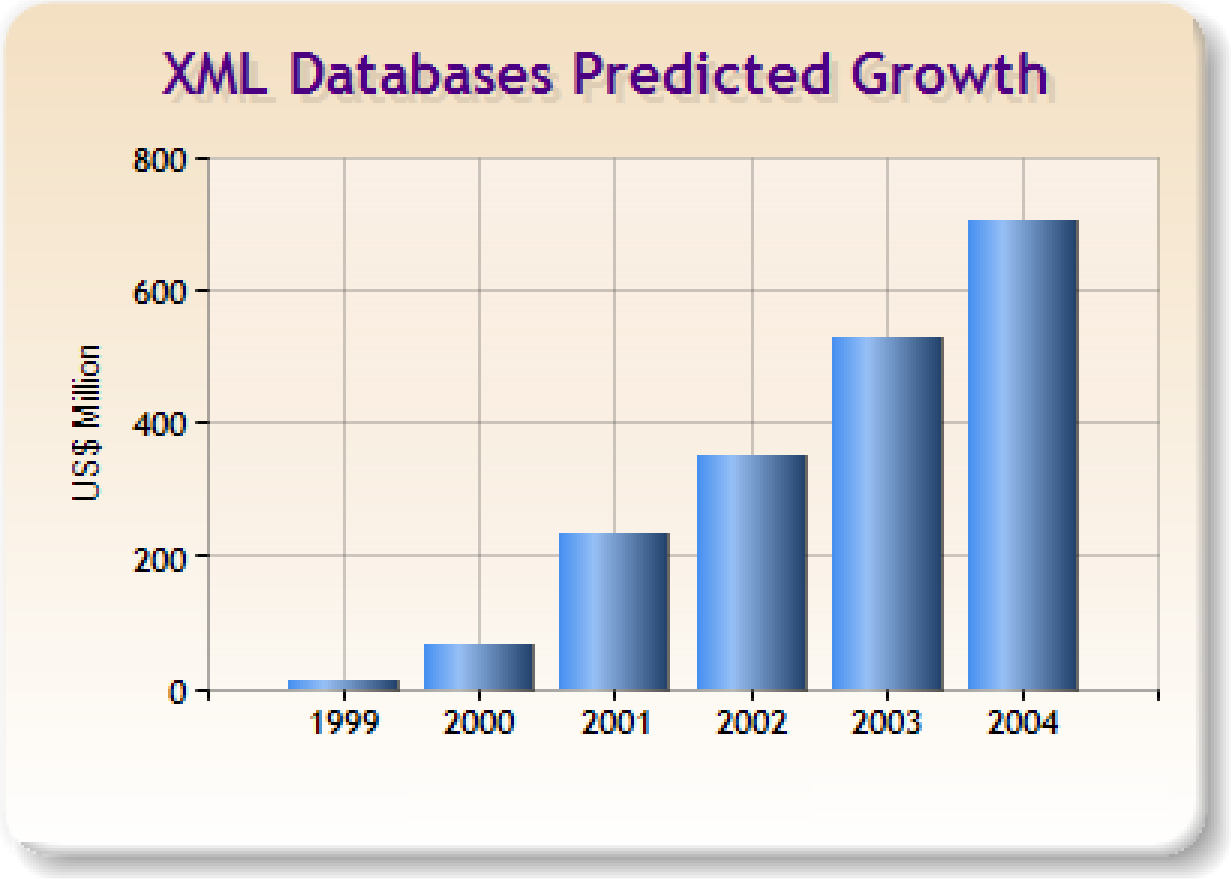
Crossing the chasm



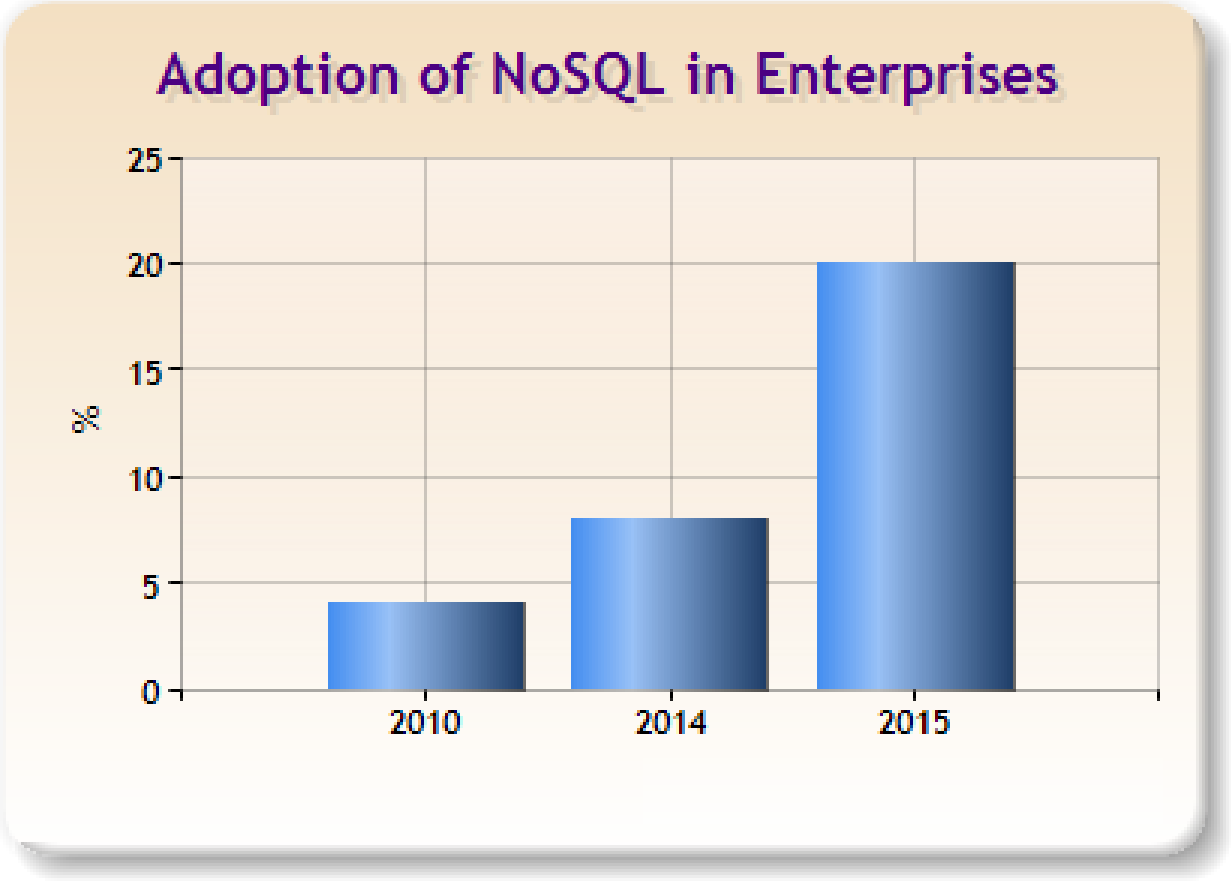
20 years ago


OO Databases Predicted Growth
US$ Million
2000
1500
1000
500
0
1996
1997
1998
1999
2000

10 years ago


XML Databases Predicted Growth
US$ Million
800
600
400
200
0
1999
2000
2001
2002
2003
2004

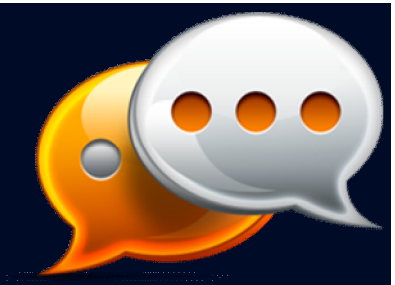
Today


Adoption of NoSQL in Enterprises
%
25
20
15
10
5
0
2010
2014
2015

The way developers really think

NoSQL is developer-friendly

But ...



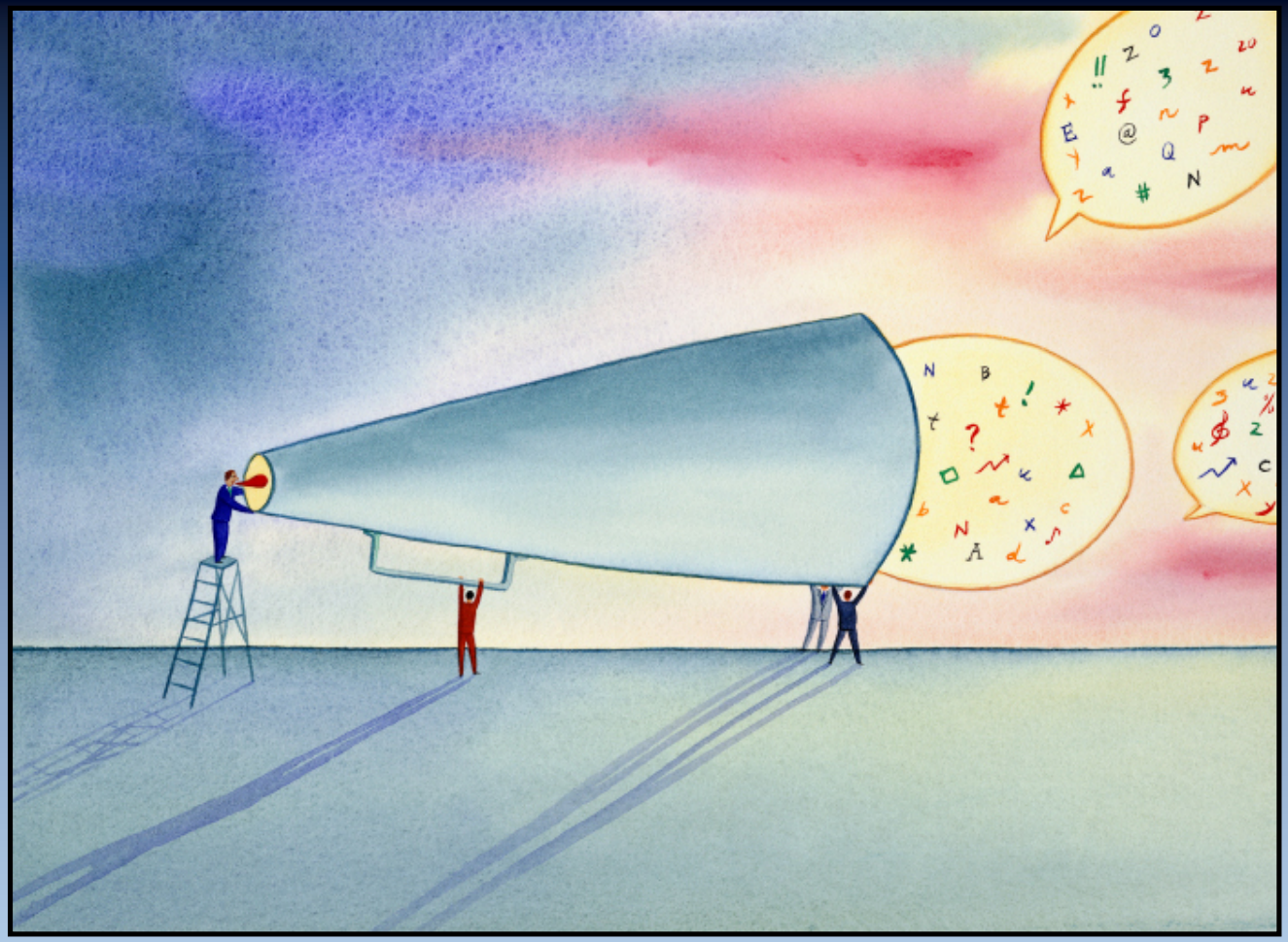
Riak ... We're talking about nearly a year of learning.[1]

Things I wish I knew about MongoDB a year ago[2]

I am learning Cassandra. It is not easy.[3]

[1] http://productionscale.com/home/2011/11/20/building-an-application-upon-riak-part-1.html
[2] http://snmaynard.com/2012/10/17/things-i-wish-i-knew-about-mongodb-a-year-ago/
[3] http://planetcassandra.org/blog/post/datastax-java-driver-for-apache-cassandra

NoSQL hoopla and hype



Extra! extra! ...

Extra! extra! ...

Source: Inspired by “The Next Big Thing 2012” The Wall Street Journal 27 September 2012

Extra! extra! ...


EXAMINER
NOSQL: THE
END OF RELATIONAL
IS NIGH!
GOSSIP
ImageChef.com

Extra! extra! ...

Extra! extra!

Source: Inspired by the movie “Airplane!” (1980)

Past proclamations of the imminent demise of relational technology

- Object databases vs. relational
  - GemStone, ObjectStore, Objectivity, etc.
- In-memory databases vs. relational
  - TimesTen, SolidDB, etc.
- Persistence frameworks vs. relational
  - Hibernate, OpenJPA, etc.
- XML databases vs. relational
  - Tamino, BaseX, etc.
- Column-store databases vs. relational
  - Sybase IQ, Vertica, etc.

