

# *Couchbase@PayPal*

Anil Madan  
Sr. Director of Engineering  
amadan@paypal.com



# 100

CURRENCIES SUPPORTED

# 155M

ACTIVE REGISTERED  
ACCOUNTS



# 203

MARKETS OFFER PAYPAL



EUROPEAN UNION  
**EURO**



AUSTRALIAN  
**DOLLAR**



CANADIAN  
**DOLLAR**



NEW ZEALAND  
**DOLLAR**



HUNGARIAN  
**FORINT**



MALAYSIAN  
**RINGGIT**



UNITED KINGDOM  
**POUNDS STERLING**



HONG KONG  
**DOLLAR**



UNITED STATES  
**DOLLAR**



TAIWAN  
**NEW DOLLAR**



CHINESE  
**RMB**



SWEDISH  
**KRONA**



SINGAPORE  
**DOLLAR**



PHILIPPINE  
**PESO**



BRAZILIAN  
**REAL**



RUSSIAN  
**RUBLE**



NORWEGIAN  
**KRONE**



JAPANESE  
**YEN**



MEXICAN  
**PESO**



TURKISH  
**LIRA**



SWISS  
**FRANC**



CZECH  
**KORUNA**



ISRAELI  
**NEW SHEKEL**



DANISH  
**KRONE**



THAI  
**BAHT**



POLISH  
**ZLOTY**

\$1 in every \$6

Spent on e-commerce is  
spent through PayPal.\*

\*Source: Morgan Stanley, "eCommerce Disruption: A Global Theme," January 6, 2013, p.21.

# Why Couchbase?

## Data volume

- Online system ; 300M – 1B documents
- 4-10k size ; 3-10TB total storage

## Data Access

- Distributed caching
- Persistence

## Data Structure

- Flexible & Schemaless; document based

## Workload characteristics

- 50% read/50% write;
- Low latency < 5-10 msec

## Availability and scalability

- Multi data center – DR/BCP
- Linearly Scalable

## Cookie Store Personalization

# Background

## Problem Statement

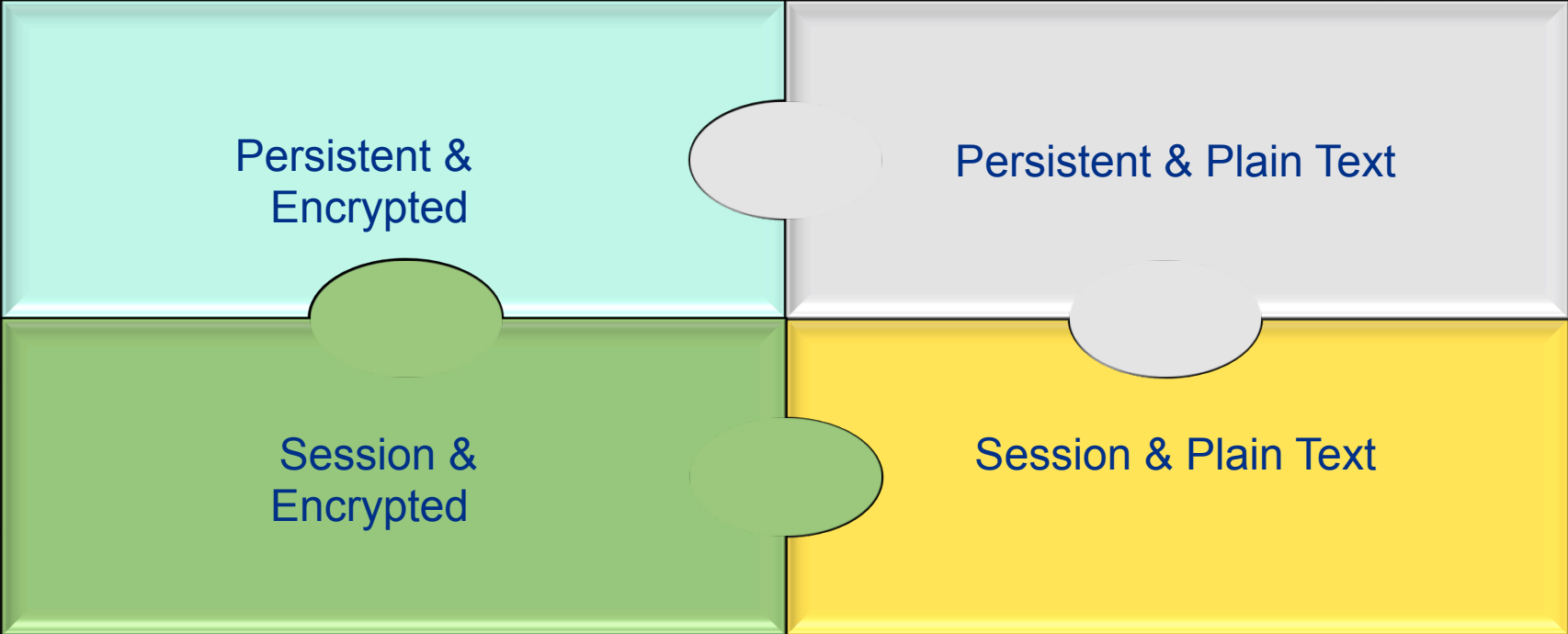
- 15 years of ungoverned growth and abuse
- Customer experience impact
- Performance impact
- Security

