# Hibernate OGM

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# About me

- Quality Assurance Engineer at JBoss / Red Hat
- Formerly played with JBoss AS / EAP
- Now having fun with Infinispan / Enterprise Datagrid
- Performance / system resilience tests in clustered environment

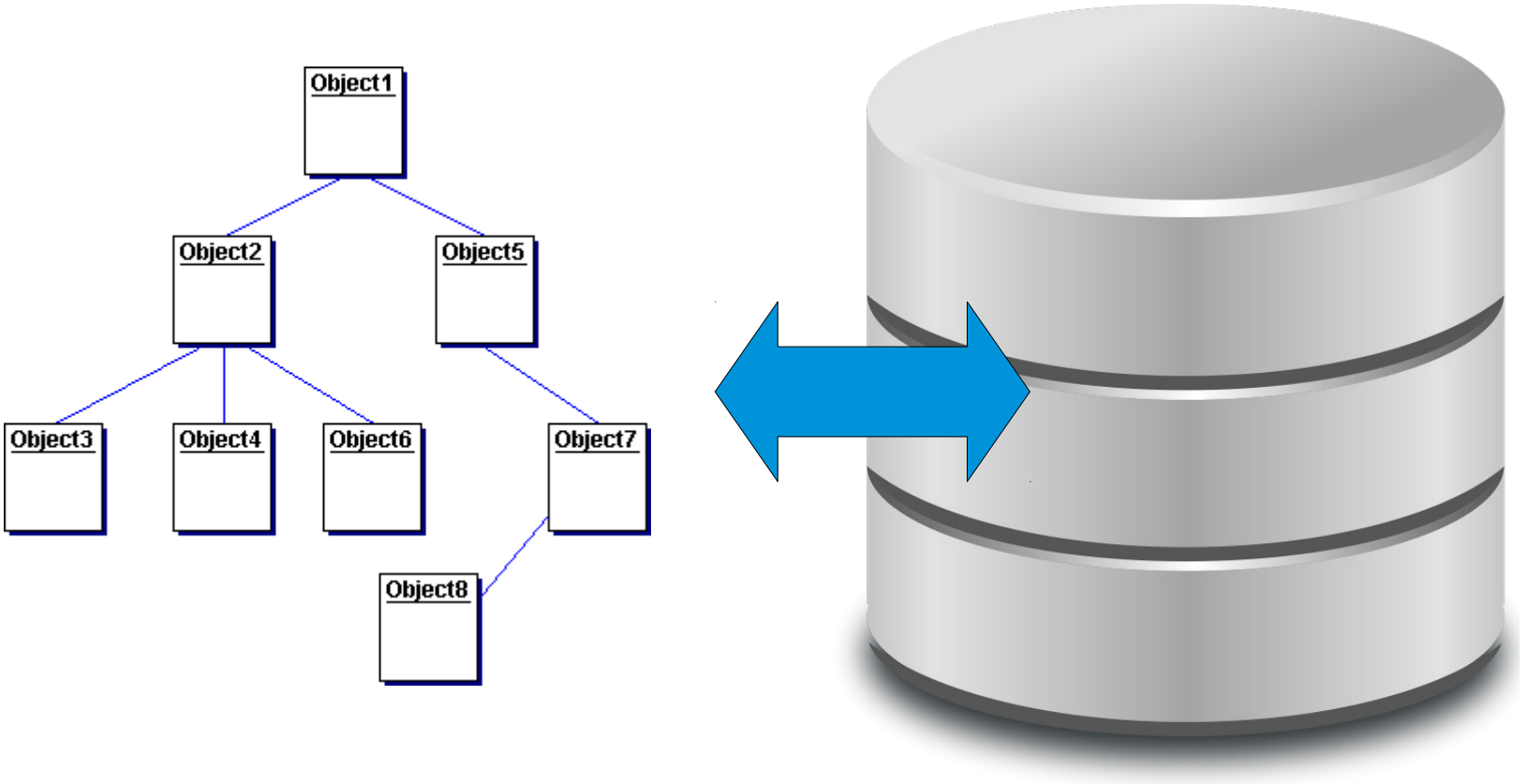



OGM !


