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Full-Text Search: Human Heaven and Database Savior in the Cloud

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Friday, June 12, 2009

Goals

> Happier users
> Happier DBAs
> Simplicity in the cloud

Emmanuel Bernard

- Hibernate Search in Action
- blog.emmanuelbernard.com
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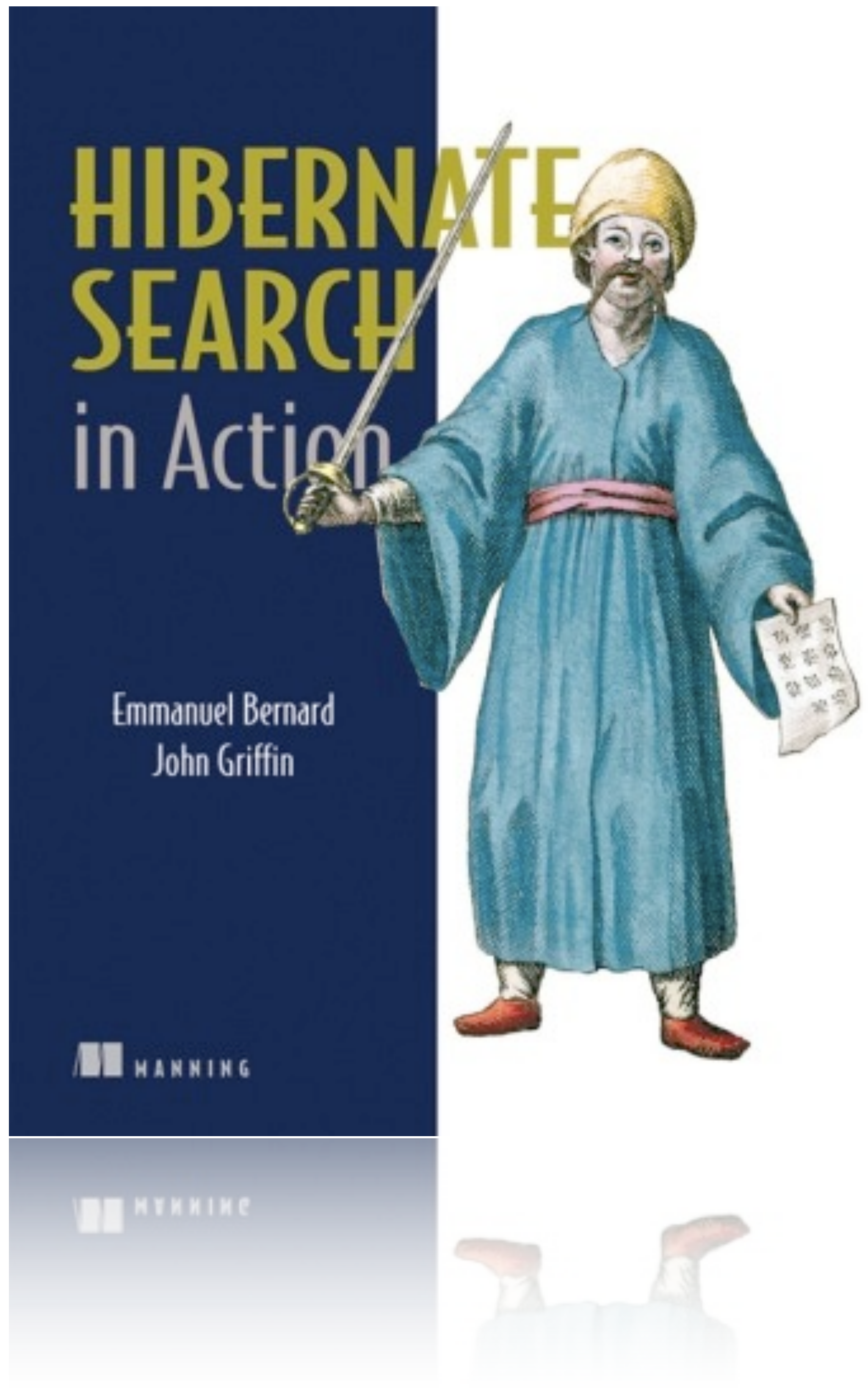