## Goals

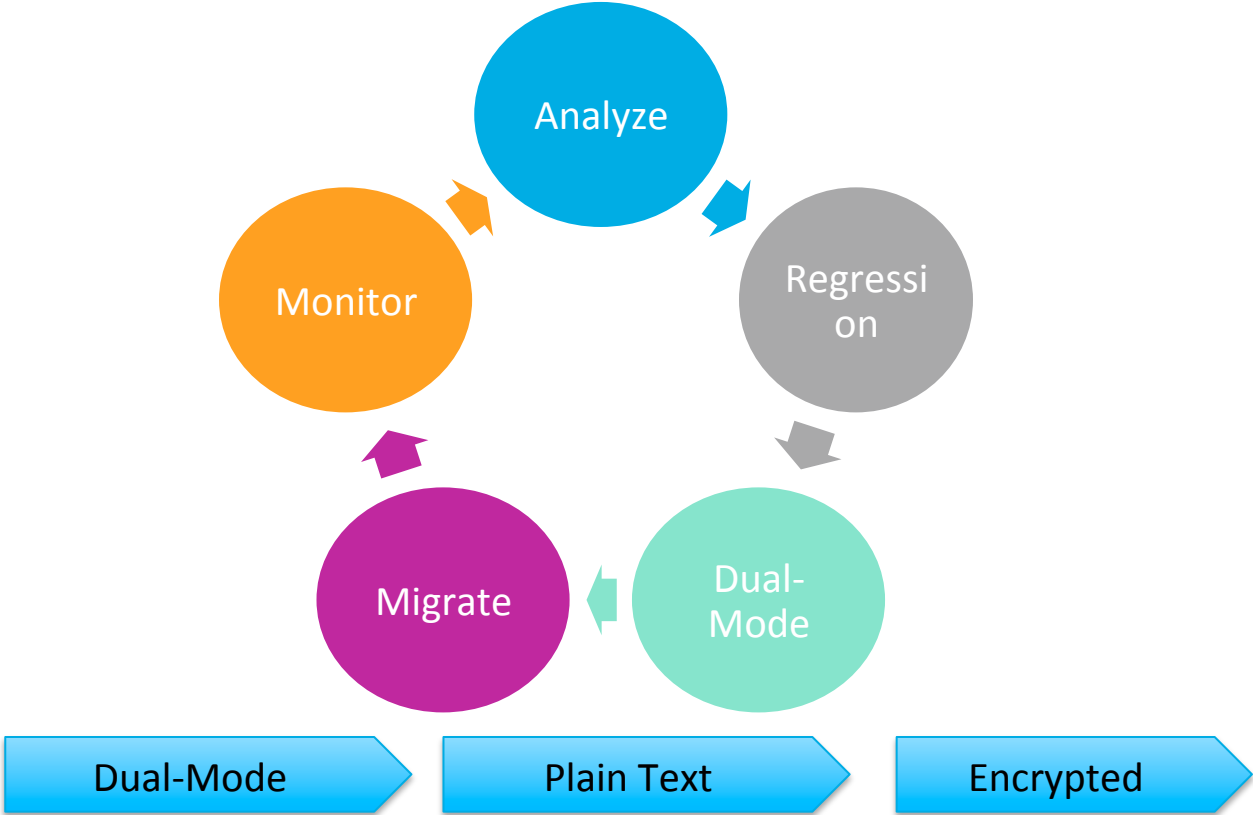
- Reduce cookie payload by 70%
- Central repository for site cookies 100%
- Cookie approval < 1 day
- Availability  $\geq 99.99\%$

