
AWS
re:Invent
NOV. 28 – DEC. 2, 2022 | LAS VEGAS, NV

PRT046

SPONSORED BY COUCHBASE, INC.

When is it time to modernize your AWS database platform?

Jeff Morris

VP, Product and Solutions Marketing
Couchbase, Inc.

aws

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Agenda

01/ Requirements for modern applications

02/ Forthcoming architecture trouble spots

03/ Hybrid operational and analytic processing

04/ Mobile and edge platforms

05/ Cloud, edge, and your pocketbook

© Couchbase 2022. All rights reserved.

Audience assumptions

- Audience members have experience with software development projects
  - Realizing that this is an invention-based problem
  - Meaning that we are creating bespoke applications that perfectly fit the needs of the business and its extended customer, employee, and partner communities

- This is not a build vs. buy discussion, nor a low-code conversation
  - Buying a ready-made solution helps efficiency of existing, well-automated, and understood processes like hiring, expense management, financial reporting, CRM, etc.

© Couchbase 2022. All rights reserved.

1 Requirements for modern DBMS

© Couchbase 2022. All rights reserved.

Customers tell us: Application requirements have changed



Deliver great experiences

- Personalized and responsive
- Anywhere and everywhere
- Real-time info and inventory
- Ensuring dependable transactions

Develop efficiently

- Simplify and accelerate development
- Tap my skills (SDKs and SQL)
- Support best practices
- Avoid data sprawl

Deploy effectively

- Support hybrid clouds, edge, 5G
- 100% uptime and global scale
- Flexible management options
- Cost effective

© Couchbase 2022. All rights reserved.

Traditional database (RDBMS) challenges



Rigid schemas

Rigid schema takes months to adapt to new requirements



Performance challenges

Low concurrency and slow performance due to 90s client-server designs



Inability to scale or multiply

Lack of scale creates a success burden that limits ultimate success



Cost

Eventually the costs of maintenance outweighs the cost of redesign

© Couchbase 2022. All rights reserved.

Innovation leaders

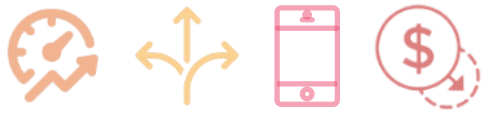


FICO

Global fraud detection and prevention

3B+
payment accounts protected

65%
of world's card accounts



Carnival

City-at-sea experience via IoT and edge-based mobile devices

15K
mobile sensors per voyage

100s M
operations per/day

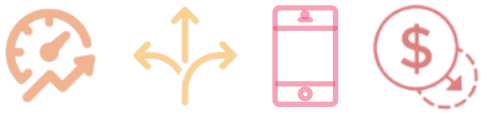


LinkedIn

High-performance caching for social network

10M+
requests/second

800M+
users



STAPLES

Product catalog, pricing, shopping cart, daily deals, inventory management

4,000
stores worldwide

1.6B
rules applied in real time

© Couchbase 2022. All rights reserved.

SOLUTION
Customer 360

APPLICATION
Social networking
Single view for internal tooling

USE CASES
Caching
Session store

ABOUT
World's largest professional services social network: 450+ million members worldwide and billions of page hits per day



Requirements

- **Address inability to scale reads on Oracle** was bringing down backend systems
- **Address Memcached caused manageability and reliability problems**
- Needed to balance performance with **built-in replication and cluster expansion, automatic partitioning** to ease load on ops team

Outcomes

- **Achieved tremendous performance at scale**, averaging <4ms latency for over 2.5 billion items
- All in-memory storage in the LinkedIn data center is done by Couchbase, powering **10+ million queries per second across all servers and clusters**
- Ease of use and built-in replication and cluster expansion have **reduced ops costs**