Aaron Walker

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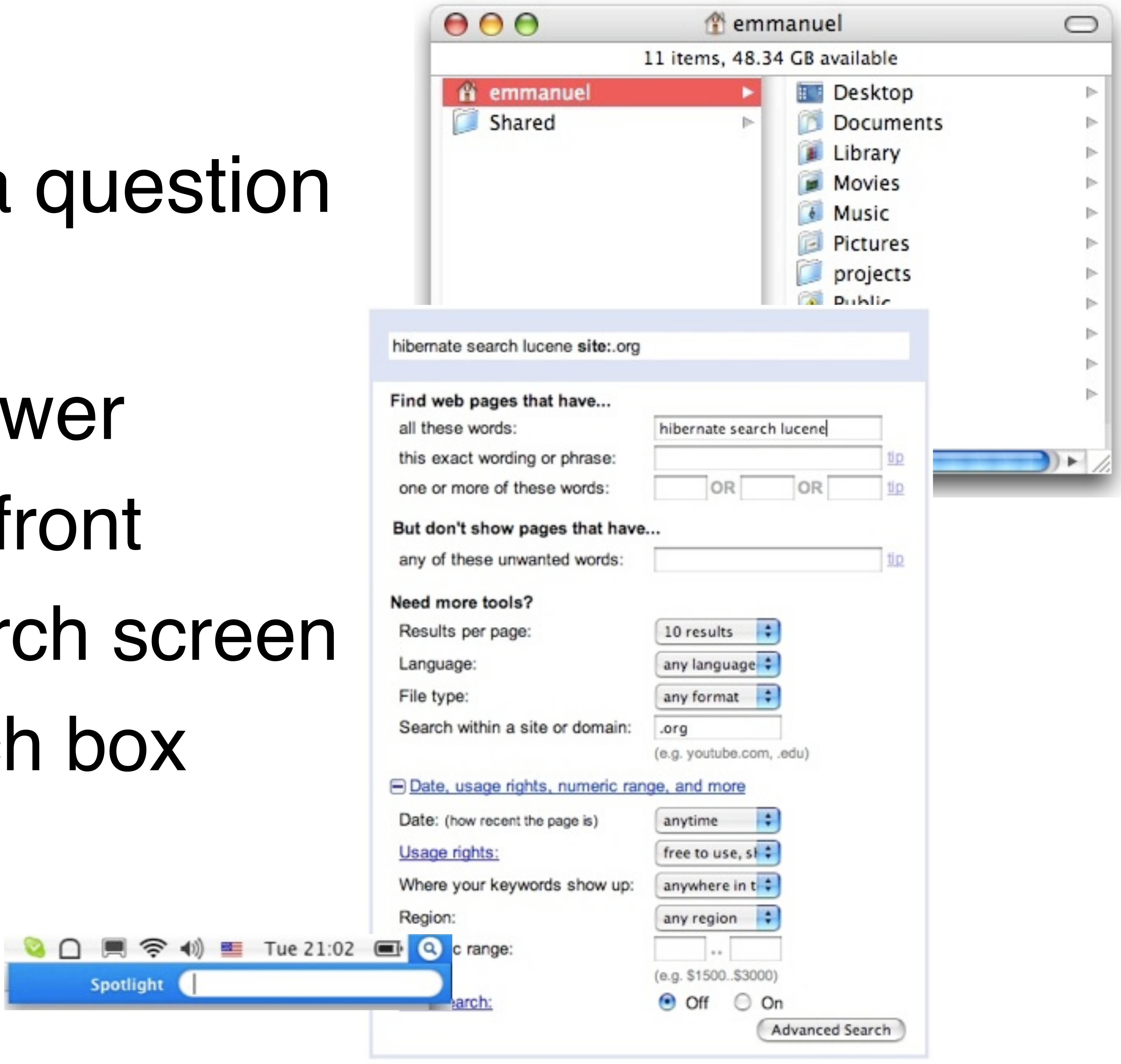
Full-text Search and
Hibernate Search

What is searching?

> Searching is asking a question

> Different ways to answer
- Categorize data up-front
- Offer a detailed search screen
- Offer a simple search box



hibernate search lucene **site:**.org

Find web pages that have...

all these words:	hibernate search lucene
this exact wording or phrase:	
one or more of these words:	OR OR

But don't show pages that have...

any of these unwanted words:	

Need more tools?

Results per page:	10 results
Language:	any language
File type:	any format
Search within a site or domain:	.org (e.g. youtube.com, .edu)

Date, usage rights, numeric range, and more

Date: (how recent the page is)	anytime
Usage rights:	free to use, sh
Where your keywords show up:	anywhere in t
Region:	any region
c range:	.. (e.g. $1500..$3000)
arch:	[✓ Off] On

Advanced Search

SQL search limits

- Wildcard / word search
  - ‘%hibernate%’
- Approximation (or synonym)
  - ‘hybernat’
- Proximity
  - ‘Java™’ close to ‘Persistence’
- Relevance or (result scoring)
- multi-”column” search