# Problem Statement - Cookie Puzzle

Known Cookies ~350



# Migration Strategy





# Functional View

Customers



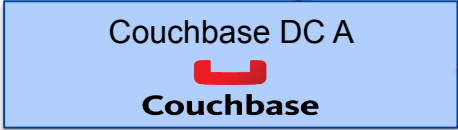
Front Tier



Mid Tier

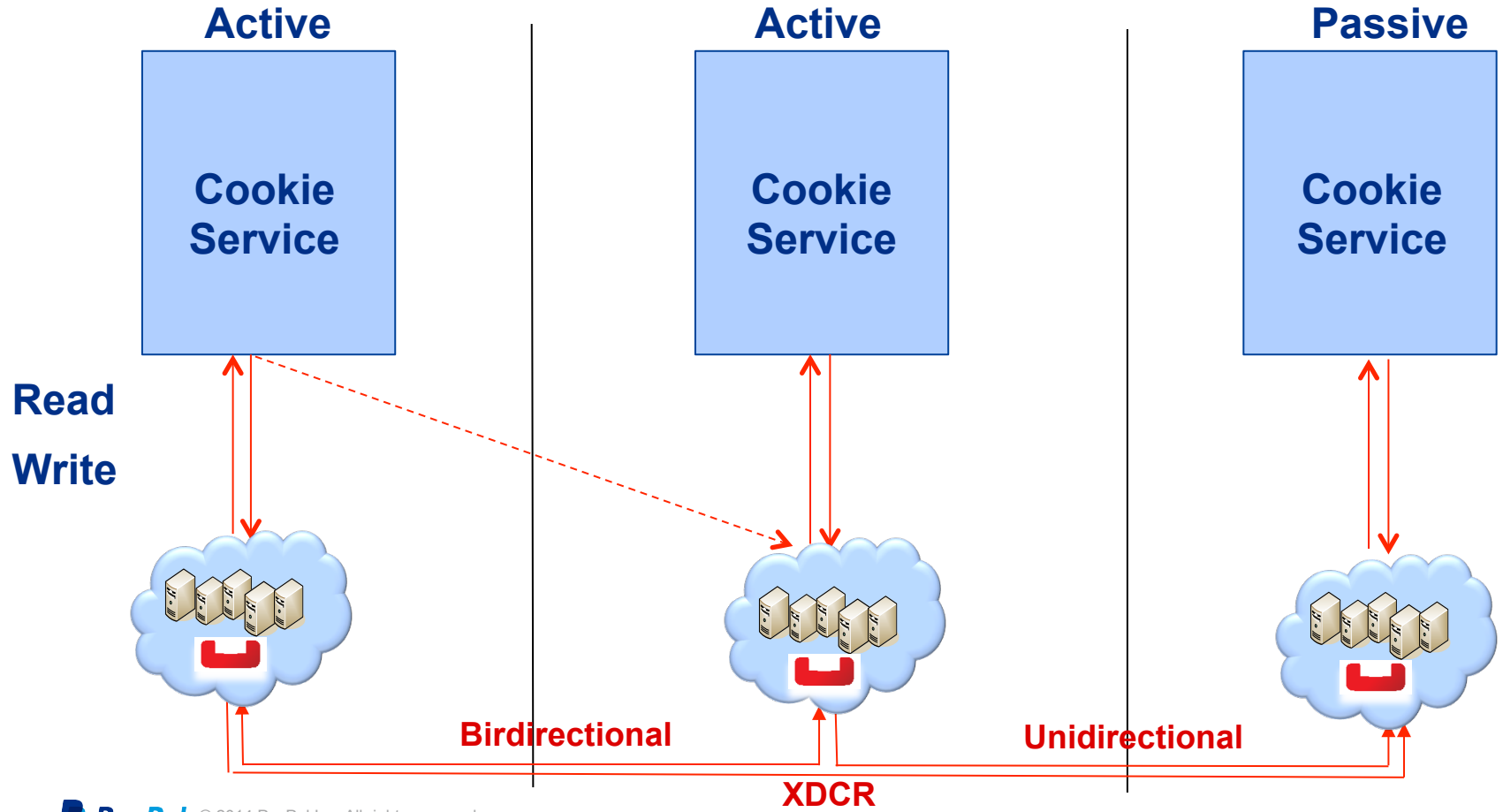


Data Tier

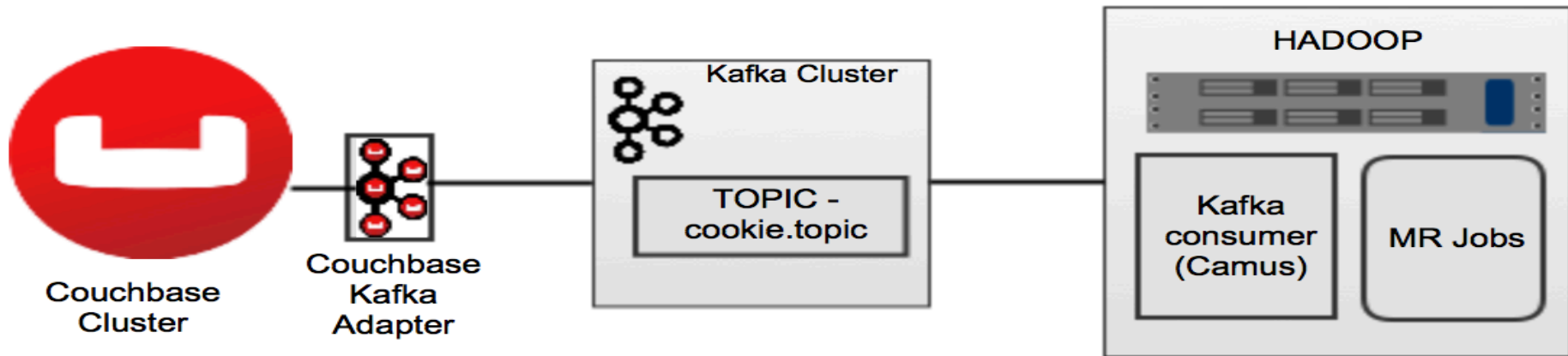


XDCR

# Deployment Model



# Cookie Analytics



<https://github.com/paypal/couchbasekafka>

# Cookie Schema



- [Cluster Overview](#)
- [Server Nodes](#)
- [Data Buckets](#)
- [Views](#)
- [XDCR](#)
- [Log](#)
- [Settings](#)

cookie > Documents

cs\_37b51d194a7513e45b56f6524f2d51f2

- Delete
- Save As...
- Save

```
1 {
2   "version": "1.0",
3   "updated": 1377196451437,
4   "cookies": {
5     "persistent": [
6       {
7         "name": "visitorId",
8         "value": "ed9ecf6913f0a491e544f404ffd8d199",
9         "expiry": 15901200
10      }
11    ],
12    "session": [
13      {
14        "name": "LANG",
15        "value": "en",
16        "expiry": 0
17      }
18    ]
19  }
20 }
```