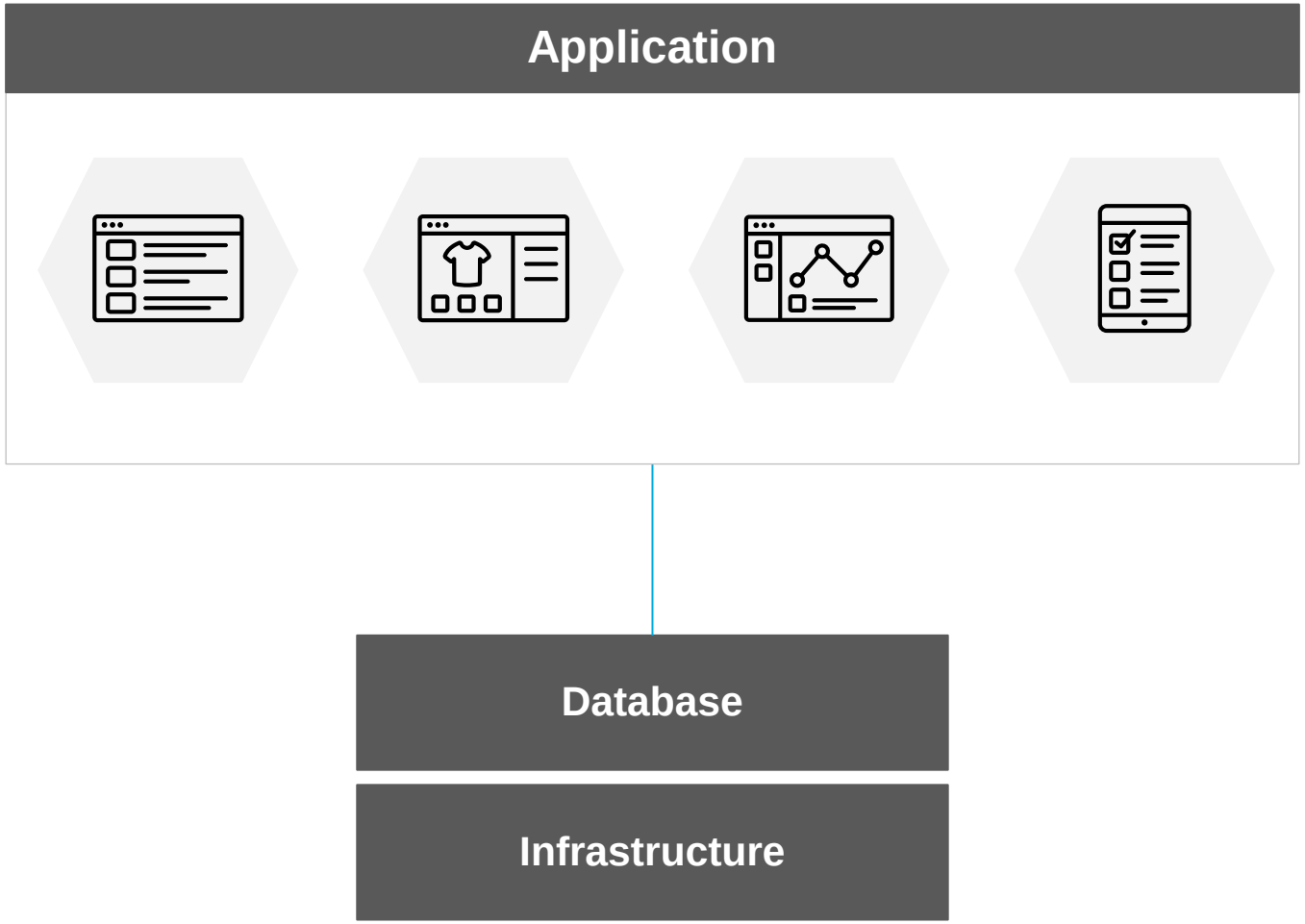
© Couchbase 2018. All rights reserved.

2 Forthcoming architecture trouble spots

© Couchbase 2022. All rights reserved.

Simplistic view: Data management for applications

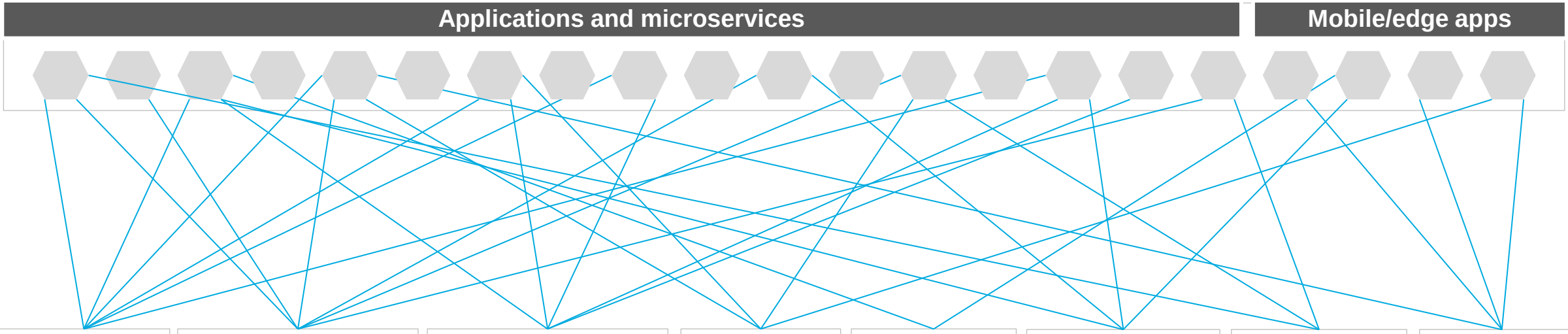
Functional requirements



© Couchbase 2022. All rights reserved.

Reality: Polyglot persistence creates data sprawl challenges

Polyglot persistence designs encourage the use of purpose-built databases for application functionality. Martin Fowler, 2011



Cache	NoSQL database	Relational database	Query tools	Full-text search	Eventing	Analytics	Mobile
redis	Amazon DynamoDB	PostgreSQL	SQL	elasticsearch	CONFLUENT	databricks	Firebase
	Azure Cosmos DB	Microsoft SQL Server		Solr	kafka	Google Big Query	SQLite
	mongoDB.	ORACLE					
	Couchbase	IBM DB2					

Infrastructure layers

© Couchbase 2022. All rights reserved.

Polyglot persistence design architectures are inefficient

Application-level capabilities

Cache | NoSQL database | Query tool | Relational database | Full-text search | Eventing | Analytics | Mobile

















Different management and security systems

Infrastructure, licenses, integration, training, operational, and support costs

Separate platform with multiple interfaces

- Independent deployment and management
- Different data model and programming interfaces
- Integration between multiple products
- Support tickets with different vendors

