

Coherence in the Retail Space: A Case Study of Adoption of Coherence at Macys.com



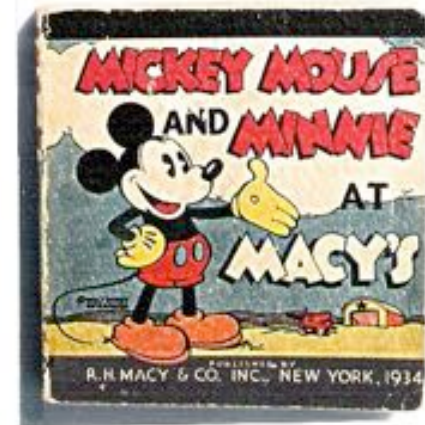


- BS in Computer Science University of Missouri
- Several years in Government sector
- With Macys for 4 years
- Likes Chinese noodles



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 website interface. At the top, there is a navigation bar with categories: at home, men's, women's, young attitude, jewelry, lingerie, cosmetics, and fragrance. Below this is the Macy's.com logo and links for SIGN IN, REGISTER, and MY ACCOUNT. A shopping cart icon shows 0 items and a CHECKOUT button. A red banner at the top right says "ATTENTION: You need JavaScript enabled to shop on this site." Below the navigation is a search bar and a "FREE SHIPPING" banner. The main content area features a large red banner for a "SEMI-ANNUAL FURNITURE SALE" with the headline "you deserve a 'tax break'" and "0% INTEREST IF PAID IN FULL WITHIN 24 MONTHS PLUS NO DOWN PAYMENT". To the right of the main banner is a "SOMETHING IS SALE & CLEARANCE" banner with "EXTRA 25-40% online clearance TOTAL SAVINGS 40-80%". Below the main banner is a "LIMITED-TIME SPECIALS" section. On the left side, there is a "SHOP THE SALE IN STORES!" section with a "HOME SALE" banner and a "NEW! MATTRESS FINDER" section. At the bottom, there is a footer with links for CUSTOMER SERVICE, MACY'S CREDIT CARD, OUR STORES, and MACY'S INC.



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

★ macy's way to shop™ for the home | bed & bath | womens | mens | kids | beauty | jewelry & watches

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



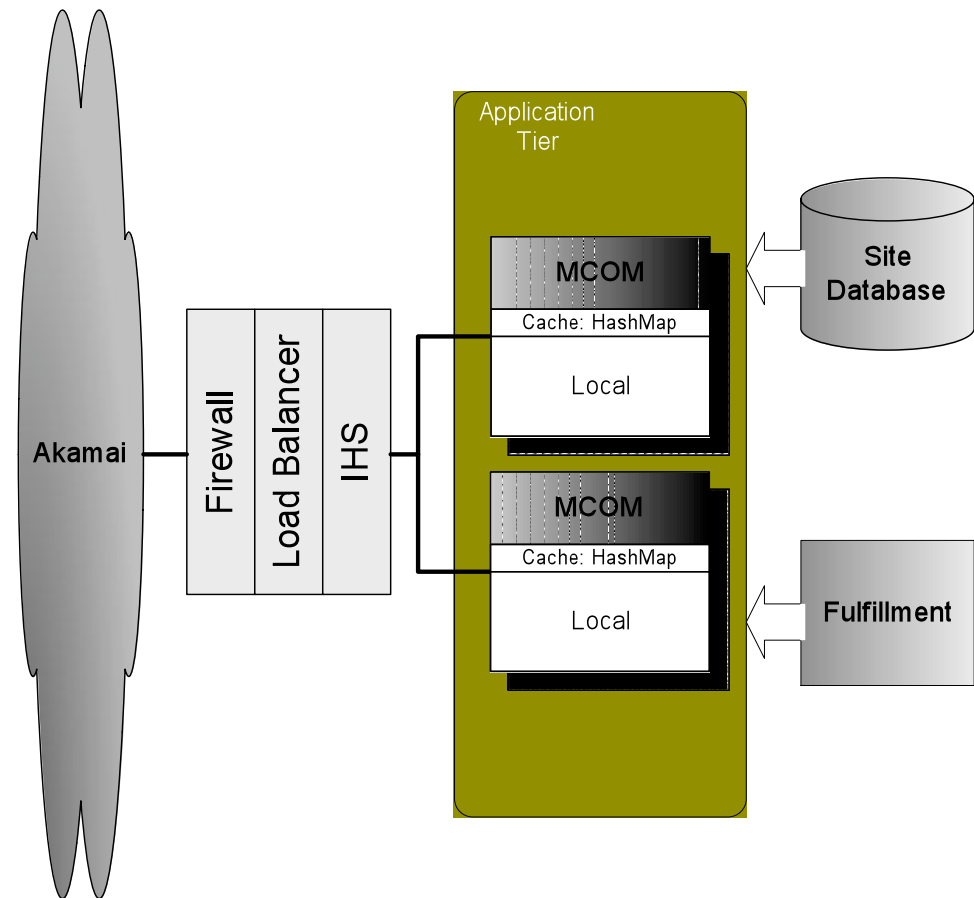


How did we get
here?