# Cookie Documents - Analytics



```
KEY : "cookieaudit"  
Value: {  
  "name": "usersession", //Name of Cookie  
  "encryptedName": "TVKbnJIgoopqWu", //Encrypted name of cookie  
  "lastModified": 1412275511226 //Last modified timestamp  
}
```



```
KEY : "cookie_name_<yyyymmddhh>"  
Value: {  
  "cookieName": "ca_CBr2MVP2...", //Cookie name  
  "AppGetMap": {"App1": 5, "App2": 9, }, //apps reading the cookie.  
  "AppPutMap": {"App1": 2, "App2": 3, }, //apps writing to the cookie  
  "totalGet": 7, //# of reads across all apps  
  "totalPut": 12, //# of writes across all apps  
  "totalKilled": 0, //# killed from browser .  
}
```

# Cookie Documents - Analytics



```
KEY : <xxx>  
Value: {  
  "totalsessions": 2, //# sessions  
  "metadata": {  
    "USERSESSIONKEYS": [ //Map of Server Sessions  
      {"cookieProfileVal": "pp_8d86d0c53d30a39ac3b546f4ffffffbc"},  
      {"cookieProfileVal": "pp_b14fea6c1470a39ac33dwf4ffffff3d"}  
    ]  
  }  
}
```

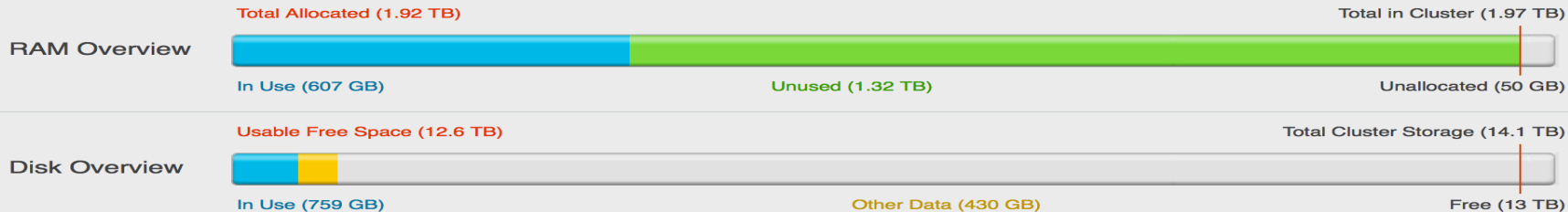


```
KEY : Cookie Key (UUID)  
Value: {{  
  "h": {  
    "clen": 105, //Cookie Length  
    "updated": 1388606400000, //Last Updated date/time  
    "brcount": 5, //# of cookies in Browser Side  
    "sercount": 10, //# of cookies migrated to server  
    "brsize": 1000, // Total size of browser cookies  
    "sersize": 3000, //Total size of Server side cookies  
  },  
}
```

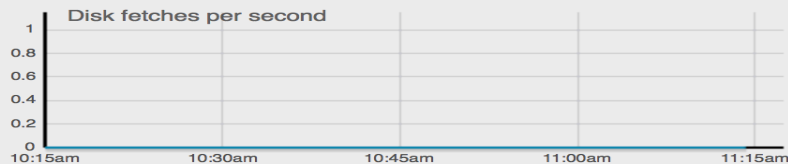
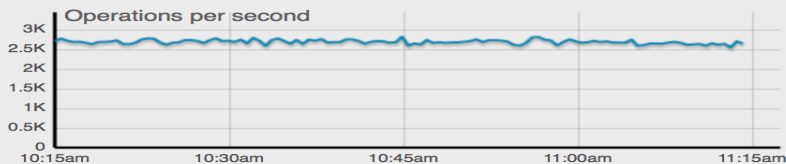
# Cluster Overview

