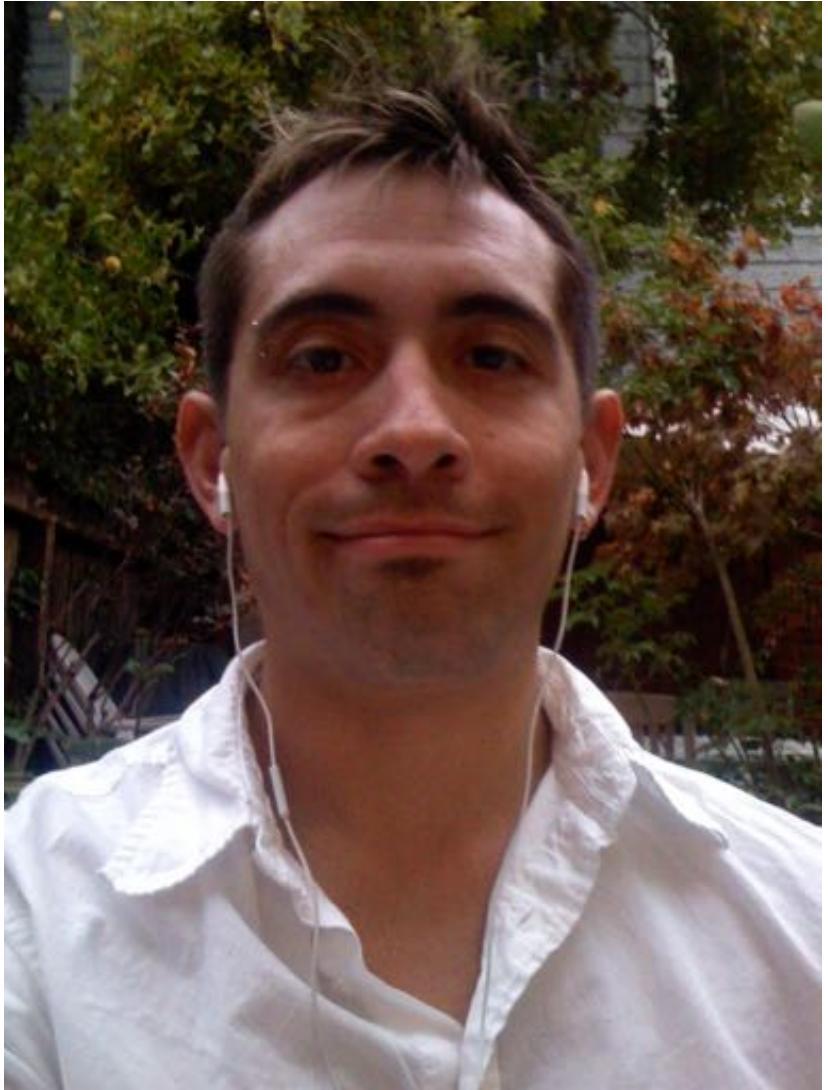


# Coherence in the Retail Space: A Case Study of Adoption of Coherence at Macy's.com

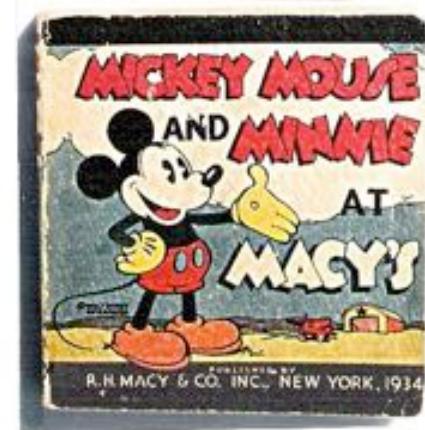




- BS in Computer Science University of Missouri
- Several years in Government sector
- With Macys for 4 years
- Likes Chinese noodles



y  
S  
?



★macy's

# Macy's.com

Opened in 1998

- 250,000 products available
- 1M page views a month

Today

- 500,000 products
- 3M page views an hour
- Highly dynamic expression of products



The screenshot shows the Macy's.com homepage with a green header bar containing links for "at home", "men's", "women's", "young attitude", "jewelry", "lingerie", "cosmetics", and "fragrance". Below the header is the main navigation bar with links for "SIGN IN | REGISTER | MY ACCOUNT", "0 items | CHECKOUT", and a note about JavaScript. A sidebar on the left lists categories like "FREE SHIPPING", "SHOP ONLINE DEALS & PROMOTIONS", "SHOP THE SALE IN STORES!", "NEW! MATTRESS FINDER", and "watch our new mattress TV spot". The main content area features a large banner for a "SEMI-ANNUAL FURNITURE SALE" with a woman sitting on a sofa. Other banners include "you deserve a ‘tax break’", "LIMITED-TIME SPECIALS", and a circular offer for "0% INTEREST IF PAID IN FULL WITHIN 24 MONTHS". The footer contains links for "CUSTOMER SERVICE", "MACY'S CREDIT CARD", "OUR STORES", "MACY'S INC.", and "macysJOBS". On the right side, there are additional links for "SALE & CLEARANCE", "EXTRA 25-40% online clearance", and "TOTAL SAVINGS 40-80%".

# Today: Multiple Client Channels

Amazon

Facebook

iPhone

amazon.com

Hello, Mariano Hernandez. We have [recommendations](#) for you. (Not Mariano?)

Mariano's Amazon.com | Today's Deals | Gifts & Wish Lists | Gift Cards

Shop All Departments | Search Macy's

Home & Garden | For The Home | Bed & Bath | Womens | Mens | Kids | Beauty

for the home | bed & bath | womens | mens | kids | beauty | jewelry & v

**BROWSE**

Shop by Category

[For The Home](#)  
[Bed & Bath](#)  
[Womens](#)  
[Mens](#)  
[Juniors](#)  
[Kids](#)  
[Beauty](#)  
[Jewelry & Watches](#)  
[Holiday Lane](#)  
[Luggage](#)  
[Rugs](#)  
[Sale](#)  
[Clearance](#)