Full Text Search

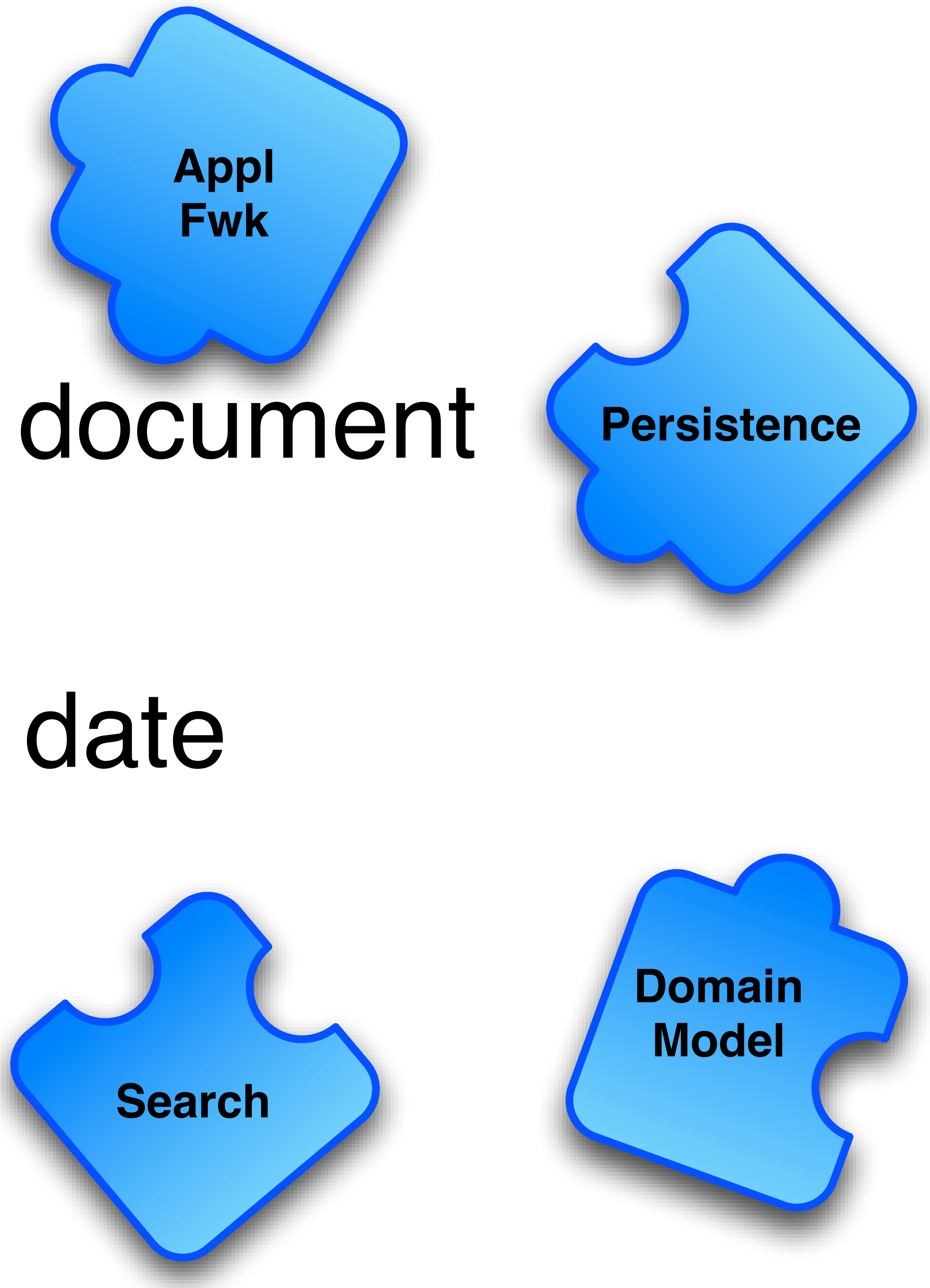
> Search information
- by word
- inverted indices (word frequency, position)

> In RDBMS engines
- portability (proprietary add-on on top of SQL)
- flexibility
- scalability

> Standalone engine

Mismatches with a domain model

> Structural mismatch
  - full text index are text only
  - no reference/association between document
> Synchronization mismatch
  - keeping index and database up to date
> Retrieval mismatch
  - the index does not store objects
  - certainly not managed objects



Hibernate Search

- Transparent indexing through event system
  - PERSIST / UPDATE / DELETE
- Convert the object structure into Index structure
  - metadata (annotations) driven
- Expose full-text search as Hibernate queries
- Uses Lucene under the hood
  - optimizations

Queries and indexing

> Query
- Managed objects
- extends Query APIs
- Minimal intrusion

> Indexing
- synchronous / asynchronous
- Plain Lucene / Clustered though JMS™

Mapping

```
@Entity @Indexed
public class Essay {
    ...
    @Id @DocumentId
    public Long getId() { return id; }

    @Field(name="Abstract", index=Index.TOKENIZED, store=Store.YES)
    public String getSummary() { return summary; }

    @Lob @Field
    public String getText() { return text; }

    @ManyToOne @IndexedEmbedded
    public Author getAuthor() { return author; }
}
```