COSTS

Products and skills

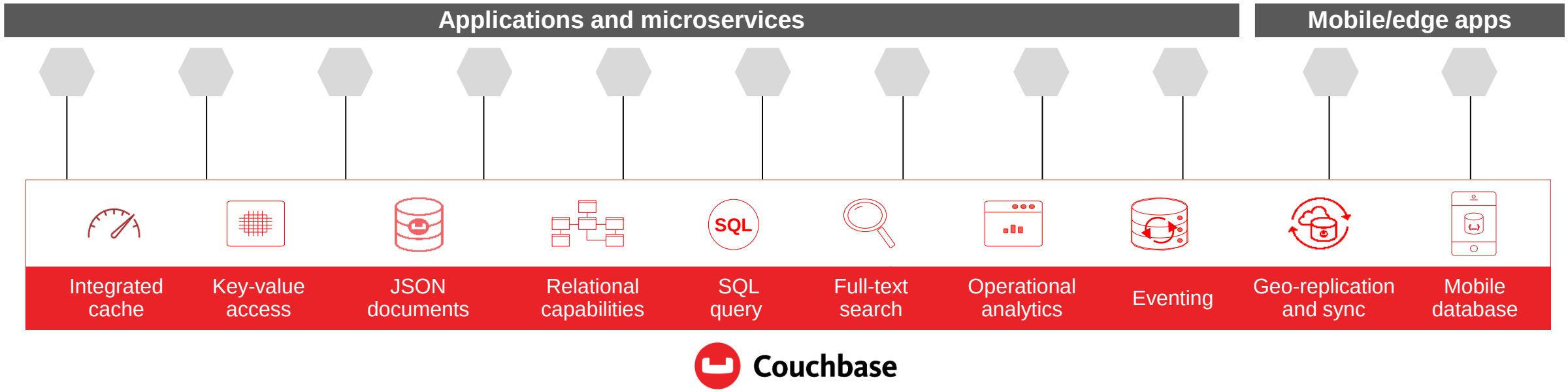
- Redis
- DynamoDB
- Postgres
- Elasticsearch
- Confluent
- Databricks

Per product (time and cost)

- License and agreement
  - Sourcing for renewals
  - Legal for agreements
- Training
  - Developers
  - Operations
- Support
- Build API or connector to database
- Purchase infrastructure

© Couchbase 2022. All rights reserved.

What is needed to achieve the convergence effect



Speed

- Memory-first design
- Cloud-native scale
- Geo-replication via XDCR
- HA, DR, and backup
- Low-latency cloud to edge

Flexibility

- JSON document
- Multimodel services
- Cloud deploy anywhere
- Mobile and edge ready

Familiar skills

- SQL++ query language
- Dynamic schema
- ACID SQL transactions
- Cost-based optimizer
- SDKs for 12+ languages

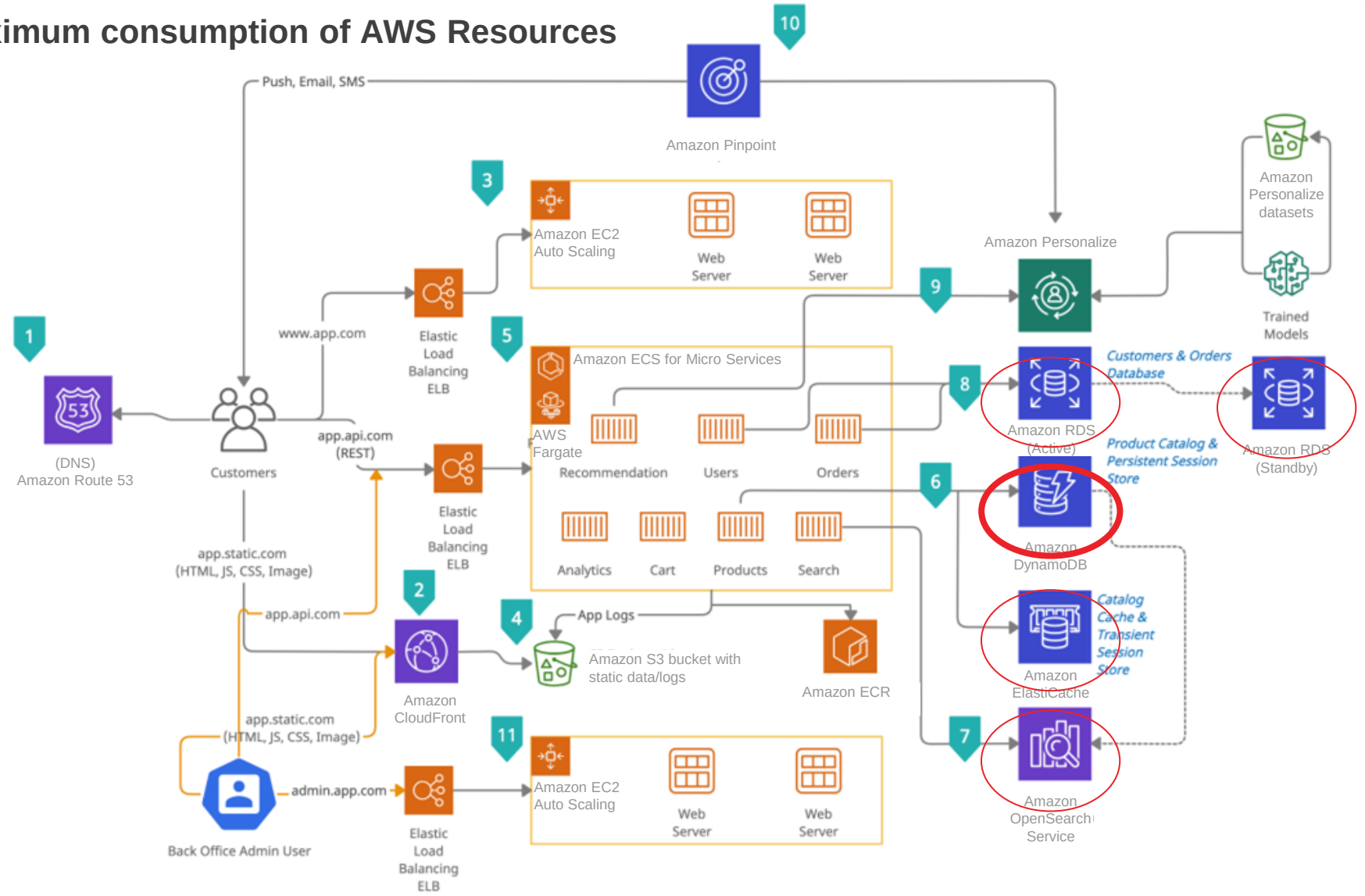
Affordability

- Elastic scaling, sharding, and rebalancing
- Multidimensional scaling
- High-density storage
- Incredible price/performance

© Couchbase 2022. All rights reserved.