**WOMEN FEATURED CATEGORIES**

DRESSES | JACKETS & BLAZERS | TOPS

**MEN FEATURED CATEGORIES**

SWEATERS | OUTERWEAR | SHIRTS

**KIDS FEATURED CATEGORIES**

BEDDING | PAJAMAS | HOODIES



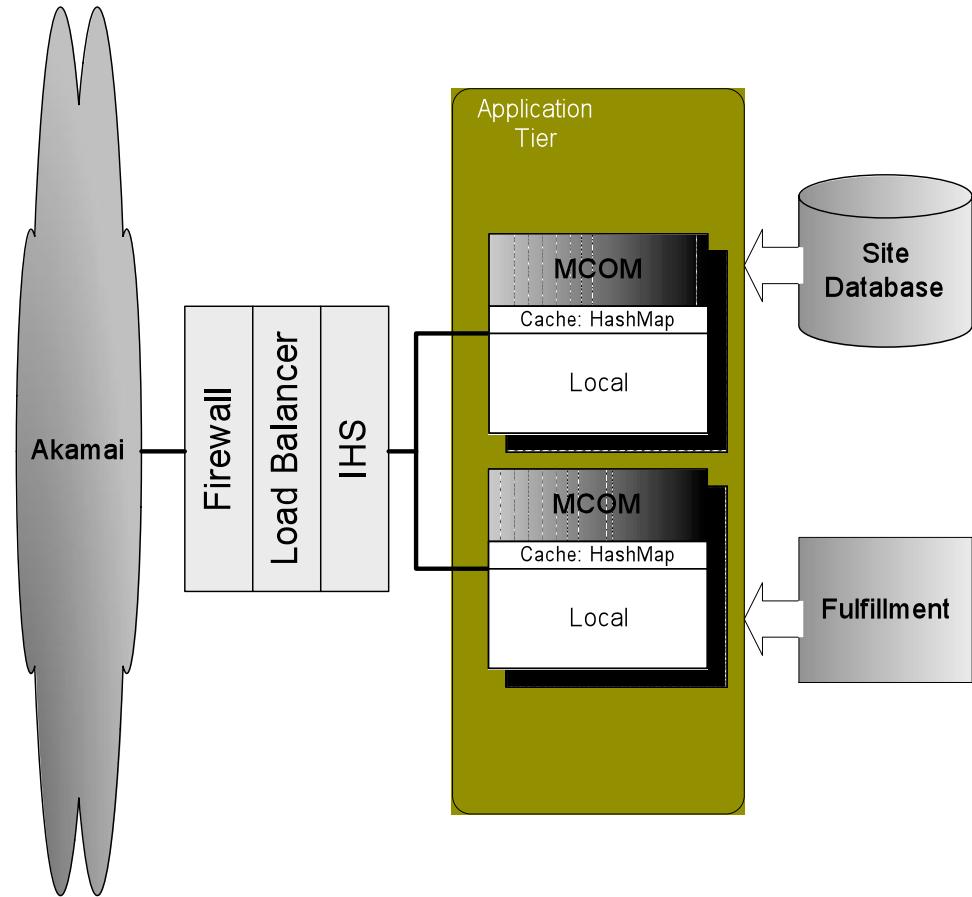


How did we get  
here?



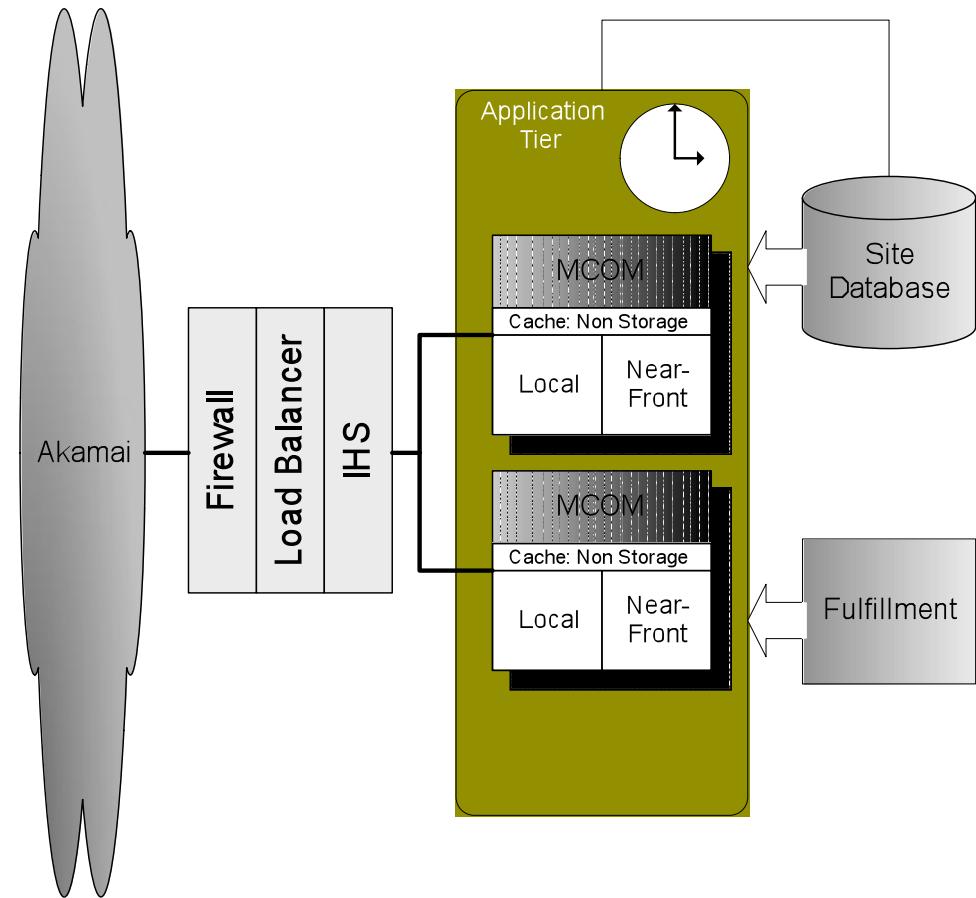
## Initial Issue - 1:

- JVMs cache by HashMap
- First Hit SLAs require cache preload
- Upper Limit of 2 concurrent preloads
- Each Cycle is 30 minutes
- No Incremental data; fresh data required full recycle
- Can't scale past 3 load cycles and meet nightly go live SLA



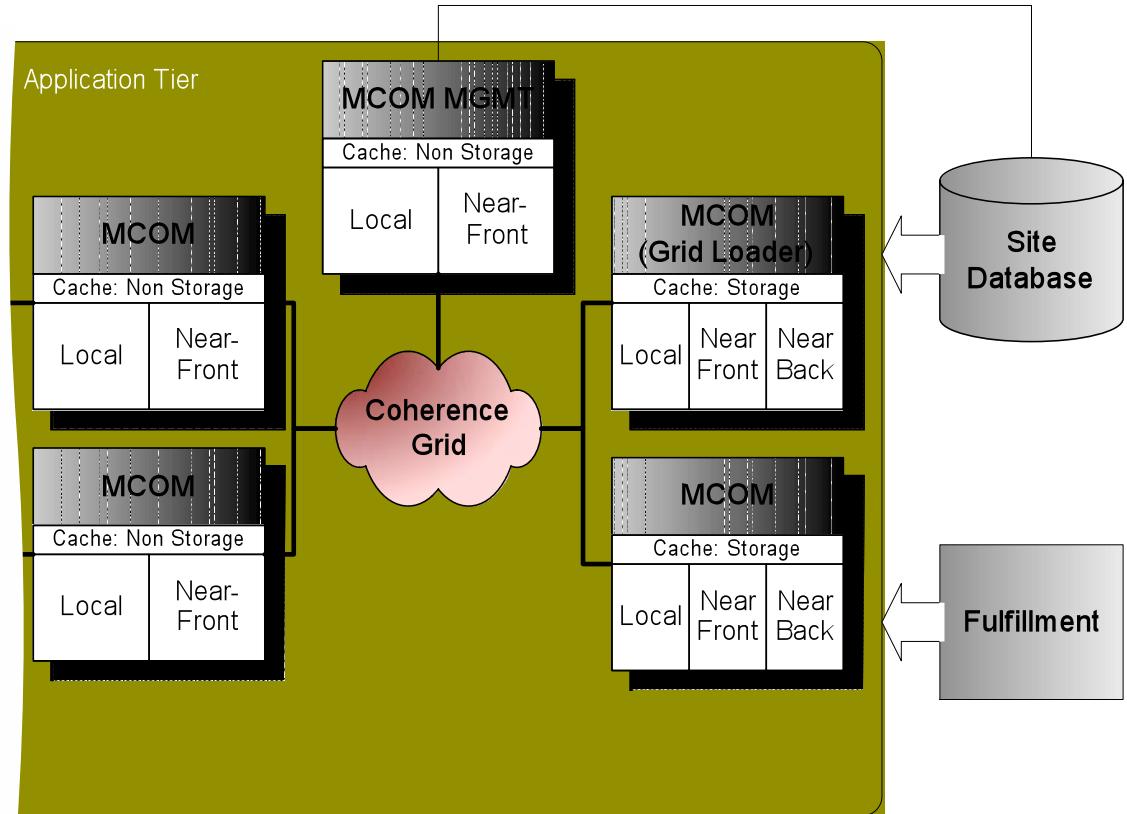
## Initial Issue - 2:

- Each JVM has to update its local product availability
- Process ran on 15s timer
- Caused numerous contentions on availability table

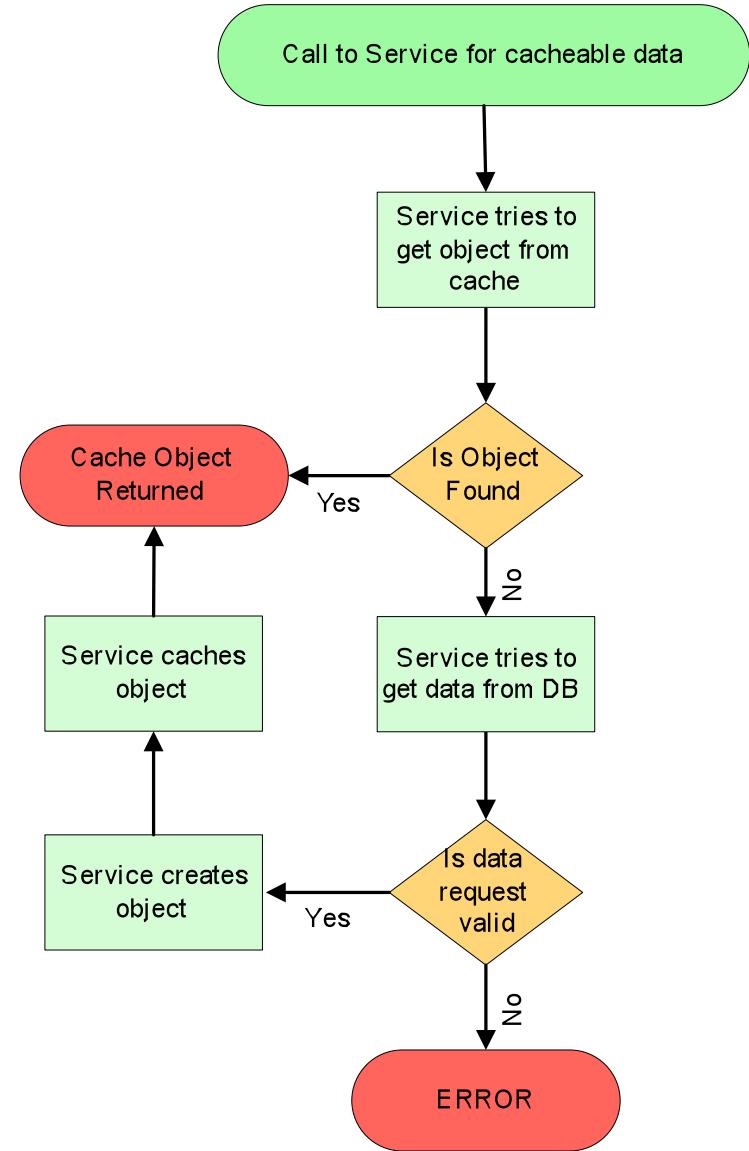


# Solution:

- Connect all nodes to grid using mix of near and local caches
- Forward facing nodes are non-storage
- Single Data loader on back
- Single Availability process using Command Cache