Query

```
FullTextEntityManager ftEm = Search.getFullTextEntityManager(em);

FullTextSession ftSession = Search.getFullTextSession(session);

org.hibernate.Query query = ftSession.createFullTextQuery(luceneQuery);
List<?> results = query.setMaxResults(100).list();

FullTextQuery query = ftSession.createFullTextQuery(luceneQuery, Author.class);
@SuppressWarnings("unchecked")
List<Author> results = query.setMaxResults(100).list();

int totalNbrOfResults = query.getResultSize();
```

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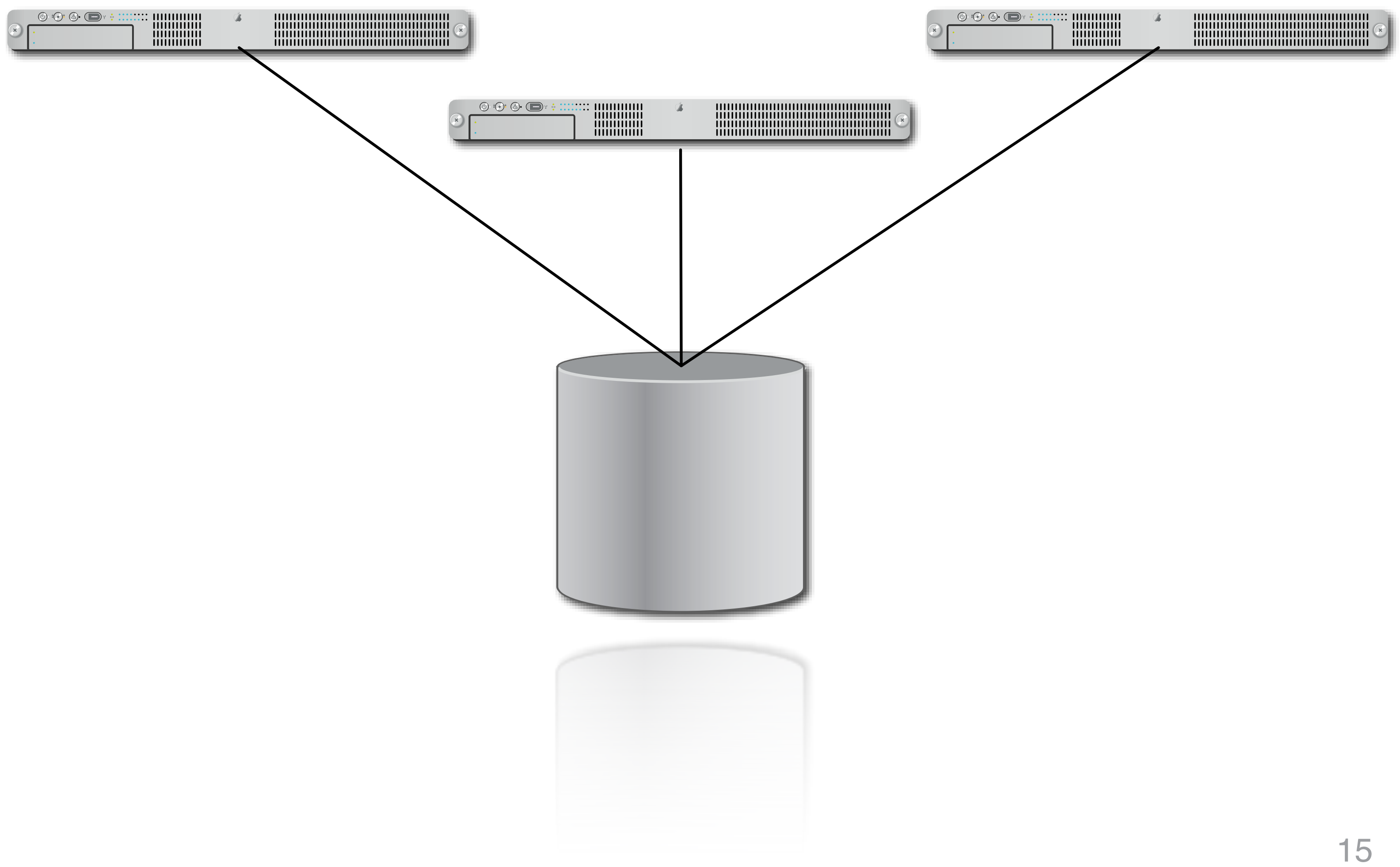
Clustering search in a Java EE environment without compromising scalability

What are the problems we are trying to solve?