Cloud providers benefit from polyglot persistence designs

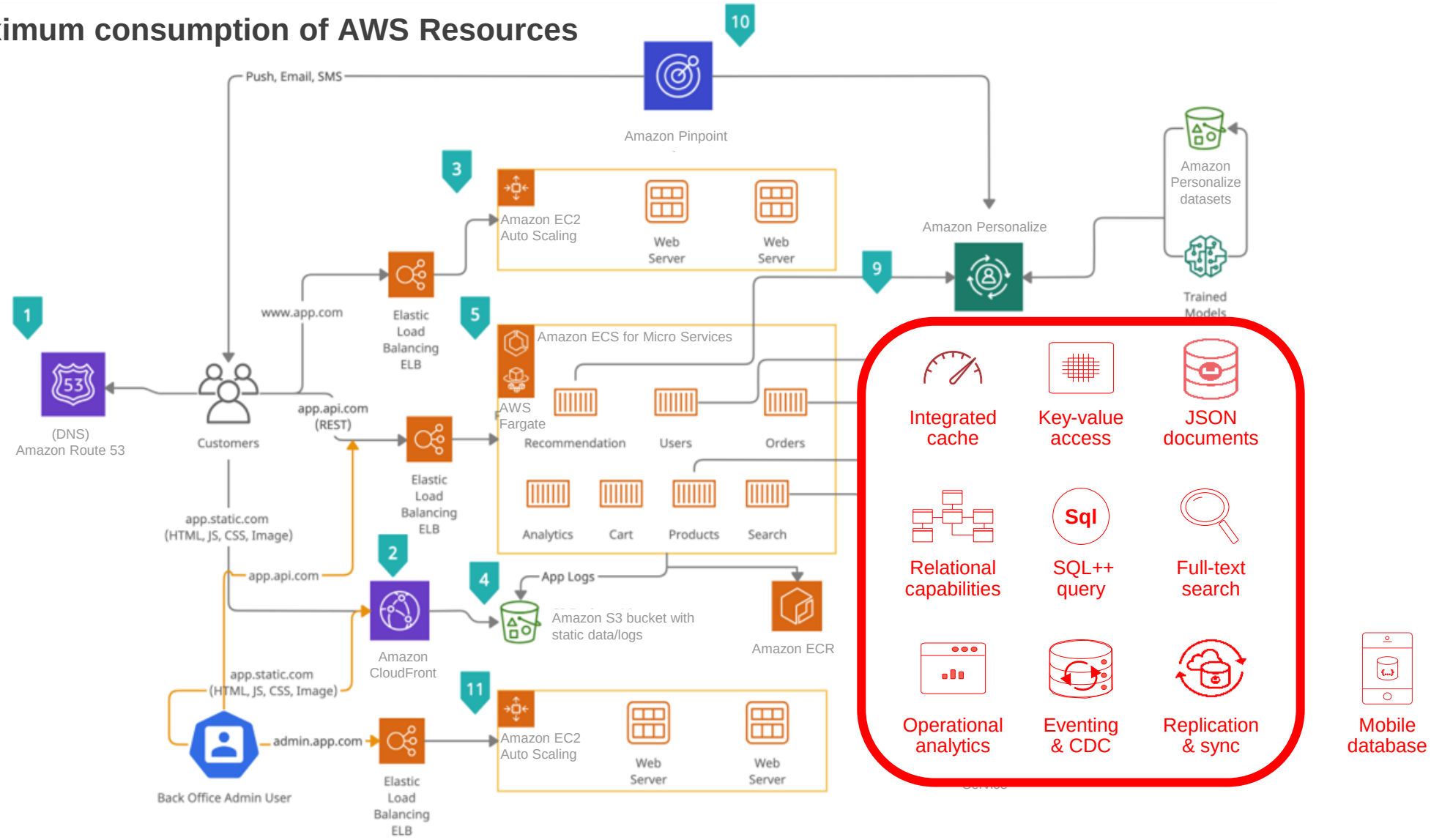
Intent is maximum consumption of AWS Resources



© Couchbase 2022. All rights reserved.