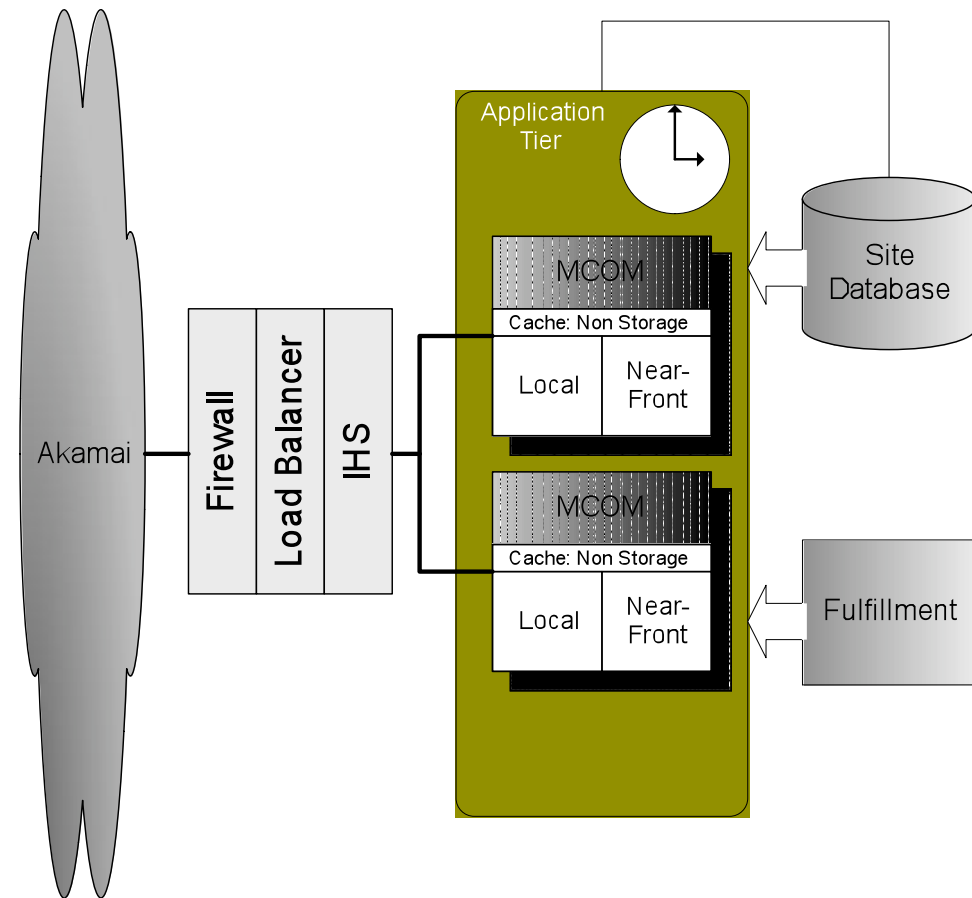
Initial Issue - 1:

- 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



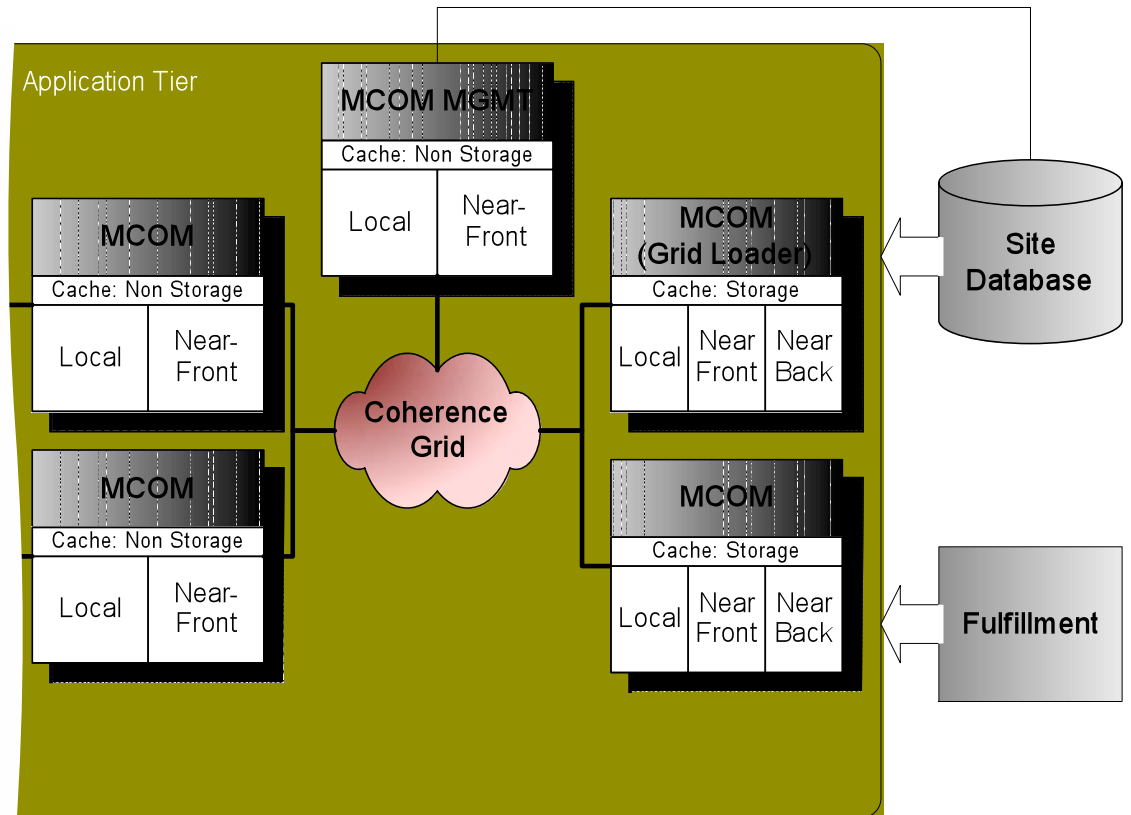
Initial Issue - 2:

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

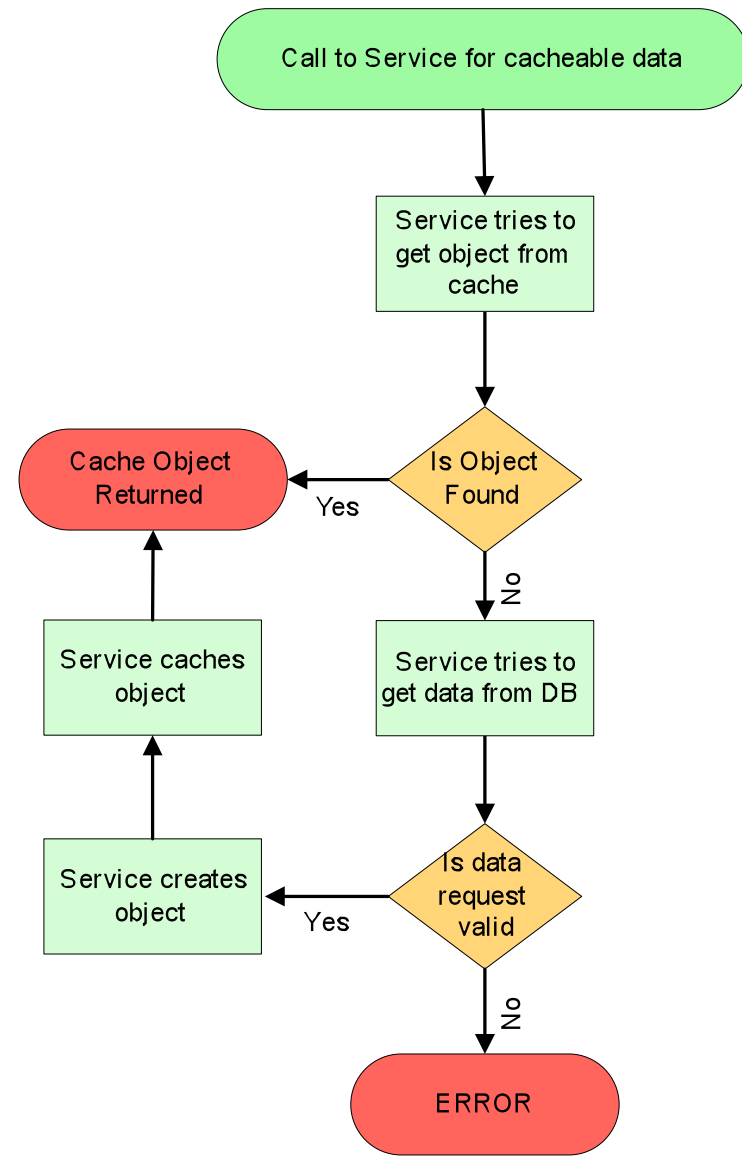


Solution:

- 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

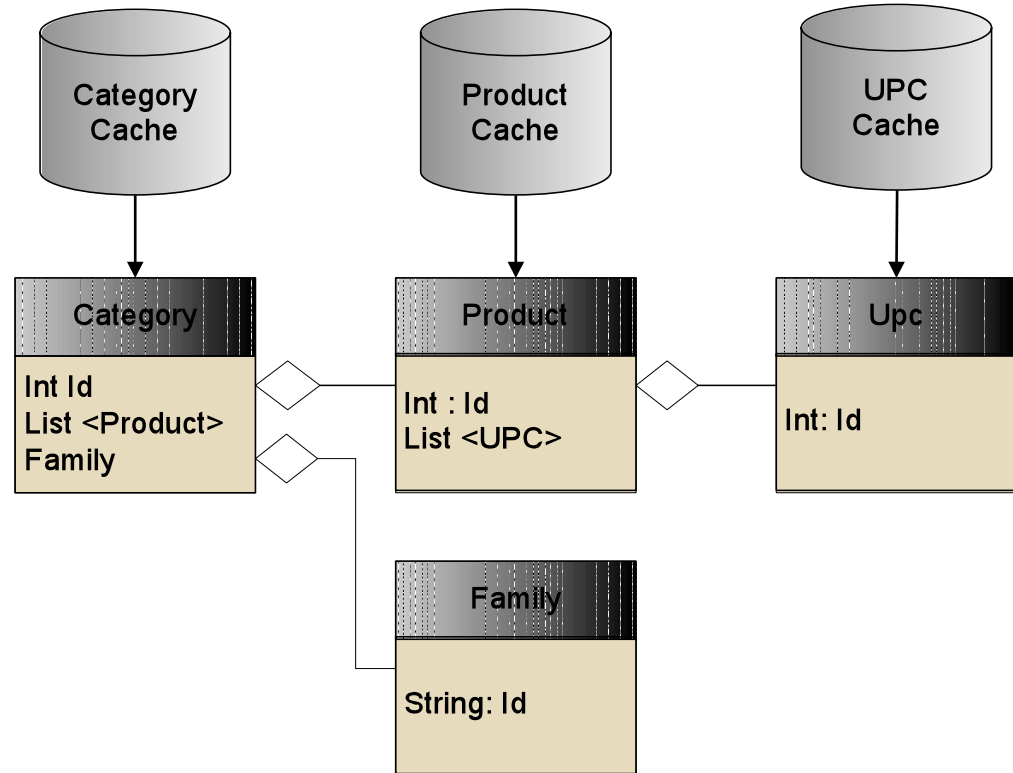


Implementation: Side Cache



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''