> SQL limitations
  - proprietary full text search
> performance bottlenecks
  - limited resources
  - non linear performance
> scaling complexities
  - limited to scaling up
  - Vendor lock-in

```
MSSQL>
SELECT * FROM articles
WHERE CONTAINS((title, body), 'database');
```

```
MySQL>
SELECT * FROM articles
 WHERE MATCH (title,body) AGAINST ('database');
```



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JUST MAGAZINES

Case study

JUST CARS JUST BIKES

JUST 4X4S JUST PARTS

JUST TRUCKS & HEAVY EQUIPMENT

Sun microsystems

Just Magazines

> Australia's number 1 selling automotive magazine
> Specializes in niche & customs vehicles
> 525,000 readers across all magazines

Just Auto - Online automotive classifieds & communities

> Classifieds
  - private & dealer ads

> Community features
  - blogs
  - projects
  - clubs
  - videos
  - and more cool web 2.0 stuff :)

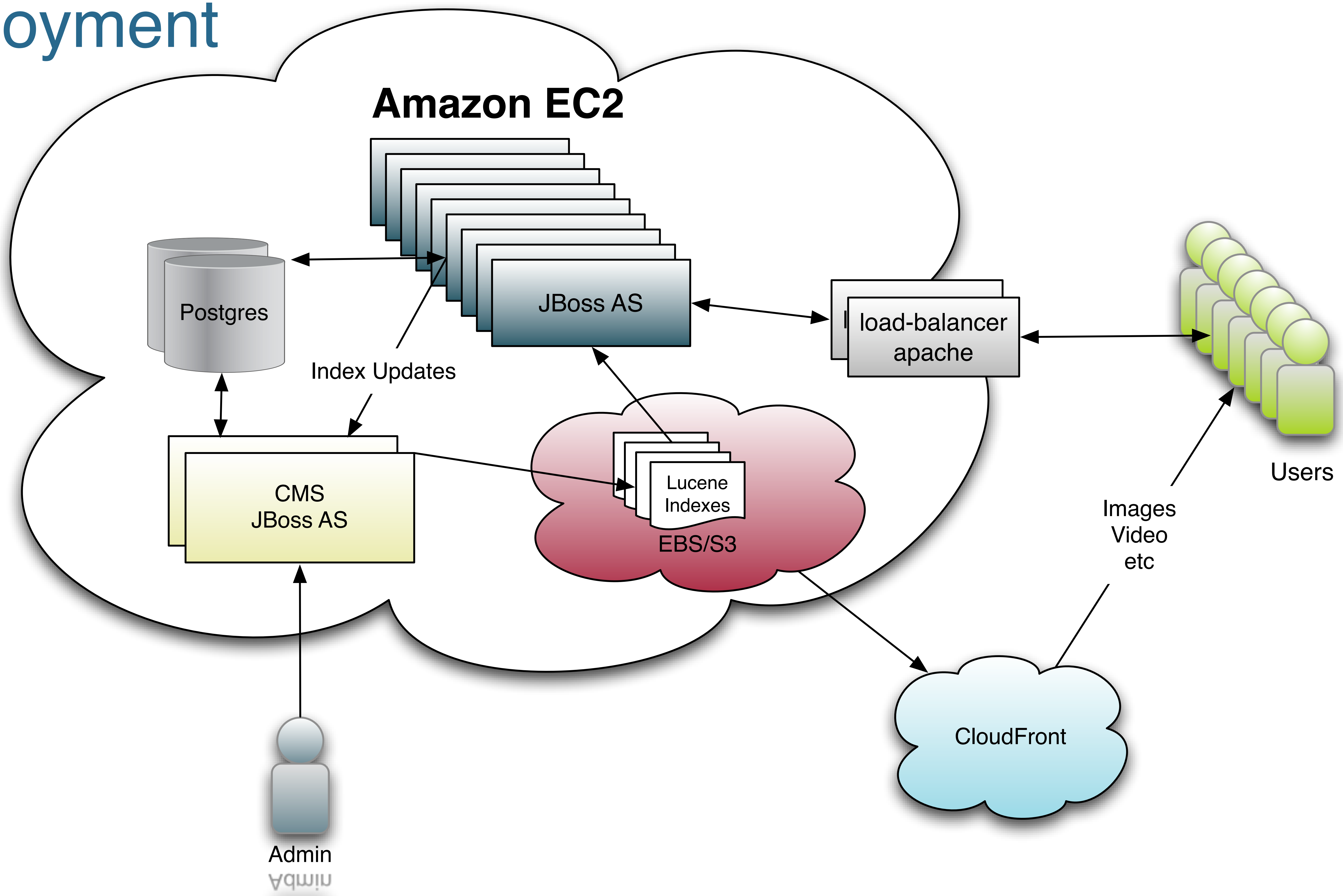
Technology Stack

> Standard JEE APIs
  - primarily EJB 3.0, JPA & JAX-RS
> Front-end
  - Freemarker templating engine
  - AJAX - mootools
> **Hibernate Search**