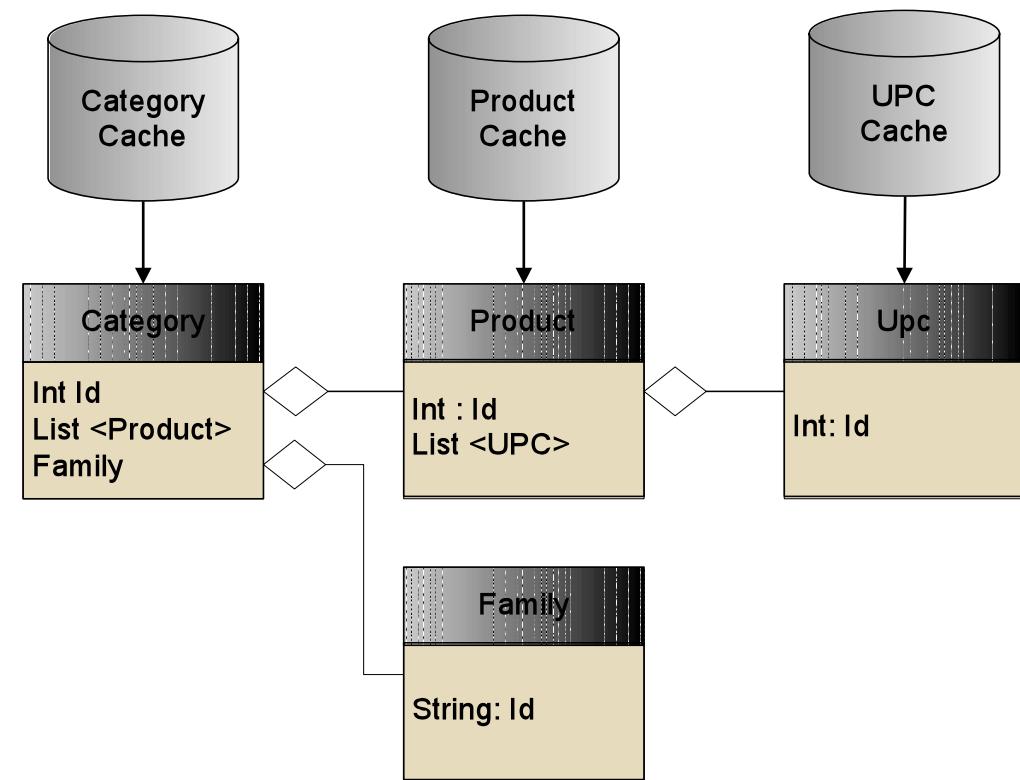


# Implementation: Side Cache



# Implementation: Traditional OOD

Cat 1  
Prod X  
UPC A  
Prod Y  
UPC B  
  
Cat 2  
Prod X  
UPC A



# Implementation: Traditional OOD

## *Category Cache*

Cat 1

Prod X  
UPC A  
Prod Y  
UPC B

Cat 2

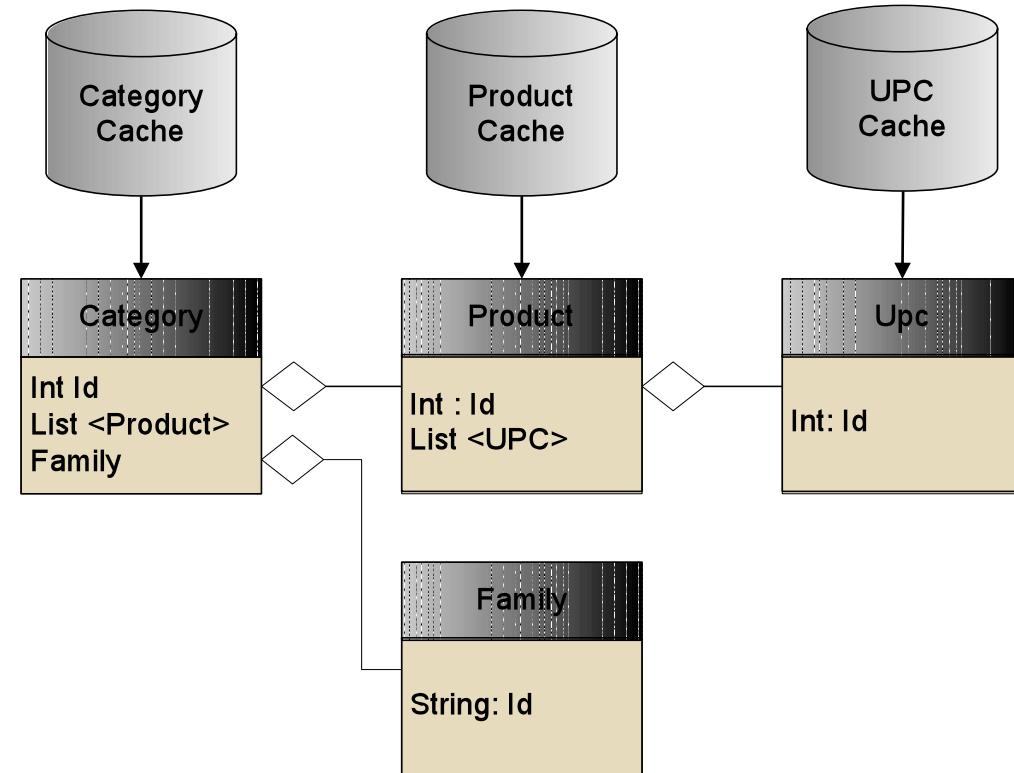
Prod X'  
UPC A'

## *Product Cache*

Prod X"  
UPC A"  
Prod Y'  
UPC B'

## *UPC Cache*

UPC A'"  
UPC B"



# Implementation: Modified OOD

## *Category Cache*

Cat 1

Prod X.Id

Prod Y.Id

Cat 2

Prod X'.Id

## *Product Cache*

Prod X

UPC A'.Id

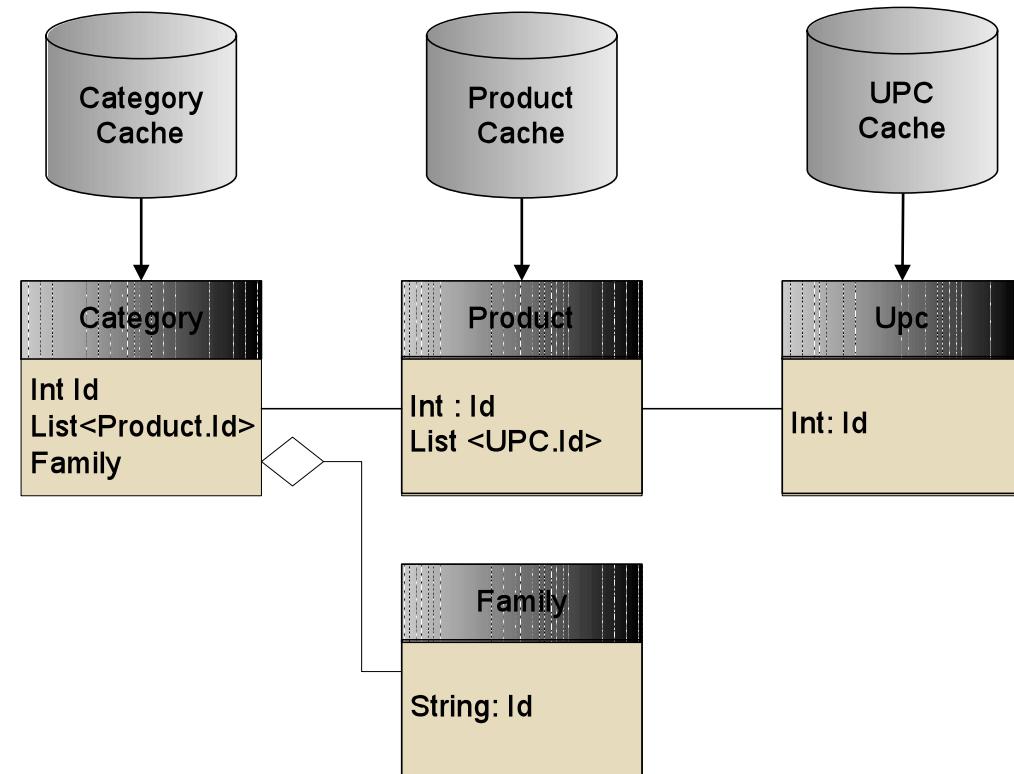
Prod Y

UPC B.Id

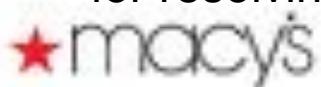
## *UPC Cache*

UPC A

UPC B



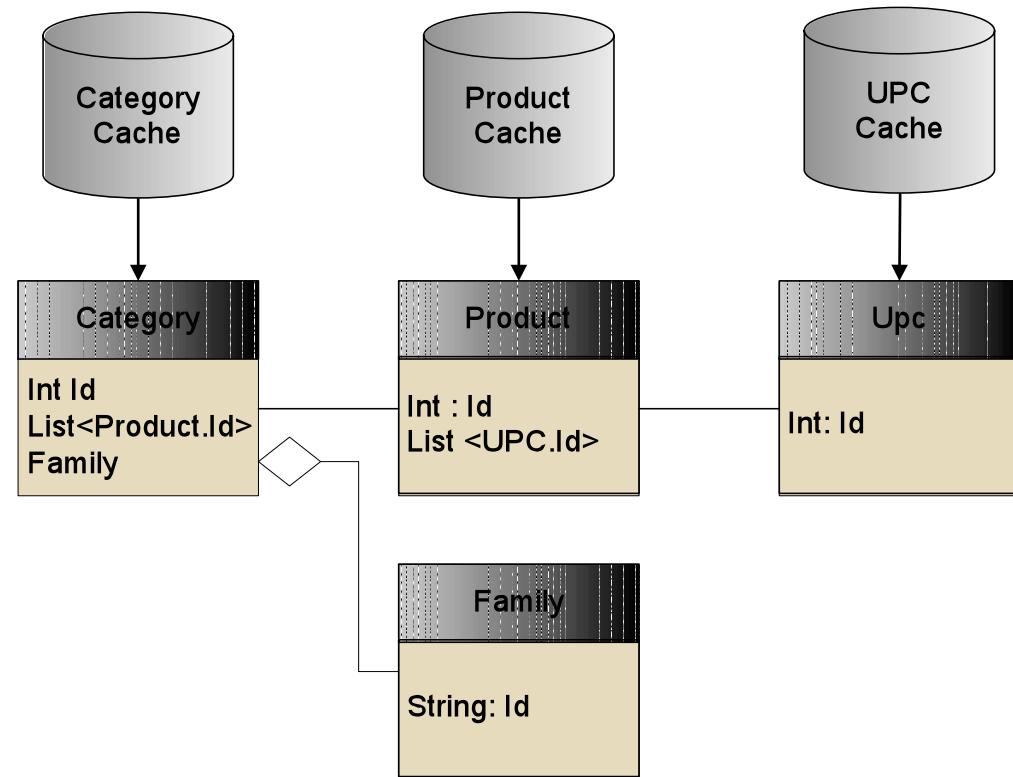
Object becomes responsible  
for resolving Ids



# Implementation: Flyweights

What about the Category to Family Relationship?