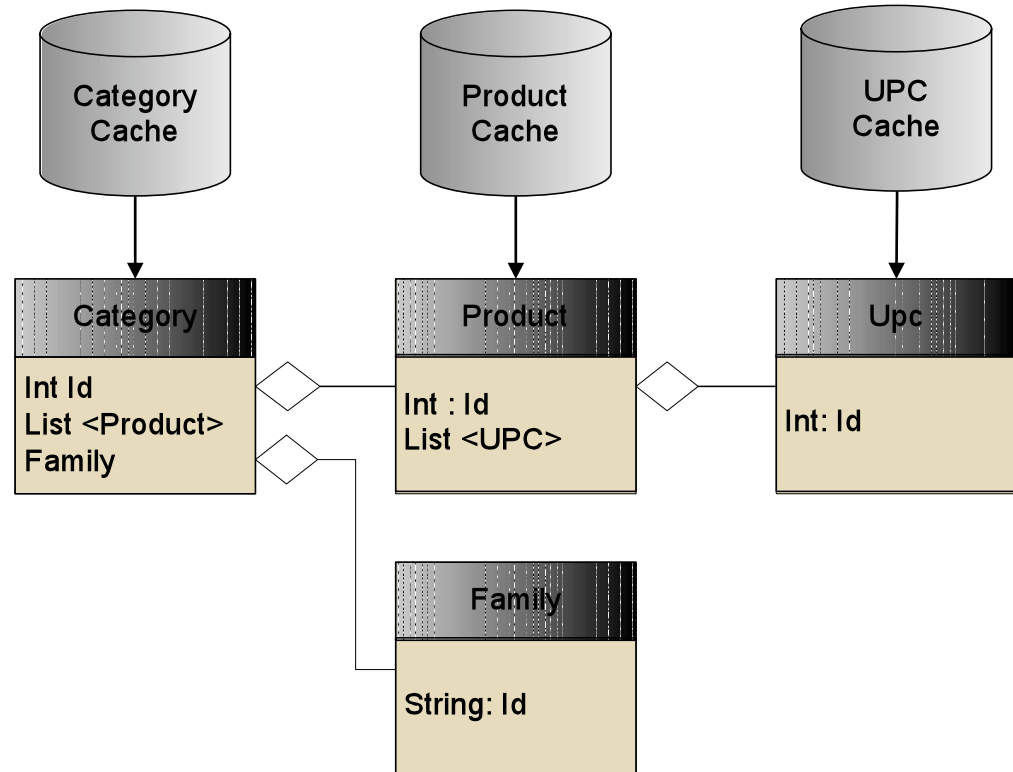
Prod Y'

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

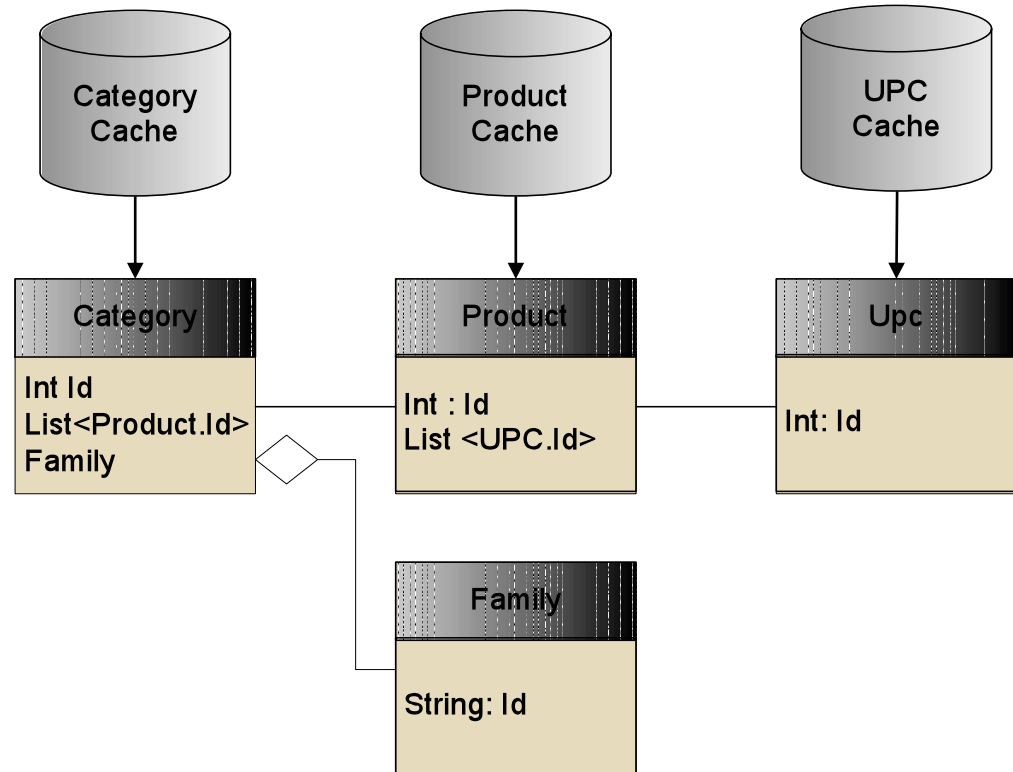
Prod Y

UPC B.Id

UPC Cache

UPC A

UPC B



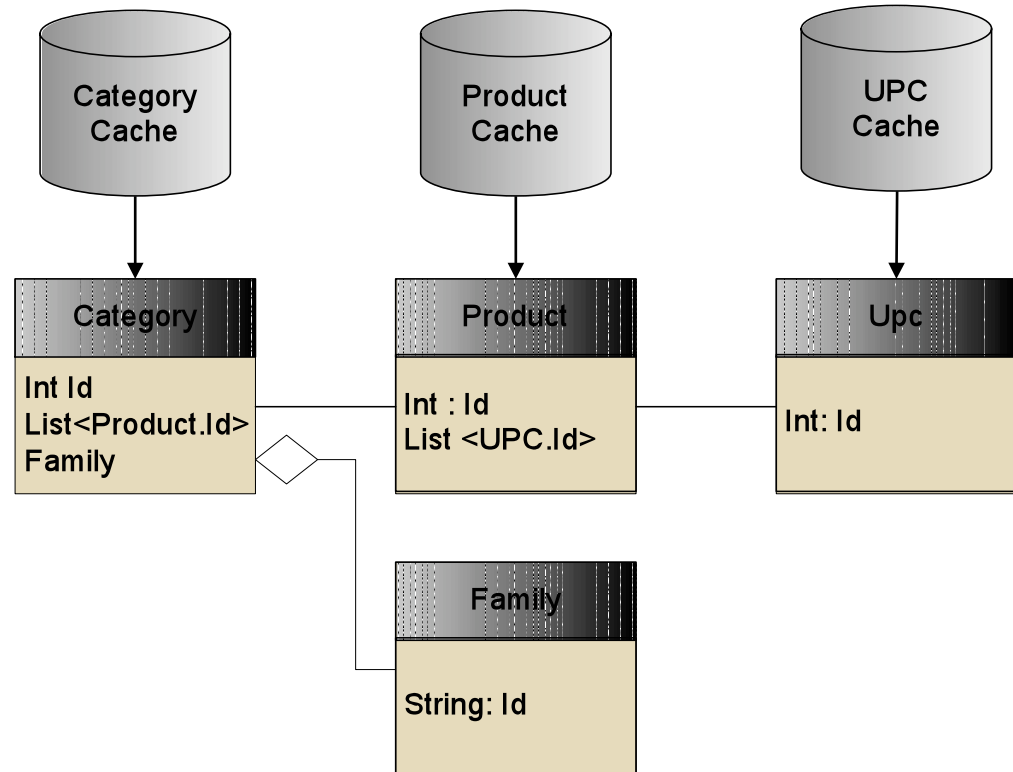
Object becomes responsible
for resolving Ids