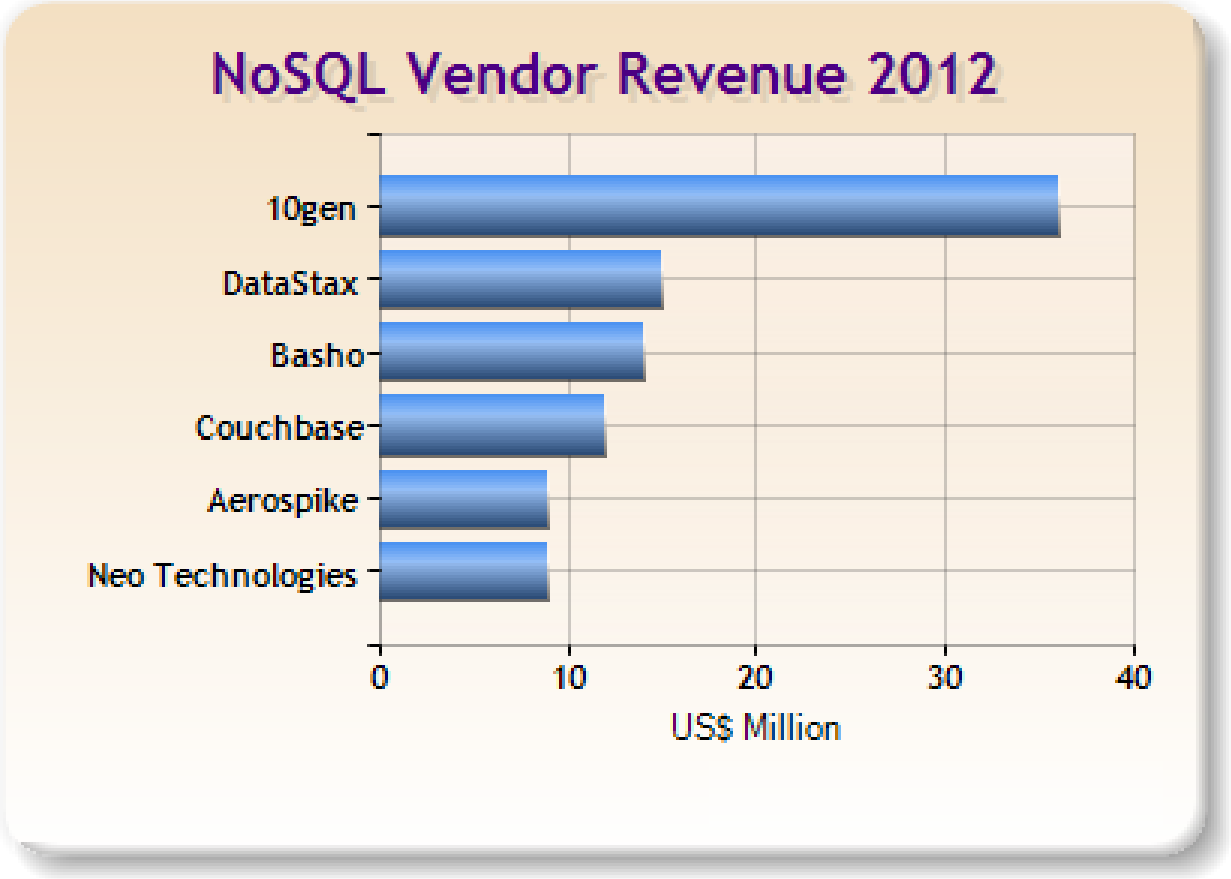
Market analysis

NoSQL market size ...

- Private companies do not publish results
- Venture Capital (VC) funding 10s/100s of millions of US $[1]
- NoSQL software revenue was US $20 million in 2011[2]

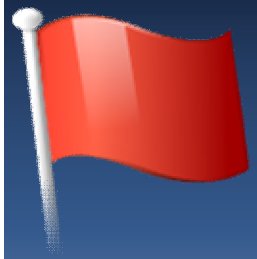
[1] http://blogs.the451group.com/information_management/2011/11/15/
[2] http://blogs.the451group.com/information_management/2012/05/

NoSQL market size



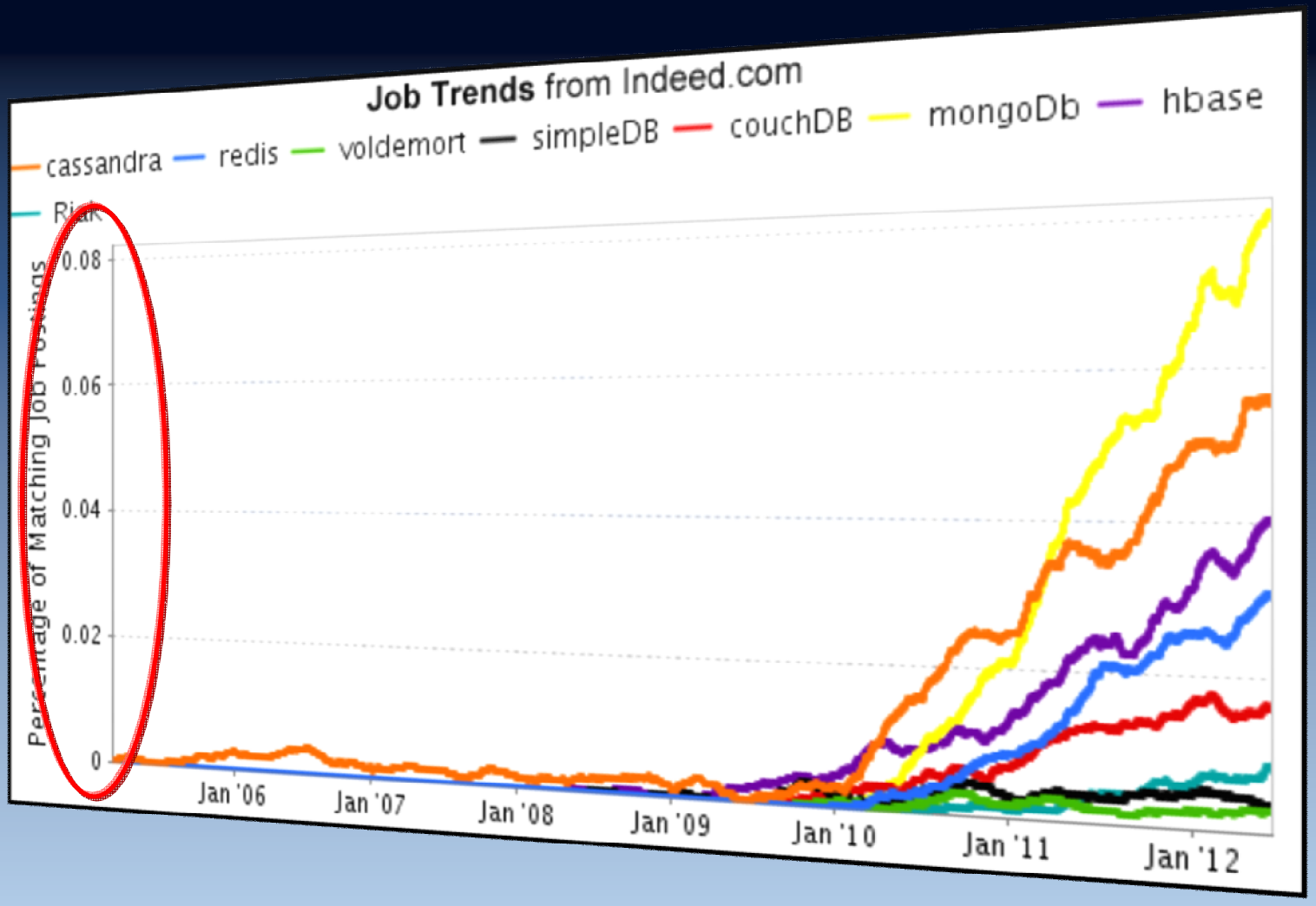
Source: http://wikibon.org/wiki/v/Big_Data_Vendor_Revenue_and_Market_Forecast_2012-2017

NoSQL job trends



Example:

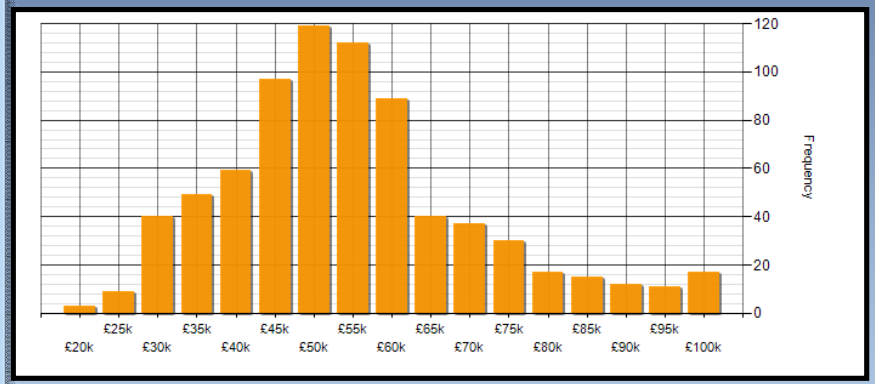
100,000
x 0.08 %
= 80 jobs!



Source: http://regulargeek.com/2012/08/30/nosql-job-trends-august-2012/ (August 2012)

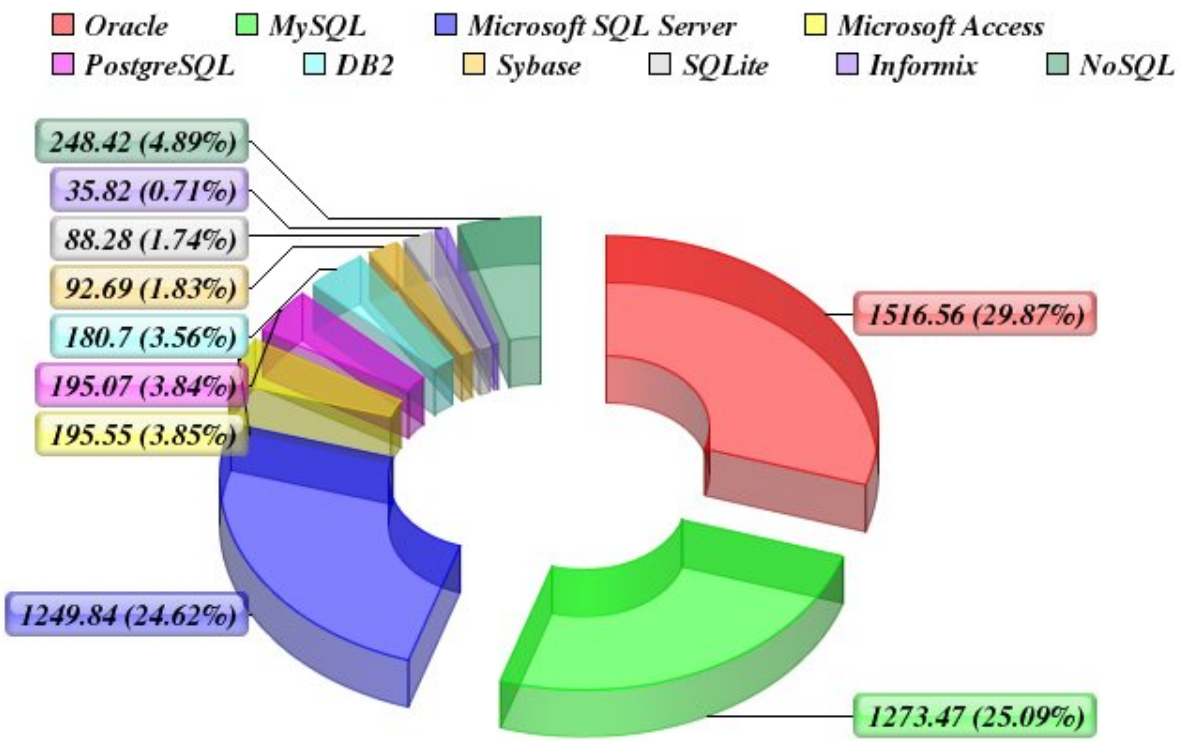
NoSQL jobs in the UK

- Database and Business Intelligence
  - MongoDB (696)
  - Cassandra (291)
  - Redis (242)
  - CouchDB (122)
  - Hive (70)
  - HBase (67)
  - Neo4j (52)
  - Couchbase (38)