## Cluster Overview

### Cluster



### Buckets (1 bucket active)



### Servers



Active Servers: 10



Servers Failed Over: 0



Servers Down: 0



Servers Pending Rebalance: 0

# Data Buckets

## Data Buckets

### Couchbase Buckets

Bucket Name	Nodes	Item Count	Ops/sec	Disk Fetches/sec	RAM/Quota Usage	Data/Disk Usage	
▼ <b>cookie</b>	● 10	298979826	2562	0	607GB / 1.92TB	558GB / 761GB	<a href="#">Views</a>

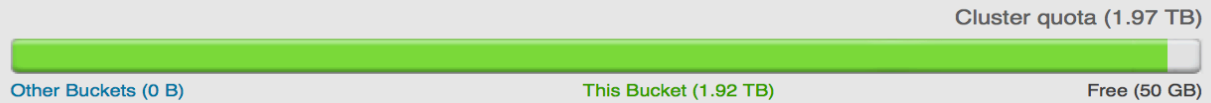
Access Control: Authentication

Replicas: 1 replica copy

Compaction: Not active

### Cache Size

Dynamic RAM Quota: 1.92TB

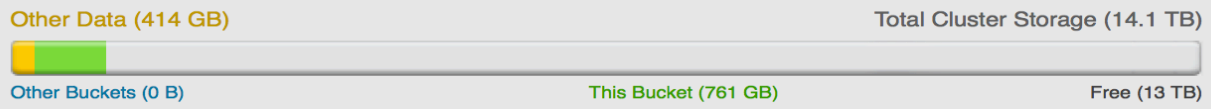


### Storage Size

Persistence Enabled: Yes

Disk Usage: 761GB

Data Usage: 558GB

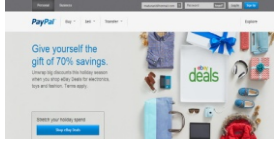




## Cookie Store Personalization

# Personalization

## Personalized Experiences



Online



Retail



Beacon



Mobile

## Touch points



Merchants



PayPal



3rd Parties



Segments

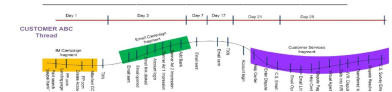


Models

## Science



Hyperlocal



Customer Journeys

## Data



PayPal

ayPal Inc. All rights



Merchant



Inc



3rd Party

# Business Problem



## Reach

Connect with over 155MM users via mobile and online



## Relevancy

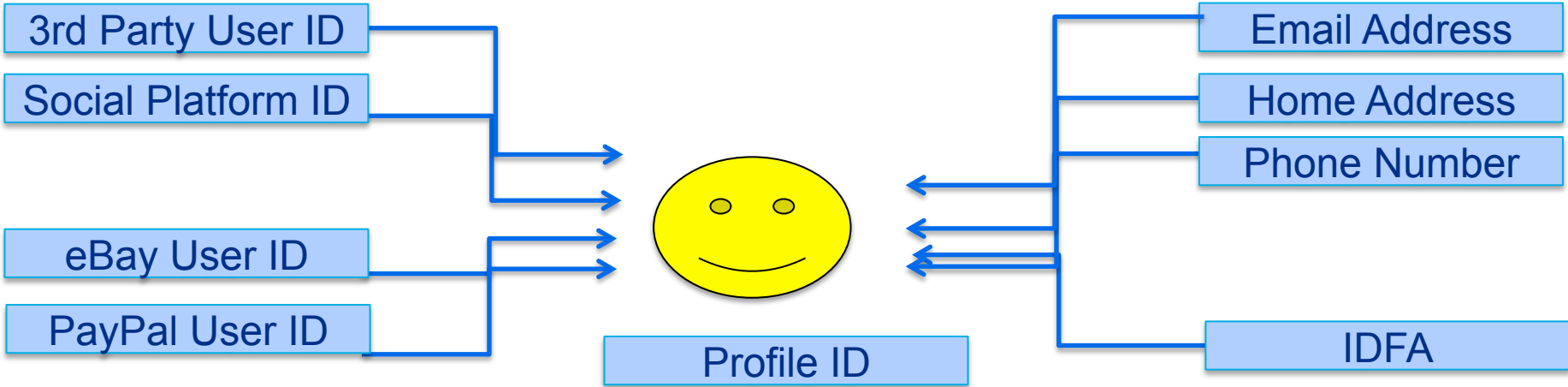
Connect the right message to the right customer