- Family fully contained by Category
- # of Family objects = # of Category objects
- Object bloat if unique # of Family is smaller than Category



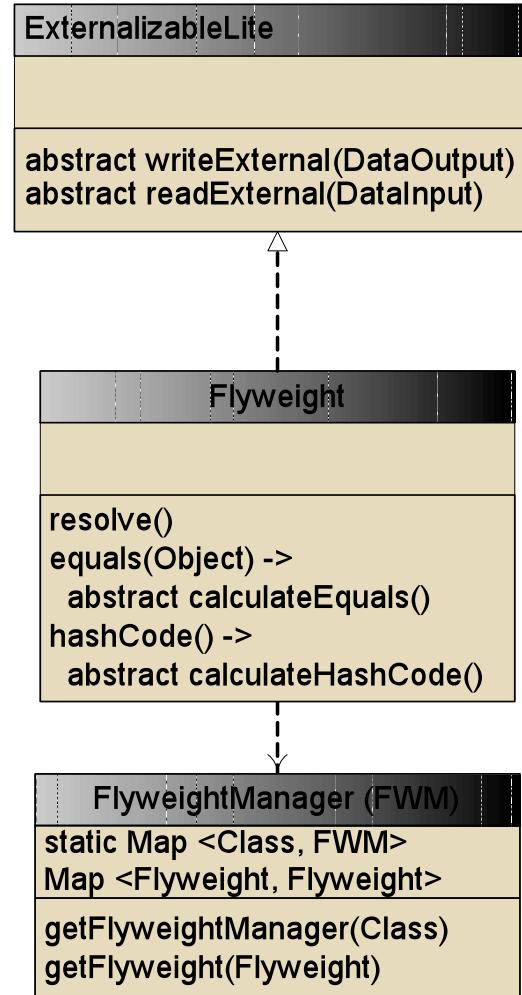
# Implementation: Flyweights

*FlyweightManager*

- Maintains all FlyweightManagers by class
- Uses Map to look for a matching flyweight, if none then saves as new object

*Flyweight*

- Overrides equals(Object) and hashCode() to call abstract methods
- Method to resolve Flyweight into managed Flyweight



# Implementation: Flyweights

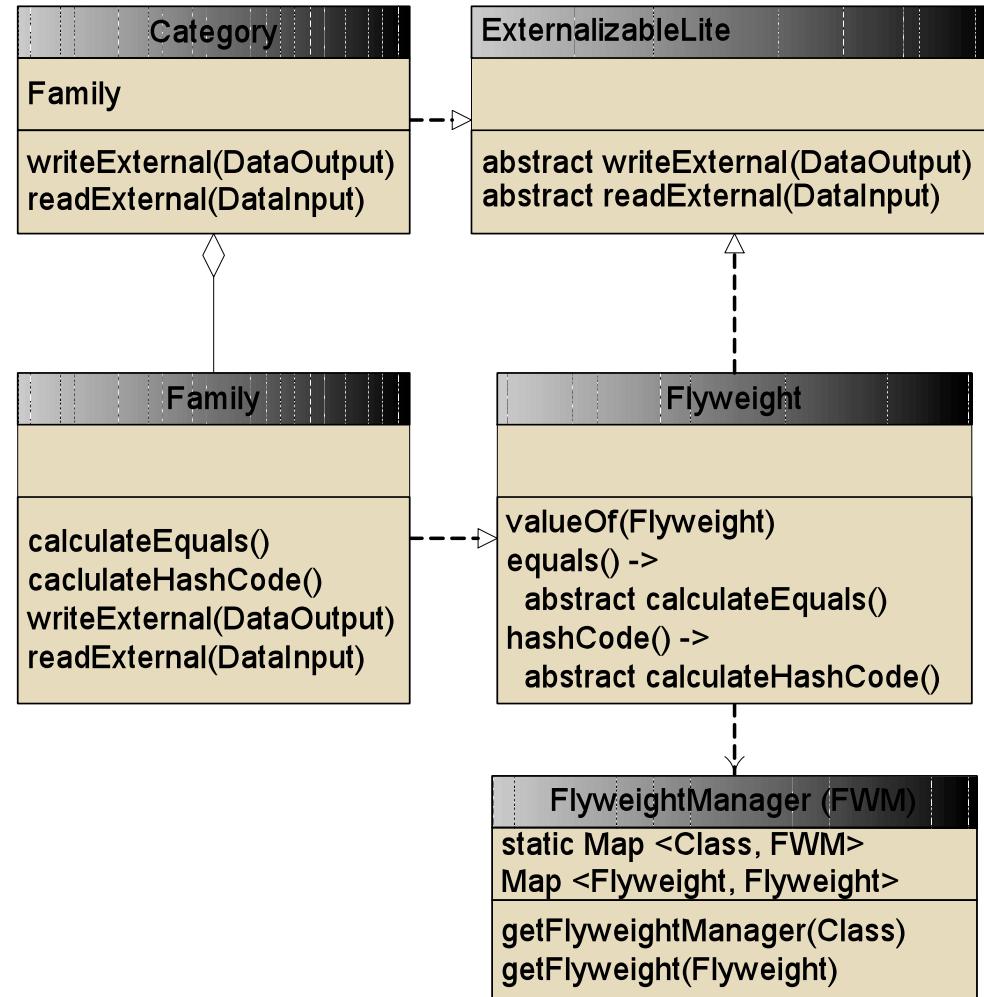
*Implement Family calculate methods*

- Compare uniquely identifying class members for equals.