Deployed in the Cloud

- Amazon Web Services
  - EC2, EBS, S3 & CloudFront
- JBoss AS on CentOS/RHEL
  - CMS Admin tool
  - Light-weight front-end (Stripped down JBoss AS)
  - JOPR - JBoss management console
- Load-balancing
  - Apache httpd, mod_cluster + DNS round-robin

Deployment


Amazon EC2
Postgres
JBoss AS
load-balancer apache
Users
Index Updates
CMS JBoss AS
Lucene Indexes
EBS/S3
Images Video etc
CloudFront
Admin

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Techniques for building highly scalable Web sites and Web applications

Overview of using Hibernate Search query projection

> Hibernate Search allows you to return a subset of properties directly from the Lucene index

> **Avoids a database hit**

> Requirements

- the properties projected must be stored in the index @Field(store=Store.YES)
- only simple properties of the indexed entity or its embedded associations

Hibernate Search query projection - APIs

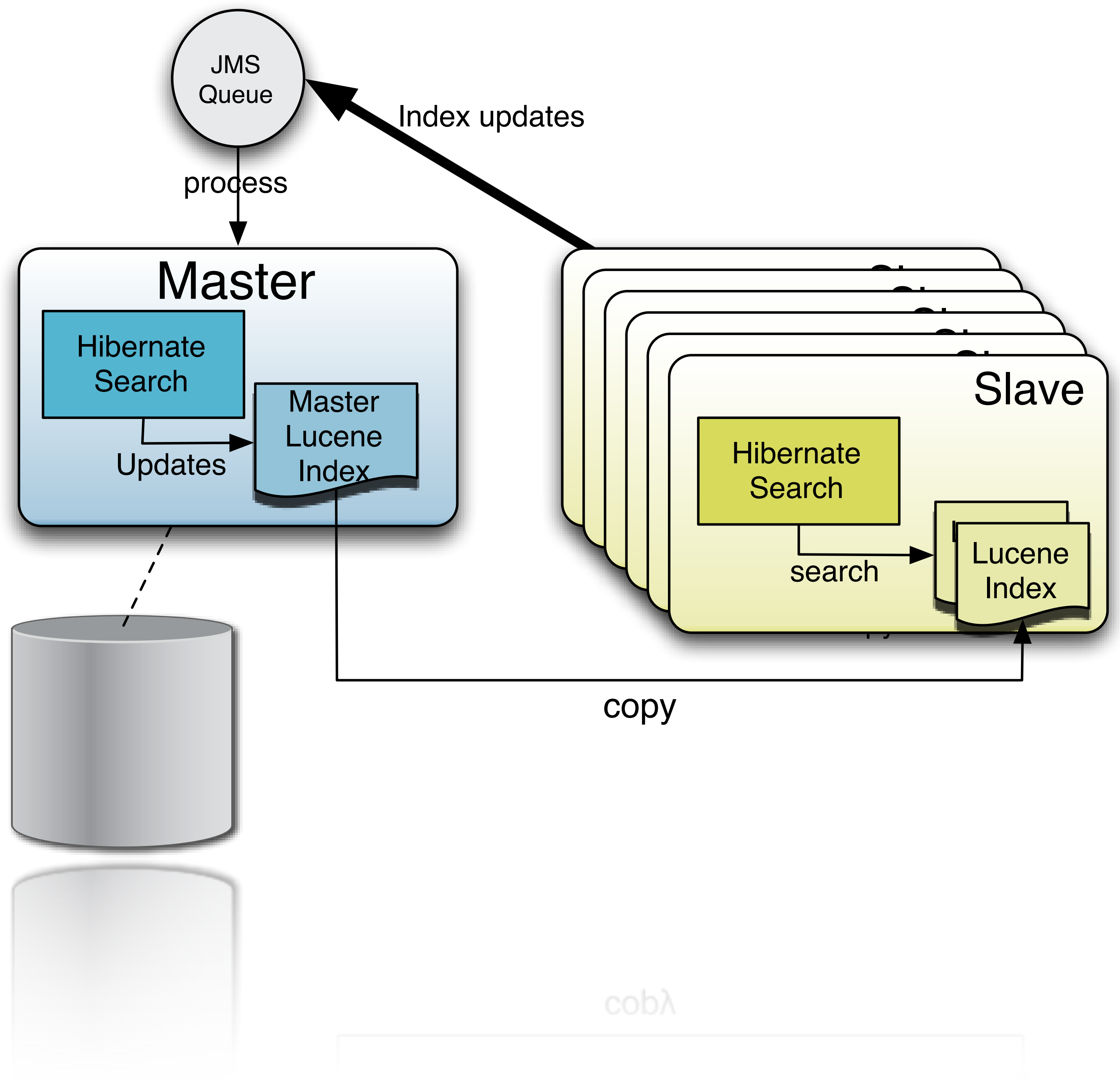
> Example - Result Transformer

```
org.hibernate.search.FullTextQuery query = s.createFullTextQuery( luceneQuery, Blog.class );

query.setProjection( "title", "author.name" );

query.setResultTransformer(
    new StaticAliasToBeanResultTransformer( BlogView.class, "title", "author" )
);

List<BlogView> results = (List<BlogView>) query.list();
for(BlogView view : results) {
    log.info( "Blog: " + view.getTitle() + ", " + view.getAuthor() );
}
```