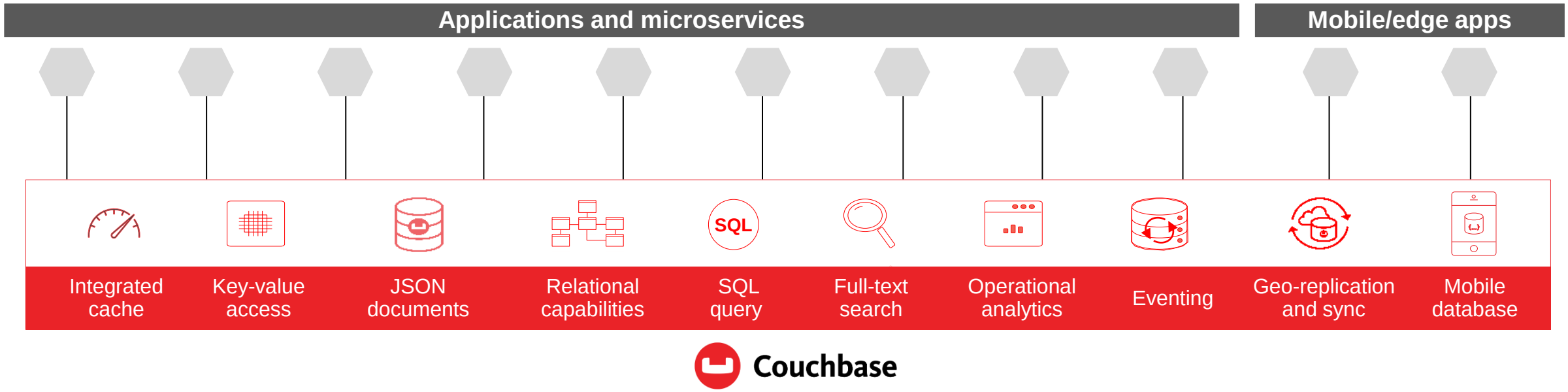
Cloud designs will converge, too

Intent is maximum consumption of AWS Resources



© Couchbase 2022. All rights reserved.

Integrated capabilities: Benefits for customers



Innovate faster and spend less

- Faster release cycles
- Less duplication & data sprawl
- Scale more easily
- Less time on maintenance
- Lower operational costs
- Lower infrastructure costs

© Couchbase 2022. All rights reserved.

3 Hybrid operational and analytic processing

© Couchbase 2022. All rights reserved.

Key customer pain points

Need to **isolate heavy analytical workloads** from operational workloads

Cumbersome to **perform analytics on JSON** data with relational databases

Need to **explore and analyze operational data** in **near real-time** before publishing to a data warehouse

Query service not optimized for reads on **one-time and complex queries**

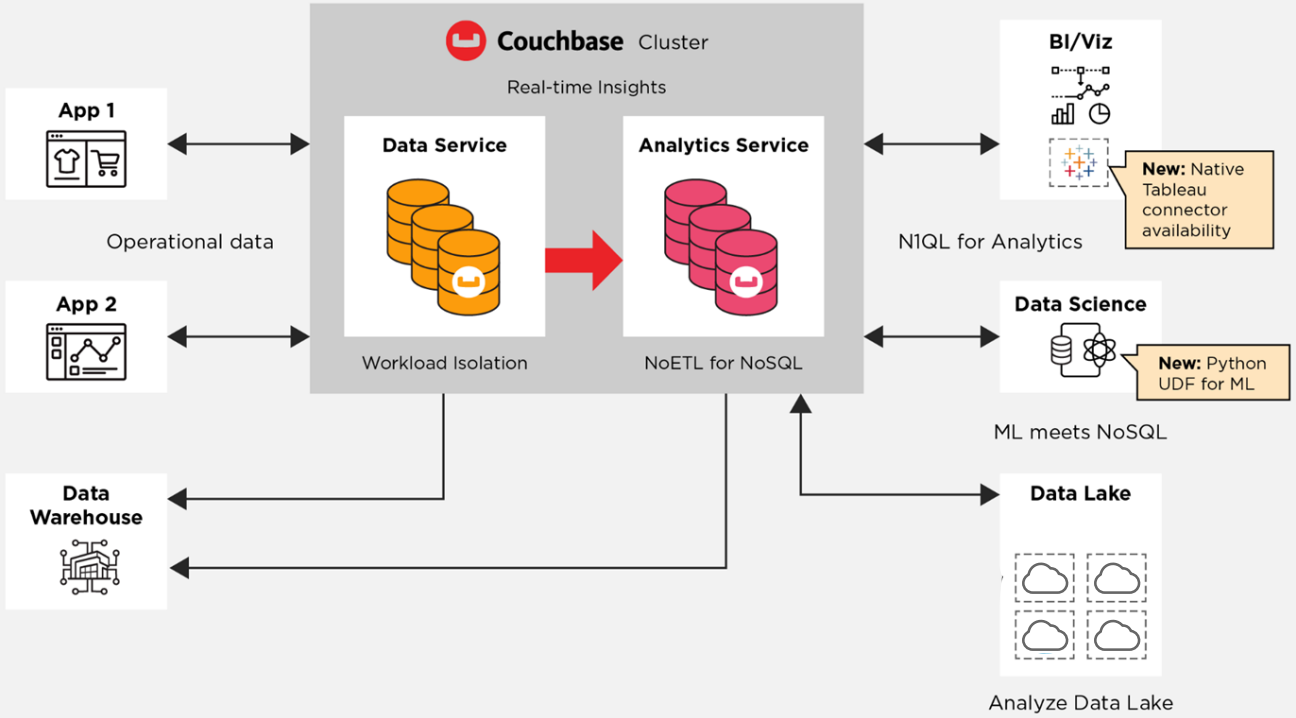
© Couchbase 2020. All rights reserved.

Hybrid operational and analytic processing

Single source for JSON analytics

Real-time insights on real-time data

- Analyze JSON data in near real-time without extract-transform-load (ETL)
- Deliver insights on current data using the analytics MPP architecture
- Use SQL++ (SQL for JSON) for complex analytical queries
- Isolate operational and analytical workloads



© Couchbase 2022. All rights reserved.

SQL++: ANSI standard, JOINS, nested objects, arrays

MongoDB Query Language

```
db.activity.aggregate(
 { $match: { startDate: { $gt: '2018-01-01',
                          $lt: '2018-12-31' } } },
 {$lookup: {
        from: "account",
        localField: "accid",
        foreignField: "id",
        as: "account_docs"
          }
 },
 { $match: { "account_docs": { $ne: [] } } },
 { $unwind: "$account_docs" },
 {
   $project: {
     item: 1,
     task: { $cond:{if:
       { $eq: ["$activityType", "Task"] }, then: 1,
           else: 0 } },
     appt: { $cond: { if:
       { $eq: ["$activityType", "Appointment"] },
then: 1,
           else: 0 } } }
 },
 {
     $group: {
         _id: "$account_docs.industry",
         tasks: { $sum: "$task" },
         appointments: { $sum: "$appt" }
 } }
);
```

Relational SQL

```
SELECT ac.industry,
 SUM(CASE WHEN a.activitytype = 'Task'
    THEN 1 ELSE 0 END ) task,
 SUM(CASE WHEN a.activitytype ='Appointment'
    THEN 1 ELSE 0 END ) appts
FROM crm.activity a
  INNER JOIN crm.account ac
     ON (a.accid = ac.id)
WHERE a.startdate BETWEEN '2018-10-01'
           AND   '2018-12-31'
GROUP BY ac.industry
```

SQL++

```
SELECT ac.industry,
 SUM(CASE WHEN a.activitytype = 'Task'
    THEN 1 ELSE 0 END ) task,
 SUM(CASE WHEN a.activitytype ='Appointment'
    THEN 1 ELSE 0 END ) appts
FROM crm.activity a
  INNER JOIN crm.account ac
     ON (a.accid = ac.id)
WHERE a.startdate BETWEEN '2018-10-01'
           AND   '2018-12-31' `
GROUP BY ac.industry
```

“SQL++ was so much easier for our teams. All of our critical microservice applications have been moved from MongoDB to Couchbase.”

Wayne Chandler
Data Architect
Microlise

© Couchbase 2022. All rights reserved.

A modern database that fuses relational, NoSQL, and cloud

The relational vs. NoSQL database debate is over!

Strengths of relational databases

- Flexible data schema
- Enterprise security
- Distributed SQL transactions
- SQL++ query language
  - JOINs across collections and documents
  - User-defined functions for PL/SQL
  - Cost-based query optimizer
  - Query memory quota assignment
- Change-data-capture, eventing, and streaming
- Index advisor (in-database and online)
- Broad SDK support
- Tableau integration

Flexibility and performance of NoSQL

- Multimodel access
- Multidimensional scaling of services (MDS)
- 100% uptime during (un)planned maintenance
- Mobile and edge storage and sync
- Deploy anywhere – Cloud(s), edge, and embedded
  - Capella DBaaS
  - Shared-nothing, scale-out architecture
  - Automatic partitioning, data rebalancing, and backup
- Cloud-native Kubernetes-based deployment and automation

© Couchbase 2022. All rights reserved.

Domino's

SOLUTION
Customer data management

APPLICATION
Commerce data hub
Data science experimentation

USE CASE
Real-time marketing campaigns and personalized ordering experience

ABOUT
World leader in pizza delivery operating a network of company-owned and franchise-owned stores globally – 3M pizzas a day, 16.5K stores in 85 countries



Requirements

- Track average transaction size, annual purchase frequency, and loyalty to determine customer lifetime value (CLV)
- Deliver personalized marketing campaigns, segments and reduce time to perform data science experiments
- Ability to perform data exploration on operational data in near real time

Outcomes

- Reduction of targeted consumer offers from **weeks/months → hours and** analyze data in near real time
- Enabled agile data mining models focused on order behaviors, propensity scoring and enabled flexible attribute creation
- Removed need to ETL for data science experiments

© Couchbase 2018. All rights reserved.

Development value

Development teams do not need extensive training nor retooling, helping accelerate time to market

Technical benefits

Skills and resources

- SQL++ imposes no learning curve for most developers, and our dynamic schema with collections makes for easy model mapping from old relational to new Couchbase
- Developer gain efficiencies from Index Advisor and other optimizations like CBO
- Accelerated time to market with CI/CD processes and Kubernetes automation

Multimodel functional improvements for richer applications

- Better features like geo-search, data streaming, and analytic queries within the applications

High performance and low TCO

- Distributed, asynchronous clustering is both very fast and pushes high availability closer to where the data is consumed, in the case of geo-distributed clusters
- Price performance of Couchbase is outstanding – From 2 to 5 times faster for benchmark workloads

© Couchbase 2022. All rights reserved.

4 Mobile data platform

© Couchbase 2022. All rights reserved.

Mobile creates significant value

Offline-first applications



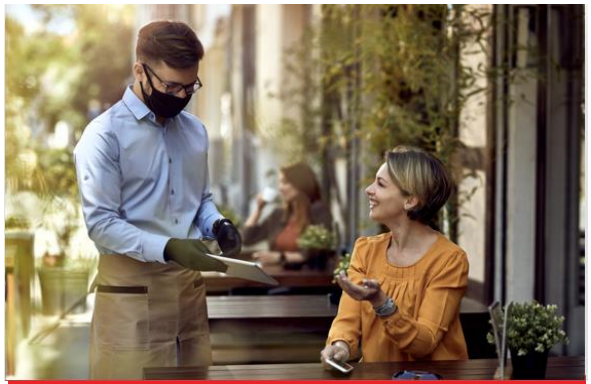
Field services

File claim reports, update customer policy information on mobile devices, even with no network connectivity



Utility workers

Access and update task lists, infrastructure maps, inspection reports, etc. on handhold devices, even with no network connectivity



Restaurants

Expedite ordering process and reduce wait times with order entry kiosks in fast food restaurants



Mobile clinics

Access and update patient health records in rural areas, even with no network connectivity

© Couchbase 2022. All rights reserved.