# OGM = Object/Grid Mapper



# We need to store objects



# JEE has a well known solution: JPA

javax.persistence.* annotations

```
@Entity
@Table(uniqueConstraints = @UniqueConstraint(columnNames = "email"))
public class Member implements Serializable {

   @Id
   @GeneratedValue
   private Long id;

   @NotNull
   @Size(min = 1, max = 25)
   @Pattern(regexp = "[A-Za-z ]*", message = "must contain only letters and spaces")
   private String name;

   @NotNull
   @NotEmpty
   @Email
   private String email;

   ...

}
```



# ORM = Object-Relational Mapping


| id<br>[PK] bigin | email<br>character varying(255) | name<br>character varying(2 | phone_number<br>character varying(12) |
|---|---|---|---|
| 0 | john.smith@mailinator.com | John Smith | 2125551212 |
| 1 | michal@linhard.sk | Michal Linhard | 421908380703 |
| | | | |



# Relational Databases

- Brought peace and order for 30 years
- Data structure abstraction
- Safety net
- Transactions
- Referential integrity
- (simple) types
- Proven usefulness
- Tuning, backup, resilience



# Relational databases

- (Some) limitations:
  - plan for scale is hard
  - data model changes are painful
- New needs
  - limitless data for later analysis
  - risk of being successful
- Cloud



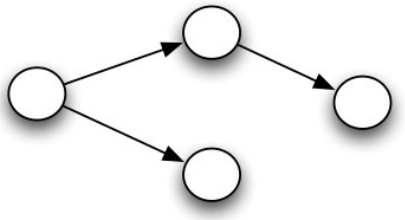
# NoSQL Alternative (Not Only SQL)

- Goals
  - very different
    - large dataset
    - high availability
    - low latency / higher throughput
  - specific data access pattern



# Not Only SQL

- Document based stores
- Column based
- Graph oriented databases
- Key / value stores



| key | value |
|---|---|
| 123 | Address@23 |
| 126 | “Booya” |

```
{ "user" : {
  "id": "124",
  "name": "Emmanuel",
  "addresses" : [
    { "city": "Paris", "country": "France" },
    { "city": "Atlanta", "country": "USA" }
  ]
}
```



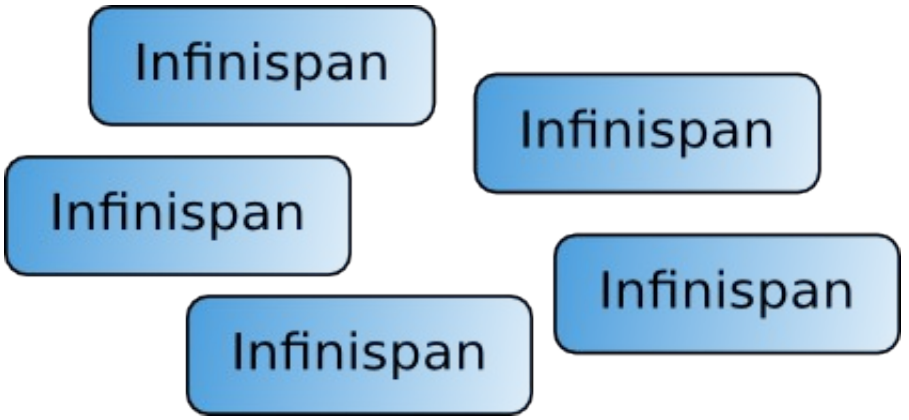
# NoSQL continued ... Flexibility at a cost

- Programming model
  - one per product :(
- no schema => app driven schema
- query (Map Reduce, specific DSL, ...)
- transaction
- durability / consistency



# Introducing Infinispan

- Clustered in-memory Key/Value store
- Each node is equal, scale by adding or killing nodes
- No bottlenecks, by design
- Cloud network friendly
  - Uses JGroups as communication layer






# Introducing Infinispan

- Support for transactions
- Cache loaders (Cassandra, JDBC, Amazon S3, ...)
- Lucene integration
- Some Hibernate integrations
  - Second level cache
  - Hibernate Search indexing backend