- See org.hibernate.transform.ResultTransformer Interface for more details

Overview of Hibernate Search index replication

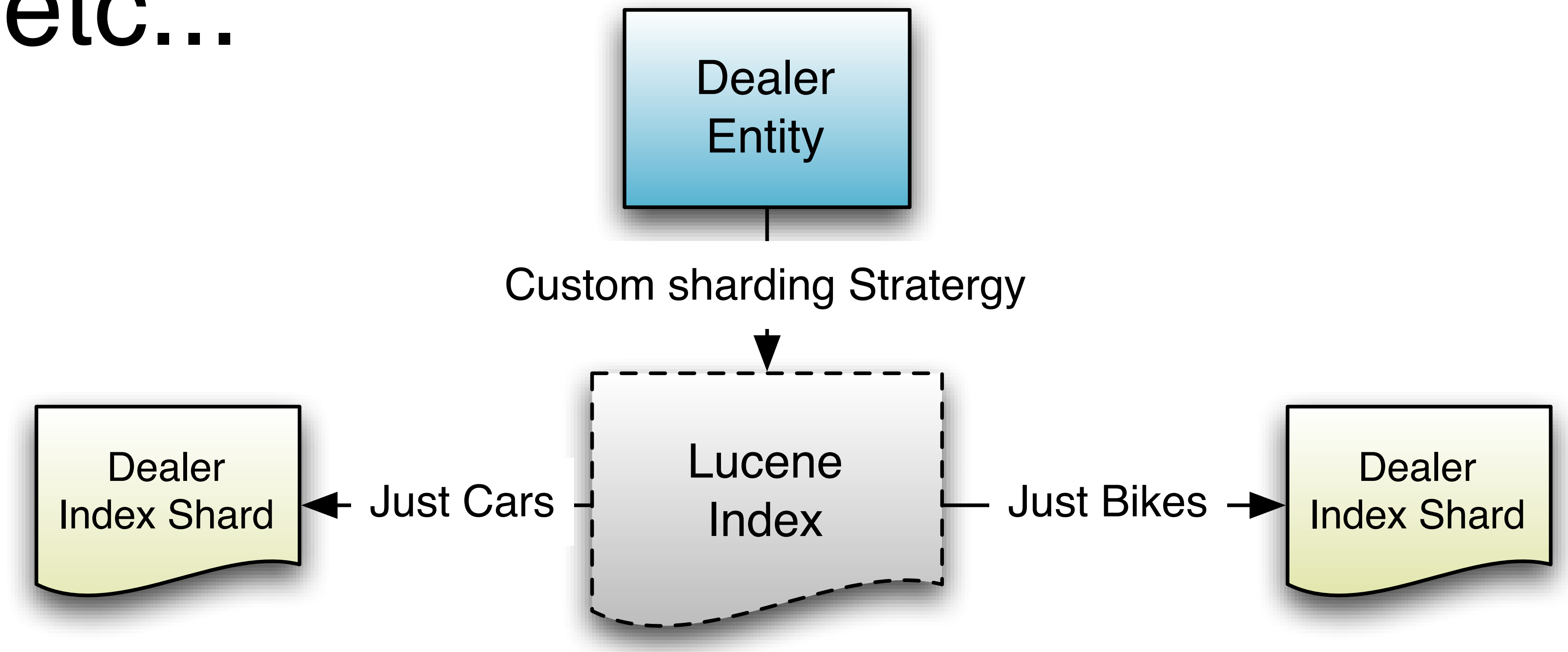
> Automatic replication
> Local indexes
> Updates delegated to a master
  - via JMS Queue
> Can easily add more slaves



Overview of Hibernate Search index sharding

> Allows you to index a given entity type into several sub indexes
  - default strategy uses hash of id field

> Can Specify a custom sharding strategy
  - shard on a business field e.g geographic location, product category, etc...



Techniques for building applications that are cloud-ready

> Break the architecture into small discrete pieces
  - separated CMS from content delivery
  - individual sites for Cars, Bikes etc...
  - JBoss micro-container

> Independently deployable components
  - can deploy CMS across number of servers
  - mix and match site deployments

Take control of your cloud

- JOPR
  - more than just a JBoss management console
  - monitor OS, App Servers, Database and more
  - pluggable agents with simple API
- EC2
  - scriptable AMIs for rapid server configuration
  - change an instances personality at runtime
  - automate automate automate

So why Amazon Web Services?