Mobile JSON Lite: Develop in any language with ubiquitous support across mobile, IoT, and custom embedded devices



- Develop faster with SQL and easy-to-use APIs
- Embed the database in any mobile, IoT, or embedded application
- Use flexible JSON format to speed development and upgrades
- Any platform, any language, any device

Embed the database on edge devices for real-time responsiveness



- Submillisecond response times, guaranteed
- Eliminate effects of slow, unreliable internet connections
- Process and analyze data at the point of interaction – **in real time**

Mobile app services

What is it?

A fully managed application backend designed for mobile, IoT, and edge applications

The feature enables extremely fast and reliable user experiences, even where no internet exists, maximizing business uptime

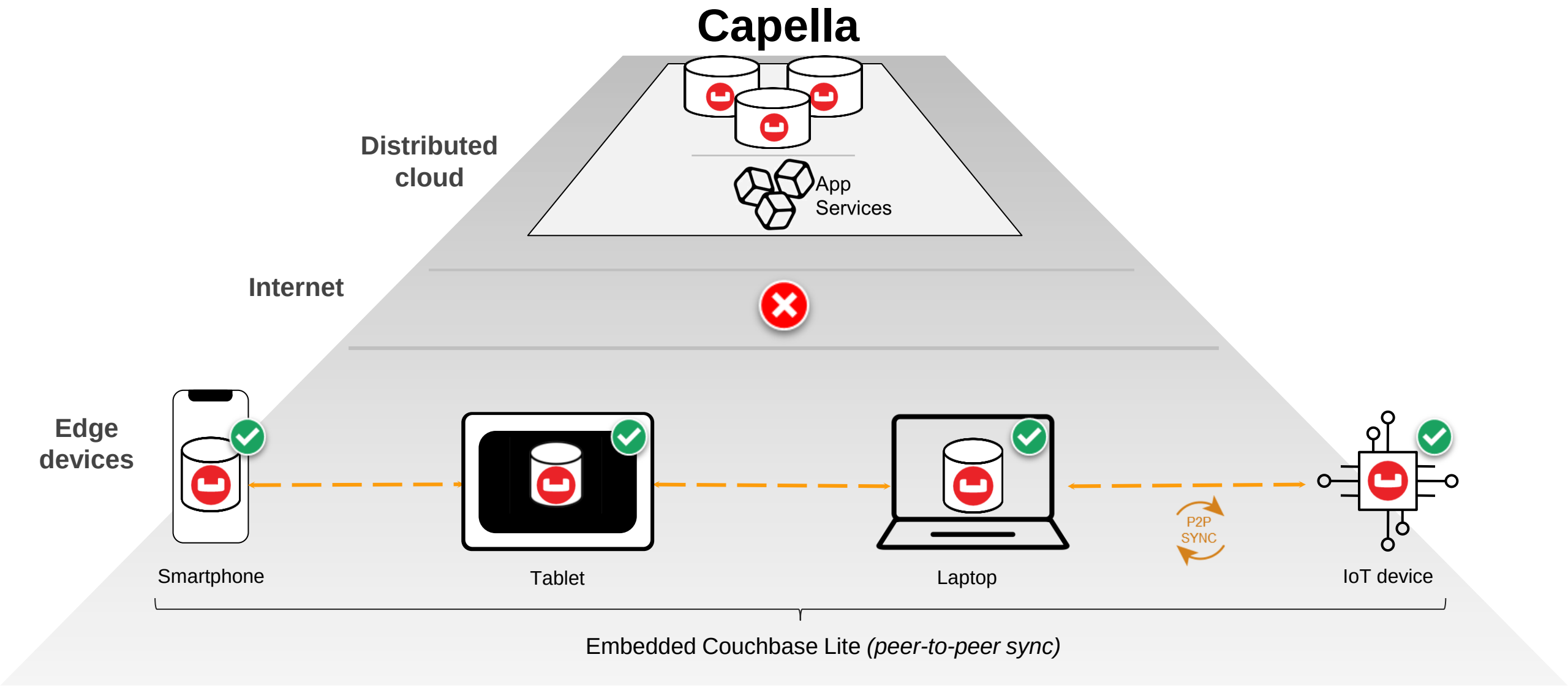
What does it do?

Customers use App Services to synchronize data between cloud and edge devices, as well as to authenticate and manage mobile/edge users



© Couchbase 2022. All rights reserved.

Offline first: Eliminate dependencies on the internet



© Couchbase 2022. All rights reserved.

Emirates:
Mission-critical applications must never go slow or fail



- Emirates needed to modernize tech checklist system, digitize a crucial preflight procedure
- Using tablets, crew members record inspections, which must be consolidated from multiple staff checklists and verified before takeoff
- Could not rely on internet for this critical process, and slowness was not an option

Emirates:
The solution - eTechLog application



- 100% uptime with Couchbase embedded in tablets
- Optimized preflight process – With peer-to-peer sync, all tablets show real-time status. Sync Gateway syncs with ground systems when connection allows.
- Higher adoption and confidence in the app, which operates regardless of internet connection
- Achieving better safety and more on-time departures

Fulfill the promise of edge computing

Speed



Guaranteed low latency and sub-millisecond data access regardless of internet bandwidth

Reliability



Uninterrupted access to data guaranteed, regardless of internet connectivity

Privacy



Superior data privacy, data governance, and regulatory policy compliance

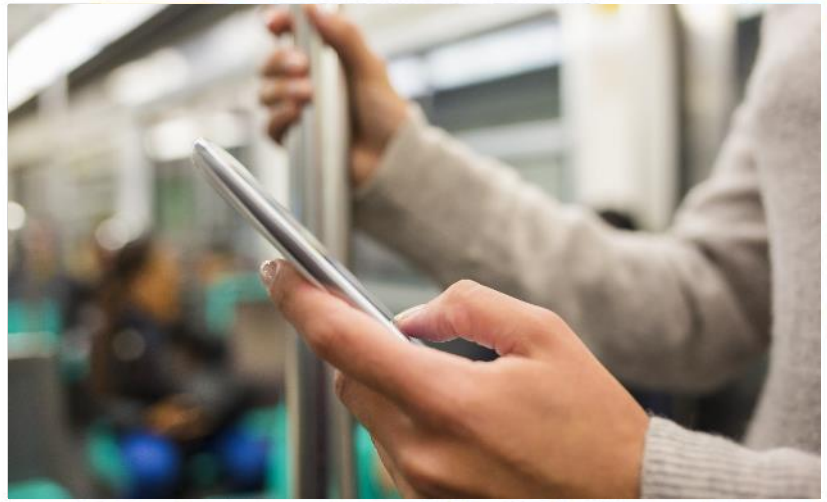
5 Cloud, edge, and your pocketbook

© Couchbase 2022. All rights reserved.

Growth of mobile and edge applications













© Couchbase 2022. All rights reserved.


Arthrex®
“We embed Couchbase in all our Synergy systems to have a **universal platform across all of our devices**.“
Gregory St Clair – Software Architect at Arthrex

Drive to add value and lower TCO

Assumes cloud-based, as-a-service deployment

Money



Time



Software



Infrastructure



Bespoke code



Labor



- Create revenue-generating products and opportunities, and lower expenses
- Shrink delivery timelines by making design and development processes more efficient
- Lower costs for resources including software, infrastructure, and management
- Write, test, and deploy as much un-invented code as quickly and efficiently as possible
- Eliminate lack of skilled labor resources as a barrier

© Couchbase 2022. All rights reserved.

CARNIVAL
CORPORATION&PLC

SOLUTION
Customer 360
IoT data management

APPLICATION
OCEAN Medallion guest ID and mobile wallet

USE CASES
User profile store
Personalization
Endpoint/device mgmt.

ABOUT
Carnival Corporation is currently the world's largest travel leisure company, with a combined fleet of over 100 vessels across 10 cruise line brands



Requirements

- Power OCEAN Medallion IoT necklace and bracelet devices to deliver customized vacation experiences
- Overcome limitations of limited space and limited connectivity
- Easily scale to support rollout across Carnival fleet
- Accelerate time to market for new features

Outcomes

- High performance at scale will allow system to be deployed across entire Carnival fleet
- Automatic syncing to geographically convenient AWS data centers when ship is in range of shore
- Schema-less data model improves developer agility

© Couchbase 2018. All rights reserved.

Calculate value for happy cruisers



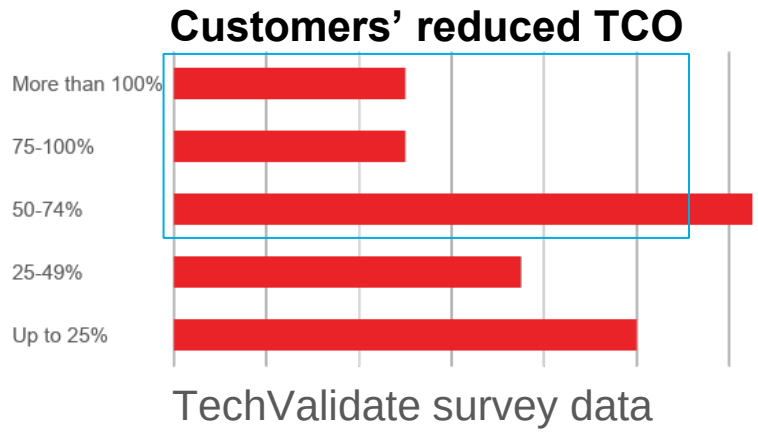
Users		Application		Profiles		Frequency		New revenue
3,000 passengers		$100 spend per voyage		30 ships		40 voyages		**$360M**
3,000 passengers		15% book again at $900		30 ships		40 voyages		**$486M**

© Couchbase 2022. All rights reserved.

Capella drives down TCO

57%

Customers who had 50% or more TCO reduction



TechValidate survey data

DBaaS reduces running costs

Hardware costs
+
Operational costs
+
Team costs

© Couchbase 2022. All rights reserved.

Modern applications create business value

Businesses enjoy both revenue and cost savings

Business benefits

Faster development

- Faster time to market – More efficient development using current resources
- Reduced complexity and higher quality
- Exceptional node-for-node performance

Customer satisfaction and loyalty improvements

- Better features
- Exceptional reliability and availability
- Better personalization

Low total cost of ownership

- No cloud provider lock-in
- Predictable consumption-based pricing model
- Significant savings on database software and infrastructure costs

© Couchbase 2022. All rights reserved.

Thank you!

Jeff Morris
jeff.morris@couchbase.com



Please complete the session survey in the **mobile app**

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.