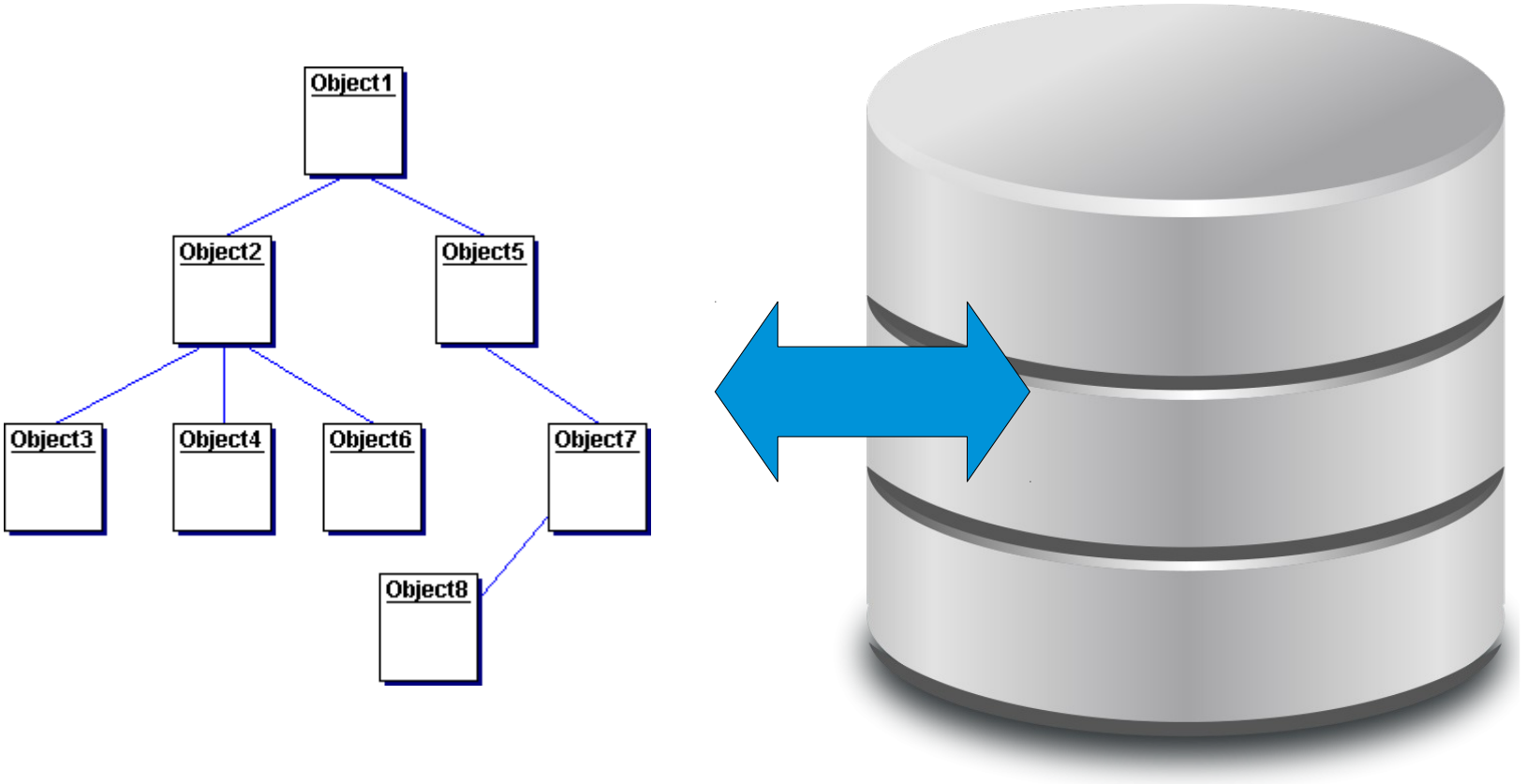


# Introducing Infinispan

- It's a java.util.concurrent.ConcurrentMap !
- map.put( “user-34”, userInstance );
- map.get( “user-34” );
- map.remove( “user-34” );
- map.putIfAbsent( “user-38”, another );

