CMS requirements on IT provided NoSQL data stores

Current CMS usage

- Hadoop (just HDFS)

- CouchDB

- MongoDB

- KyotoCabinet

} see next talk

General NoSQL observations

General NoSQL observations

When all you have is a hammer everything looks like a nail

General NoSQL observations

- Generally simple to set up and manage

- Most designed for "web scale" applications, targeting clustered deployments

- NoSQL, while catchy, is a poor name

  - Especially when so many of them have a SQL-like interface...

General NoSQL observations

- Specialise and drop traditionally "required" features

- Less forgiving than traditional SQL databases

  - Optimised for specific access patterns/behaviour, outside of those very suboptimal

General NoSQL observations

- Choice of tool must be done carefully

  - Eventually consistent systems are **eventually consistent**...

- Very use case dependent

- Lot of choice on the "market"

General NoSQL observations

- Good for startups with limited resources and exposure to risk

- Good for large companies who build data centres with lots of loosely related data and large DevOps teams

Scale

- Designed, and simpler to run, at scales higher than traditional databases

- Majority of NoSQL stores promise automagical horizontal scaling

- For many use cases that isn't actually critical, scale point is beyond where the use case sits

- Experiments can (and already do!) successfully run these tools at low scale

Looking back

- CERN has, to date, provided an excellent Oracle service

- It has not provided a MySQL cluster, groups have managed MySQL themselves

- Create a parallel for a NoSQL solution

What would `nosql.cern.ch` look like?

- Service, complimenting the Oracle RAC's upon which VO's can build applications on (a la PhyDB)

- Needs to provide a reliable service that experiments cannot provide themselves due to:

  - complexity

  - scale

- It should be a sizeable, expandable cluster, partitioned by VO

What would `nosql.cern.ch` look like?

- Two classes of NoSQL stores available:

  - Complimentary

  - Game changing

- In my view only game changing stores are really interesting

Community

- "Rolling our own" would be a disaster

- CMS would not be interested in a CERN specific NoSQL project

  - Smaller support base

- Engage with existing community (majority of NoSQL tools are open source)

Community

- Consider community/ecosystem when choosing technology

- Look for systems running at, or beyond, our scales

  - let someone else find those scaling issues

- CONTRIBUTE, don't fork/start new project

Technology choice

- Differences between NoSQL databases much larger than between traditional databases, at least to the end user

- Decision between key:value stores and more complex data processing systems

- IMHO technology choice less important than commitment of support

Software?

- MongoDB/CouchDB

  - Already in use, would use a suitable centrally provided system were one available

  - Yet to hit scale issues, and possibly never will

- Cassandra

  - Not used in CMS

  - Apparently not quite at interesting scale, O(150TB)

- Only game changer, in my view, is Hadoop

Why Hadoop?

- Proven from terabyte to multi-petabyte scales

- Vendor and student awareness

- Large, active open source community

  - Already some use in HEP

CMS Requirements

- Pick a single existing project and contribute to it

  - Fragmentation of effort could be a concern, due to number of tools

- CMS *cannot* manage a usefully sized Hadoop cluster, and would need IT to be involved were we to start using it significantly

Let imagine it's Hadoop

- This would be a major project

  - Major changes to purchasing and provisioning of servers, and operations

  - Applications need re-architecting for Map:Reduce paradigm

- Next step would be to identify some demonstrator use cases

Possible demonstrators

- Identify use cases where relational databases are problematic:

  - Log analysis - ideal for Dashboard "historical view" etc.

  - Analysis of application performance

  - More complex data catalogues

- Worth noting that specific classes of analysis/ processing become possible in new regime

Do we actually need `nosql.cern.ch?`

- There are sites "out there" that already have Hadoop clusters

- Could we run demonstrator projects there and move experience back to CERN?

- Minimum cluster size to be interesting O(100)TB

Do we actually need `nosql.cern.ch`?

- Existing solutions work at currently required scale

  - Need to avoid a solution looking for a problem

- Retooling to a new database platform is very costly

  - Expect new tools will be first users

- When will we outgrow what Oracle can provide?
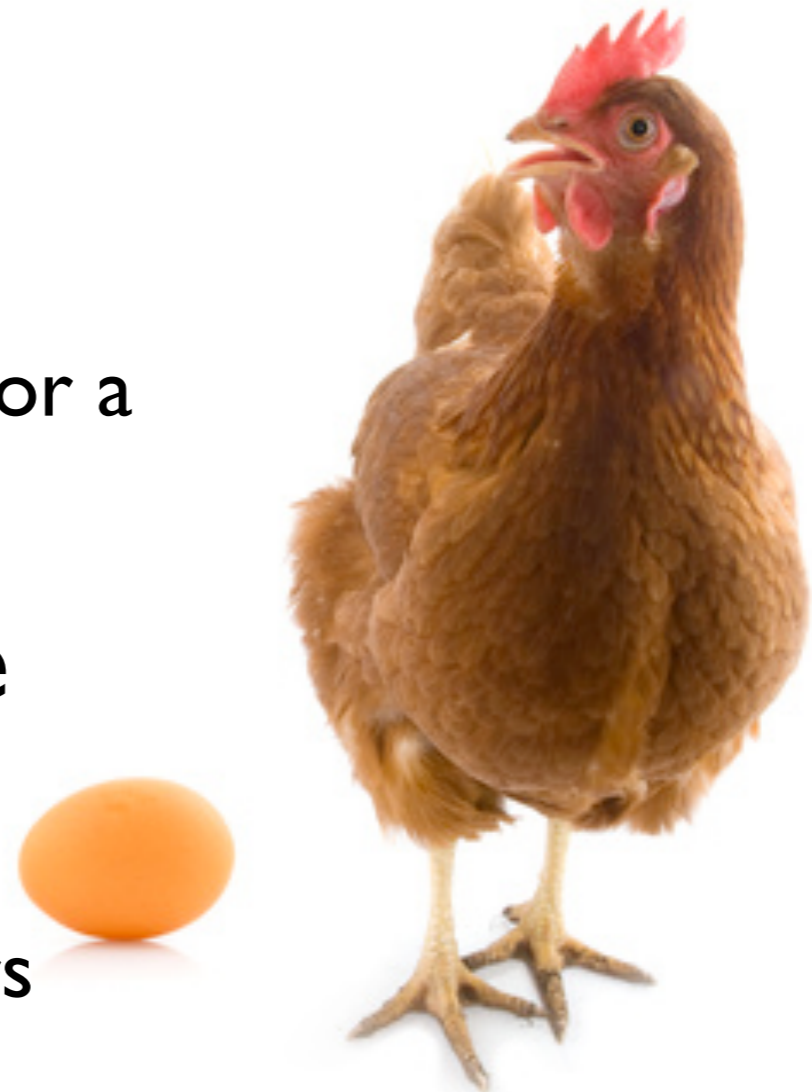
Conclusions

- Would be happy to move to an IT provided CouchDB/MongoDB instance were a suitable service offered

  - Complimentary service, not be a game changer

- Game changing NoSQL use needs significant research before being justifiable

- Agree on demonstrators, possibly run offsite

Conclusions

- NoSQL is no panacea

- Diversity of NoSQL space makes a centrally provided solution difficult

- Solutions beyond the scope of a single organisation