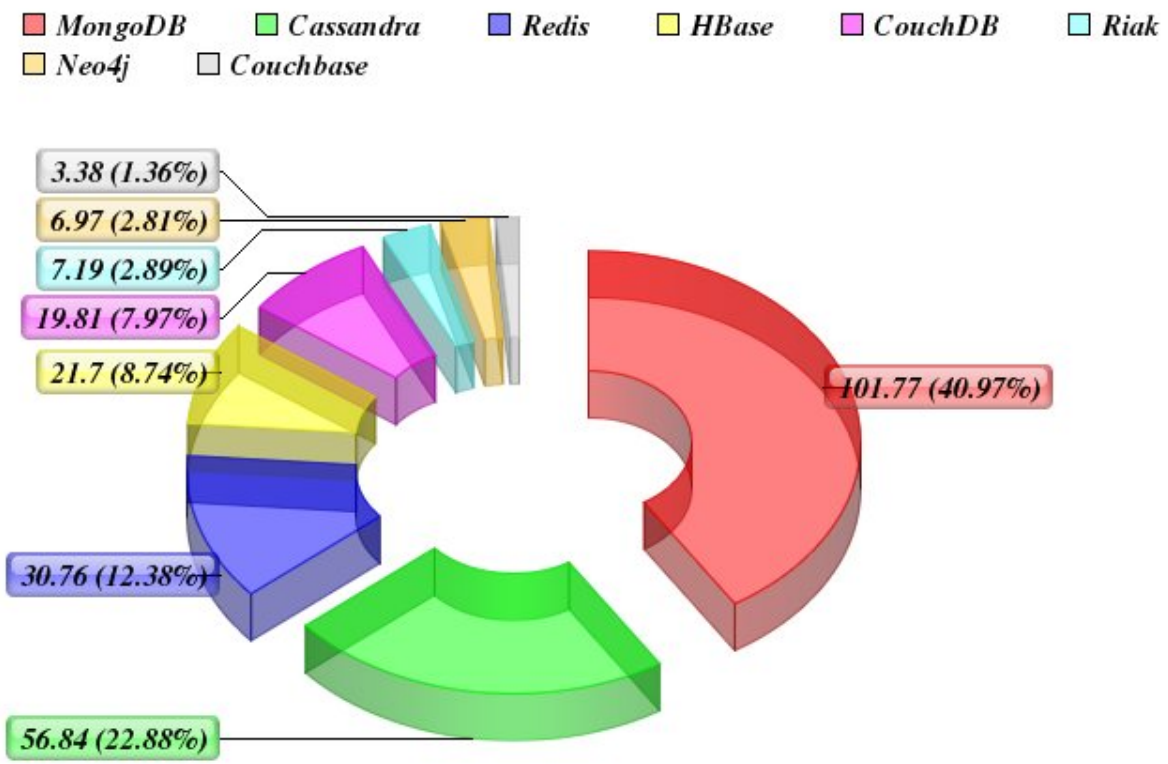
Source: http://www.itjobswatch.co.uk/jobs/uk/nosql.do (May 2013)

DB-Engines ranking ...



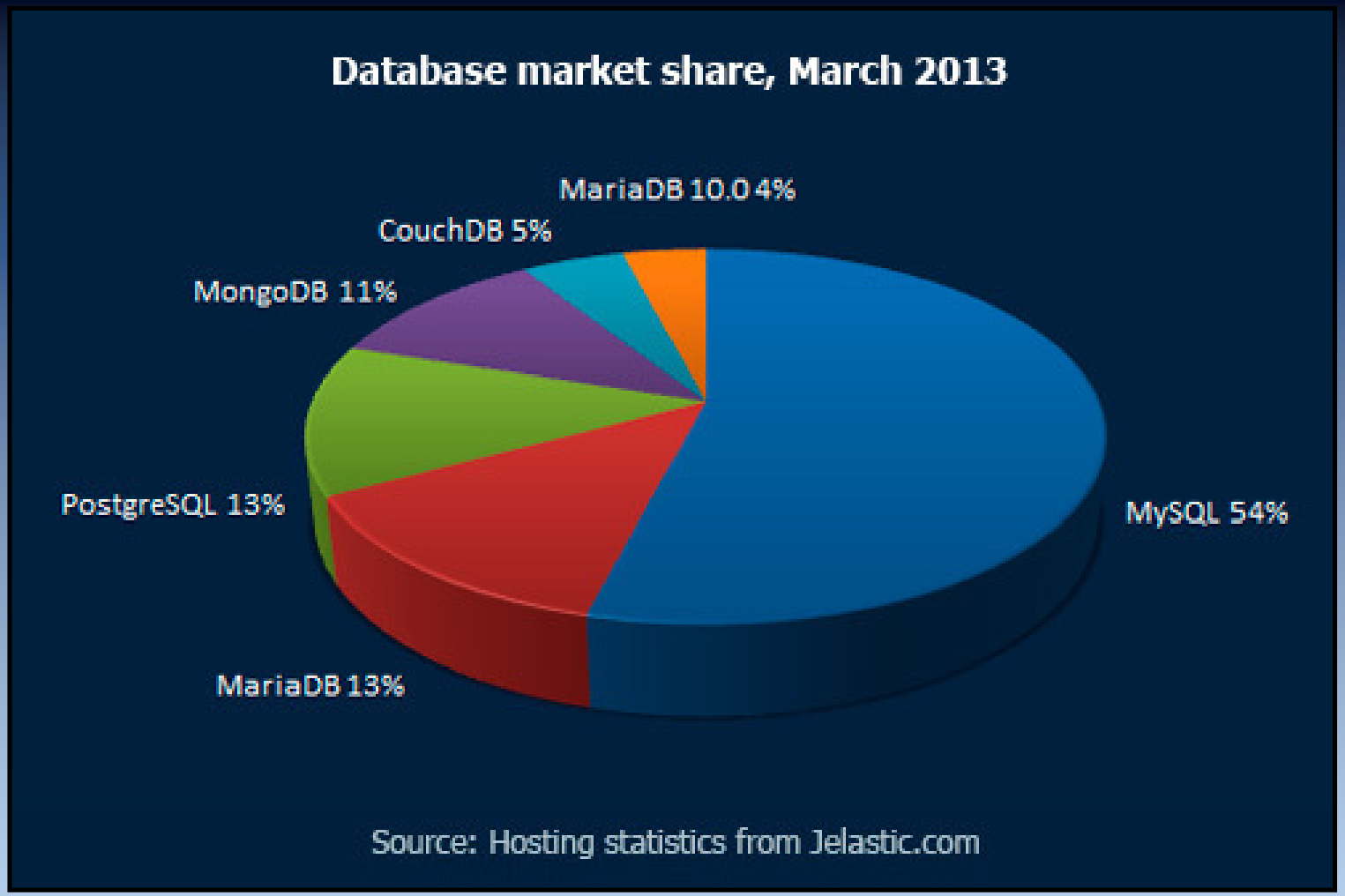
Source: http://db-engines.com/en/ranking/ (November 2012)

DB-Engines ranking



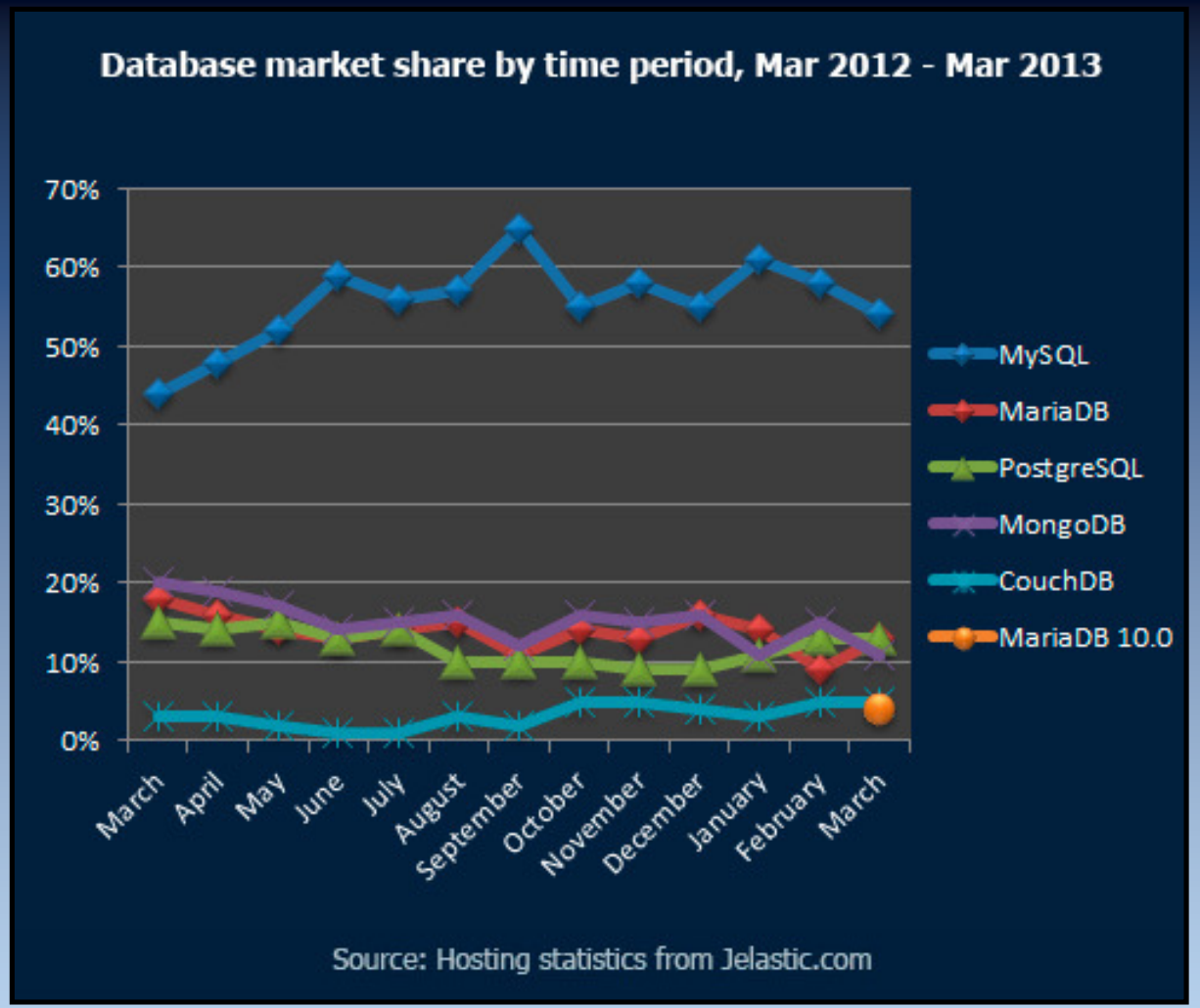
Source: http://db-engines.com/en/ranking/ (November 2012)

PaaS example ...