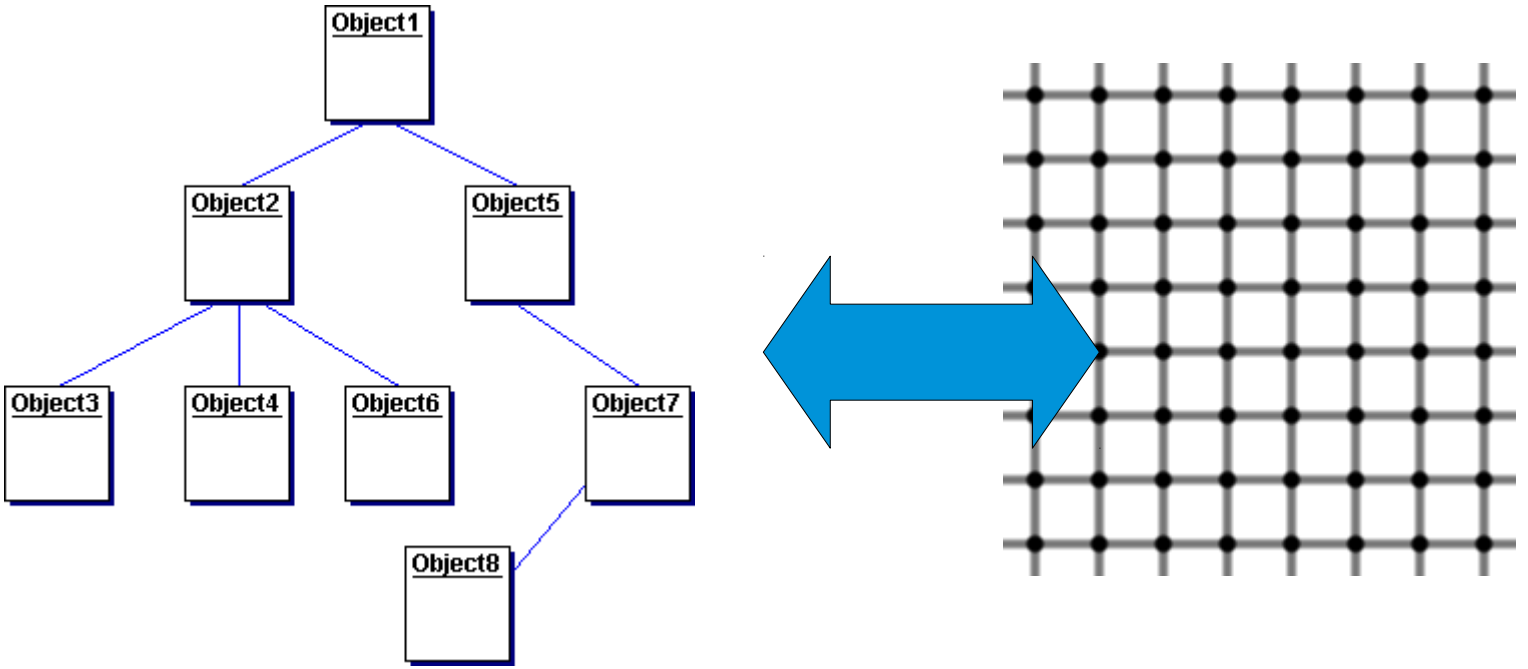


# Back to the beginning ...






# Wanna move to NoSQL Storage ?




But don't want to learn new API / Programming Model ?



# Introducing 


- JPA for NoSQL
- Encourage new data usage patterns
- Familiar environments
- Ease of use
- Easy to jump in / out
- Push NoSQL exploration in enterprises
- “PaaS for existing API” initiative