Name and Status, not cached date

- Use same members to build hashCode

Using Apache's  
HashCodeBuilder build  
HashCode from Name  
and Status



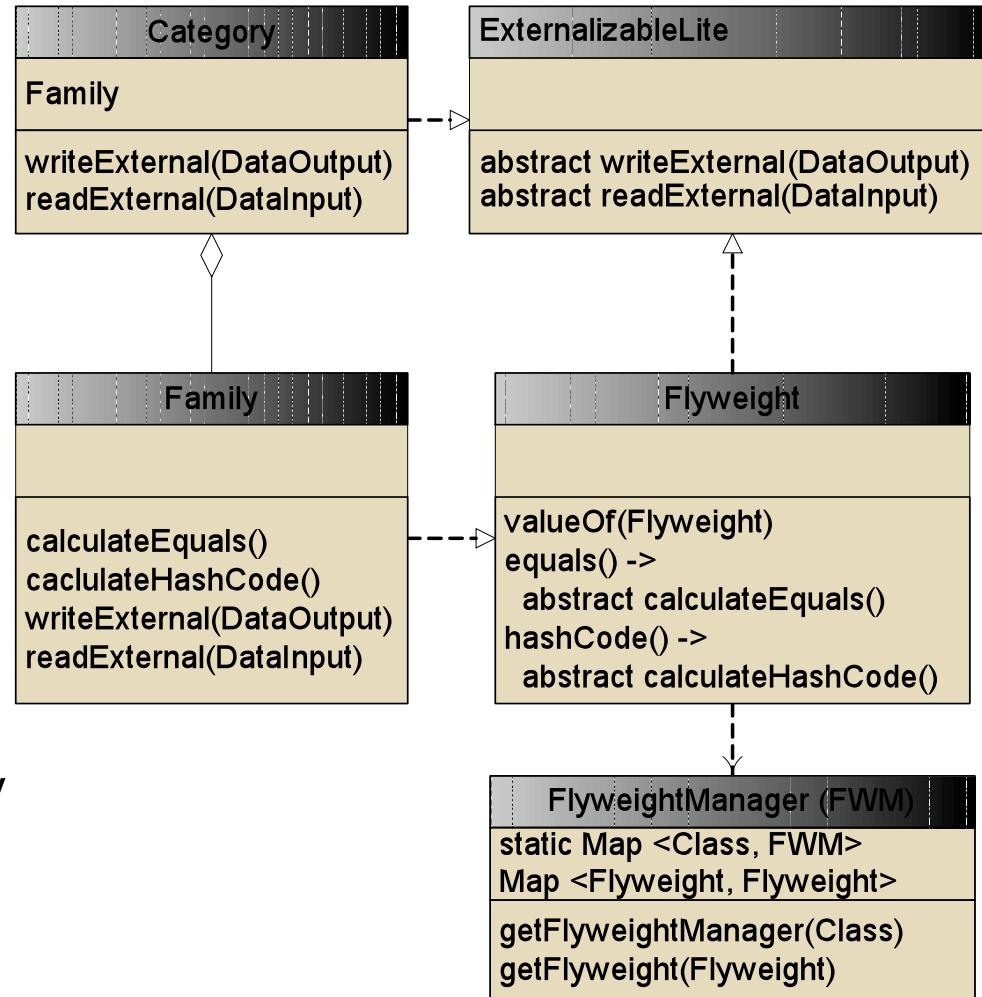
# Implementation: Flyweights

## *Writing/Reading Family*

- Nothing special, just write what belongs to Family and read in the same order

## *Writing/Reading Category*

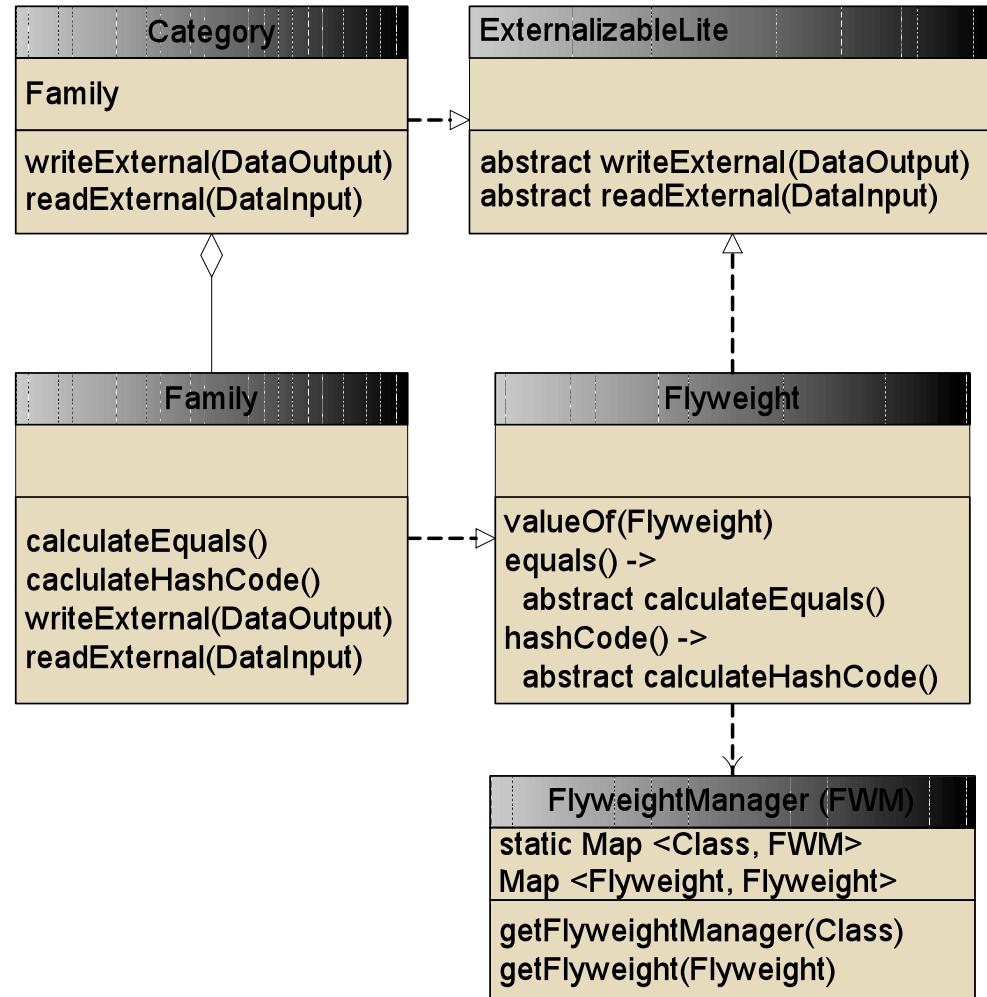
- Category writes contained Objects, including Family
- Read all Objects in same order. Call resolve() on Family and set to class family member



# Implementation: Flyweights

Cost: duplication of Family on storage nodes

Benefit: reduced heap on front storage nodes.



# Implementation: Spring Enabling

*A brief introduction*

Spring allows initialization  
and wiring of Objects  
(beans) by XML

Beans can define lifecycle  
methods and Spring will  
call them at the  
appropriate times.