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



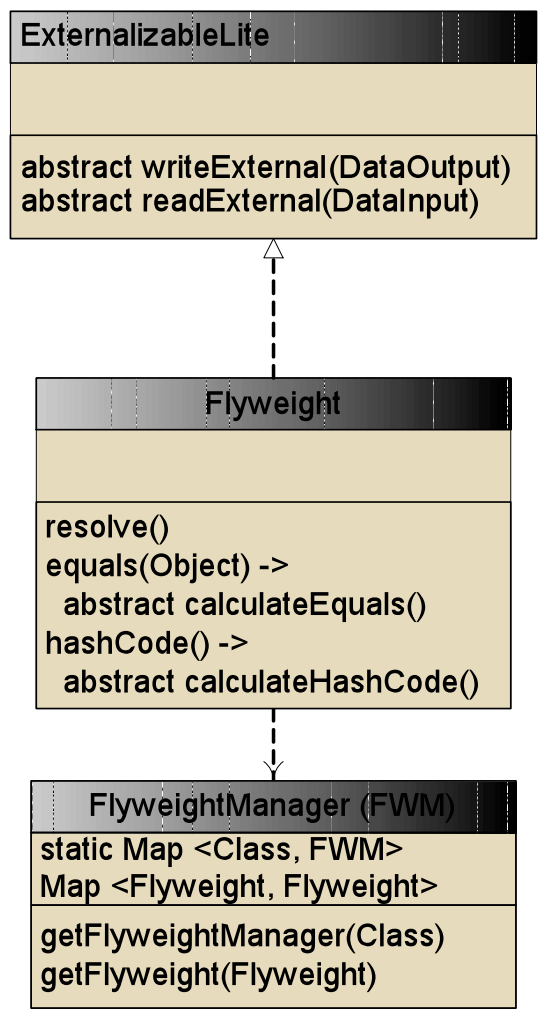
Implementation: Flyweights

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

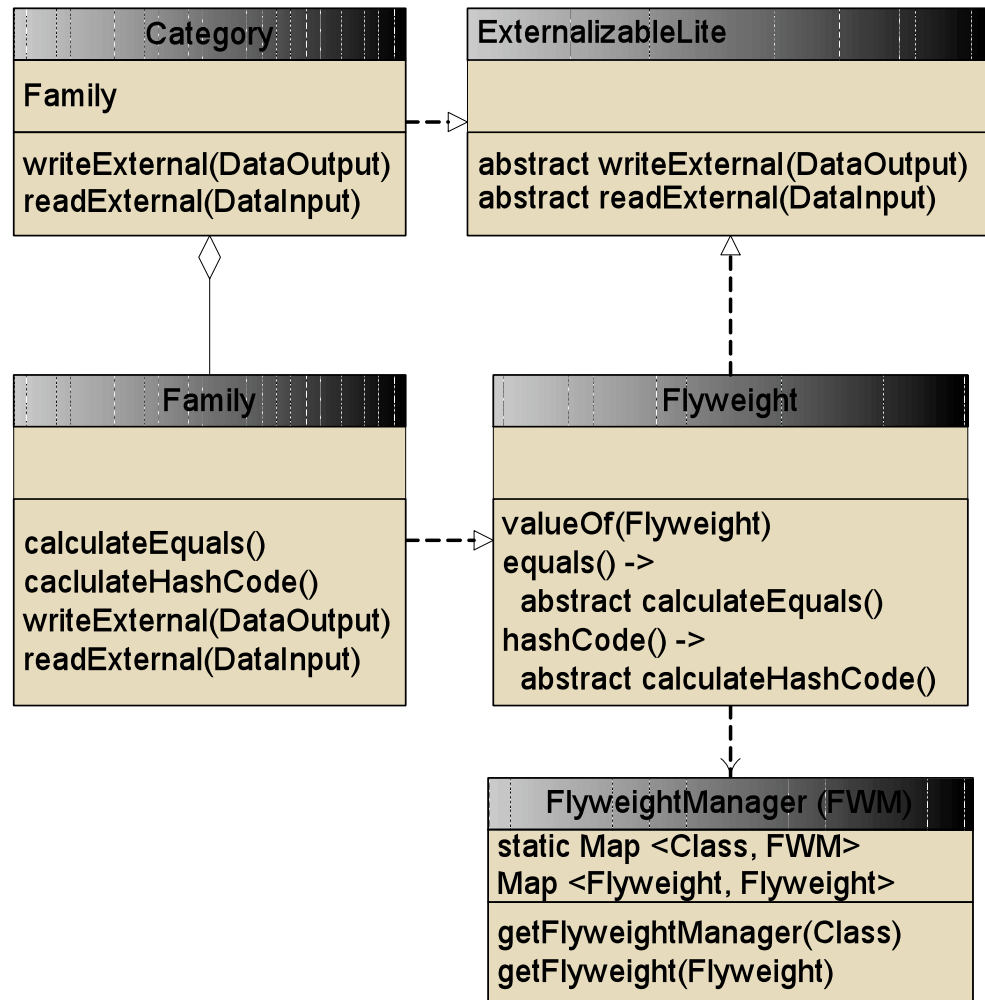
Implement Family calculate methods

- 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



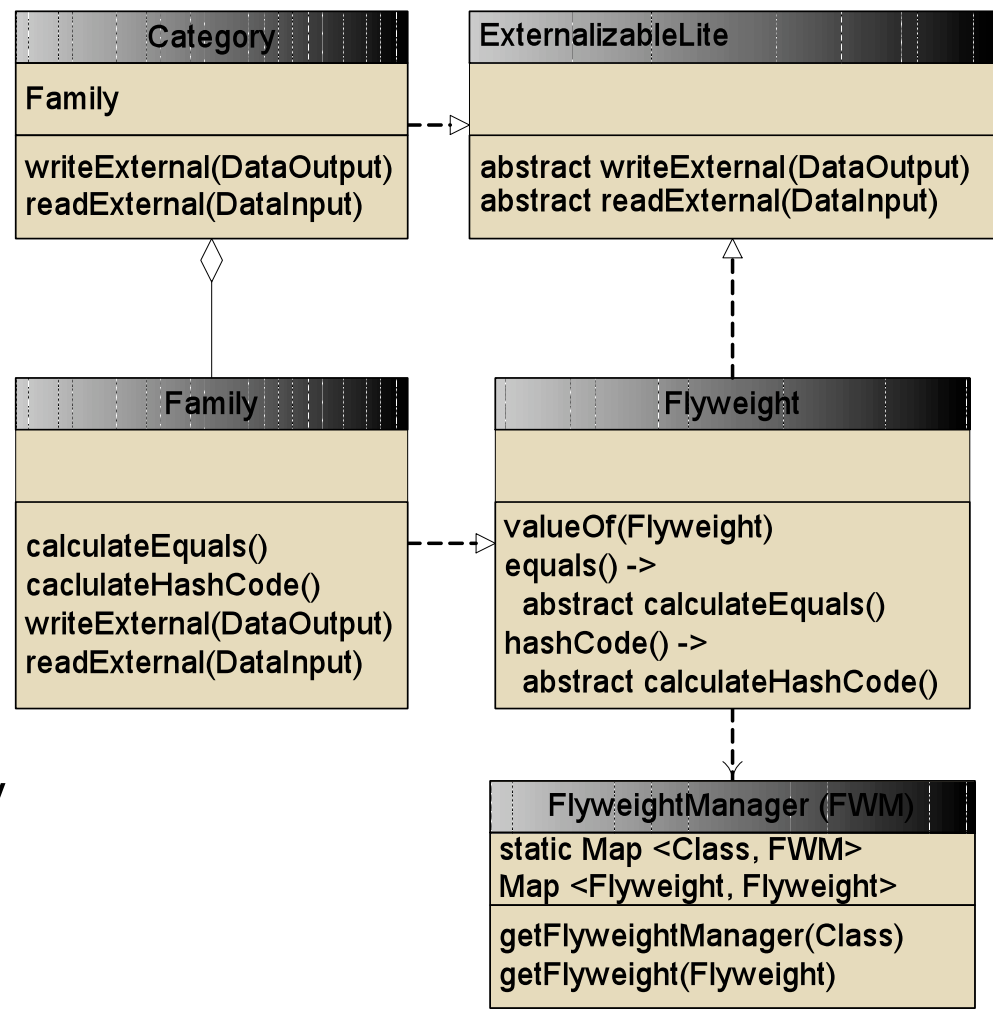