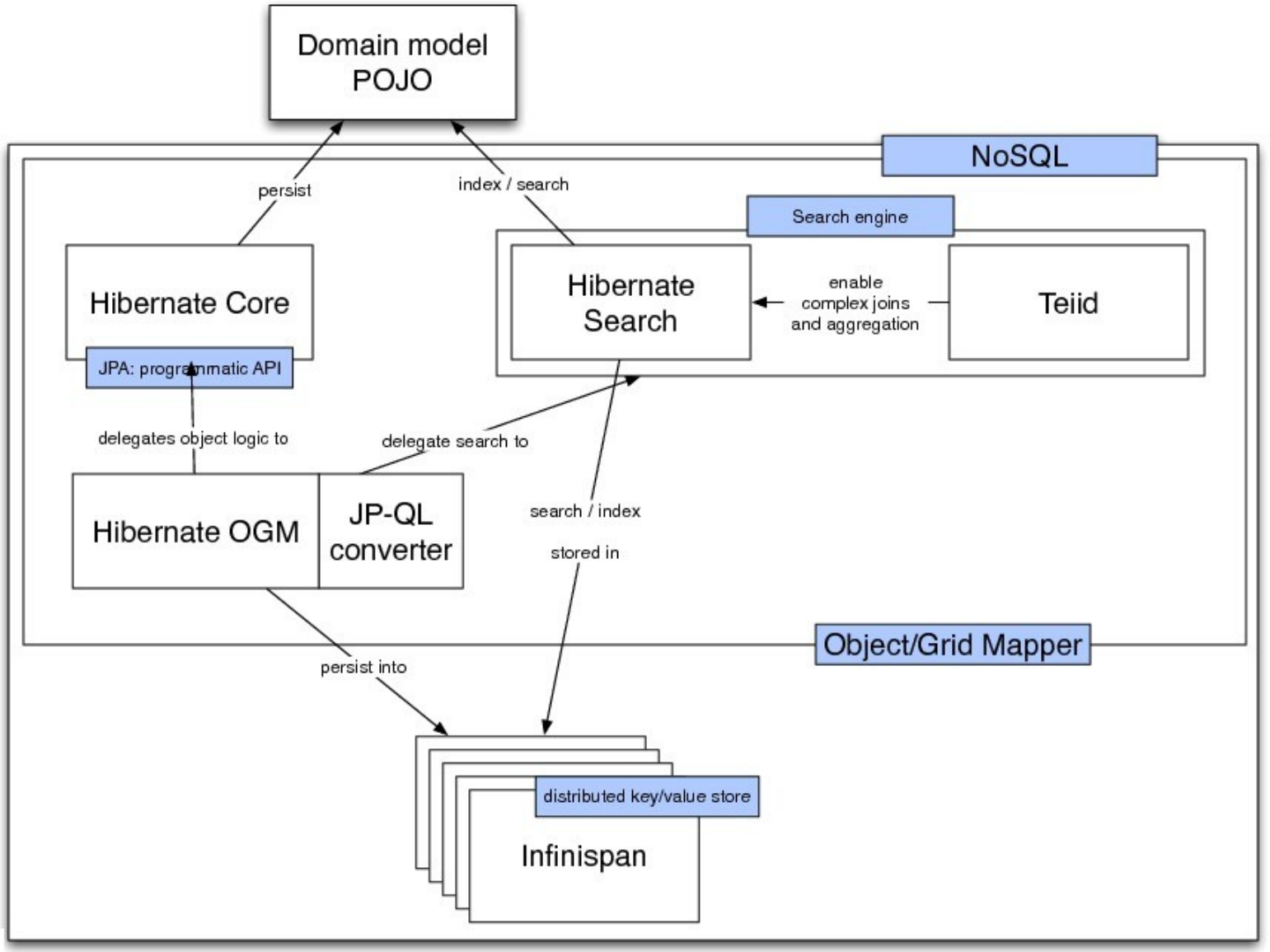


# Introducing 


- Currently works with Infinispan
- Object CRUD (+associations)
- Reuses Hibernate Search, Hibernate Core
- JP-QL queries
- Not a silver bullet



# General Architecture








# Introducing HIBERNATE OGM

# Concepts



# Schema or no schema?

- Schema-less
  - move to new schema very easy
  - app deal with old and new structure or migrate all data
  - need strict development guidelines
- Schema
  - reduce likelihood of rogue developer corruption
  - share with other apps
  - “didn’t think about that” bugs reduced



# Entities as serialized blobs?

- Serialize objects into the (key) value
  - store the whole graph?
  - maintain consistency with duplicated objects
  - guaranteed identity a == b
  - concurrency / latency
  - structure change and (de)serialization, class definition changes