Source: Jelastic, used with permission

PaaS example



Source: Jelastic, used with permission

NoSQL

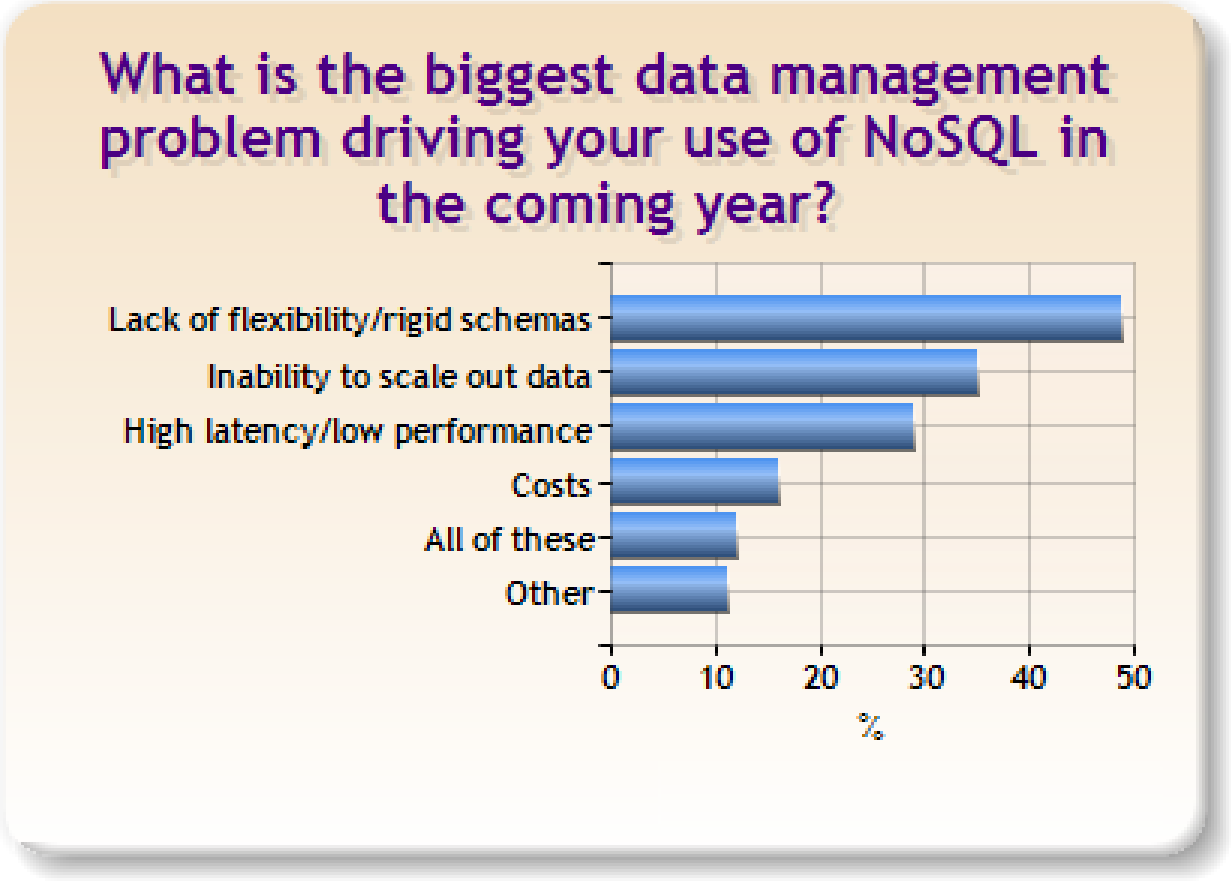

STARRING AGILE DEV AND POLY GLOT
EPISODE IV: A NEW HOPE FOR DEVELOPERS
NoSQL The Movie!
THE WAY DEVELOPERS REALLY THINK
01.01.2013
DIRECTED BY AKMAL CHAUDHRI PRODUCED BY AKMAL CHAUDHRI WRITTEN BY AKMAL CHAUDHRI DISTRIBUTED BY AKMAL CHAUDHRI SOUNDTRACK BY AKMAL CHAUDHRI MUSIC BY AKMAL CHAUDHRI EDITED BY AKMAL CHAUDHRI COPYRIGHT AKMAL CHAUDHRI
PG PARENTAL GUIDANCE SUGGESTED
SOME MATERIAL MAY NOT BE SUITABLE FOR CHILDREN

NoSQL The Movie!

Why did NoSQL datastores arise?

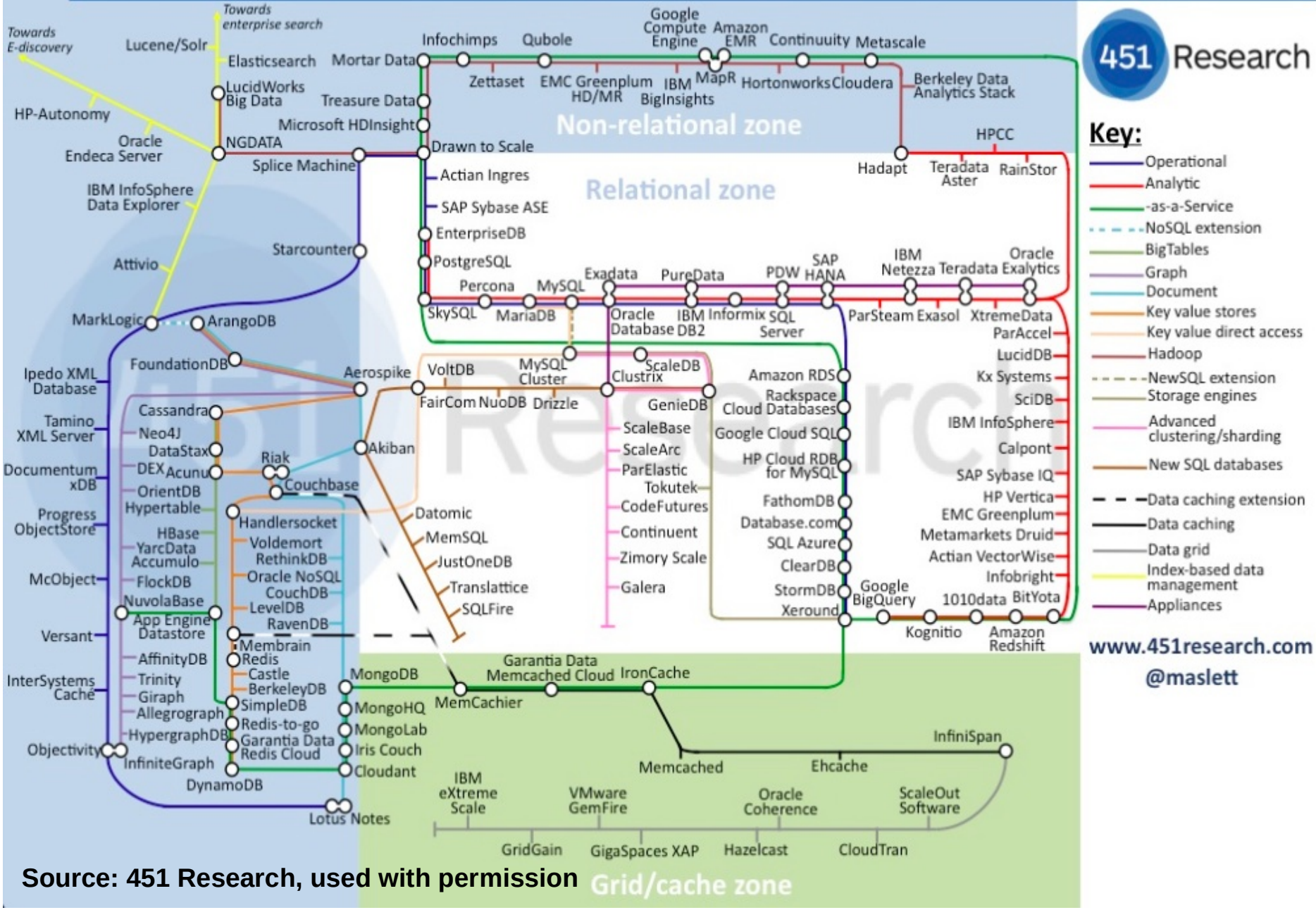
- Some applications need very few database features, but need high scale
- Desire to avoid data/schema pre-design altogether for simple applications
- Need for a low-latency, low-overhead API to access data
- Simplicity -- do not need fancy indexing -- just fast lookup by primary key

NoSQL drivers



Source: Couchbase NoSQL Survey (December 2011)

Database Landscape Map – December 2012



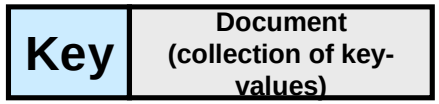
Source: 451 Research, used with permission

Major categories of NoSQL ...

Type	Examples
Document store	 
Column store	 
Key-value store	  
Graph store	 

Major categories of NoSQL

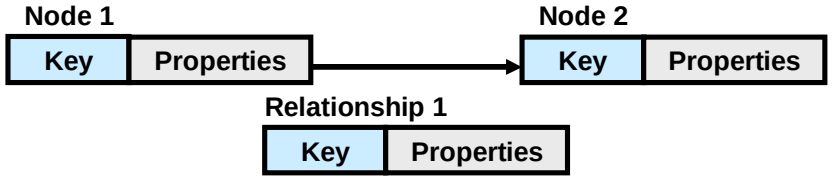
Document store

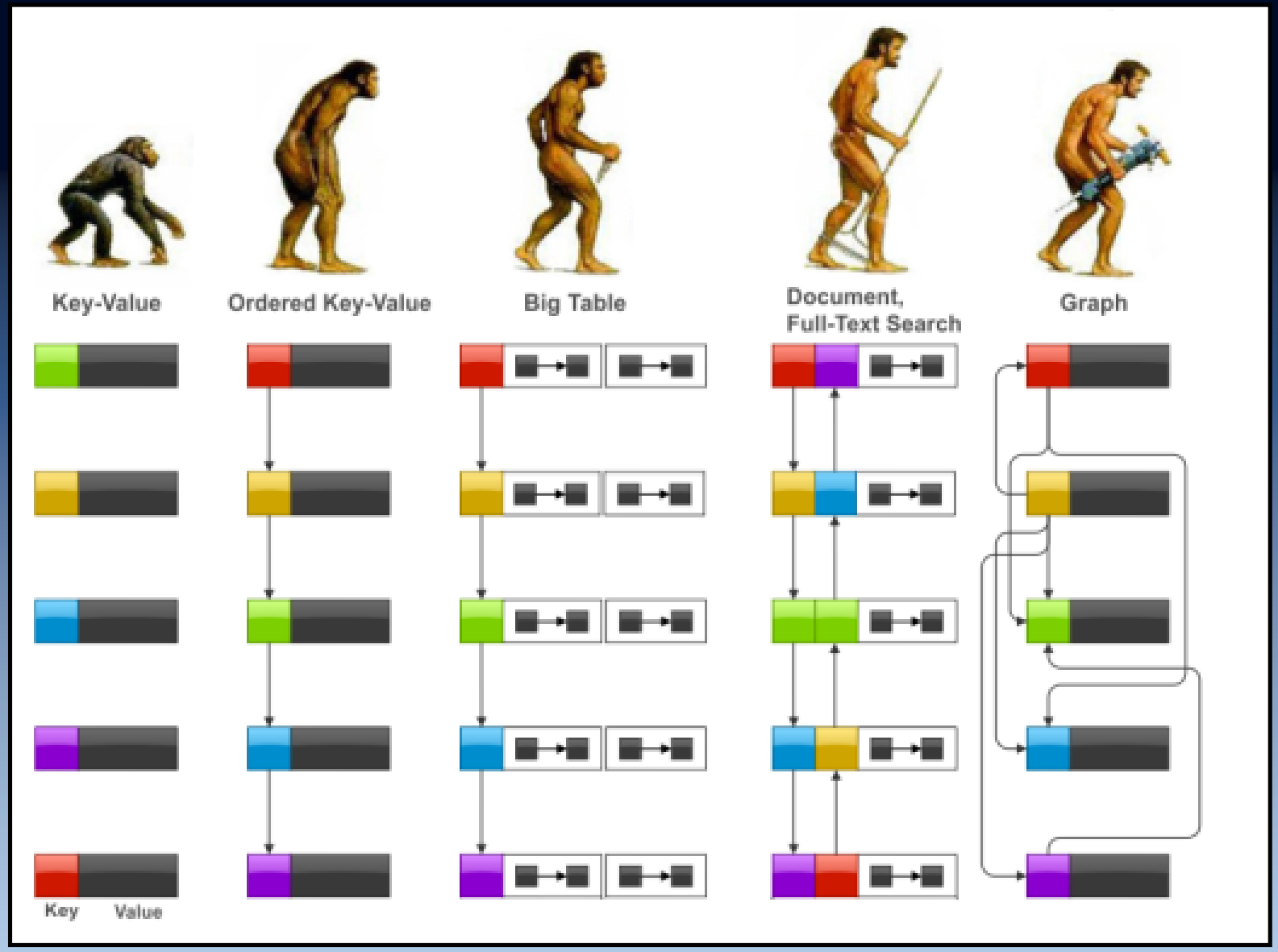


Column store

Key-value store

Graph store





Source: Ilya Katsov, used with permission


DEMO
mongoDB

Connection

```
private static final String DBNAME = "demodb";
private static final String COLLNAME = "people";
...
MongoClient mongoClient = new MongoClient("localhost", 27017);
DB db = mongoClient.getDB(DBNAME);
DBCollection collection = db.getCollection(COLLNAME);

System.out.println("Connected to MongoDB");
```

Create

```
BasicDBObject document = new BasicDBObject();

List<String> likes = new ArrayList<String>();
likes.add("satay");
likes.add("kebabs");
likes.add("fish-n-chips");

document.put("name", "akmal");
document.put("age", 40);
document.put("date", new Date());
document.put("likes", likes);

collection.insert(document);
```

Read

```
BasicDBObject document = new BasicDBObject();
document.put("name", "akmal");

DBCursor cursor = collection.find(document);

while (cursor.hasNext())
    System.out.println(cursor.next());

cursor.close();
```

Update

```
BasicDBObject document = new BasicDBObject();
document.put("name", "akmal");

BasicDBObject newDocument = new BasicDBObject();
newDocument.put("age", 29);

BasicDBObject updateObj = new BasicDBObject();
updateObj.put("$set", newDocument);

collection.update(document, updateObj);
```

Delete

```
BasicDBObject document = new BasicDBObject();
document.put("name", "akmal");

collection.remove(document);
```


DEMO
mongoDB
node
JS

Connection

```
var async = require('async');
var MongoClient = require('mongodb').MongoClient;
MongoClient.connect("mongodb://localhost:27017/demodb",
function(err, db) {
   if (err) {
      return console.log(err);
   }
   console.log("Connected to MongoDB");
   var collection = db.collection('people');
   var document = {
      'name':'akmal',
      'age':40,
      'date':new Date(),
      'likes':['satay', 'kebabs', 'fish-n-chips']
   };
```

Create

```
function (callback) {
   collection.insert(document, {w:1}, function(err, result) {
      if (err) {
         return callback(err);
      }
      callback();
   });
},
```