Implementation: Flyweights

Writing/Reading Family

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

Writing/Reading Category

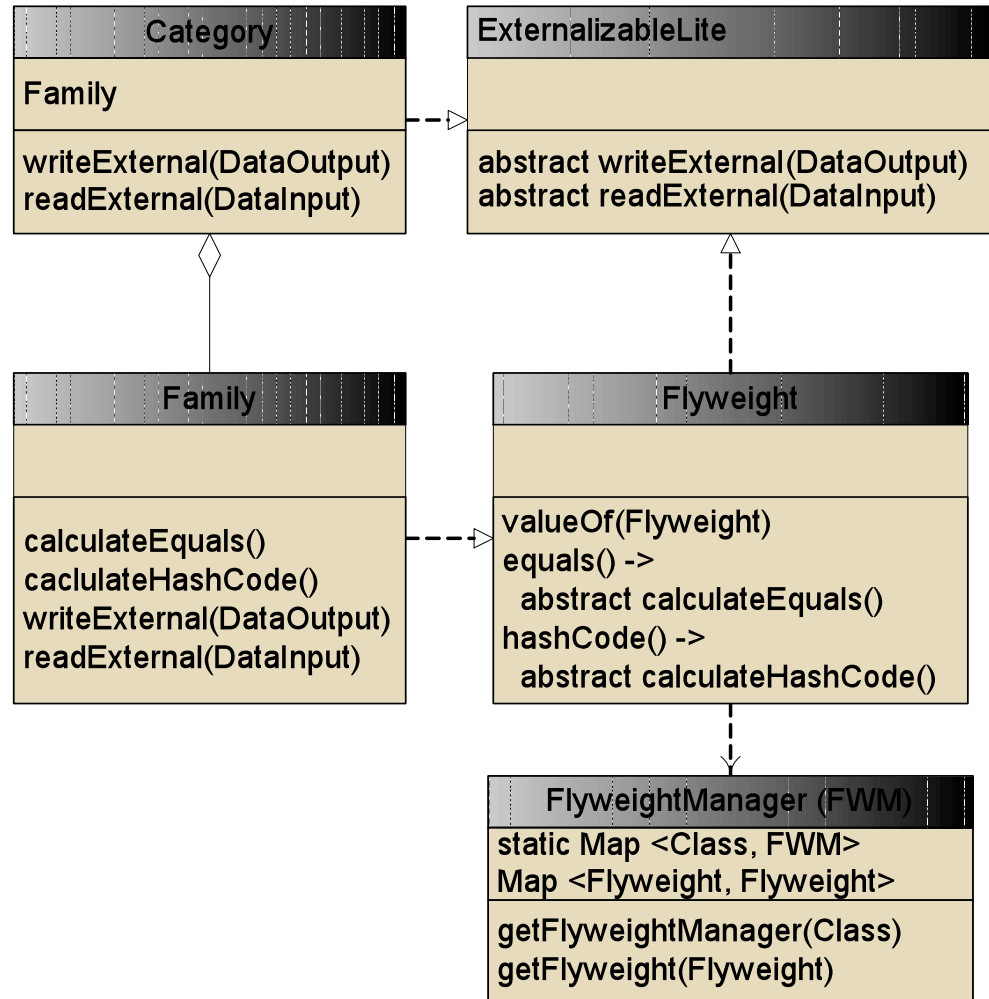
- Category writes contained Objects, including Family
- Read all Objects in same order. Call resolve() on Family and set to class family member