# OGM’s approach to schema

- Keep what’s best from relational model
  - as much as possible
  - tables / columns / PKs
- Decorrelate object structure from data structure
- Data stored as (self-described) tuples
- Core types limited
  - portability



# OGM’s approach to schema

- Store metadata for queries
  - Lucene index
- CRUD operations are key lookups



# Storage - Entities

- Entities are stored as tuples (Map<String,Object>)
- Key is composed of
  - table name, PK column names, PK values
- Value is Map<String,Object>
  - String: column name
  - Object: simple type (serializable)
  - e.g. {id=1, name="Charlie", date-of-birth=23-03-1983}

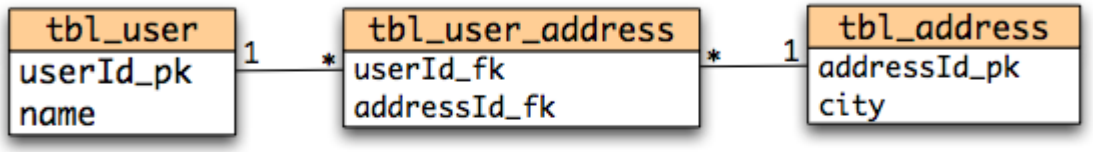


# Storage - Associations

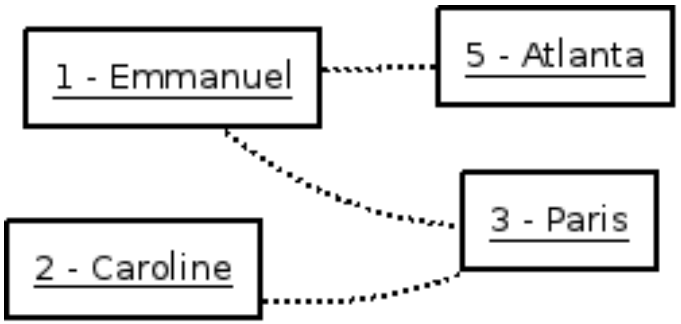
- Cannot store exactly like relational DBs (key lookup)
  - still tuple based
- Each association in two keys (both sides)
  - table name, FK column names, FK values (for a given side)
- Value is the list of tuples
- Focus on speedy reads
  - association writes involve two key lookups



# How does it work?


| key | value |
|---|---|
| tbl_user,userId_pk,1 | {userId_pk=1,name="Emmanuel"} |
| tbl_user,userId_pk,2 | {userId_pk=2,name="Caroline"} |
| tbl_address,addressId_pk,3 | {addressId_pk=3,city="Paris"} |
| tbl_address,addressId_pk,5 | {addressId_pk=5,city="Atlanta"} |
| tbl_user_address,userId_fk,1 | { {userId_fk=1, addressId_fk=3}, {userId_fk=1, addressId_fk=5} } |
| tbl_user_address,userId_fk,2 | { {userId_fk=2, addressId_fk=3} } |
| tbl_user_address,addressId_fk,5 | { {userId_fk=1, addressId_fk=5} } |
| tbl_user_address,addressId_fk,3 | { {userId_fk=1, addressId_fk=3}, {userId_fk=2, addressId_fk=3} } |






# Queries

- Hibernate Search indexes entities
- Store Lucene indexes in Infinispan
- JP-QL to Lucene query transformation
- Works for simple queries
  - Lucene is not a relational SQL engine



# Queries

select a from Animal a where a.size > 20

```
> animalQueryBuilder
      .range().onField(“size”).above(20).excludeLimit()
      .createQuery();
```

select u from Order o join o.user u where o.price > 100 and u.city = “Paris”

```
> orderQB.bool()
      .must(
            orderQB.range()
            .onField(“price”).above(100).excludeLimit().createQuery() )
      .must(
            orderQB.keyword(“user.city”).matching(“Paris”).createQuery())
      .createQuery();
```



# Conclusion

- JPA for NoSQL
- Reusing mature projects
- Keep the good of the relational model
- Do queries too
- Alpha quality
- Quite promising and exciting
- No Silver bullet



# More info

- Project page
  - http://www.hibernate.org/subprojects/ogm.html
- Code
  - https://github.com/hibernate/hibernate-ogm/

Questions ?