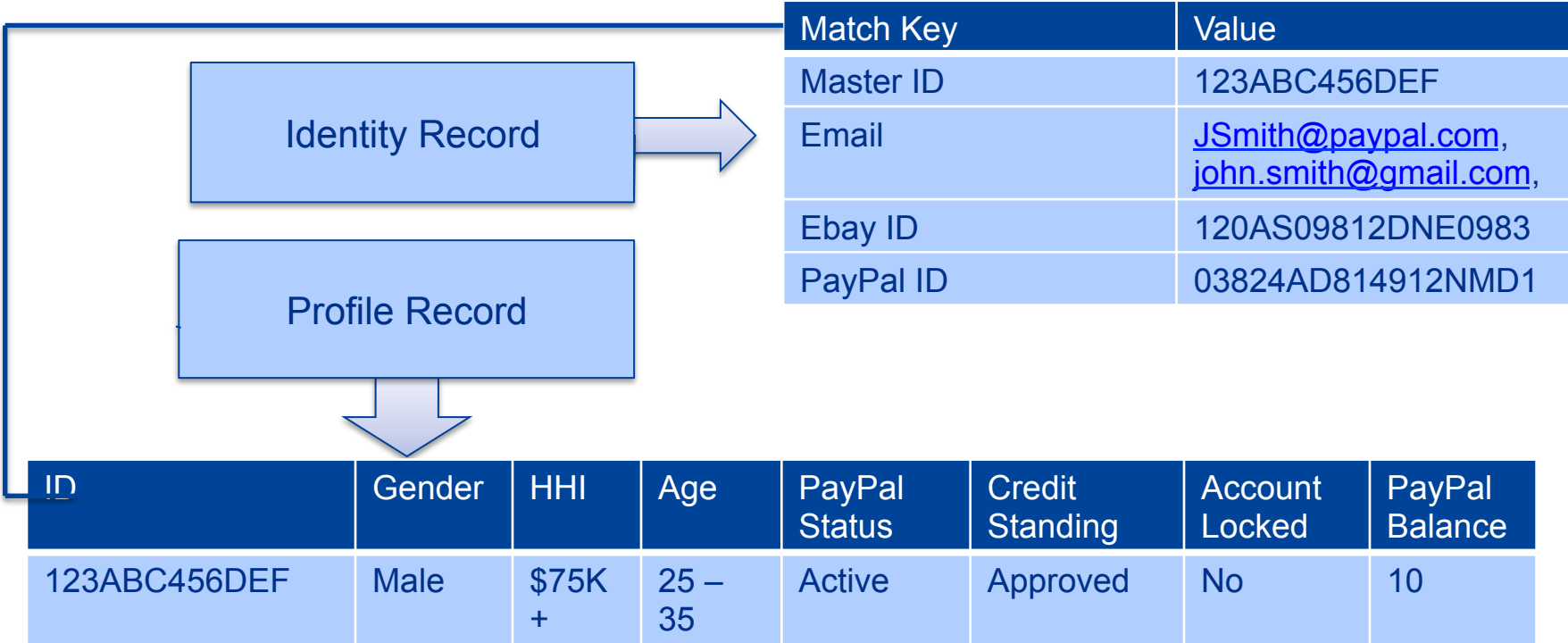
## Redemption

Drive shoppers to purchase and close the loop

# Real Time Personalization Service (RPS)



# Identity & Profile Schema



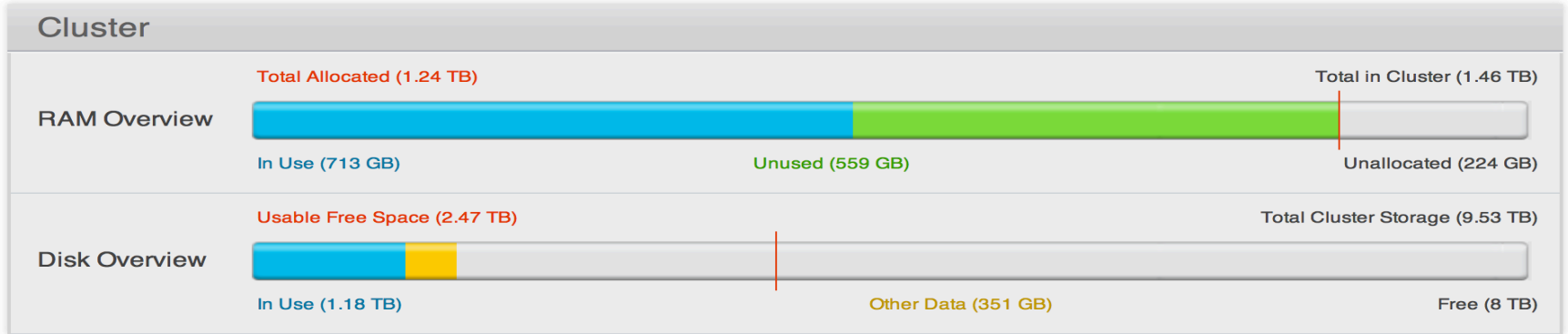
# Identity & Profile Documents

Document id=550e8400-e29b-41d4-a716-446655440000

```
{
  key : "eguid_1234"
  value: "550e8400-e29b-41d4-a716-446655440000"
  "matchKeyData" : [{"pguid_1234" : "45564757"}, {"eguid_5678" : "45657556"}],
  "segmentProviders" : [
    {
      key : "pguid_5678"      "name" : "ebay",
      value: "550e8400-e29b-41d4-a716-446655440000"
      "attributes" : {
        "created" : 698465466,
        "updated" : 759669696,
        key : "idfa_90"      "updated" : 759669696,
        value: "550e8400-e29b-41d4-a716-446655440000"
        "segments" : {
          "ebay.gender": "1",
          "ebay.married": "0",
          "ebay.age_range": "2",
          "ebay_hhi": "75"
        }
      }
    },
    "segments" : {
      "pp.signup.recency": "6579696",