Read

```
function (callback) {
   collection.findOne({'name':'akmal'}, function(err, item) {
      if (err) {
         return callback(err);
      }
      console.log(item);
      callback();
   });
},
```

Update

```
function (callback) {
   collection.update({'name':'akmal'}, {$set:{'age':29}}, {w:1},
   function(err, result) {
      if (err) {
         return callback(err);
      }
      callback();
   });
},
```

Delete

```
function (callback) {
   collection.remove({'name':'akmal'}, function(err, result) {
      if (err) {
         return callback(err);
      }
      callback();
   });
},
```


DEMO
cassandra

Connection

```
Class.forName("org.apache.cassandra.cql.jdbc.CassandraDriver");
connection = DriverManager.getConnection(
   "jdbc:cassandra://localhost:9160/demodb");

System.out.println("Connected to Cassandra");
```

Create

```
String query =
"BEGIN BATCH\n" +
"INSERT INTO people (name, age, date, likes) VALUES ('akmal', 40, '"
+ new Date() +
"', {'satay', 'kebabs', 'fish-n-chips'})\n" +
"APPLY BATCH;";

Statement statement = connection.createStatement();
statement.executeUpdate(query);
statement.close();
```

Read

```
String query = "SELECT * FROM people";

Statement statement = connection.createStatement();
ResultSet cursor = statement.executeQuery(query);

while (cursor.next())
   for (int j = 1; j < cursor.getMetaData().getColumnCount()+1; j++)
      System.out.printf("%-10s: %s%n",
         cursor.getMetaData().getColumnName(j),
         cursor.getString(cursor.getMetaData().getColumnName(j)));

cursor.close();
statement.close();
```

Update

```
String query =
   "UPDATE people SET age = 29 WHERE name = 'akmal'";

Statement statement = connection.createStatement();
statement.executeUpdate(query);
statement.close();
```

Delete

```
String query =
"BEGIN BATCH\n" +
"DELETE FROM people WHERE name = 'akmal'\n" +
"APPLY BATCH;";

Statement statement = connection.createStatement();
statement.executeUpdate(query);
statement.close();
```


DEMO
redis

Connection

```
Jedis j = new Jedis("localhost", 6379);
j.connect();

System.out.println("Connected to Redis");
```

Create

```
String id = Long.toString(j.incr("global:nextUserId"));

j.set("uid:" + id + ":name", "akmal");
j.set("uid:" + id + ":age", "40");
j.set("uid:" + id + ":date", new Date().toString());
j.sadd("uid:" + id + ":likes", "satay");
j.sadd("uid:" + id + ":likes", "kebabs");
j.sadd("uid:" + id + ":likes", "fish-n-chips");

j.hset("uid:lookup:name", "akmal", id);
```

Read

```
String id = j.hget("uid:lookup:name", "akmal");

print("name ", j.get("uid:" + id + ":name"));
print("age ", j.get("uid:" + id + ":age"));
print("date ", j.get("uid:" + id + ":date"));
print("likes ", j.smembers("uid:" + id + ":likes"));
```

Update

```
String id = j.hget("uid:lookup:name", "akmal");

j.set("uid:" + id + ":age", "29");
```

Delete

```
String id = j.hget("uid:lookup:name", "akmal");

j.del("uid:" + id + ":name");
j.del("uid:" + id + ":age");
j.del("uid:" + id + ":date");
j.del("uid:" + id + ":likes");
```

DEMO

Connection

```
private static final String DB_PATH =
   "C:/neo4j-community-1.8.2/data/graph.db";

private static enum RelTypes implements RelationshipType {
   LIKES
}
...
graphDb =
   new GraphDatabaseFactory().newEmbeddedDatabase(DB_PATH);
registerShutdownHook(graphDb);

System.out.println("Connected to Neo4j");
```

Create

```
Transaction tx = graphDb.beginTx();

try {
   firstNode = graphDb.createNode();
   firstNode.setProperty("name", "akmal");
   firstNode.setProperty("age", 40);
   firstNode.setProperty("date", new Date().toString());
   secondNode = graphDb.createNode();
   secondNode.setProperty("food", "satay, kebabs, fish-n-chips");
   relationship = firstNode.createRelationshipTo(secondNode,
      RelTypes.LIKES);
   relationship.setProperty("likes", "likes");
   tx.success();
} finally { tx.finish(); }
```

Read

```
Transaction tx = graphDb.beginTx();

try {
   print("name", firstNode.getProperty("name"));
   print("age", firstNode.getProperty("age"));
   print("date", firstNode.getProperty("date"));
   print("likes", secondNode.getProperty("food"));
   tx.success();
} finally { tx.finish(); }
```

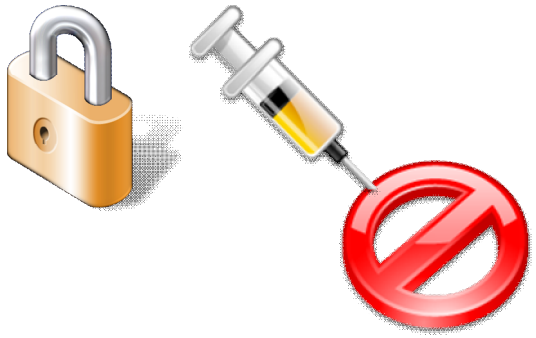
Update

```
Transaction tx = graphDb.beginTx();

try {
   firstNode.setProperty("age", 29);
   tx.success();
} finally { tx.finish(); }
```

Delete

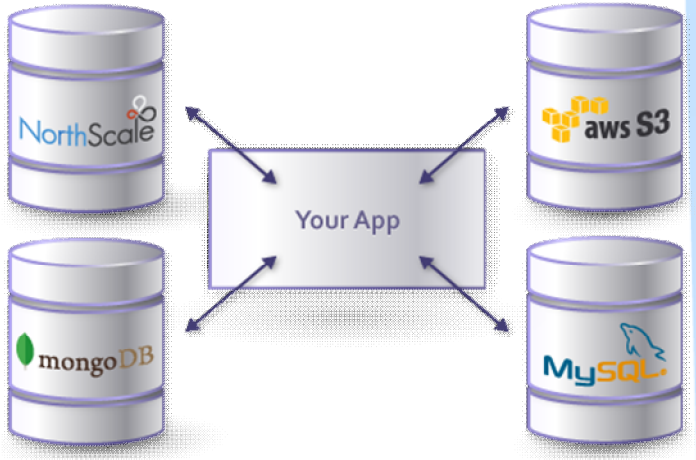
```
Transaction tx = graphDb.beginTx();

try {
   firstNode.getSingleRelationship(RelTypes.LIKES,
      Direction.OUTGOING).delete();
   firstNode.delete();
   secondNode.delete();
   tx.success();
} finally { tx.finish(); }
```

Security and vulnerability



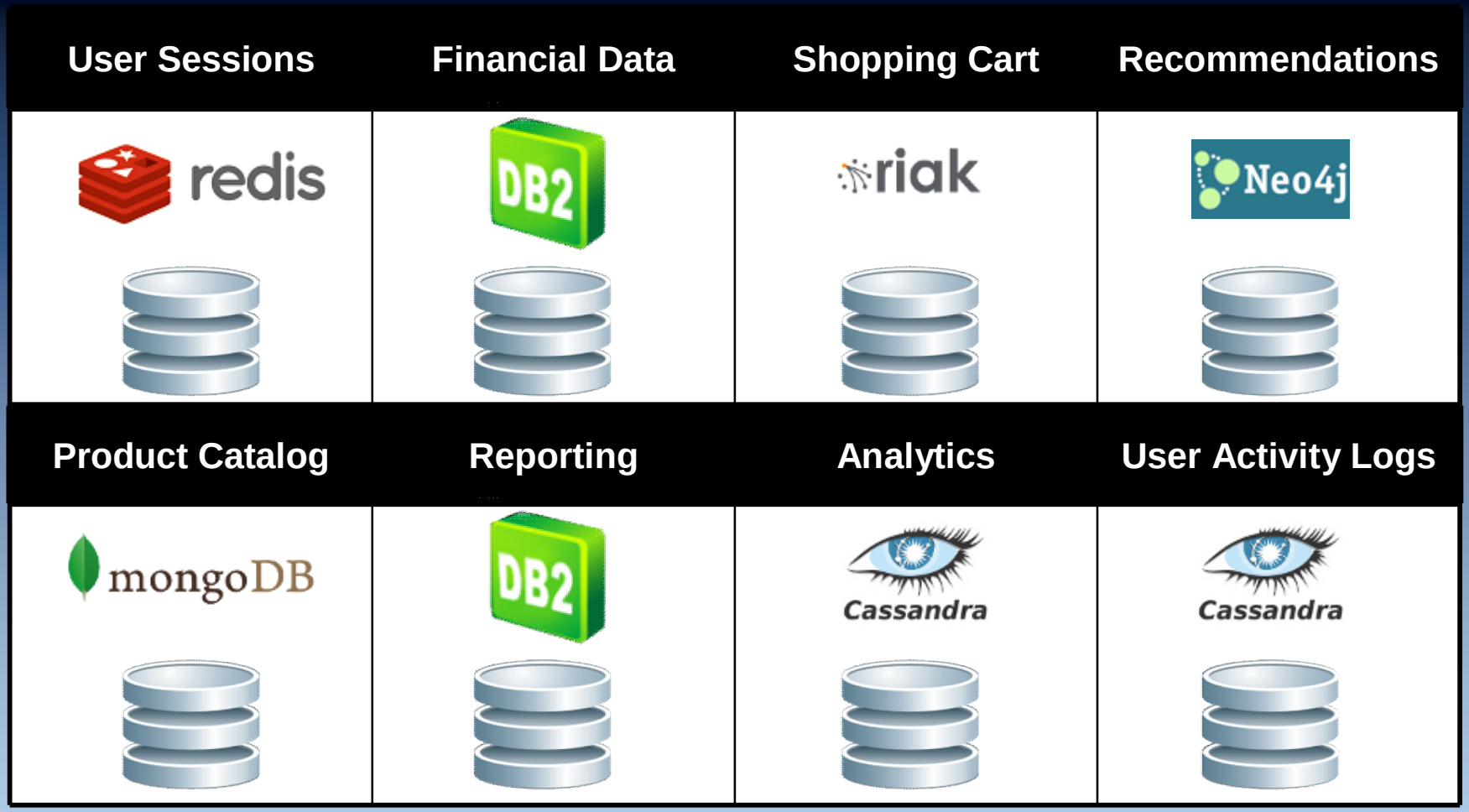
Security

Polyglot persistence



Source: Heroku, used with permission

Polyglot persistence



Source: Adapted from http://martinfowler.com/bliki/PolyglotPersistence.html

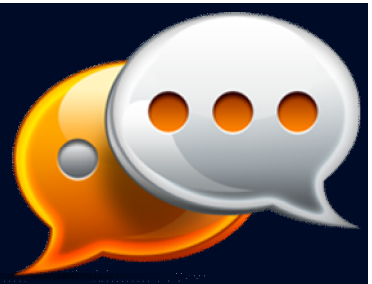
Polyglot persistence examples

- Disney
  - Cassandra, Hadoop, MongoDB
- Interactive Mediums
  - CouchDB, MySQL
- Mendeley
  - HBase, MongoDB, Solr, Voldemort
- Netflix
  - Cassandra, Hadoop/HBase, RDBMS, SimpleDB
- Twitter
  - Cassandra, FlockDB, Hadoop/HBase, MySQL

Polyglot persistence

- NoSQL product specialization requires developer knowledge and skills for each platform
- Different APIs
  - Develop public API for each NoSQL store (Disney)

Public API for NoSQL store



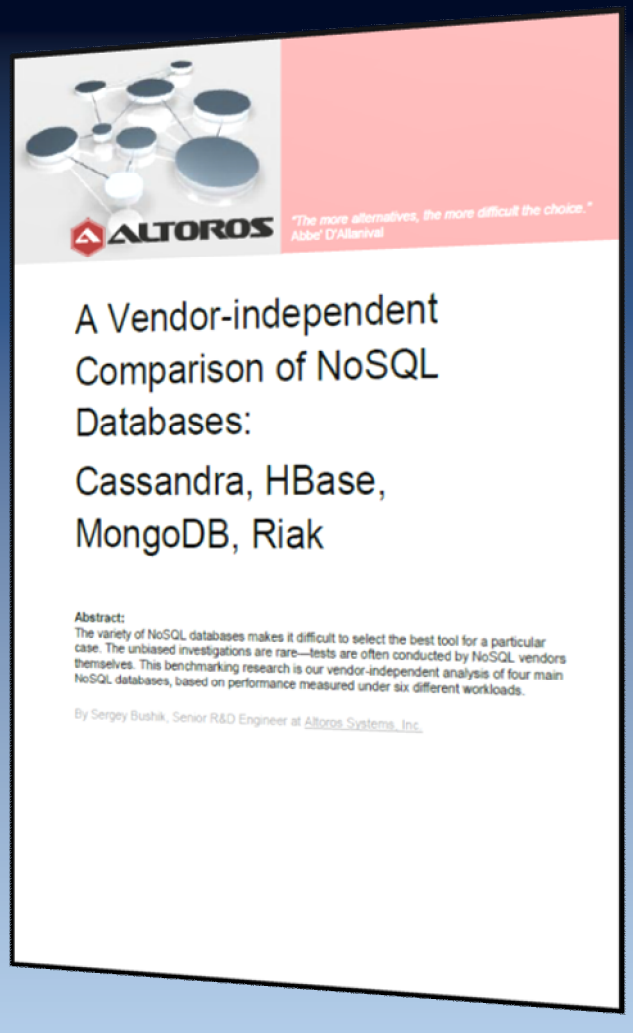
In some cases, the team decided to hide the platform's complexity from users; not to facilitate its use, but to keep loose-cannon developers from doing something crazy that could take down the whole cluster. It could show them all the controls and knobs in a NoSQL database, but "they tend to shoot each other," Jacob said. "First they shoot themselves, then they shoot each other."