All beans are contained  
by a *context*. Contexts  
may have parent/child  
relationships.

```
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.springframework.org/schema/beans http://www.springframework.org/schema/beans-2.5.xsd
                                         http://www.springframework.org/schema/util http://www.springframework.org/schema/util-2.5.xsd">

    <bean id="contextAggregator" class="com.macy's.wds.maintenancemanager.CacheClusterAdminService">
        <init-method>performFullMaintenance</init-method>
        <description>Provides information for the cache cluster</description>
        <property name="serverInfo">
            <ref bean="serverInfoFactory" />
        </property>
        <property name="dataSource" ref="dataSource" />
        <property name="useInLineCacheCluster">
```



# Implementation: Spring Enabling

*Starting Coherence*

Configure coherence using  
System.setProperty()

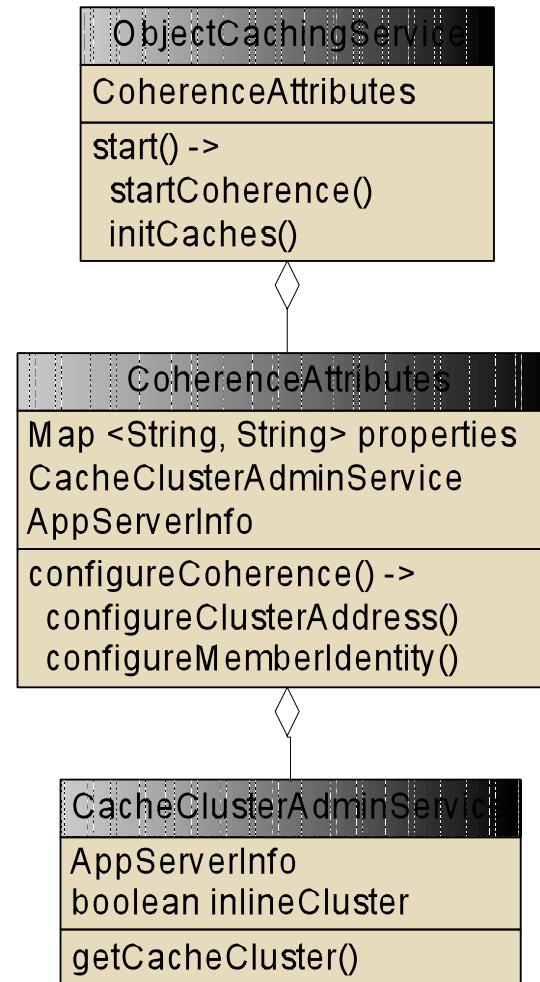
*tangosol.coherence.clusteraddress*

CoherenceAttributes.properties  
directly injected

CacheCluster Use AppServerInfo to  
define cluster address

InlineCacheCluster randomly  
generates cluster address/port

DatabaseCacheCluster gets  
cluster address/port from DB

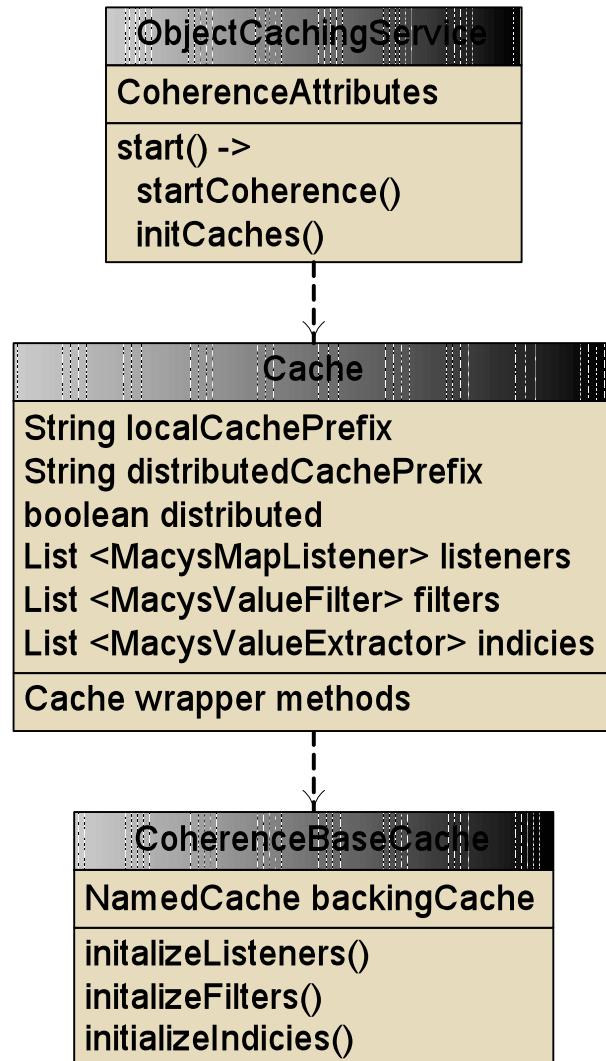


# Implementation: Spring Enabling *Initializing Caches*

ObjectCachingService iterates over Cache beans defined within Spring context calling init().

Cache.init() creates backing cache, uses <prefix>-beanName as cache name and passes in listeners, filters, and indicies.

CoherenceBaseCache calls CacheFactory.getCache with name then initializes its listeners, filters, and indicies.



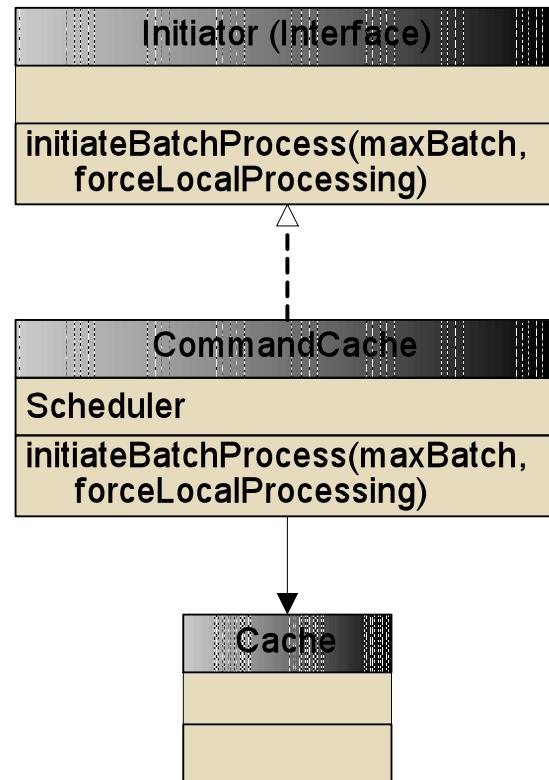
## **Implementation: Command Cache**

Use Case: Product is no longer available. Change might trigger a series of tasks, and prefer to have work done close to the UPC data.



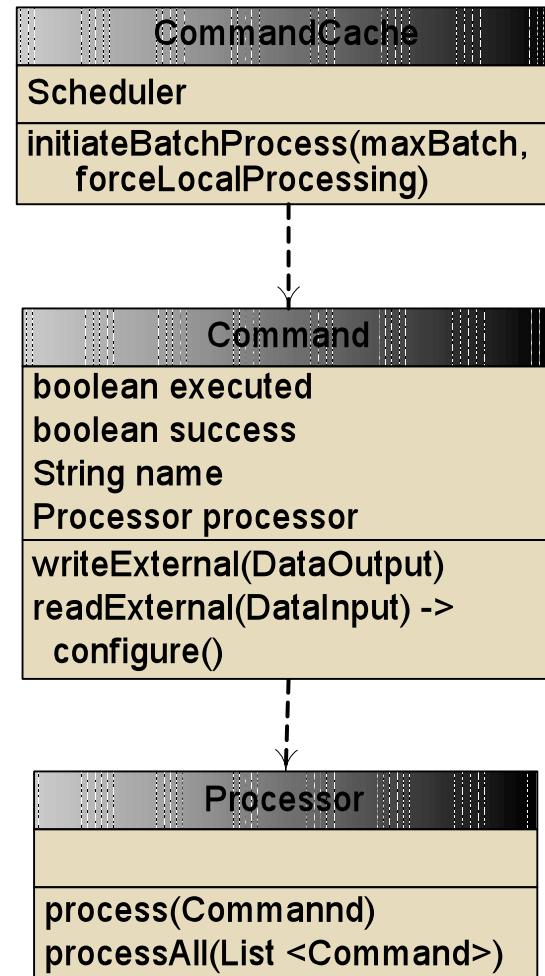
# Implementation: Command Cache

- CommandCache uses an outside Scheduler (Quartz) because CachingService threads are reentrant and might cause deadlocks.
- Scheduler is only defined on storage nodes ensuring separation
- CommandCache locks itself when processing, blocking other nodes
- Can force processing to nodes that contain commands, otherwise done by FIFO.