> Flexibility
  - easily add and remove instances
  - scale on demand
> Play space
  - can quick bring-up environments to experiment with
  - production migration
> No lock-in
> Complete cloud offering

More Amazon Web Services

- S3 - Simple Storage
- Elastic Block Storage - EBS
  - fast persistence storage
  - mounted multiple volumes in RAID 0
  - snapshot backups to S3
- CloudFront
  - content delivery network
  - used for static content images & video

Summary

> Hibernate Search
  - unified programmatic model
  - feels like Hibernate, search like Lucene

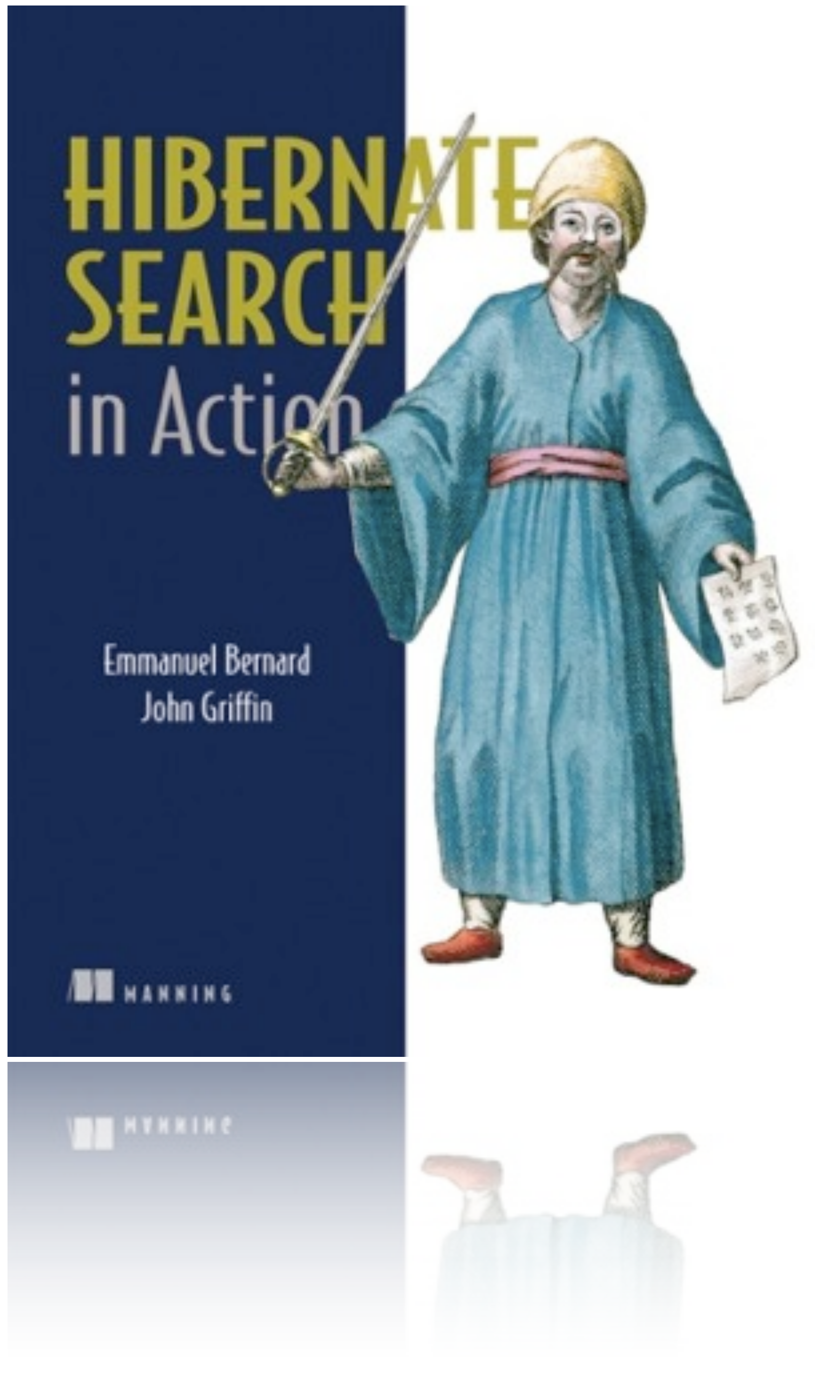
> Scalability
  - avoid inessential database hits
  - simple is better

> Simplicity in the Cloud
  - design to scale out, not up!!!

Questions?

- http://search.hibernate.org
- Hibernate Search in Action (Manning)
- http://lucene.apache.org

- a.walker@base2services.com
- emmanuel@hibernate.org



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