Source: "How Disney built a big data platform on a startup budget" Derrick Harris (2012)

Benchmarks and performance

Yahoo Cloud Serving BM

- Yahoo Cloud Serving Benchmark (YCSB)
  - Research paper
  - Slide deck
- Altoros Report
  - 50+ pages
- Thumbtack Report
  - 40+ pages

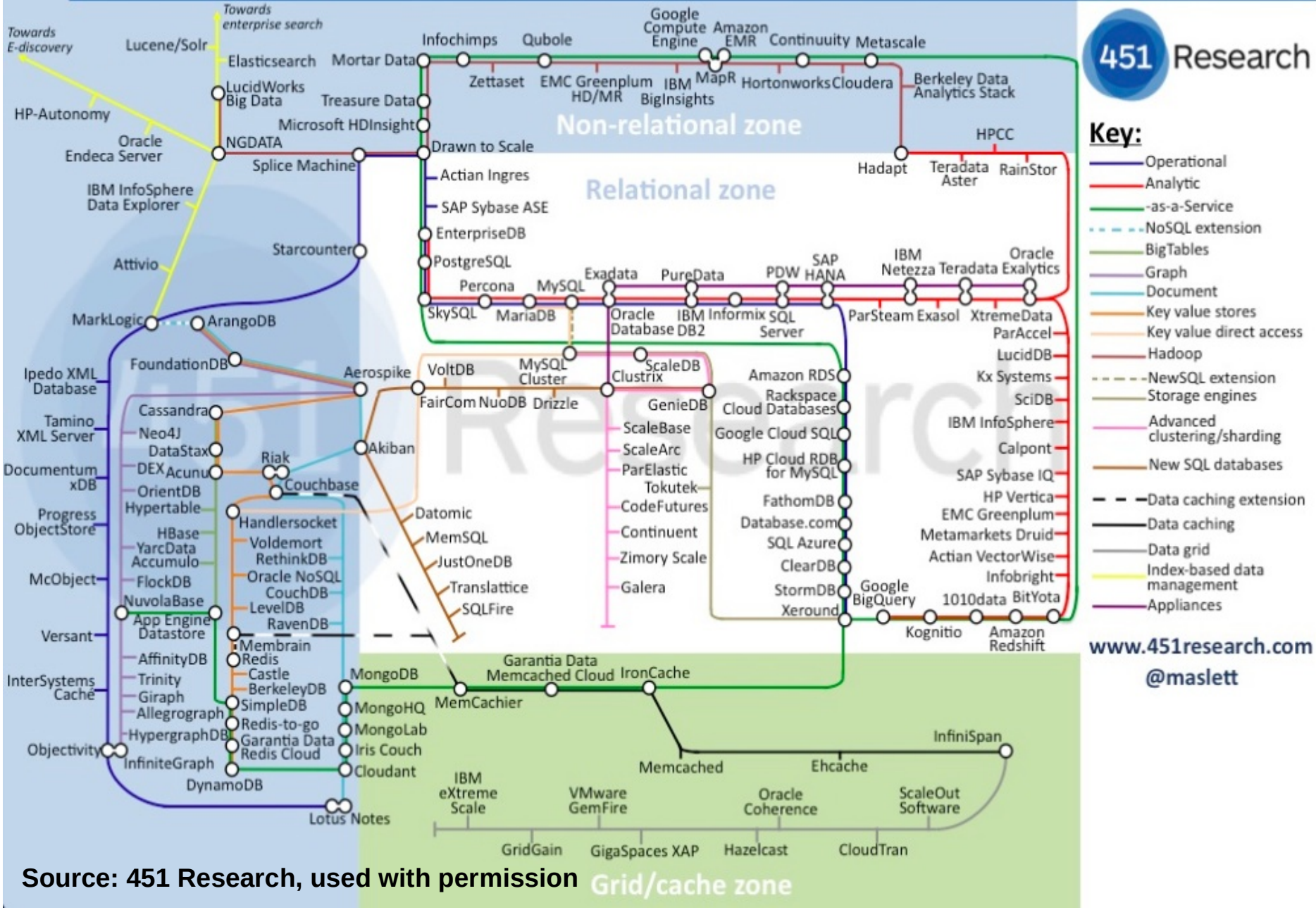


BI/Analytics 


DEMO
mongoDB
pentaho
POWERFUL ANALYTICS MADE EASY™

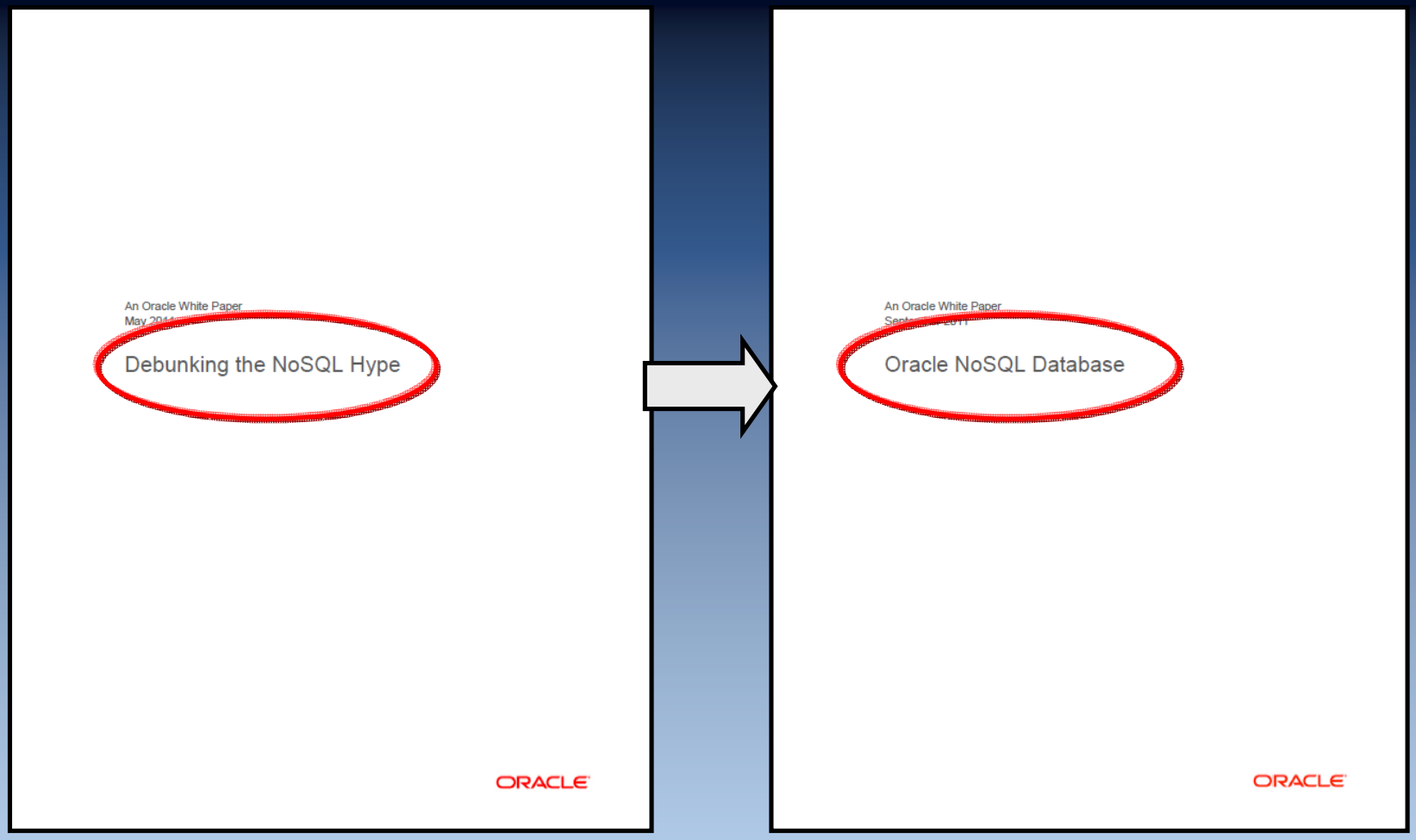
NoSQL alternatives

Database Landscape Map – December 2012



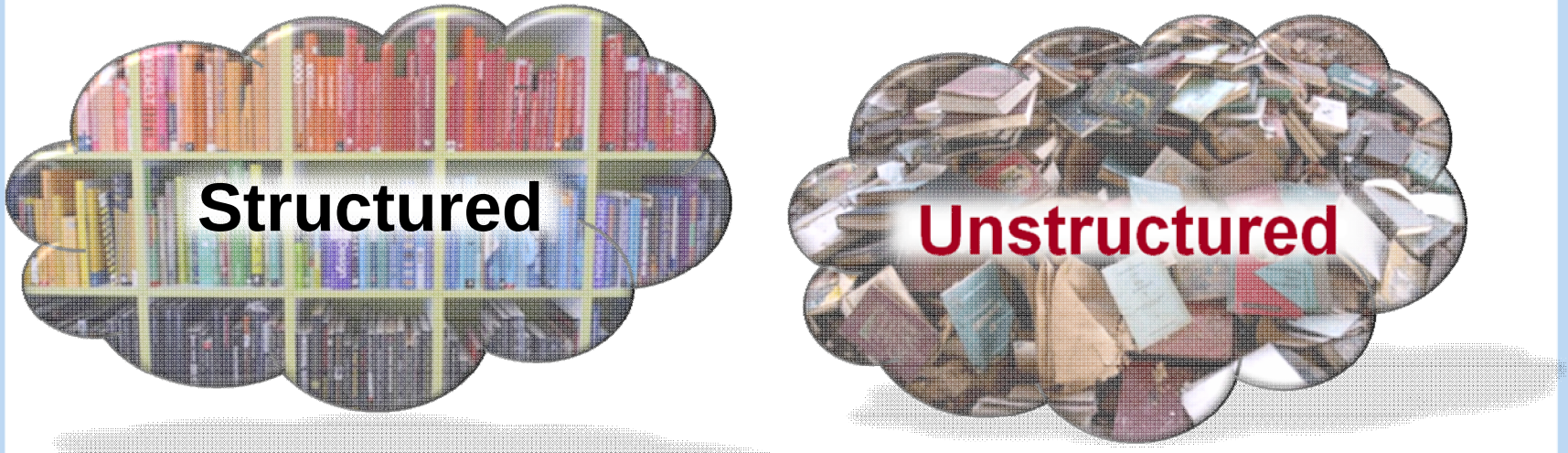
Source: 451 Research, used with permission

What about Oracle?

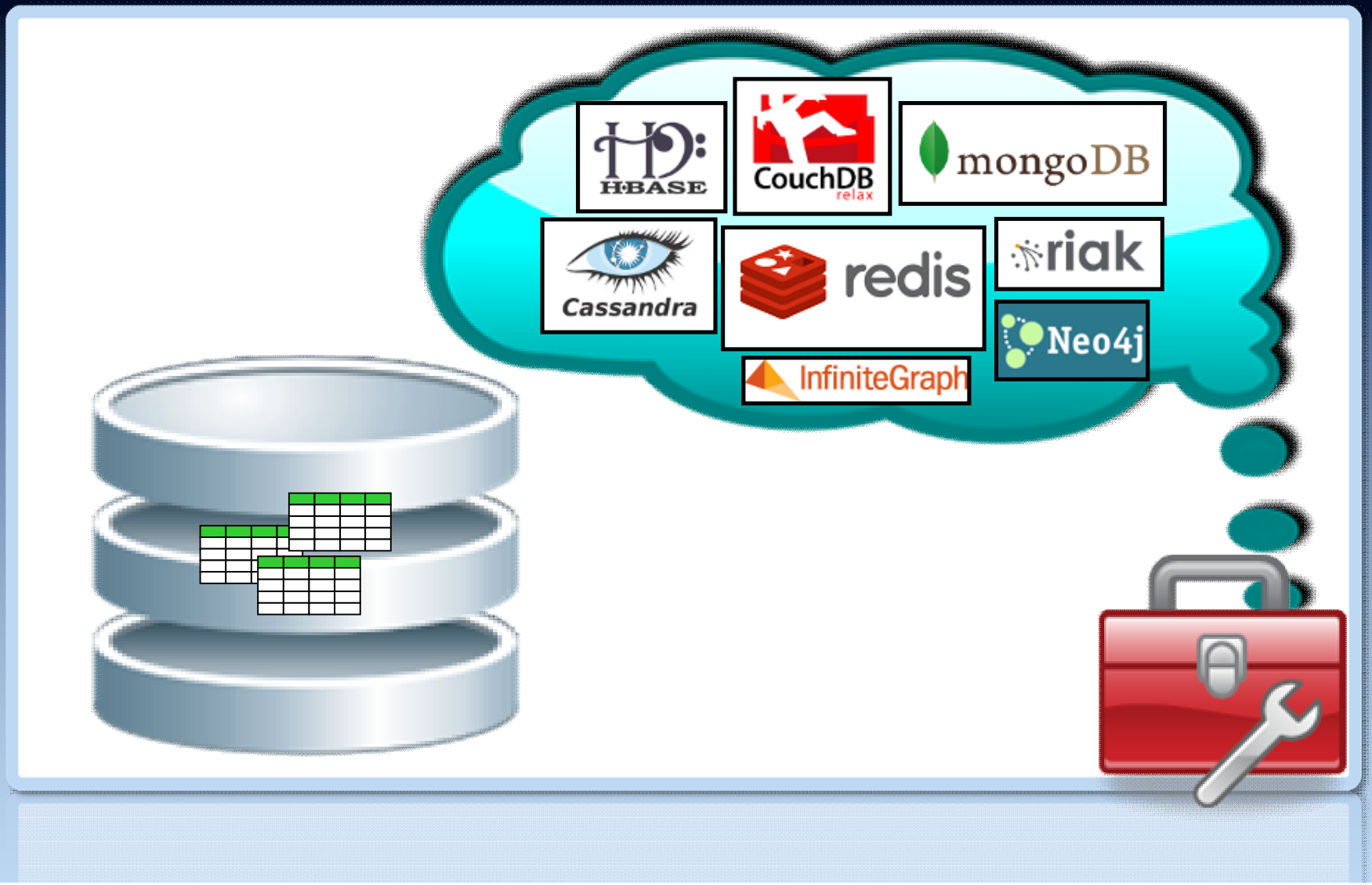


Summary

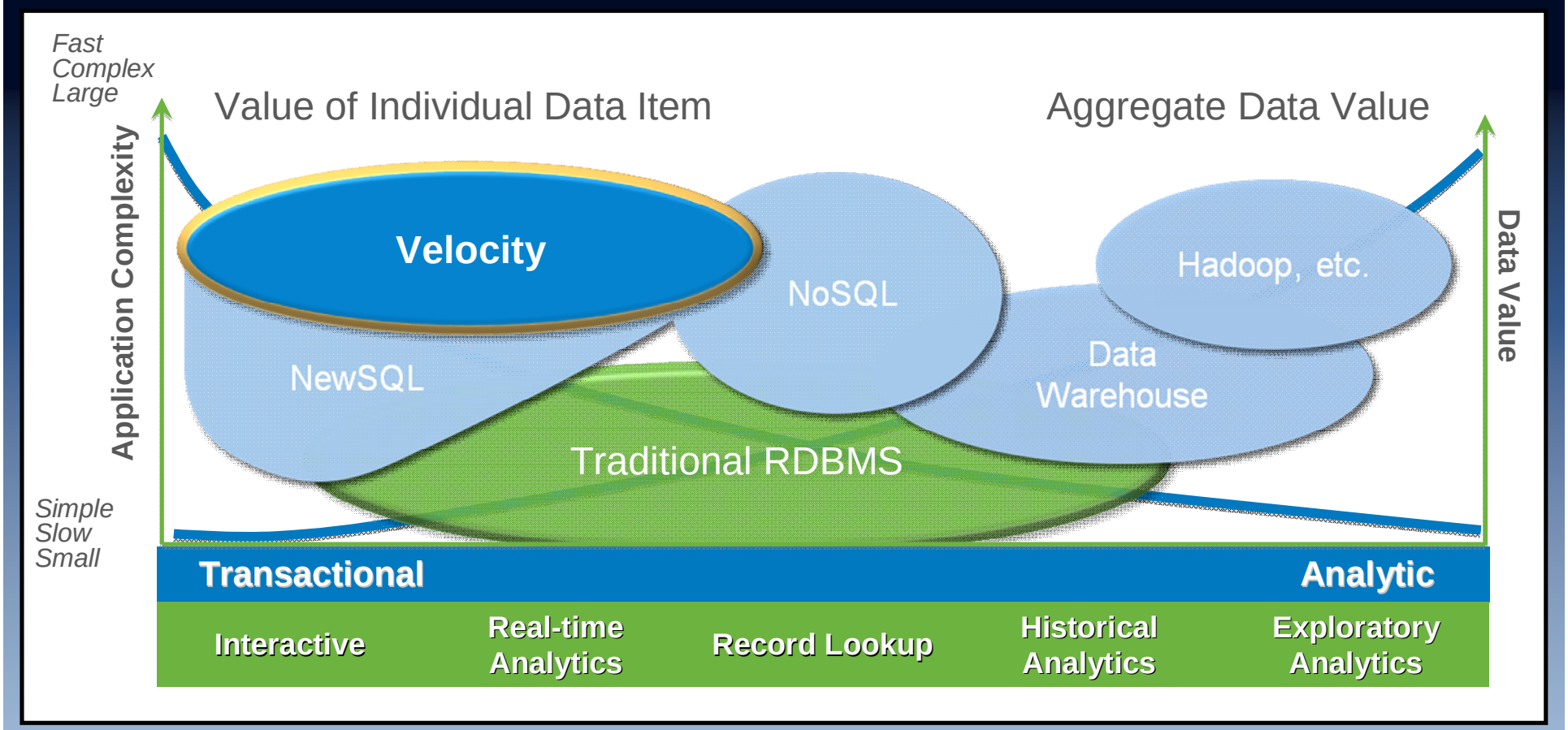
Structured vs. unstructured



Relational vs. NoSQL toolbox

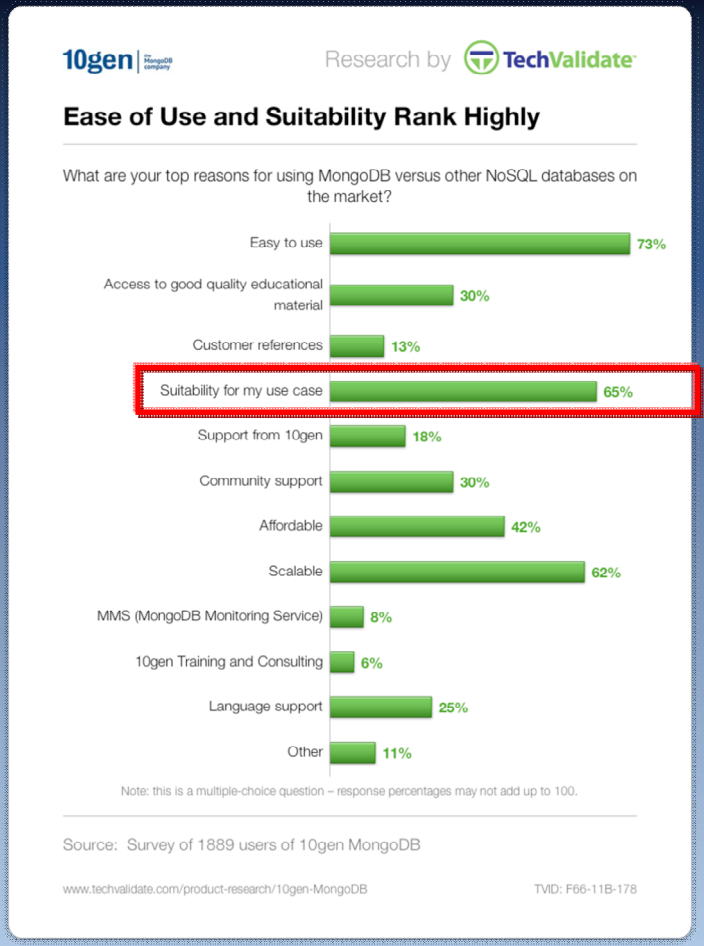


Choices, choices



Source: VoltDB, used with permission

Understand your use case



Source: http://www.techvalidate.com/tvid/F66-11B-178/

Understand vendor-speak

What vendor says	What vendor means
The biggest in the world	The biggest one we've got
The biggest in the universe	The biggest one we've got
There is no limit to ...	It's untested, but we don't mind if you try it
A new and unique feature	Something the competition has had for ages
Currently available feature	We are about to start Beta testing
Planned feature	Something the competition has, that we wish we had too, that we might have one day
Highly distributed	International offices
Engineered for robustness	Comes in a tough box

Source: "Object Databases: An Evaluation and Comparison" Bloor Research (1994)

Contact details

Find me on ...


http://www.linkedin.com/in/akmalchaudhri


http://twitter.com/akmalchaudhri

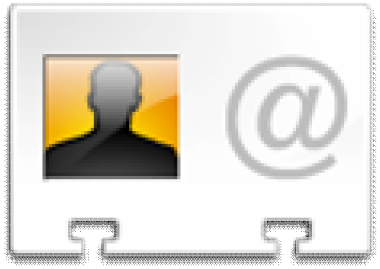

http://www.quora.com/Akmal-Chaudhri


http://www.facebook.com/akmal.chaudhri


http://plus.google.com/105126255575427189842/


http://www.slideshare.net/VeryFatBoy/

http://www.youtube.com/VeryFatBoyVideos/



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{"thank":"You"}

Resources

History

- First NoSQL meetup
  - http://nosql.eventbrite.com/
  - http://blog.oskarsson.nu/post/22996139456/nosql-meetup
- First NoSQL meetup debrief
  - http://blog.oskarsson.nu/post/22996140866/nosql-debrief
- First NoSQL meetup photographs
  - http://www.flickr.com/photos/russss/sets/72157619711038897/

NoSQL Search roadshow

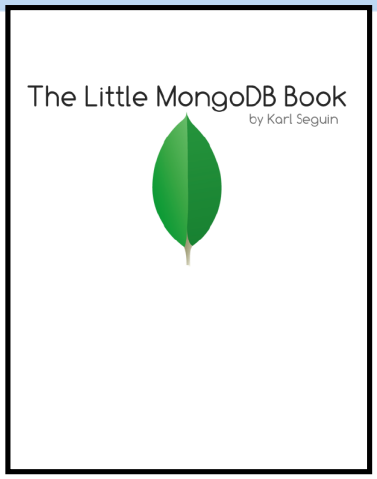
- Multi-city tour 2013
  - Munich
  - Berlin
  - San Francisco
  - Copenhagen
  - Zurich
  - Amsterdam
  - London

Source: http://nosqlroadshow.com/

Web sites

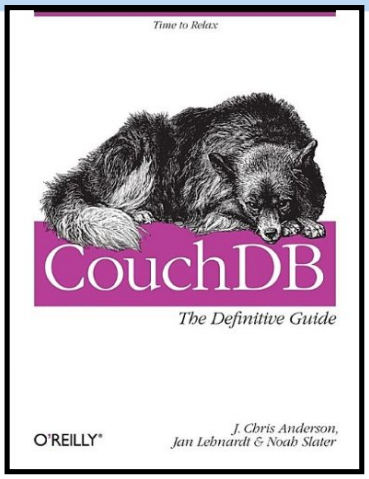
- NoSQL Databases and Polyglot Persistence: A Curated Guide
  - http://nosql.mypopescu.com/
- NoSQL: Your Ultimate Guide to the Non-Relational Universe!
  - http://nosql-database.org/

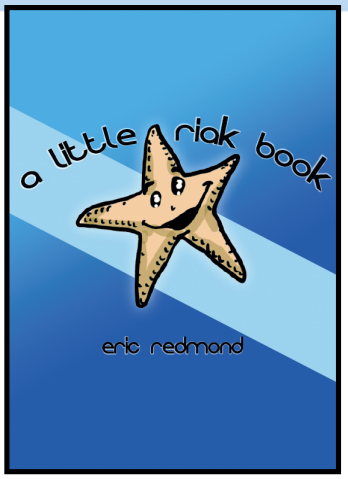
Free books ...



- The Little MongoDB Book
  - http://openmymind.net/2011/3/28/The-Little-MongoDB-Book/
- The Little Redis Book
  - http://openmymind.net/2012/1/23/The-Little-Redis-Book/

Free books





- CouchDB: The Definitive Guide
  - http://guide.couchdb.org/
- A Little Riak Book
  - https://github.com/coderoshi/little_riak_book/

Free training


10gen | The MongoDB Company

CERTIFICATE
Dec. 24th, 2012

This is to certify that

Akmal Chaudhri

successfully completed

M101: MongoDB for Developers

a course of study offered by 10gen, The MongoDB Company

Dwight Merriman
Chief Executive Officer
10gen, Inc.

Andrew Erlichson
Vice President, Education
10gen, Inc.

Authenticity of this certificate can be verified at https://education.10gen.com/downloads/certificates/1e73378509f046f28cbcb221f9d7cff/Certificate.pdf


10gen | The MongoDB Company

CERTIFICATE
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M102: MongoDB for DBAs

a course of study offered by 10gen, The MongoDB Company

Dwight Merriman
Chief Executive Officer
10gen, Inc.

Andrew Erlichson
Vice President, Education
10gen, Inc.

Authenticity of this certificate can be verified at https://education.10gen.com/downloads/certificates/c0e418e393e247eb818d82d047254ff4/Certificate.pdf

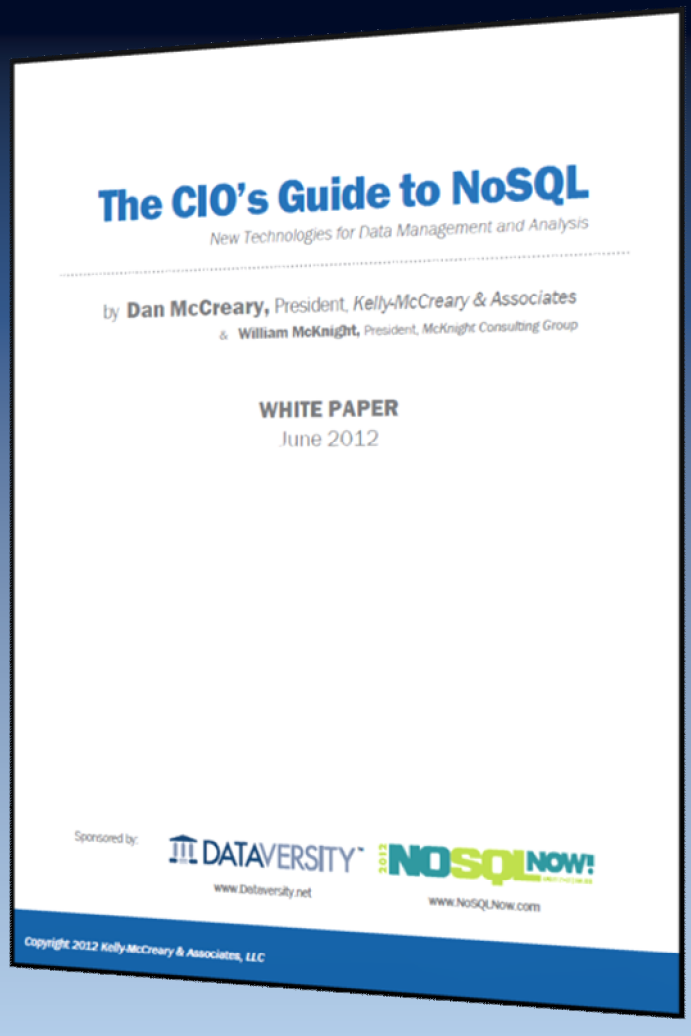
- Free courses on MongoDB
  - https://education.10gen.com/

Articles

- Saying Yes to NoSQL
  - http://www.nofluffjuststuff.com/s/magazine/NFJS_theMagazine_Vol3_Issue3_May2011.pdf
- The State of NoSQL
  - http://www.infoq.com/articles/State-of-NoSQL/

White papers

- The CIO's Guide to NoSQL
  - http://documents.dataversity.net/whitepapers/the-cios-guide-to-nosql.html



Product selection ...

- 101 Questions to Ask When Considering a NoSQL Database
  - http://highscalability.com/blog/2011/6/15/101-questions-to-ask-when-considering-a-nosql-database.html
- 35+ Use Cases for Choosing Your Next NoSQL Database
  - http://highscalability.com/blog/2011/6/20/35-use-cases-for-choosing-your-next-nosql-database.html

Product selection

- NoSQL Options Compared: Different Horses for Different Courses
  - http://www.slideshare.net/tazija/nosql-options-compared/
- NoSQL Data Modeling Techniques
  - http://highlyscalable.wordpress.com/2012/03/01/nosql-data-modeling-techniques/
- Choosing a NoSQL data store according to your data set
  - http://00f.net/2010/05/15/choosing-a-nosql-data-store-according-to-your-data-set/

Short product overviews ...

- Picking the Right NoSQL Database Tool
  - http://blog.monitis.com/index.php/2011/05/22/picking-the-right-nosql-database-tool/
- NoSQL Databases -- A Look at Apache Cassandra
  - http://blog.monitis.com/index.php/2011/05/24/nosql-databases-a-look-at-apache-cassandra/
- The NoSQL Databases -- A Look at HBase
  - http://blog.monitis.com/index.php/2011/05/31/the-nosql-databases-a-look-at-hbase/

Short product overviews ...

- A Look at Some NoSQL Databases -- MongoDB, Redis and Basho Riak
  - http://blog.monitis.com/index.php/2011/06/06/a-look-at-some-nosql-databases-mongodb-redis-and-basho-riak/
- Picking the Right NoSQL Database, Part 4 -- CouchDB and Membase
  - http://blog.monitis.com/index.php/2011/06/17/picking-the-right-nosql-database-part-4-couchdb-and-membase/

Short product overviews

- Cassandra vs MongoDB vs CouchDB vs Redis vs Riak vs HBase vs Couchbase vs Neo4j vs Hypertable vs ElasticSearch vs Accumulo vs VoltDB vs Scalaris comparison
  - http://kkovacs.eu/cassandra-vs-mongodb-vs-couchdb-vs-redis/
- vsChart.com
  - http://vschart.com/list/database/

Case studies ...

- Real World NoSQL: HBase at Trend Micro
  - http://gigaom.com/cloud/real-world-nosql-hbase-at-trend-micro/
- Real World NoSQL: MongoDB at Shutterfly
  - http://gigaom.com/cloud/real-world-nosql-mongodb-at-shutterfly/
- Real World NoSQL: Cassandra at Openwave
  - http://gigaom.com/cloud/realworld-nosql-cassandra-at-openwave/

Case studies

- Real World NoSQL: Amazon SimpleDB at Netflix
  - http://gigaom.com/cloud/real-world-nosql-amazon-simpledb-at-netflix/
- Real World NoSQL: Membase at Tribal Crossing
  - http://gigaom.com/cloud/real-world-nosql-membase-at-tribal-crossing/
- How Disney built a big data platform on a startup budget
  - http://gigaom.com/data/how-disney-built-a-big-data-platform-on-a-startup-budget/

Security ...

- NoSQL, no security?
  - http://www.slideshare.net/wurbanski/nosql-no-security/
- NoSQL, No Injection!?
  - http://www.slideshare.net/wayne_armorize/nosql-no-sql-injections-4880169/
- Attacking MongoDB
  - http://www.slideshare.net/cyber-punk/mongo-db-eng/
- NoSQL, But Even Less Security
  - http://blogs.adobe.com/asset/files/2011/04/NoSQL-But-Even-Less-Security.pdf

Security

- NoSQL Database Security
  - http://conference.auscert.org.au/conf2011/presentations/Louis Nyffenegger V1.pdf
- Does NoSQL Mean No Security?
  - http://www.darkreading.com/database-security/167901020/security/news/232400214/does-nosql-mean-no-security.html
- A Response To NoSQL Security Concerns
  - http://www.darkreading.com/blog/232600288/a-response-to-nosql-security-concerns.html

Polyglot persistence ...

- Polyglot Persistence
  - http://www.slideshare.net/jwoodslideshare/polyglot-persistence-two-great-tastes-that-taste-great-together-4625004/
- HBase at Mendeley
  - http://www.slideshare.net/danharvey/hbase-at-mendeley/
- Polyglot Persistence Patterns
  - http://abhishek-tiwari.com/post/polyglot-persistence-patterns/

Polyglot persistence

- Polyglot Persistence: EclipseLink with MongoDB and Derby
  - http://java.dzone.com/articles/polyglot-persistence-0/
- D. Ghosh (2010) Multiparadigm data storage for enterprise applications. *IEEE Software*. Vol. 27, No. 5, pp. 57-60

Performance benchmarks ...

- Yahoo Cloud Serving Benchmark
  - http://research.yahoo.com/node/3202/
  - http://altoros.com/nosql-research
  - http://www.slideshare.net/tazija/evaluating-nosql-performance-time-for-benchmarking/
- Benchmarking Couchbase Server
  - http://www.slideshare.net/Couchbase/t1-s4-couchbase-performancebenchmarkingv34/

Performance benchmarks ...

- Ultra-High Performance NoSQL Benchmarking
  - http://thumbtack.net/solutions/ThumbtackWhitePaper.html
- Benchmarking Top NoSQL Databases
  - http://www.datastax.com/resources/whitepapers/benchmarking-top-nosql-databases

Performance benchmarks ...

- MongoDB Performance Pitfalls -- Behind The Scenes
  - http://blog.trackerbird.com/content/mongodb-performance-pitfalls-behind-the-scenes/
- MySQL vs. MongoDB Disk Space Usage
  - http://blog.trackerbird.com/content/mysql-vs-mongodb-disk-space-usage/
- MongoDB: Scaling write performance
  - http://www.slideshare.net/daumdna/mongodb-scaling-write-performance/

Performance benchmarks

- Can the Elephants Handle the NoSQL Onslaught?
  - http://vldb.org/pvldb/vol5/p1712_avriliafloratou_vldb2012.pdf
- Solving Big Data Challenges for Enterprise Application Performance Management
  - http://vldb.org/pvldb/vol5/p1724_tilmannrabl_vldb2012.pdf
- Linked Data Benchmark Council
  - http://ldbc.eu/

BI/Analytics

- BI/Analytics on NoSQL: Review of Architectures Part 1
  - http://www.dataversity.net/bianalytics-on-nosql-review-of-architectures-part-1/
- BI/Analytics on NoSQL: Review of Architectures Part 2
  - http://www.dataversity.net/bianalytics-on-nosql-review-of-architectures-part-2/

Various graphics ...

- Database Landscape Map -- December 2012
  - http://blogs.the451group.com/information_management/2012/12/20/database-landscape-map-december-2012/
- Necessity is the mother of NoSQL
  - http://blogs.the451group.com/information_management/2011/04/20/necessity-is-the-mother-of-nosql/
- NoSQL, Heroku, and You
  - https://blog.heroku.com/archives/2010/7/20/nosql/

Various graphics

- The NoSQL vs. SQL hoopla, another turn of the screw!
  - http://www.parelastic.com/blog/nosql-vs-sql-hoopla-another-turn-screw/
- Navigating the Database Universe
  - http://www.slideshare.net/lisapaglia/navigating-the-database-universe/

Discussion fora

- NoSQL
  - http://www.linkedin.com/groups?gid=2085042
- NewSQL
  - http://www.linkedin.com/groups/NewSQL-4135938
- Google groups
  - http://groups.google.com/group/nosql-discussion

NoSQL jokes/humour ...

- LinkedIn discussion thread
  - http://www.linkedin.com/groups/NoSQL-Jokes-Humour-2085042.S.177321213
- NoSQL Better Than MySQL?
  - http://www.youtube.com/watch?v=QU34ZVD2ylY
  - Shorter version of “Episode 1 - MongoDB is Web Scale”
- say No! No! and No! (=NoSQL Parody)
  - http://www.youtube.com/watch?v=fXc-QDJBXpw

NoSQL jokes/humour

- C.R.U.D.
  - http://crudcomic.com/
  - Scroll-back for some great humour on NoSQL!

Miscellaneous ...

- Powerpoint template
  - http://www.articulate.com/rapid-elearning/heres-a-free-powerpoint-template-how-i-made-it/
- Autostereogram
  - http://www.all-freeware.com/images/full/46590-free_stereogram_screensaver_audio___multimedia_other.jpeg
- Theatre Curtain Animations
  - http://www.slideshare.net/chinateacher1/theater-curtain-animations/

Miscellaneous ...

- Bar and Column charts
  - http://www.diychart.com/
- Newspaper headlines
  - http://www.imagechef.com/ic/make.jsp?tid=Newspaper+Headline
- Pie charts
  - http://www.onlinecharttool.com/

Miscellaneous

- Icons and images
  - http://www.geekpedia.com/icons.php
  - http://cemagraphics.deviantart.com/
  - http://www.freestockphotos.biz/
  - http://www.graphicsfuel.com/2011/09/comments-speech-bubble-icon-psd/
  - http://icondock.com/