## Implementation: Command Cache

- Command requires a name. Used by configure() to find its Processor from Spring.
- At initiateBatchProcess Filter is used to select non executed commands
- Commands are grouped by Processor
- Processor executes each command within its group



# Implementation: Monitoring

## RTView for Coherence

- Provides great visibility into cache activity
- Provides customized screens functional group drill downs and heat maps.

## Special issues:

- Data overload due to large number of caches
- Compatibility with JDK 1.4



# Implementation: Monitoring

## RTView for Coherence

- Provides great visibility into cache activity
- Provides customized screens functional group drill downs and heat maps.

## Special issues:

- Data overload due to large number of caches
- Compatibility with JDK 1.4



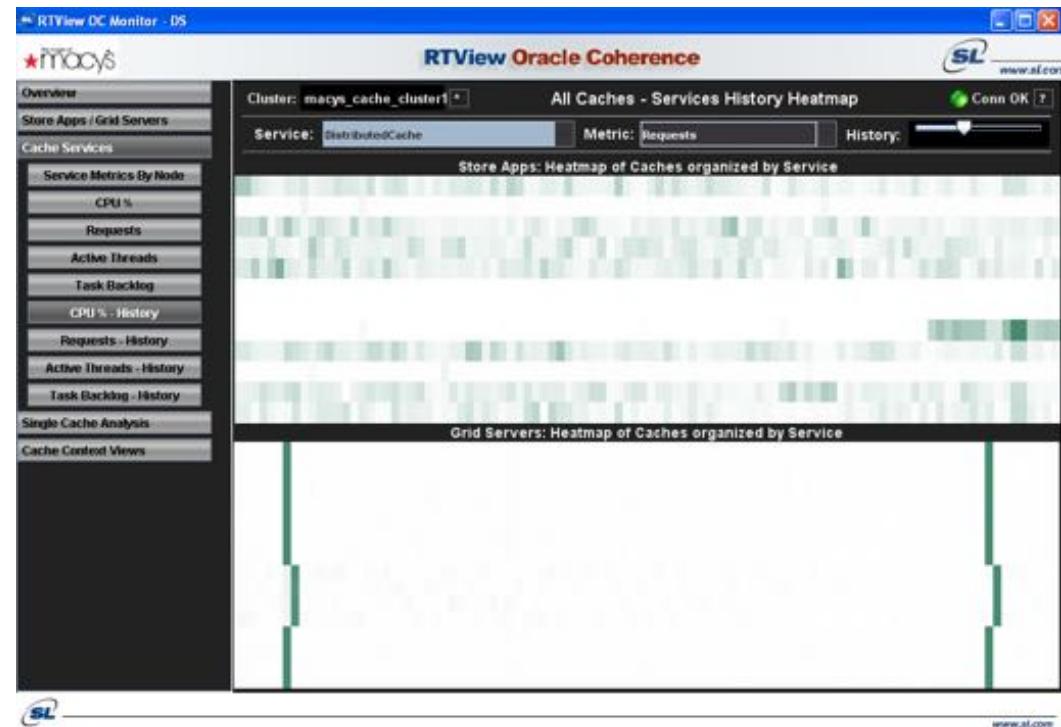
# Implementation: Monitoring

## RTView for Coherence

- Provides great visibility into cache activity
- Provides customized screens functional group drill downs and heat maps.

## Special issues:

- Data overload due to large number of caches
- Compatibility with JDK 1.4



## Findings:

- Too much cache wrapping makes Coherence difficult to extend
- Difficult to trace problems down into coherence layer.
- Provides for centralized runtime management of the application

# Tomorrow: Personalization



Personalized links display based upon Janet's shopping interests and behavior/pattern.

Janet's personalized content.

The screenshot shows the Macy's website homepage with a red dashed box highlighting the personalized greeting "Janet, welcome! Checkout your macy's. (Not Janet?)". Another red dashed box highlights the "Recently Viewed" section, which includes items like "Macy's MEA" and "Macy's Daughter Jamaican Punch Body Butter". A third red dashed box highlights the "Top Finds for You" section, which includes items like "Boxy Little Girl 'Million Miles' Tiered Dress" and "Kidorable 'butterfly' Collection". A red arrow points from the "Janet's personalized content." text to the "Recently Viewed" section. Another red arrow points from the "Personalized links display based upon Janet's shopping interests and behavior/pattern." text to the "Top Finds for You" section.

the magic of **macy's** we're on facebook! become our fan

for the home bed & bath women men juniors kids beauty & fragrance shoes handbags & accessories jewelry & watches sale

\* Janet, welcome! Checkout [your macy's](#). (Not Janet?)

CUSTOMERS' TOP RATED ★★★★☆ STORES GIFTS & GIFT CARDS WEDDING REGISTRY

details & promo code exclusions apply

FREE SHIPPING on fantastic finds you need right now!

ONLINE FASHION CLEARANCE SAVE 50-75%

now's the time: get wear-now fall fashion at great prices plus 99¢ shipping too!

women men kids  
sweaters pants girls 2-6x  
tops suits  
jeans jackets  
shoes

Top Finds for You

Boxy Little Girl "Million Miles" Tiered Dress Reg. \$34.00 Now \$17.00 MORE COLORS AVAILABLE

Kidorable "butterfly" Collection Reg. \$14.00 - 36.00 Sale \$8.99 - 24.99

Recently Viewed

Macy's MEA  
Macy's Daughter Jamaican Punch Body Butter, 8 oz.  
\$18.00 MORE COLORS AVAILABLE

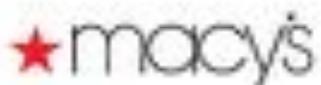
get 10% rewards while giving back to your community, find out how

CUSTOMER SERVICE ►  
order tracking return  
shipping info contact us secure shopping  
MACY'S CREDIT CARD ►  
pay your bill view credit account apply now & save  
OUR STORES ►  
share locations & hours this week in stores tell us what you think  
MACY'S BIG ►  
macysJOBS press room investors  
Visually impaired customers: [download our new user assistance tool](#)

©2009 Macys.com is a registered trademark. All rights reserved. [Legal Notice](#) [Privacy Policy](#) [Pricing Policy](#) [Your California Privacy Rights](#) [Recalls](#)  
Macy's.com, Inc., 605 Market Street, San Francisco, CA 94105. Request our [corporate name and address by email](#).

Fraud Alert

MACY'S TV TURN OVER A NEW LEAF



# Tomorrow: Service Delivery Platform

Oracle Coherence is a key enabler of the new, agile, SOA architecture

Services use Near Cache allows accelerated random access to the grid

Grid used as the transport media for event exchange  
Special issues:

