



## Couchbase Use Cases at UPS

**Konstantin Tadenev, UPS, Principal Architect**

**October 17, 2019**

# Agenda

Scale and Complexity of Technology at UPS

Couchbase Statistics at UPS

7 Common Use Cases

# Scale and Complexity of Technology at UPS

## Service Area

- More than 220 countries and territories; every address in North America and Europe





# Scale and Complexity of Technology at UPS

Delivery fleet – over 120,000 vehicles, including 10,000 alternative fuel and advanced technology vehicles





# Scale and Complexity of Technology at UPS

Aircraft – own 249, leased 298

The third-largest cargo airline worldwide by freight volume flown



# Scale and Complexity of Technology at UPS

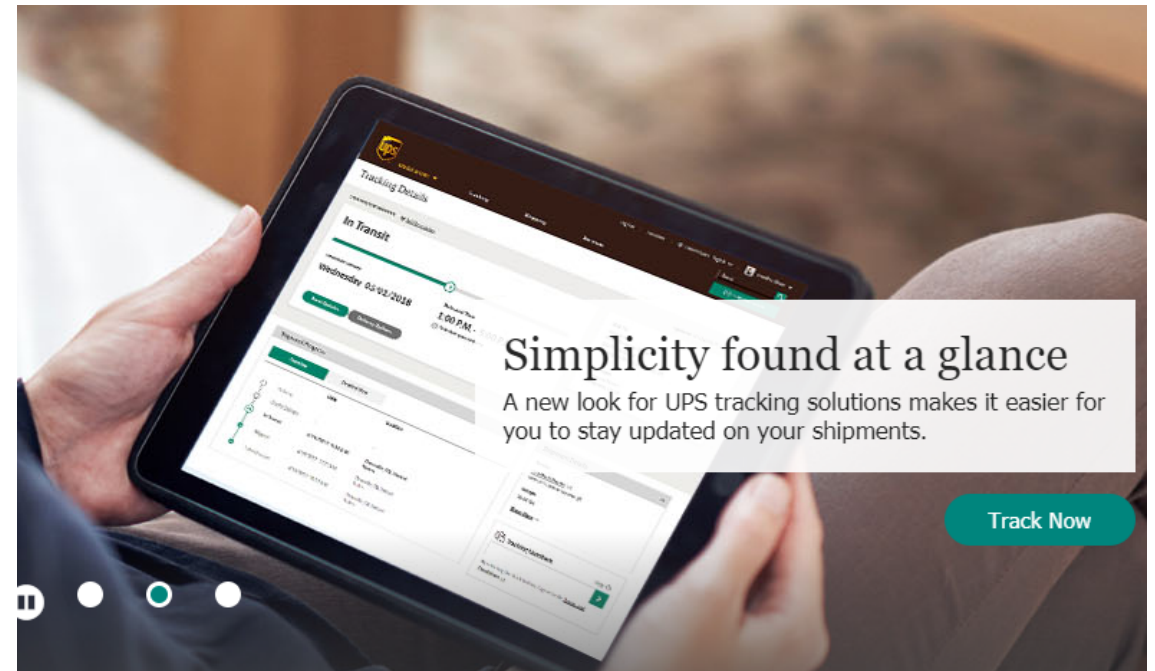
Mobile devices – greater than 137,000 in daily use



# Scale and Complexity of Technology at UPS

## Tracking requests

- 211 million per day
- 338 million on the peak day of 2018





# Scale and Complexity of Technology at UPS

UPS is the first logistics company operating commercial drone deliveries via ***UPS Flight Forward*** subsidiary



# Couchbase Statistics at UPS



22 production applications running Couchbase



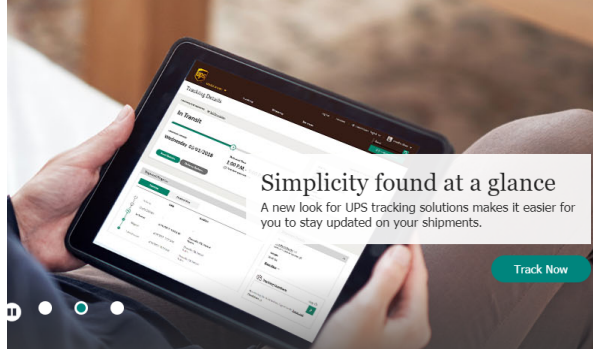
The largest application  
5.5 billion documents  
24 TB of user data (compressed)  
Average 51,500 ops/sec  
48 Couchbase nodes



Couchbase Lite  
30,000 mobile devices

# Use Cases at a Glance

## Customer Engagement



## Naturally-document-oriented Cases



Customer Profile

## Agile Platform for Microservices



## High Availability – Active/Active Architectures



## Event Processing



## Mobile

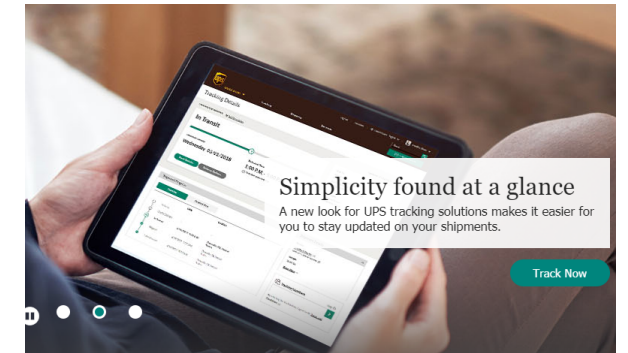


## Session Management





# Customer Engagement



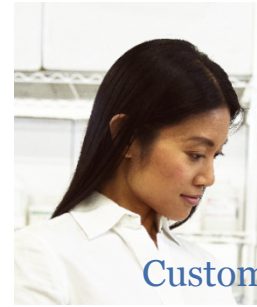
## Objectives

- Provide visibility into the full lifecycle of packages and shipments
- Offer actionable intelligence to shippers, receivers and other types of customers of all sizes via dashboards and alerts
- Enable customer to view transaction history, apply what-if scenarios and make well-informed decisions

## How is Couchbase helping?

- Using Couchbase as persistent elastic cache allows to serve frequently-referenced data at micro-second velocity
- HTAP (Hybrid Transactional-Analytical Processing) features of Couchbase allow for flexibility in building and serving aggregates at high performance and responsiveness levels

# Naturally Document-Oriented Cases



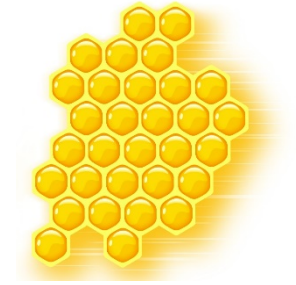
## Objectives

- Quite often business information is managed and accessed as a consistent set. Some examples at UPS:
  - Customer profiles
  - Addresses and location profiles
  - Characteristics of physical and IT assets

## How is Couchbase helping?

- Consistent sets of business information are a natural fit for the document-oriented model of Couchbase
- The document data model in these cases is typically much simpler than a more traditional relational model
- Schema flexibility and adaptability contributes significantly to business agility

# Agile Platform for Microservices



## Objectives

- One of the principles of microservices-based architectures is hiding implementation details. This means that each service needs to control its own data as to allow evolution independent of other services

## How is Couchbase helping?

- Degrees of data isolation offered by Couchbase:
  - By key prefix
  - By bucket
  - By cluster
  - New with Couchbase 6.5 (developer preview) – Collections
- Couchbase support for flexible schema greatly simplifies CI/CD pipelines



# High Availability – Active/Active Architectures



## Objectives

- Reduce recovery times for the geographically-distributed solutions, across data centers, availability zones, and regions