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
       http://www.springframework.org/schema/util http://www

<bean id="contextAggregator" class="com.macy.wis.mainte

<bean id="cacheClusterAdminService"
      class="com.macy.wis.services.caching.dataaccess.Cache
      init-method="performFullMaintenance">

  <description>Provides information for the cache clus
  </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()

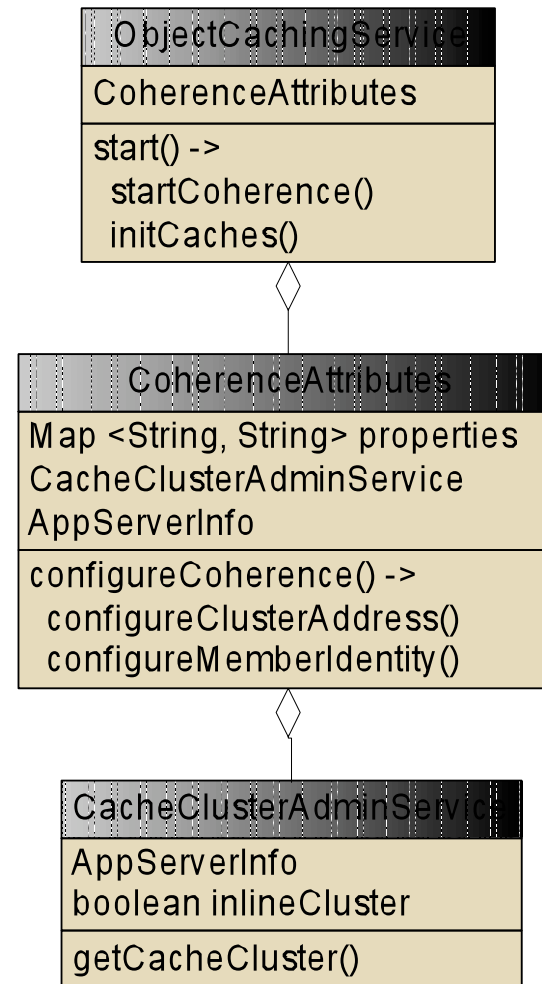
tangosol.coherence.clusteraddress

CoherenceAttributes.properties
directly injected

CacheCluster Use AppServerInfo to
define cluster address

InlineCacheCluster randomly
generates cluster address/port

DatabaseCacheCluster gets
cluster address/port from DB



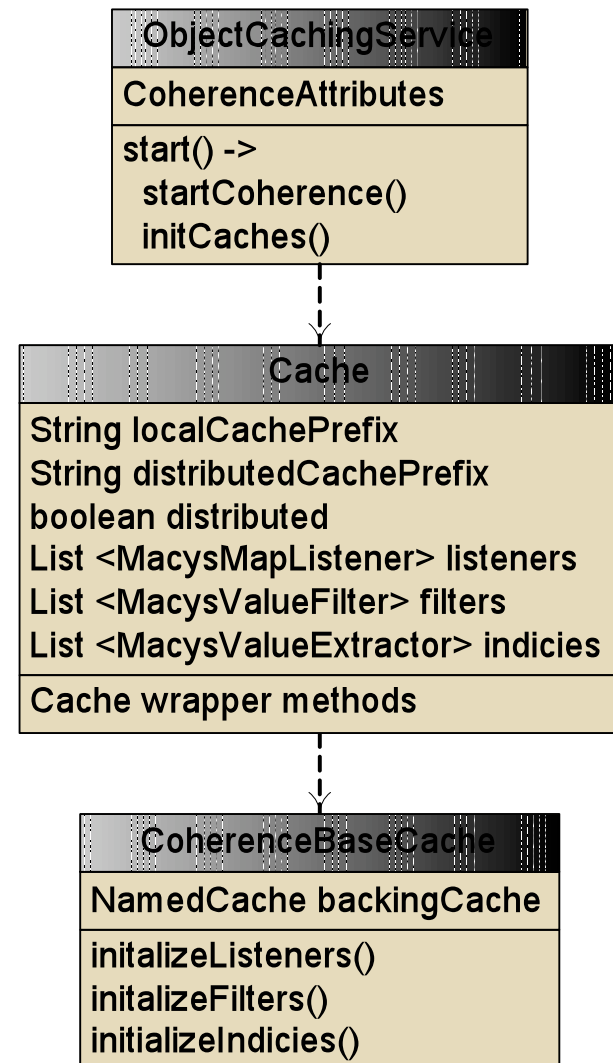
Implementation: Spring Enabling

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.