      "pp.bml.standing": "Approved",
      "pp.account.locked": "4",
      "pp.account.balance": "10"
    }
  ]
}
```

# Cluster Overview


## Cluster Overview






### Buckets (4 buckets active)

Waiting for samples...

### Servers

 Active Servers: 26









-  Servers Failed Over: 0
-  Servers Down: 0
-  Servers Pending Rebalance: 0

# Data Buckets

## Data Buckets

### Couchbase Buckets

Create New Data Bucket

Bucket Name	Nodes	Item Count	Ops/sec	Disk Fetches/sec	RAM/Quota Usage	Data/Disk Usage		
 <b>identity</b>	 26	1146748735	110	0.999	326GB / 572GB	350GB / 617GB	<a href="#">Documents</a>	<a href="#">Views</a>
 <b>impression</b>	 26	0	0	0	72.7MB / 2.53GB	62.9MB / 65.4MB	<a href="#">Documents</a>	<a href="#">Views</a>
 <b>profile</b>	 26	354141898	358	0	316GB / 572GB	305GB / 482GB	<a href="#">Documents</a>	<a href="#">Views</a>
 <b>transientProfile</b>	 26	131265192	0	0	70.5GB / 126GB	77.3GB / 115GB	<a href="#">Documents</a>	<a href="#">Views</a>