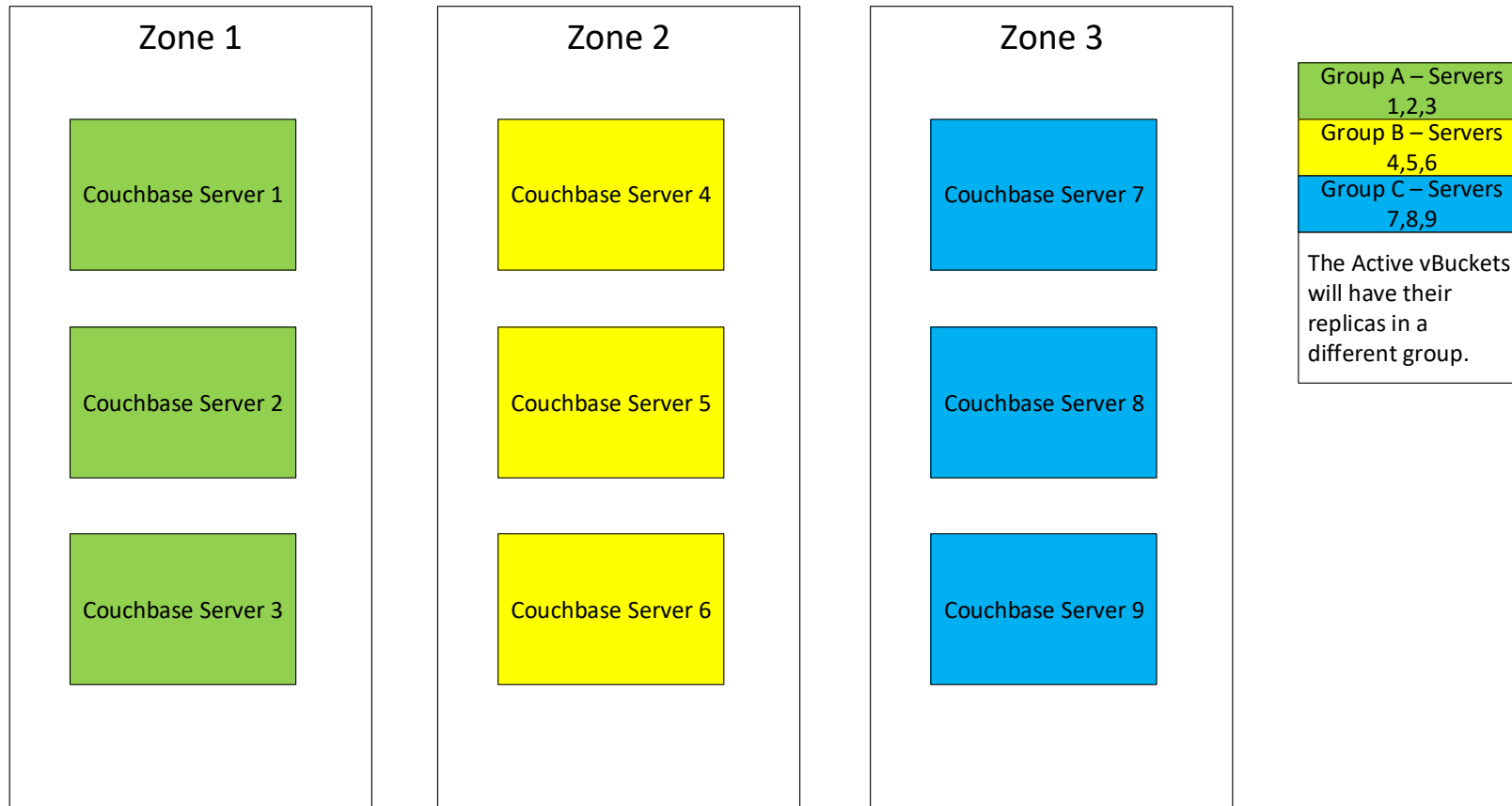
## How is Couchbase helping?

- In-cluster vBucket replication and rapid recovery from a node failure ensure high availability within a data center (on premises) or region in Public Cloud
  - Note that a Couchbase cluster can be stretched across multiple availability zones within a given region for safeguarding against an availability zone failure (see next slide)
- Couchbase XDCR supports multi-directional replication and conflict resolution across geographically-distant data centers or regions

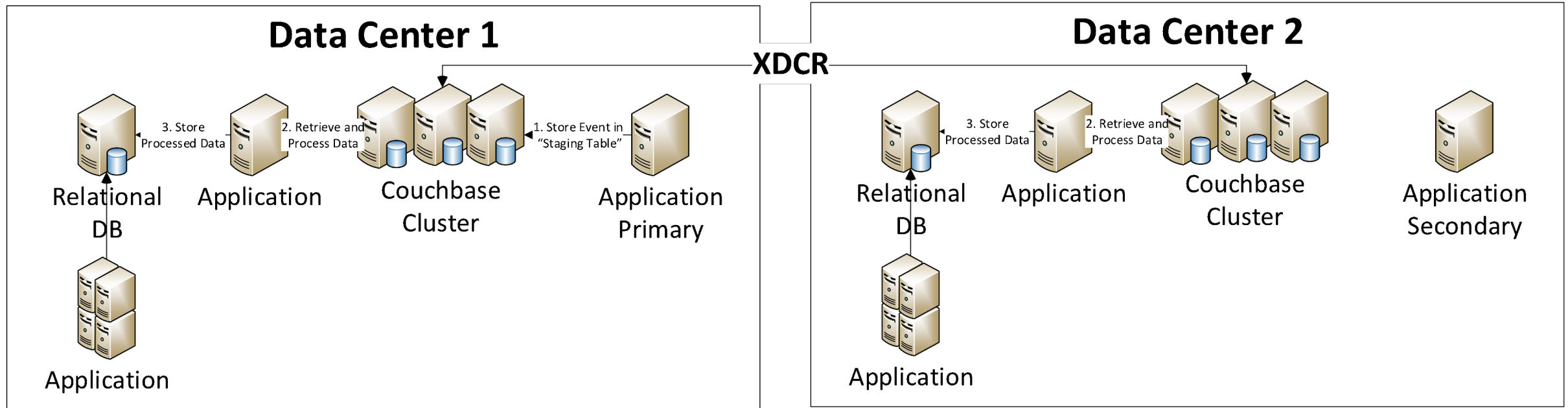
## What would we like Couchbase to improve?

- Conflict resolution events notifications
- Persistence of the “losing” writes

# Example of Stretching a Couchbase Cluster Across Availability Zones



# Example of Using Couchbase as a Staging Database: Improving Availability of the Entire Solution





# Event Processing



## Objectives

- Event-processing applications often deal with multiple streams of incoming messages and require a database lookup in order to obtain an object state and interpret the business meaning of the event.
- Timely flow of information puts high demands on database performance driving response-time requirements into the sub-millisecond range

## How is Couchbase helping?

- Memory-first architecture allows Couchbase to meet the sub-millisecond response-time requirements for key-value operations
- Horizontal near-linear scalability allows to meet ever-growing volume demands

# Mobile



## Objectives

- Provide industrial-strength, JSON-native, light-footprint, fully-supported, imbedded database platform for mobile devices
- Optionally – synchronize the data with Private or Public Cloud

## How is Couchbase helping?

- Couchbase Light meets all the requirements on mobile devices
- UPS is using Couchbase Light mainly as a write-aside persistent mobile cache, whereby the app is responsible for data synchronization via light-weight messaging middleware
- In some cases, Couchbase Mobile Gateway proved its usefulness

# Session Management



## Objectives

- Cloud-ready application methodologies such as “12-factor” call for strictly-stateless processes
- Web apps require maintenance of session state
- Elastic caches and databases are being used in the industry to hold the session state
- Session state is typically short-lived

## How is Couchbase helping?

- Couchbase Ephemeral Buckets provide a platform for highly-performant, elastic, and resilient session cache
- Optionally, persistent buckets can be used for the same purpose (if persistence is required), with little to no performance penalty due to the memory-first architecture of Couchbase

# Let's Dream!

## What would a Couchbase platform of the future look like?

- Fully-automated Platform-as-a-Service (PaaS)
- Workload-based auto-scaling (out and in)
- Secure
  - Networking
  - Encryption
  - Integration with external identity and access management services
- Automated rolling upgrades
- Self-healing, seamless failed-node recovery with the subsequent HA restoration
- Automated backups
- Cluster-sizing wizard

## What is your dream?







Thank  
you

