Couchbase Use Cases at UPS

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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

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

Zone 1
- Couchbase Server 1
- Couchbase Server 2
- Couchbase Server 3

Zone 2
- Couchbase Server 4
- Couchbase Server 5
- Couchbase Server 6

Zone 3
- Couchbase Server 7
- Couchbase Server 8
- Couchbase Server 9

Group A – Servers 1, 2, 3
Group B – Servers 4, 5, 6
Group C – Servers 7, 8, 9

The Active vBuckets will have their replicas in a different group.
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