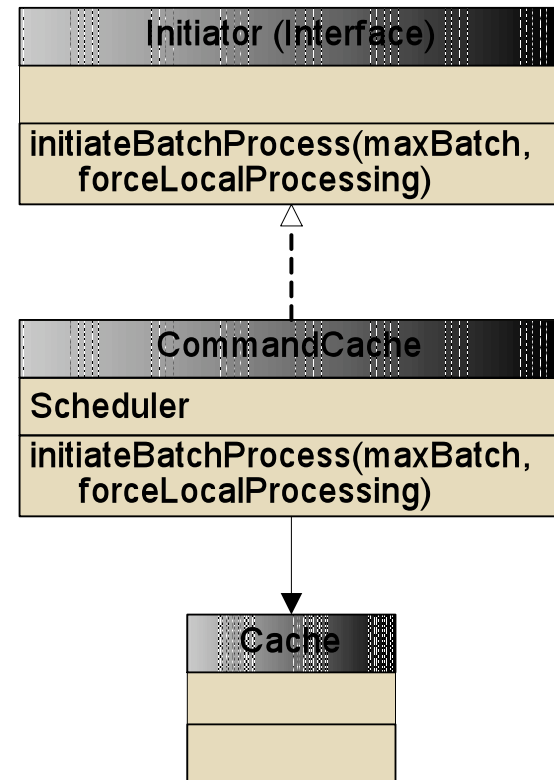


Implementation: Command Cache

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.

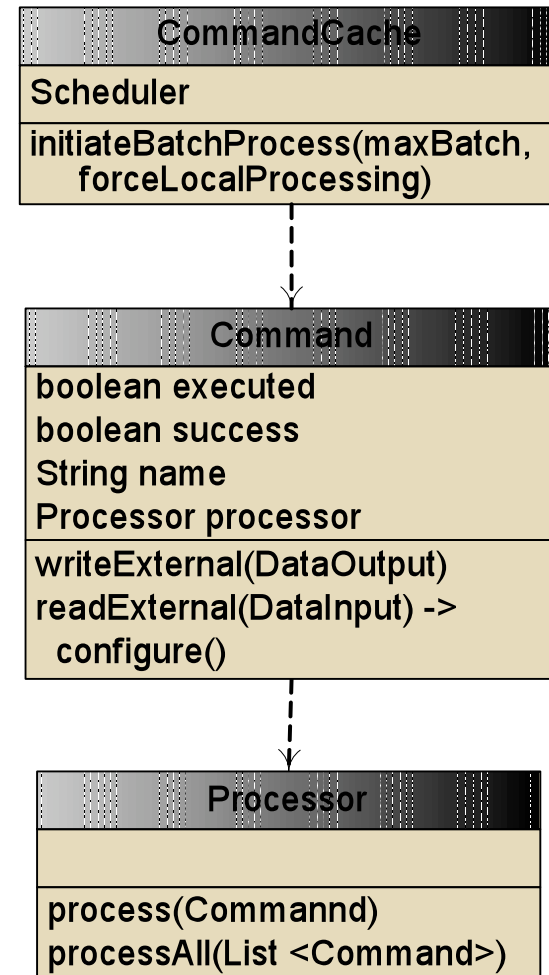
Implementation: Command Cache

- 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

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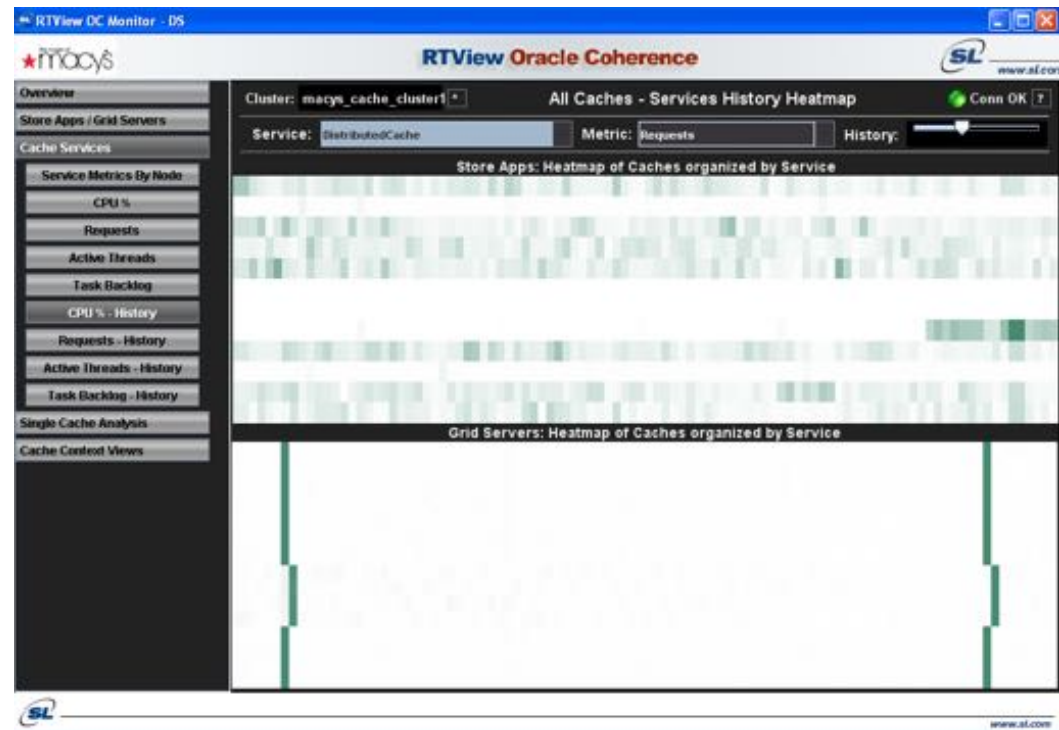
Implementation: Monitoring

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

Janet's bag: 1 item sign in | register | my account

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

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

Janet, welcome! Checkout **your macy's** (Not Janet?)

FREE SHIPPING on fantastic finds you need right now! [details & promo code](#)
exclusions apply

ONLINE FASHION CLEARANCE
SAVE 50-75%
now's the time: get wear-now fall fashion at great prices plus 99¢ shipping too!

Top Finds for You

Recently Viewed

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

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MACY'S TV TURN OVER A NEW LEAF

fraud alert



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:

