Dive into Streams with Brooklin

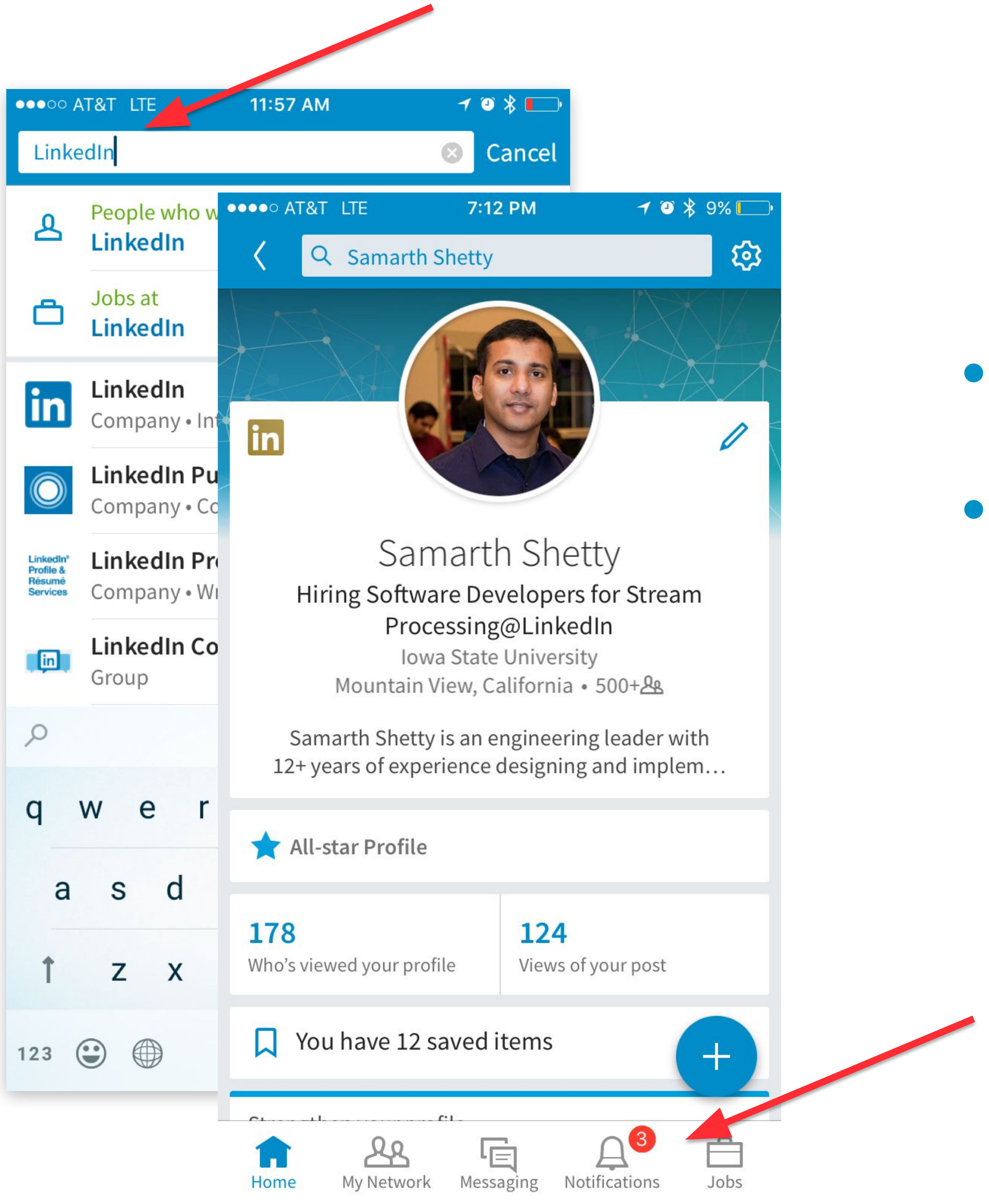
Celia Kung

LinkedIn

Outline

Background

Nearline Applications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LinkedIn Cancel

People who w
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Samarth Shetty

Samarth Shetty
Hiring Software Developers for Stream Processing@LinkedIn
Iowa State University
Mountain View, California • 500+

Samarth Shetty is an engineering leader with 12+ years of experience designing and implem…

All-star Profile

178
Who's viewed your profile

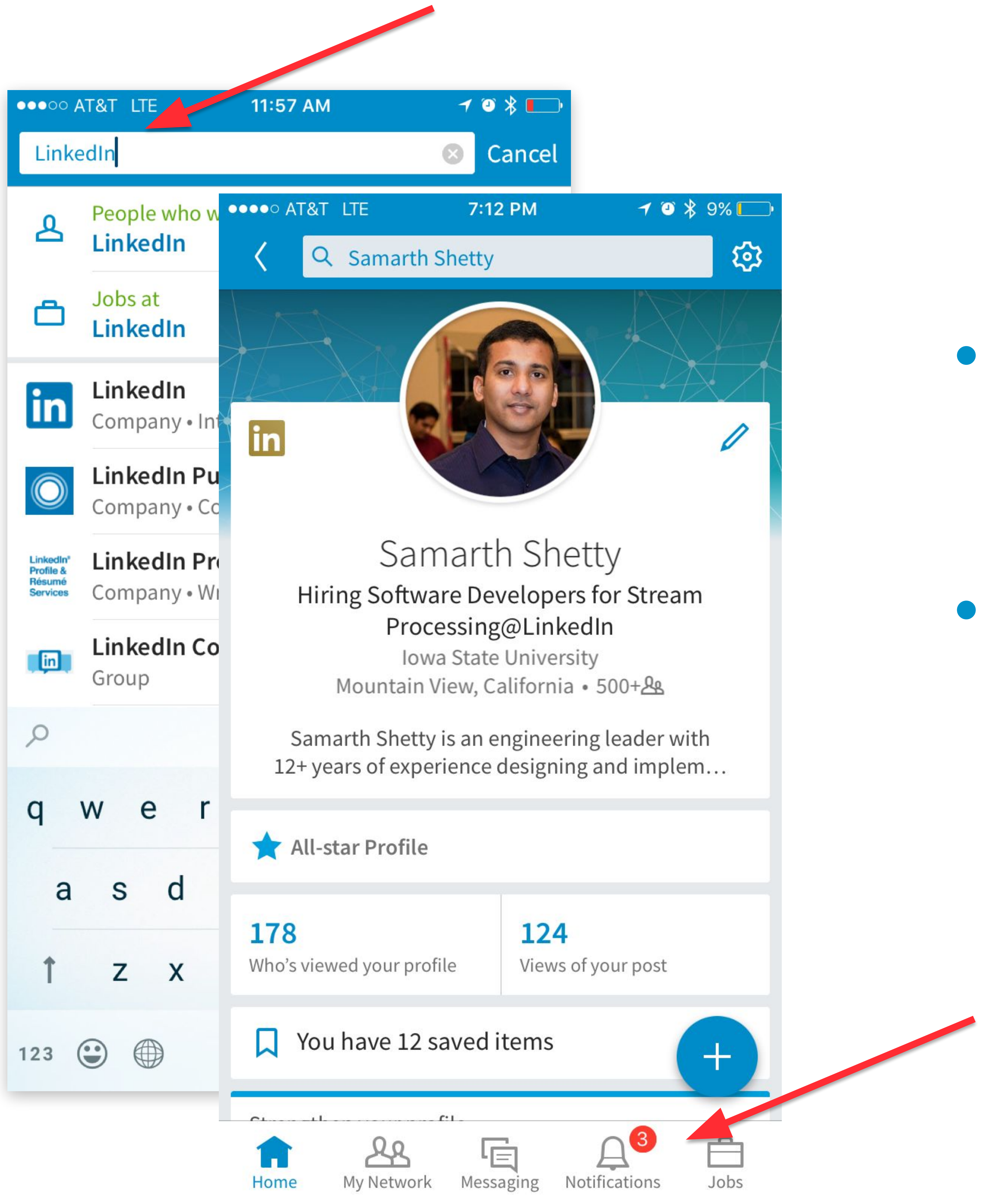
124
Views of your post

You have 12 saved items

Home My Network Messaging Notifications Jobs

- Require near real-time response
- Thousands of applications at LinkedIn
  - E.g. Live search indices, Notifications

Nearline Applications



Samarth Shetty
Hiring Software Developers for Stream Processing@LinkedIn
Iowa State University
Mountain View, California • 500+

Samarth Shetty is an engineering leader with 12+ years of experience designing and implem…

- Require continuous, low-latency access to data
  - Data could be spread across multiple database systems
- Need an easy way to move data to applications
  - App devs should focus on event processing and not on data access

Heterogeneous Data Systems

ORACLE

kafka

MySQL

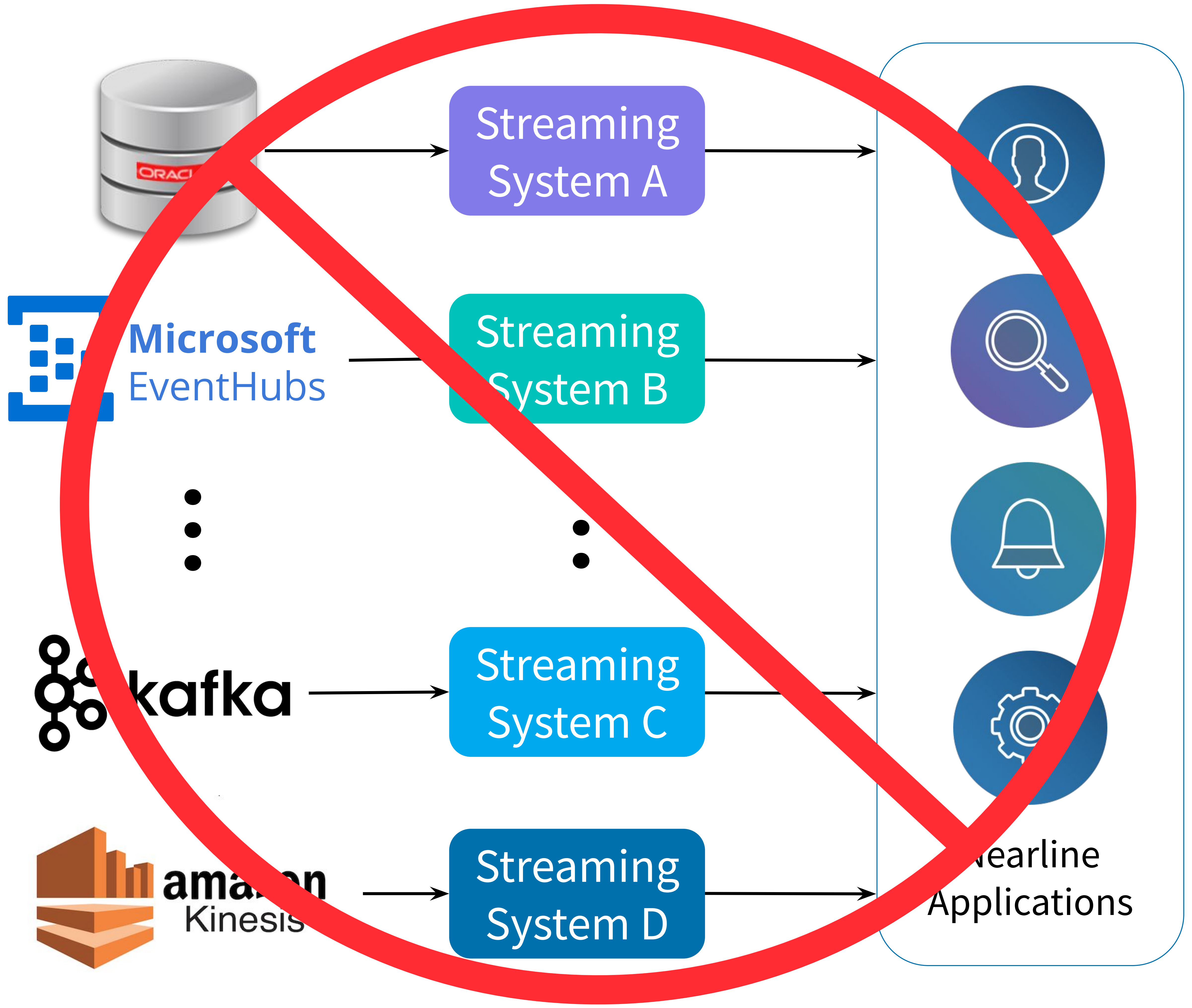
amazon
Kinesis

Microsoft
EventHubs

Espresso
(LinkedIn's
document store)

DynamoDB Streams

Building the Right Infrastructure



- Build separate, specialized solutions to stream data from and to each different system?
  - Slows down development
  - Hard to manage!

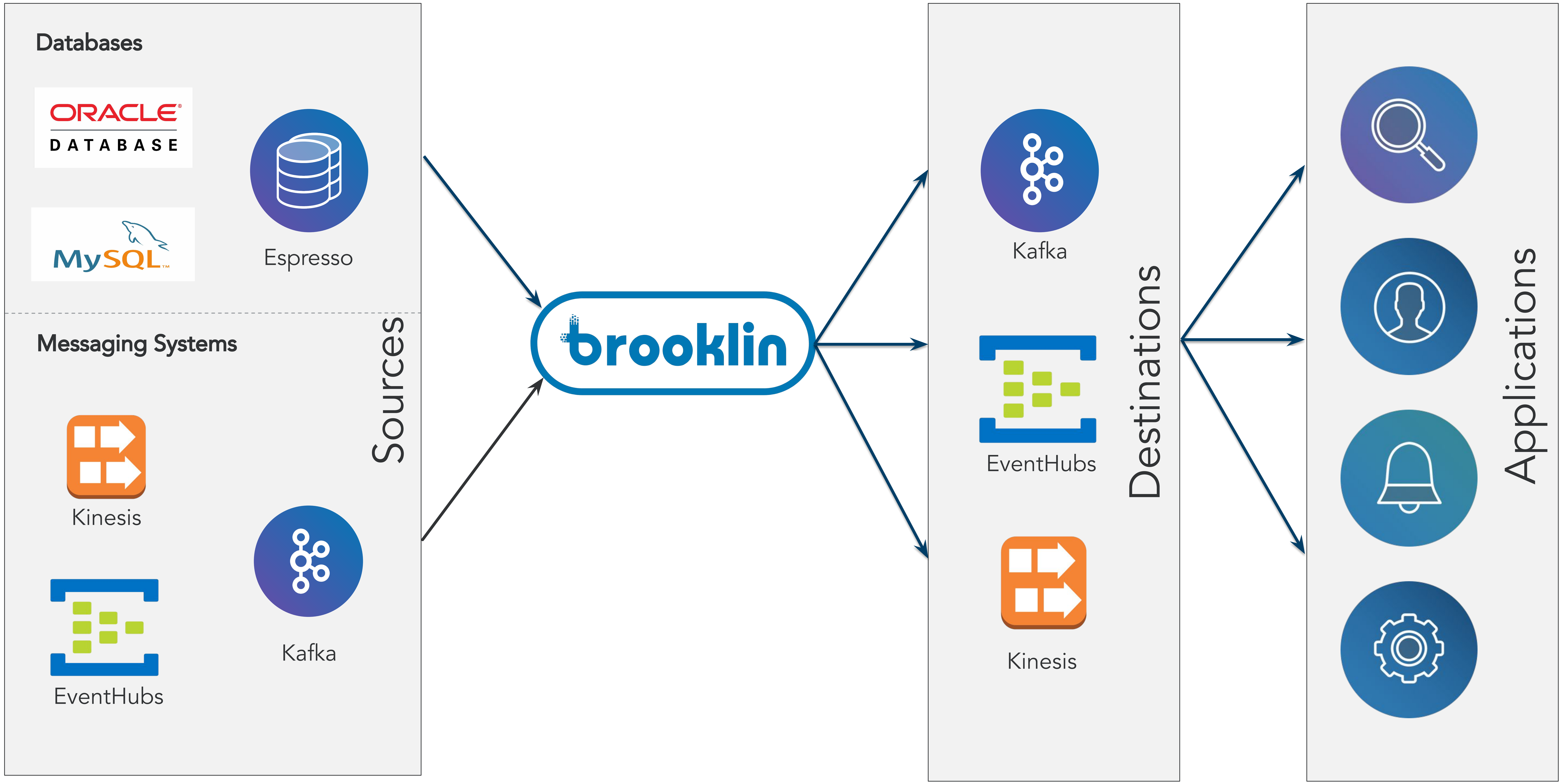
Need a centralized, managed, and extensible service to continuously deliver data in near real-time

Brooklin

Brooklin

- **Streaming** data pipeline service
- Propagates data from **many** source types to **many** destination types
- **Multitenant:** Can run several thousand streams simultaneously
- Streams are **dynamically provisioned** and **individually configured**
- **Extensible**: Plug-in support for additional sources/destinations

Pluggable Sources & Destinations



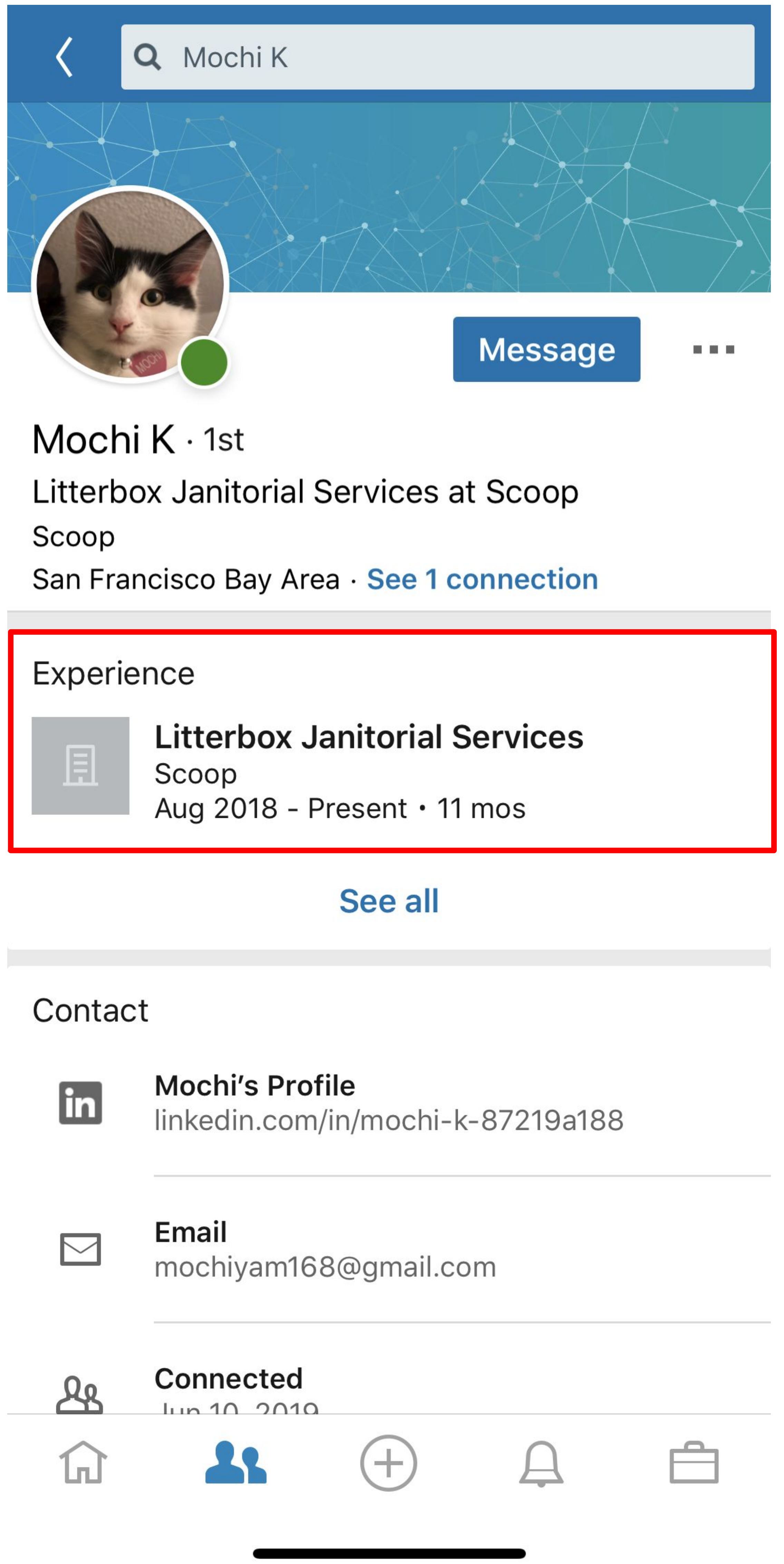
Scenarios

Scenario 1:

Change Data Capture

Capturing Live Updates

1. Member updates her profile to reflect her recent job change



Mochi K

Mochi K · 1st

Litterbox Janitorial Services at Scoop

Scoop

San Francisco Bay Area · See 1 connection

Experience

Litterbox Janitorial Services

Scoop

Aug 2018 - Present • 11 mos

See all

Contact

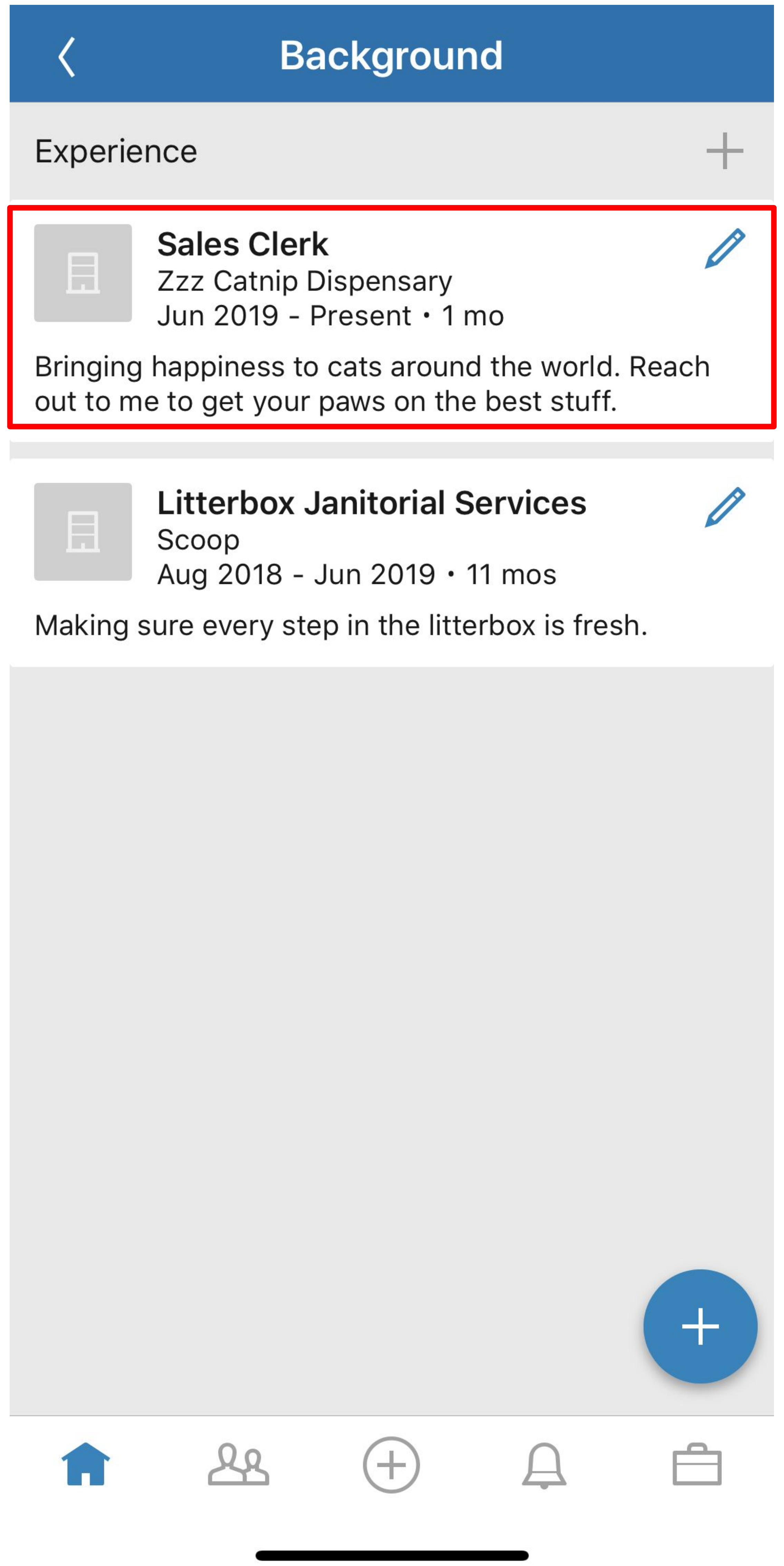
Mochi's Profile

linkedin.com/in/mochi-k-87219a188

Email

mochiyam168@gmail.com

Connected



Background

Experience

Sales Clerk

Zzz Catnip Dispensary

Jun 2019 - Present • 1 mo

Bringing happiness to cats around the world. Reach out to me to get your paws on the best stuff.

Litterbox Janitorial Services

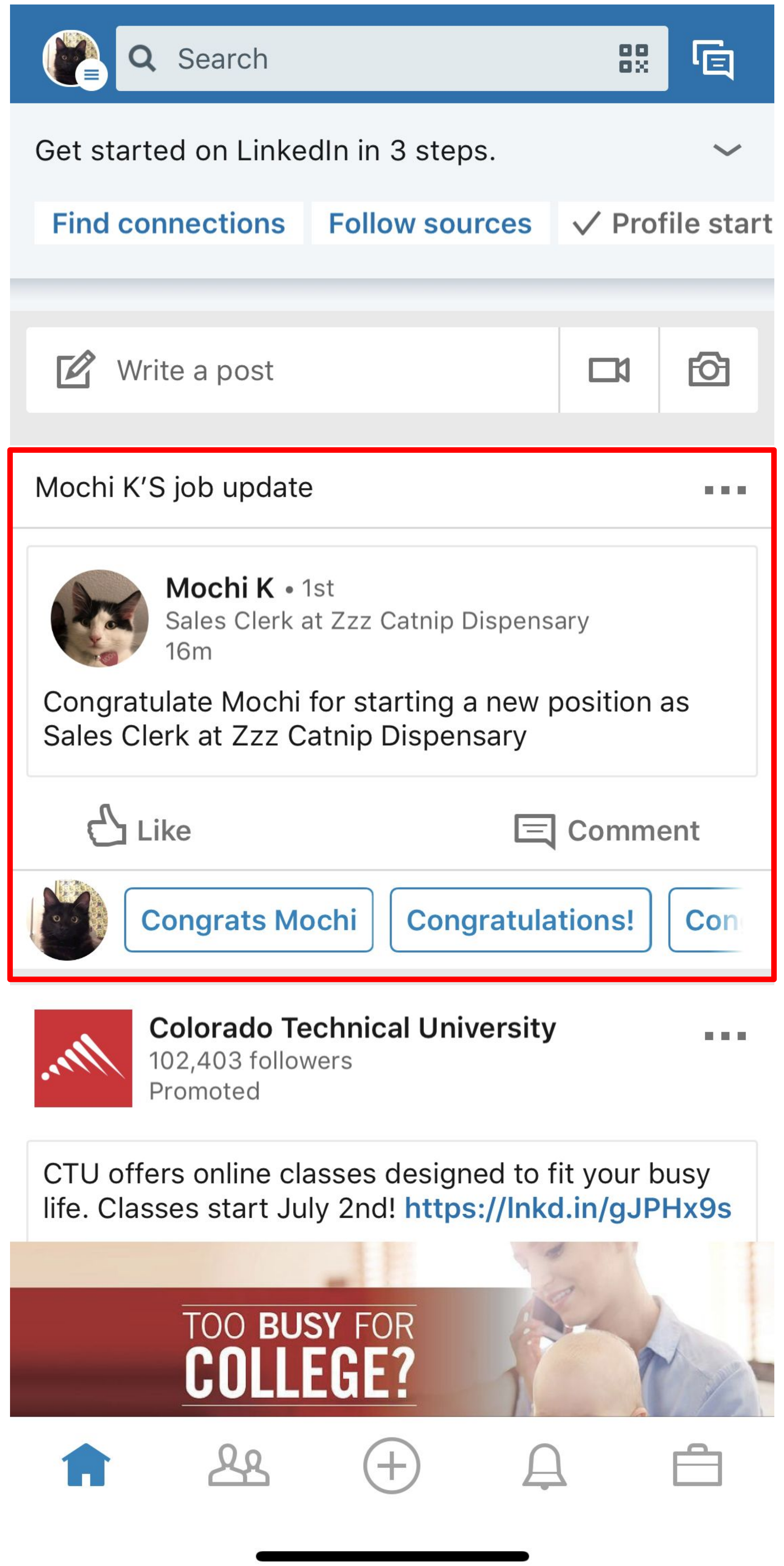
Scoop

Aug 2018 - Jun 2019 • 11 mos

Making sure every step in the litterbox is fresh.

Capturing Live Updates

2. LinkedIn wants to inform her colleagues of this change


Search

Get started on LinkedIn in 3 steps.

Find connections | Follow sources | ✓ Profile start

Write a post

Mochi K'S job update

Mochi K • 1st
Sales Clerk at Zzz Catnip Dispensary
16m

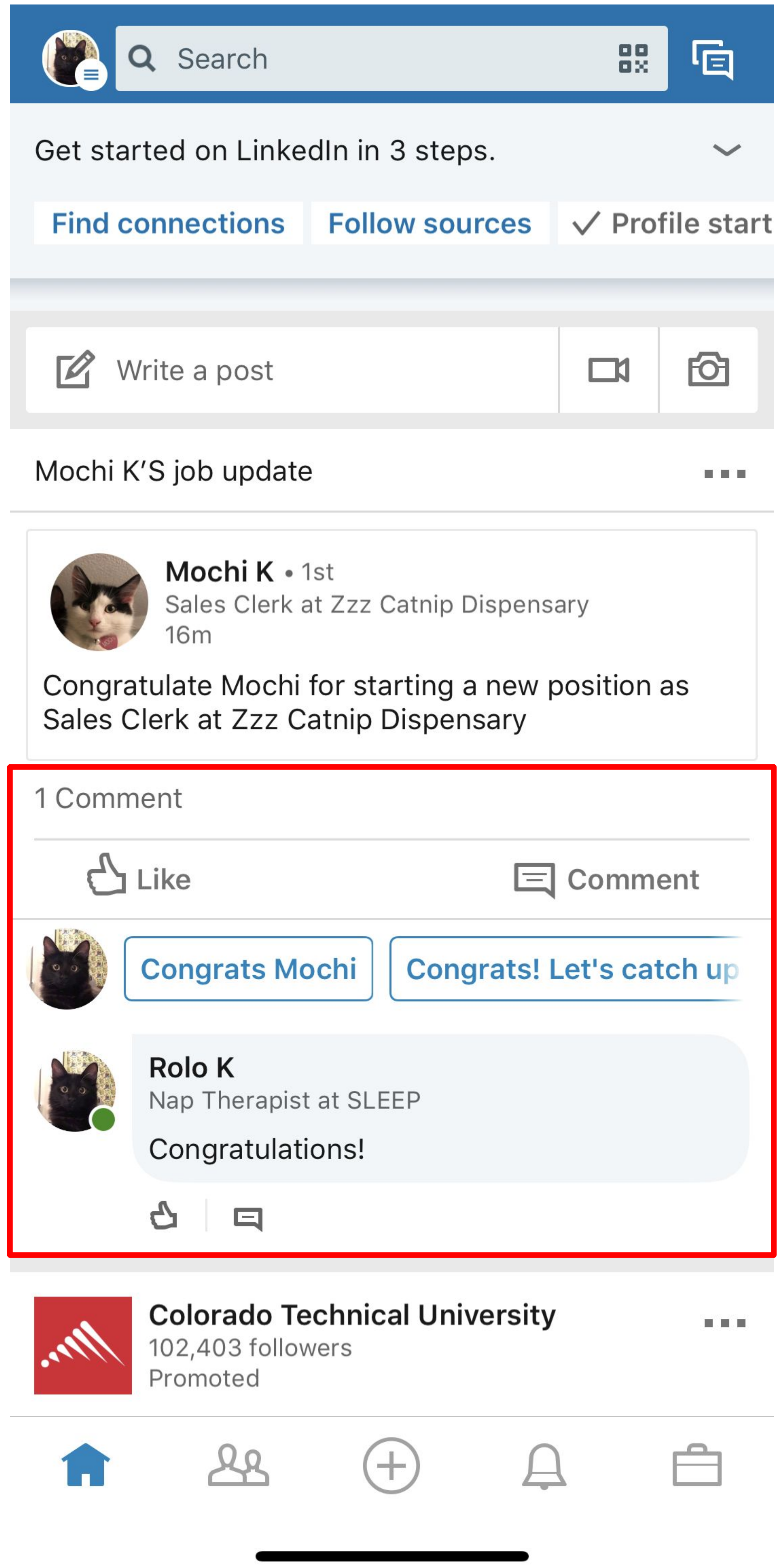
Congratulate Mochi for starting a new position as Sales Clerk at Zzz Catnip Dispensary

Like | Comment

Congrats Mochi | Congratulations! | Con

Colorado Technical University
102,403 followers
Promoted

CTU offers online classes designed to fit your busy life. Classes start July 2nd! https://lnkd.in/gJPHx9s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1 Comment

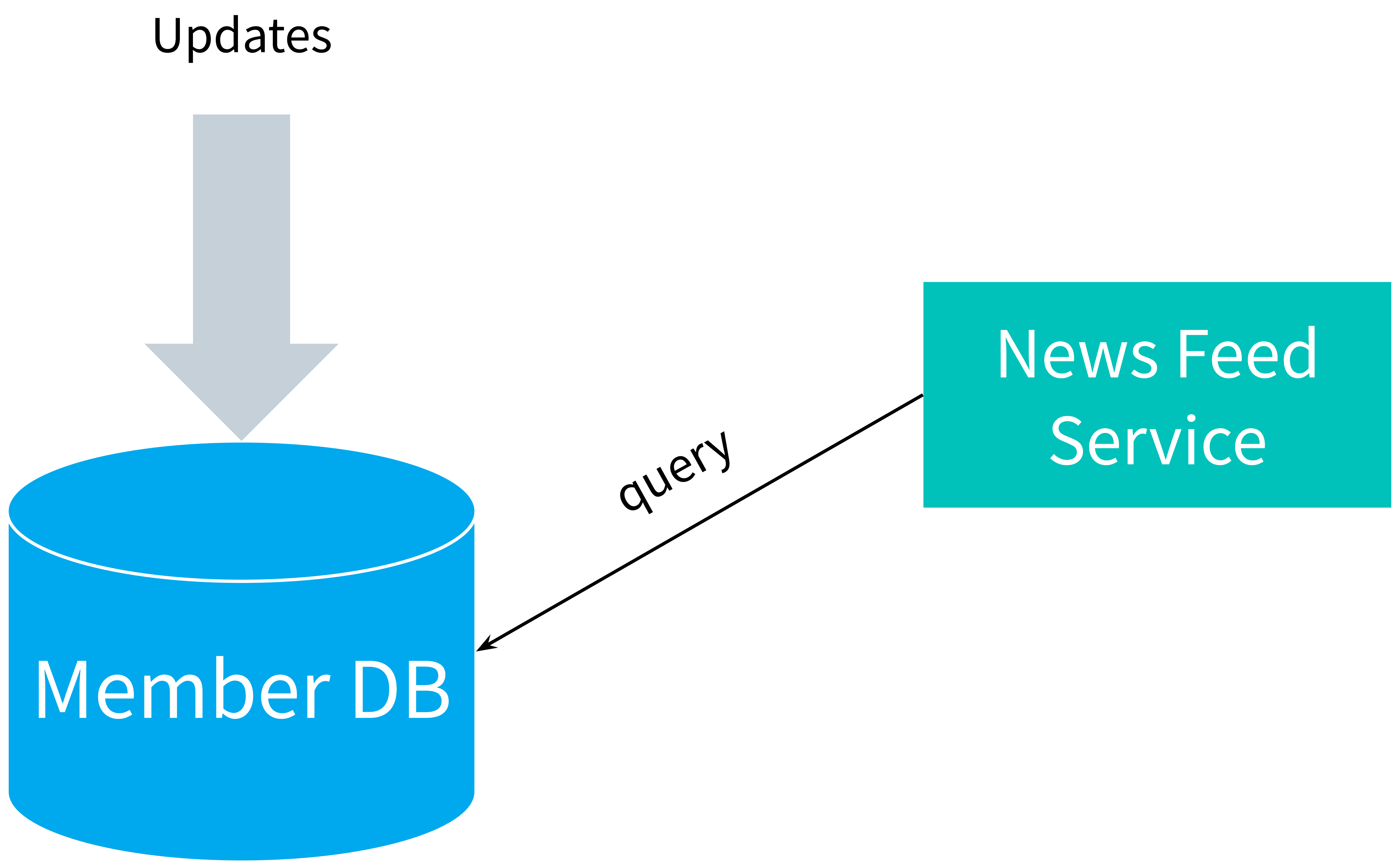
Like | Comment

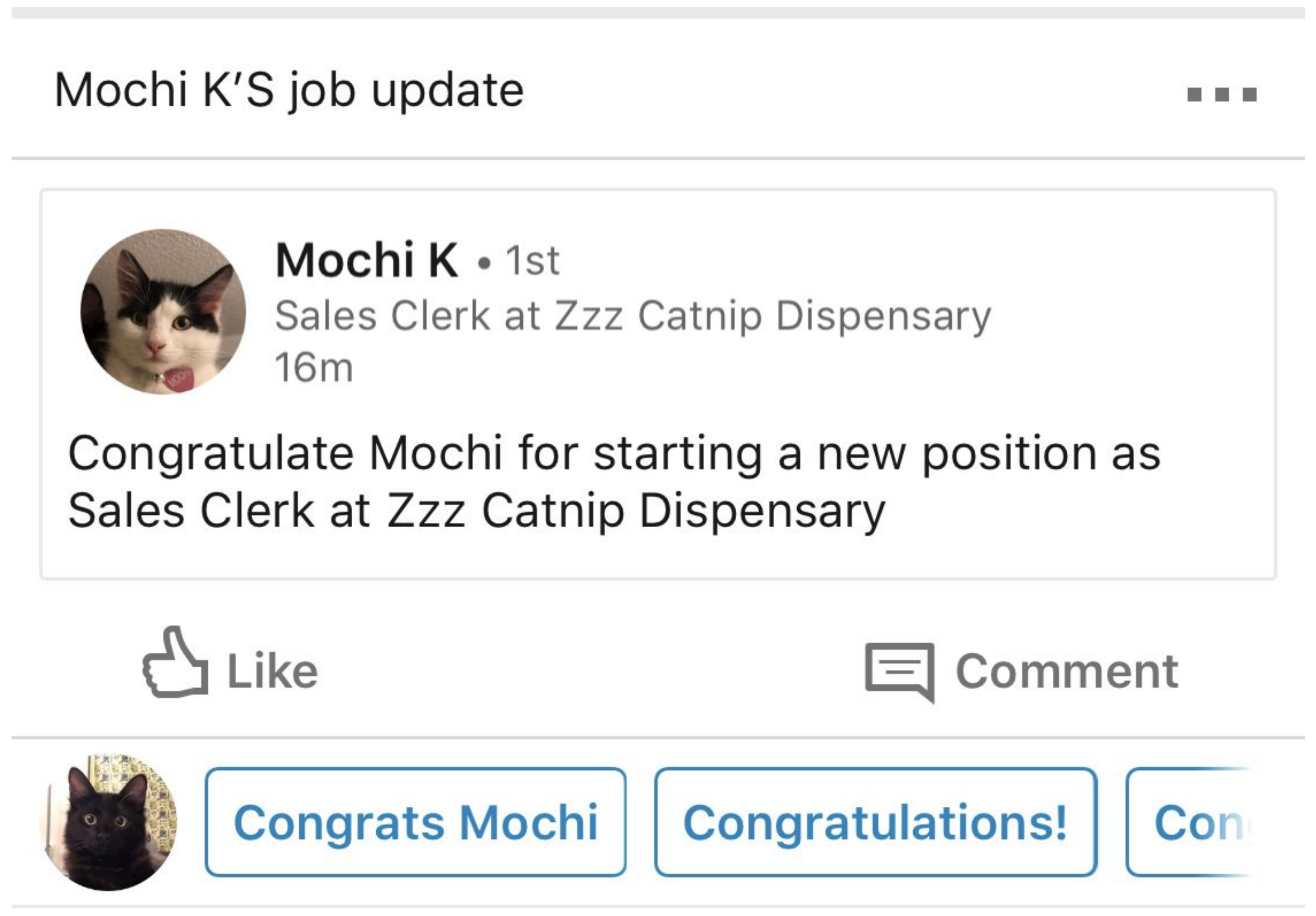
Congrats Mochi | Congrats! Let's catch up

Rolo K
Nap Therapist at SLEEP
Congratulations!

Colorado Technical University
102,403 followers
Promoted

Capturing Live Updates

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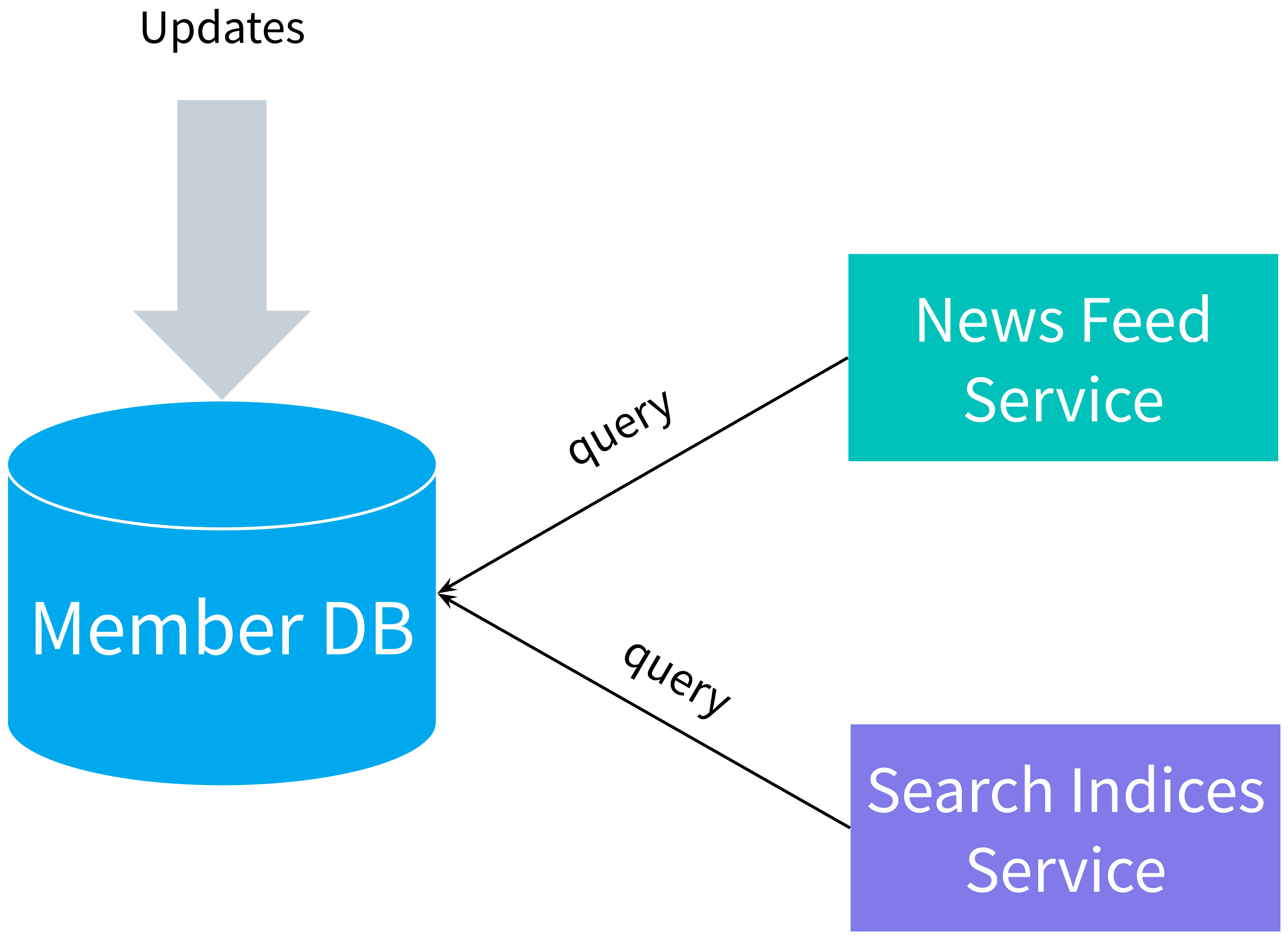

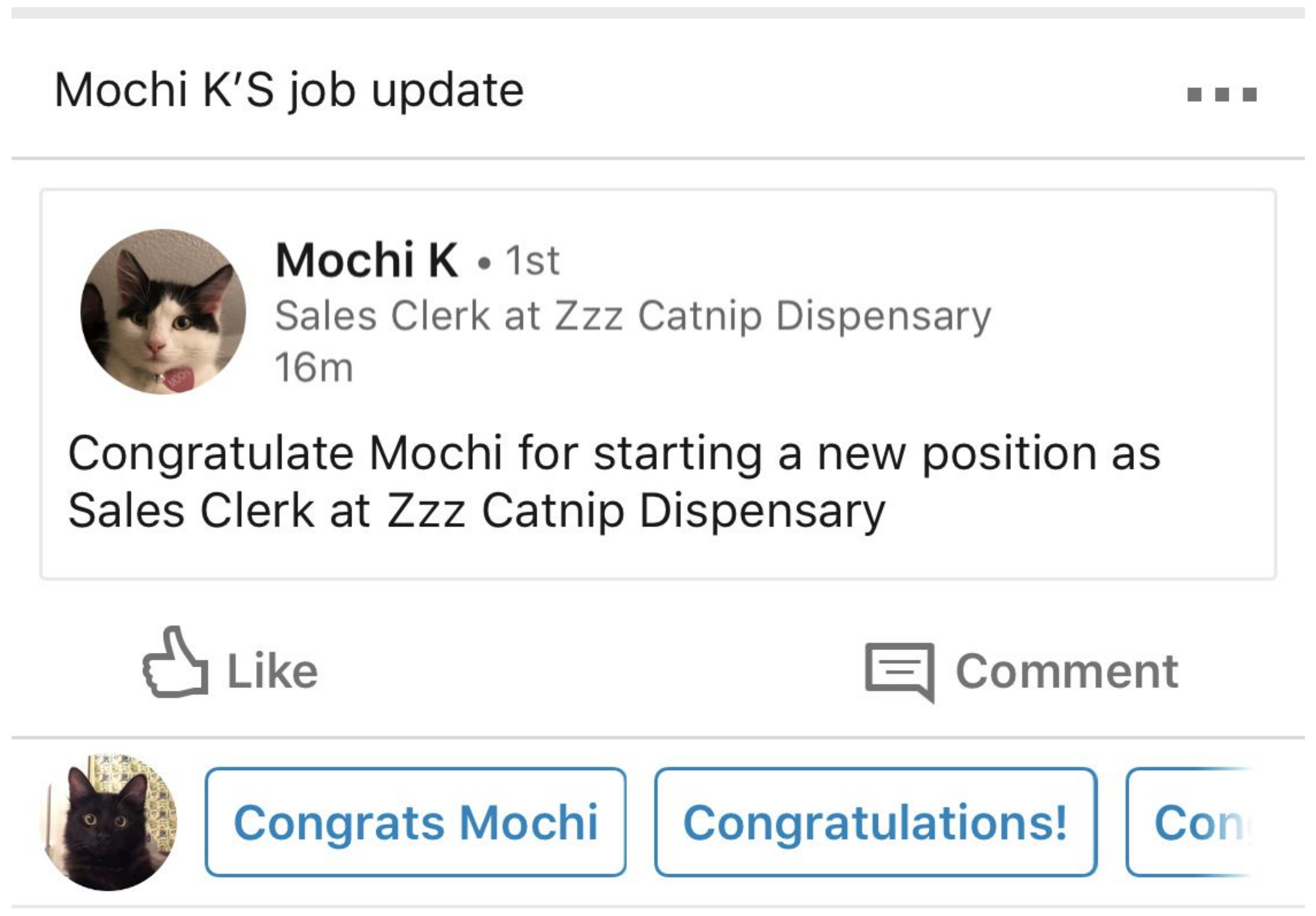
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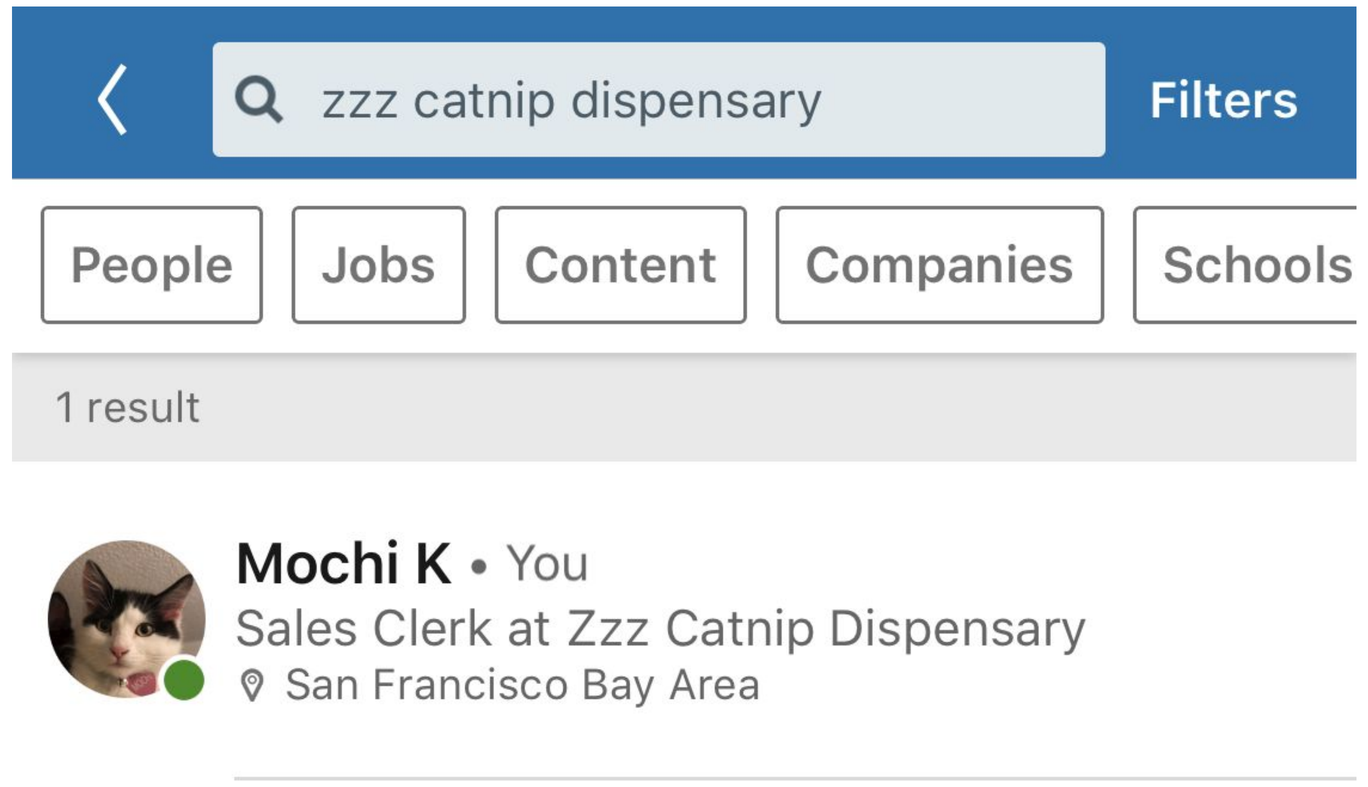
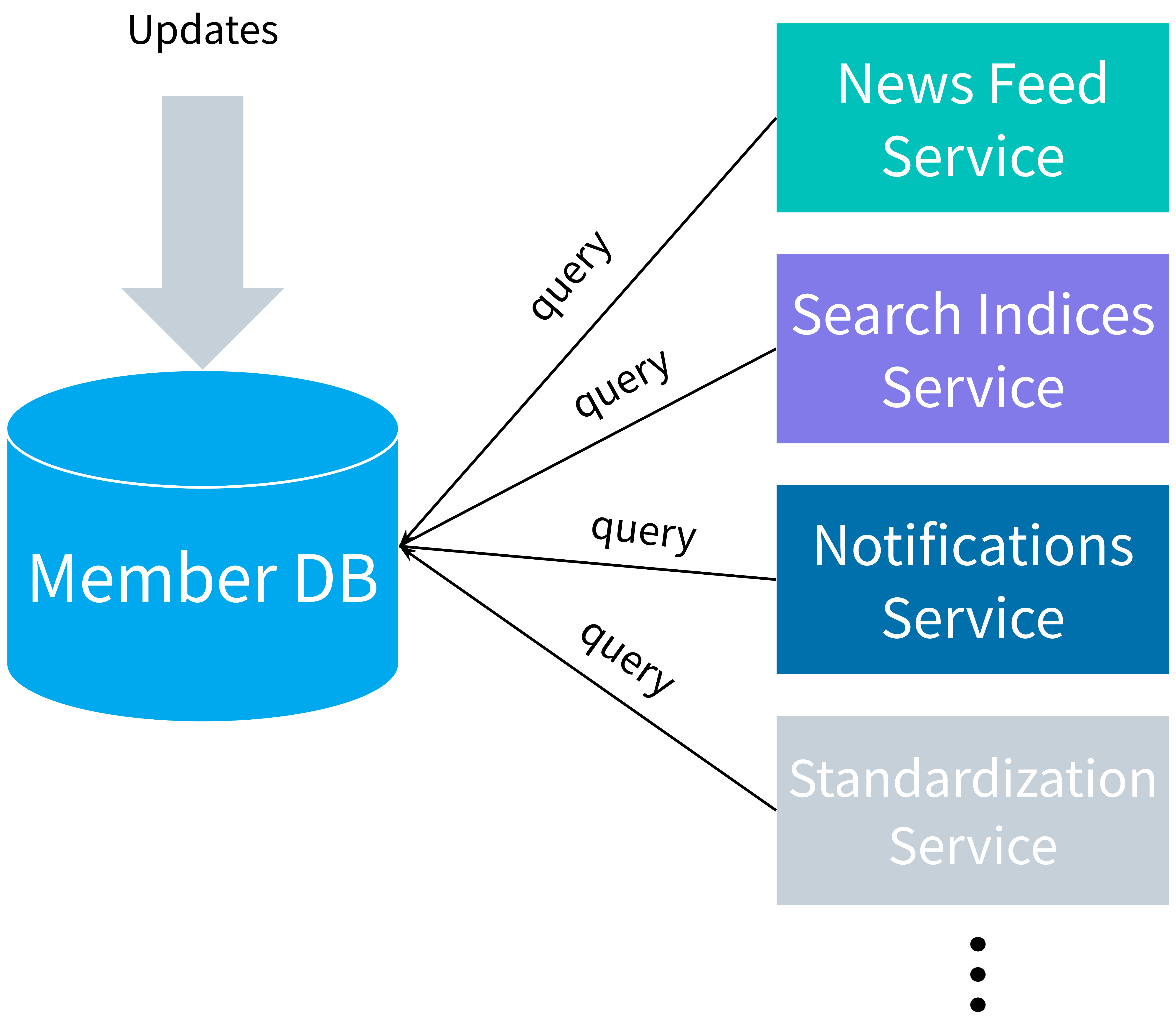
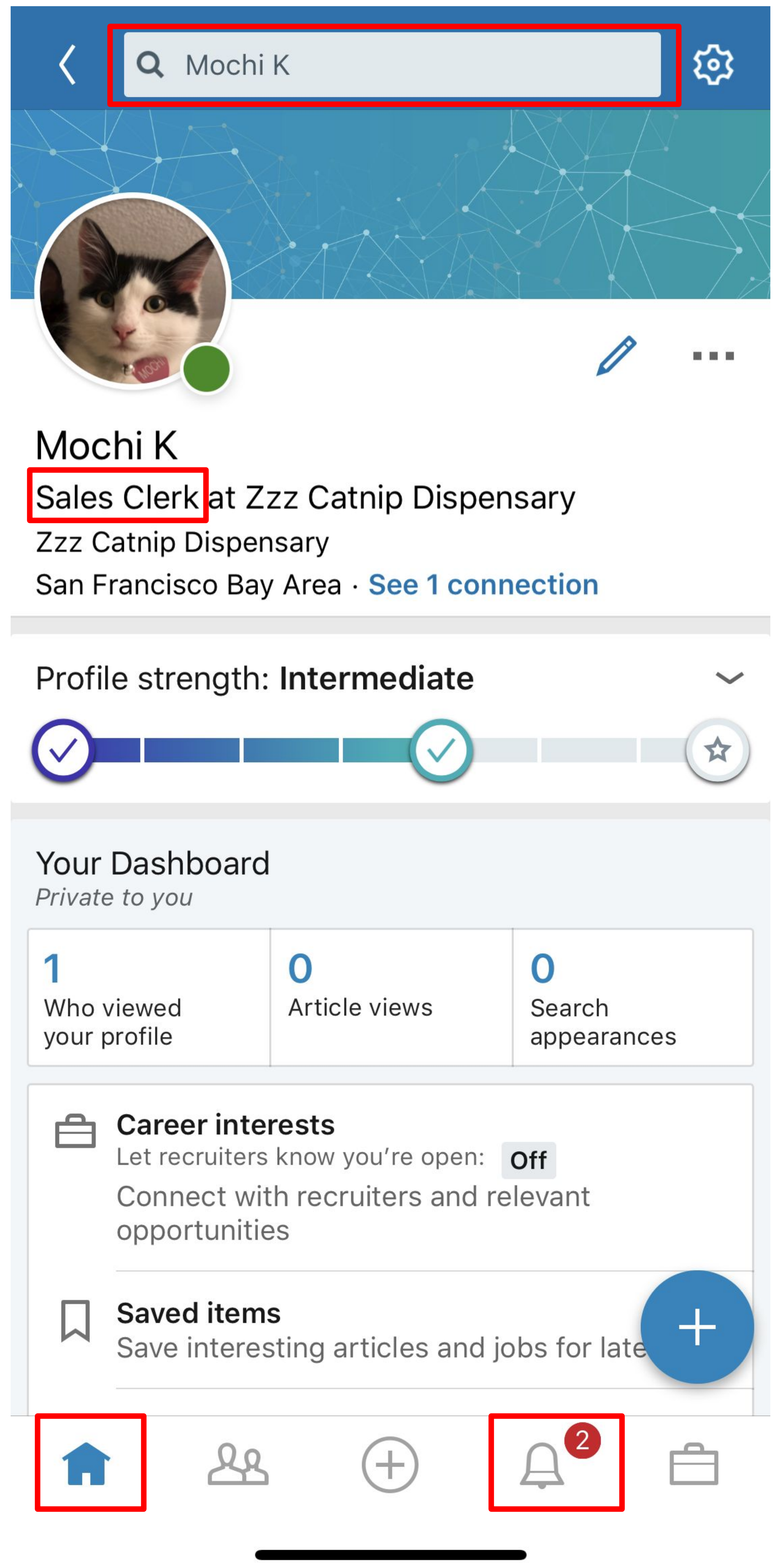


1 result

Mochi K • You
Sales Clerk at Zzz Catnip Dispensary
San Francisco Bay Area

Capturing Live Updates




Mochi K

Mochi K
Sales Clerk at Zzz Catnip Dispensary
Zzz Catnip Dispensary
San Francisco Bay Area · See 1 connection

Profile strength: **Intermediate**

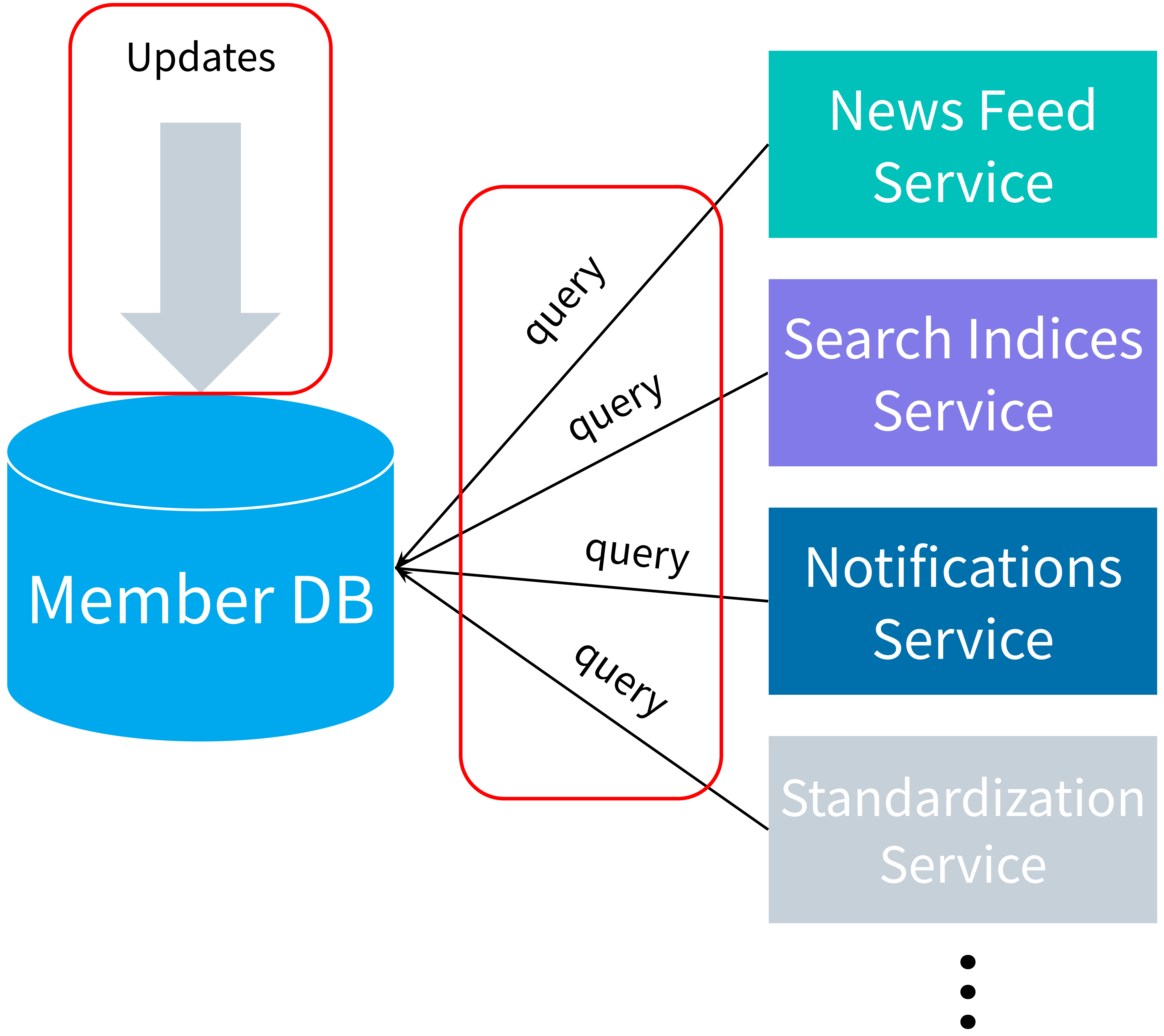
Your Dashboard
Private to you

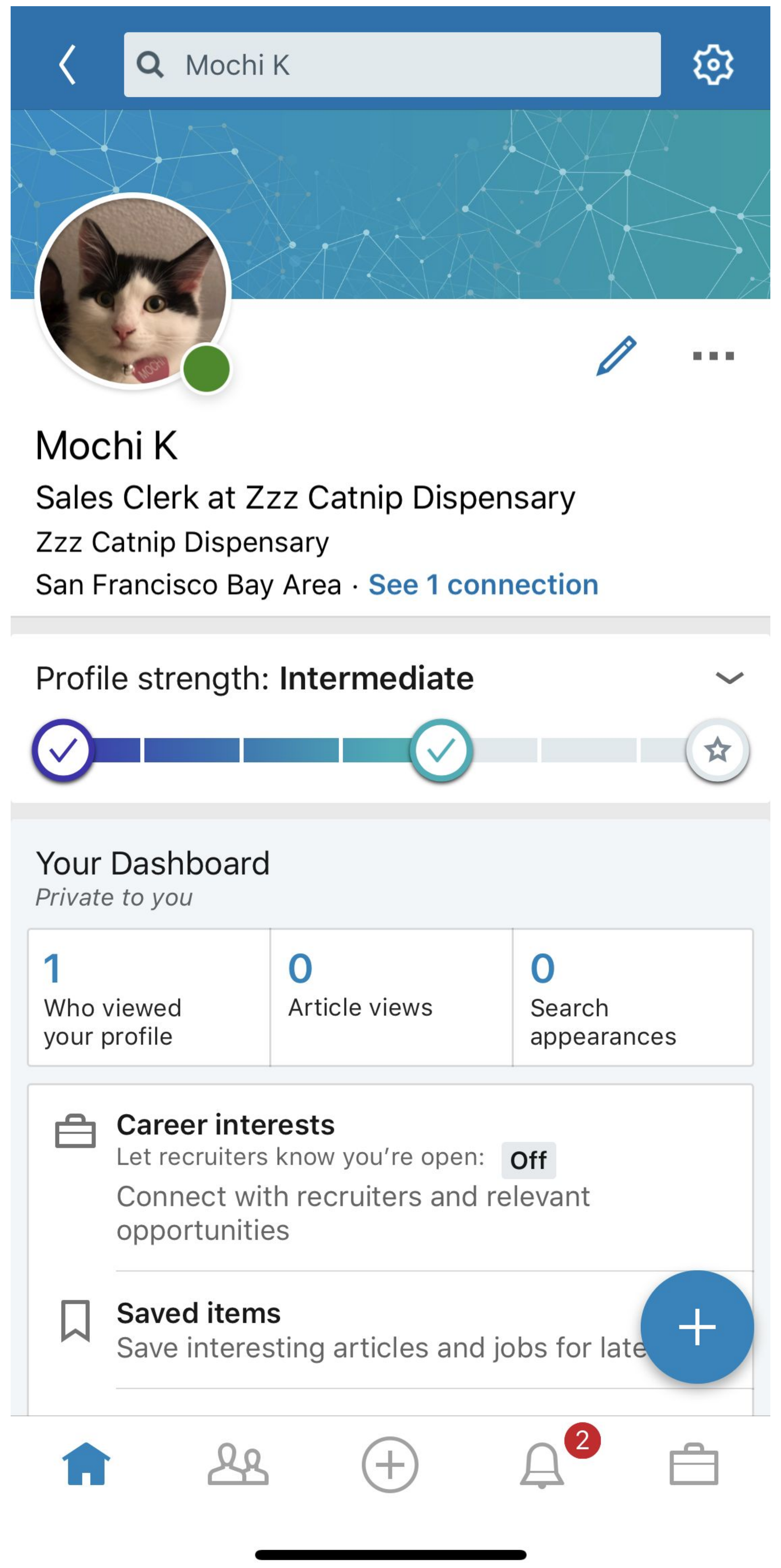
1 Who viewed your profile	0 Article views	0 Search appearances

Career interests
Let recruiters know you're open: Off
Connect with recruiters and relevant opportunities

Saved items
Save interesting articles and jobs for late

Capturing Live Updates





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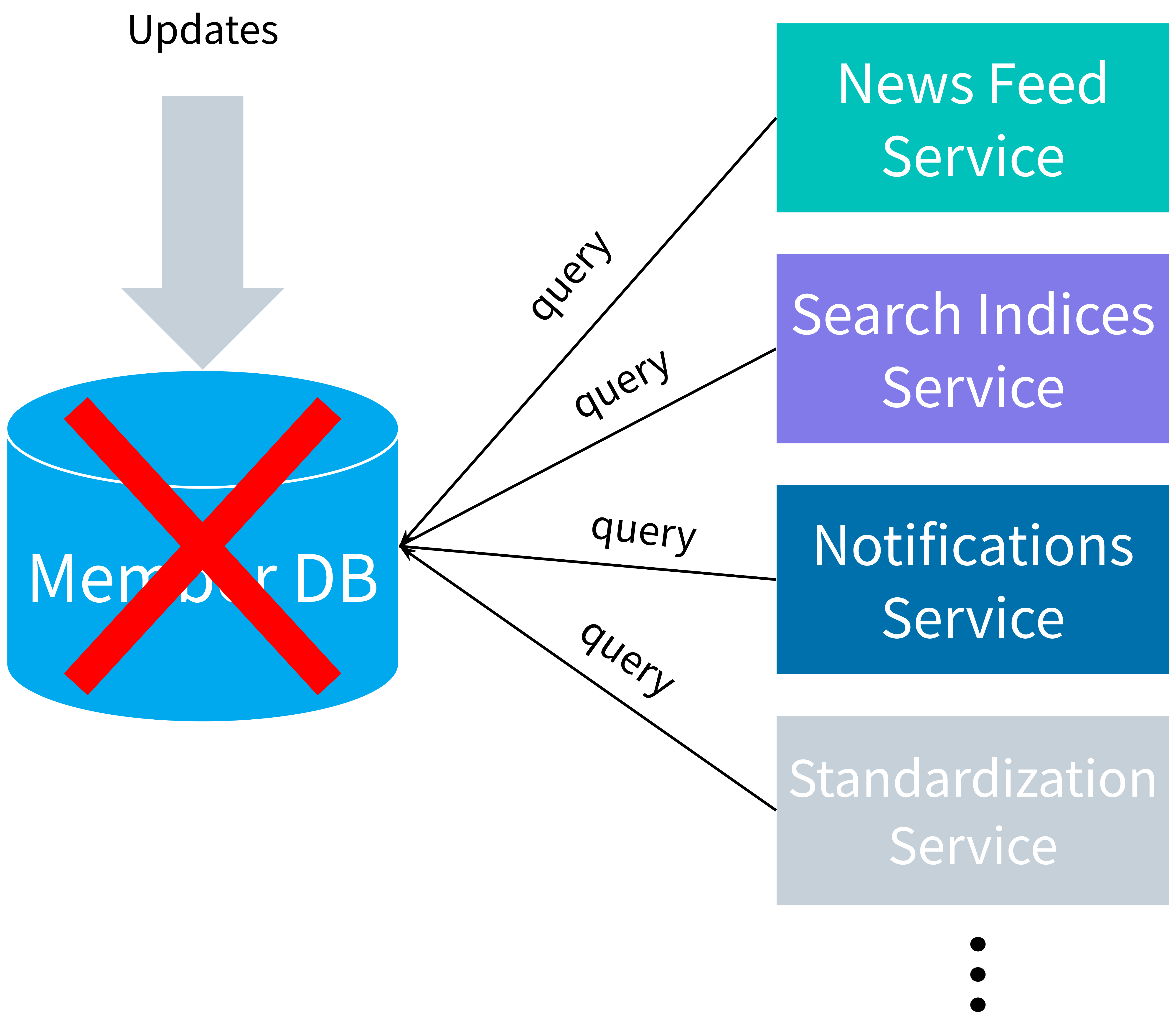

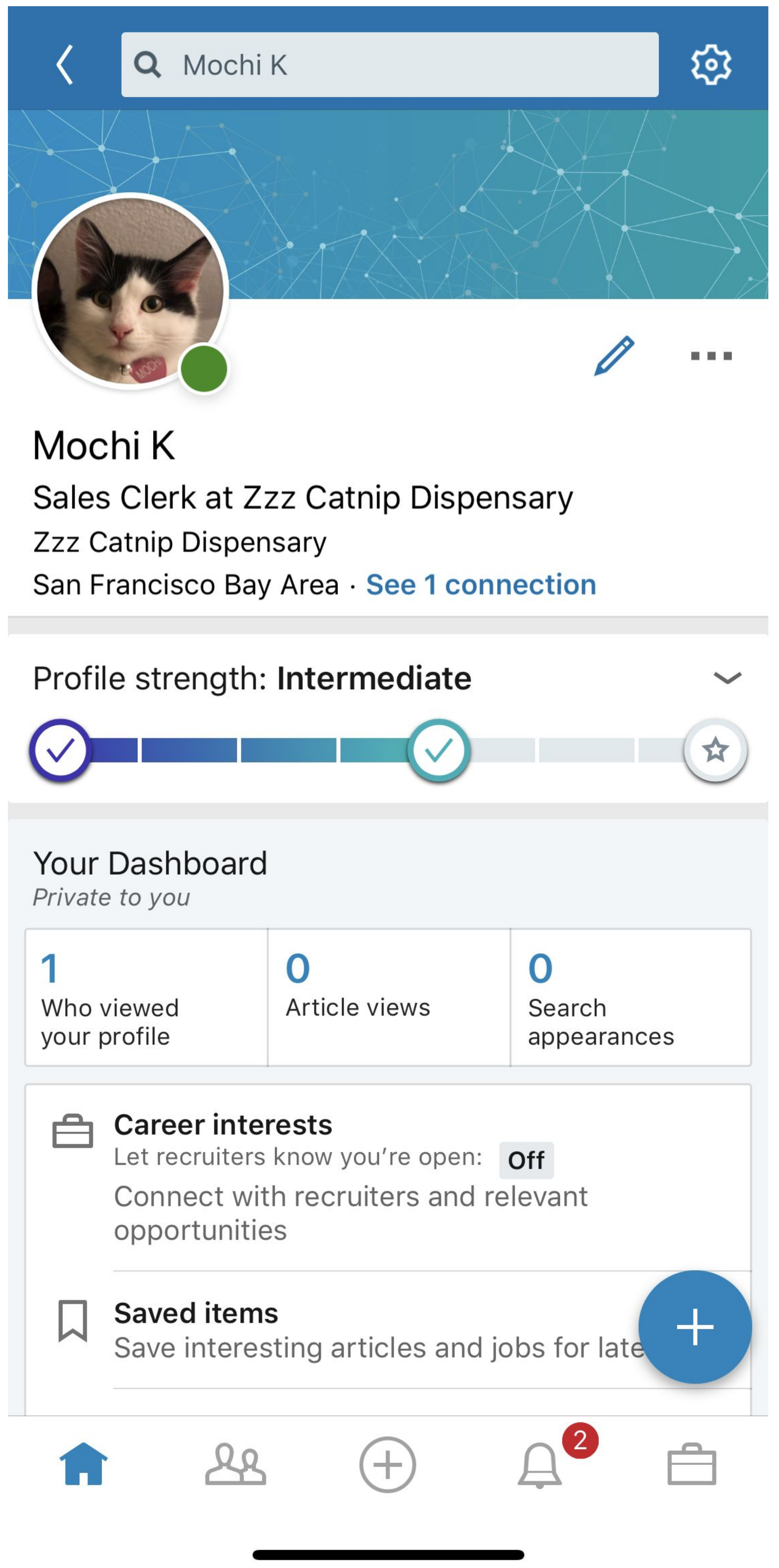

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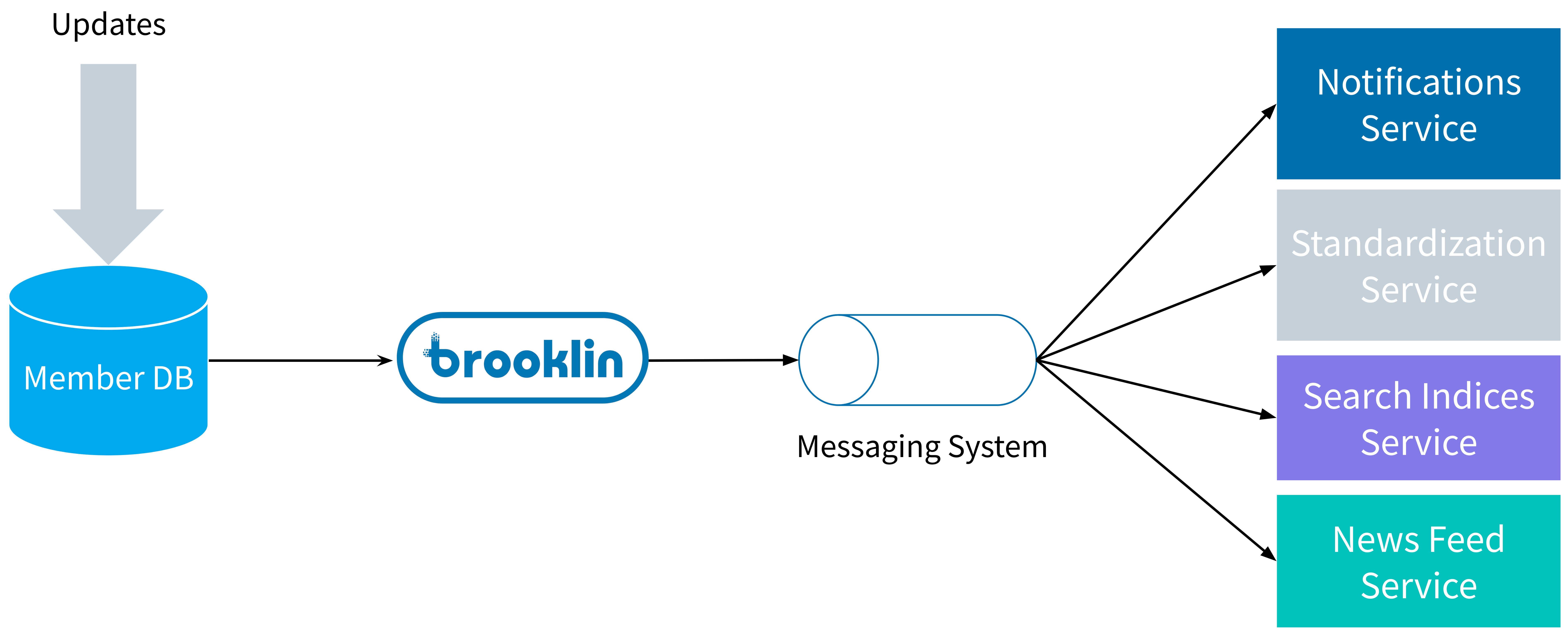
Change Data Capture (CDC)

- Brooklin can stream database updates to a change stream
- Data processing applications consume from **change streams**

- **Isolation:** Applications are decoupled from the sources and don’t compete for resources with online queries
- Applications can be at **different points** in change timelines

Change Data Capture (CDC)



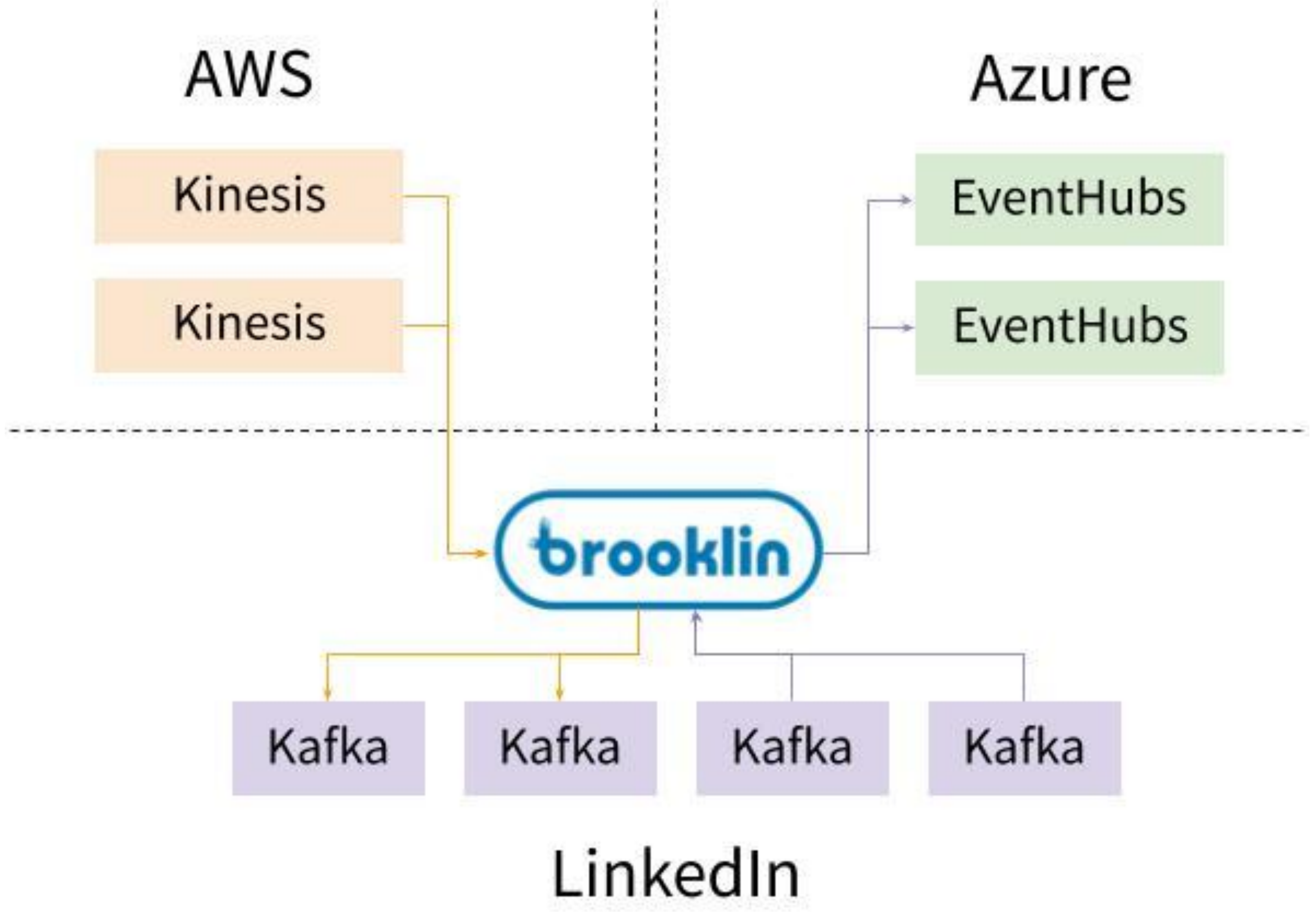
Scenario 2:

Streaming Bridge

Stream Data from X to Y

- Across…
    - cloud services
    - clusters
    - data centers

Streaming Bridge

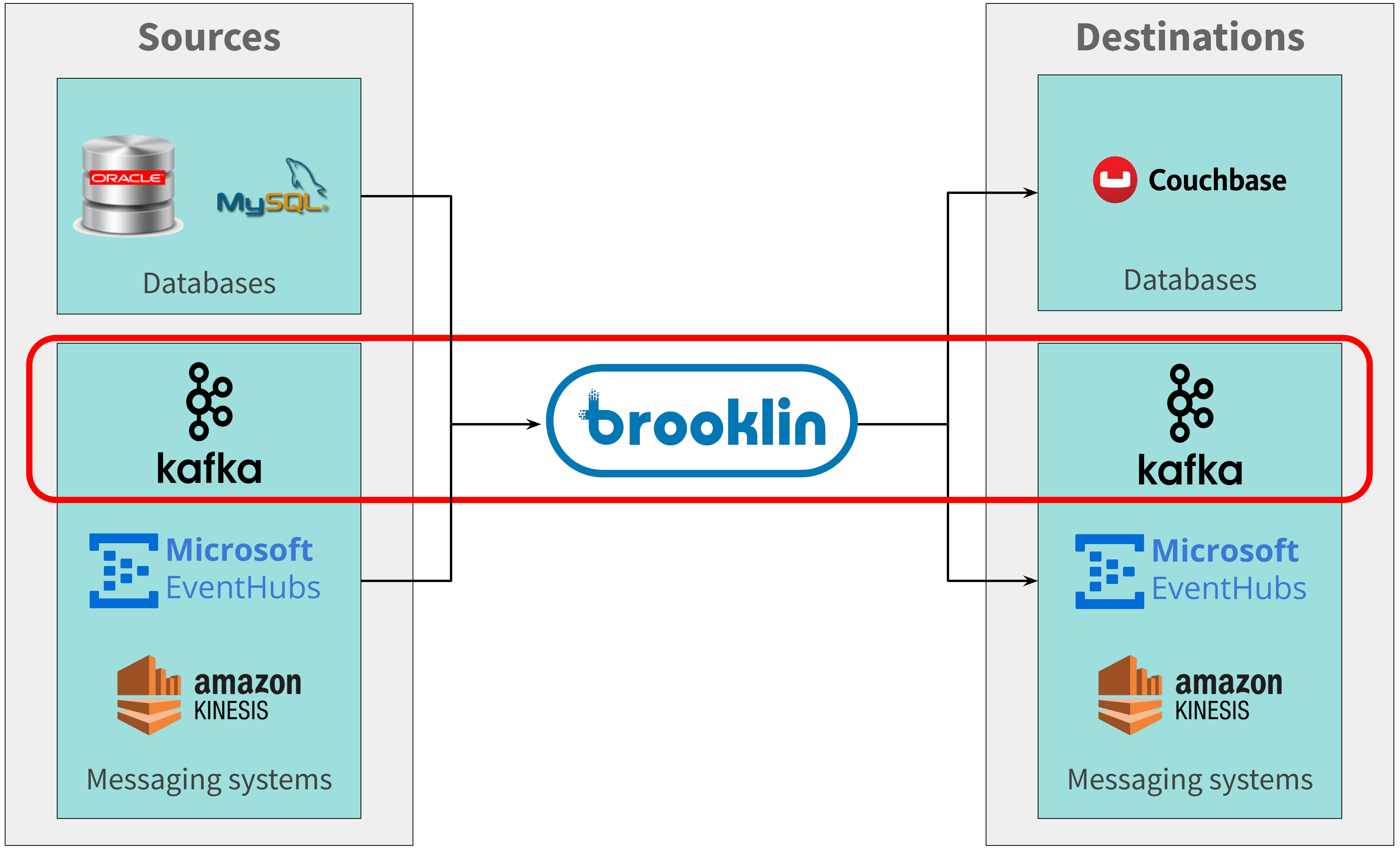


- **Data pipe** to move data between different environments
- Enforce **policy**: Encryption, Obfuscation, Data formats

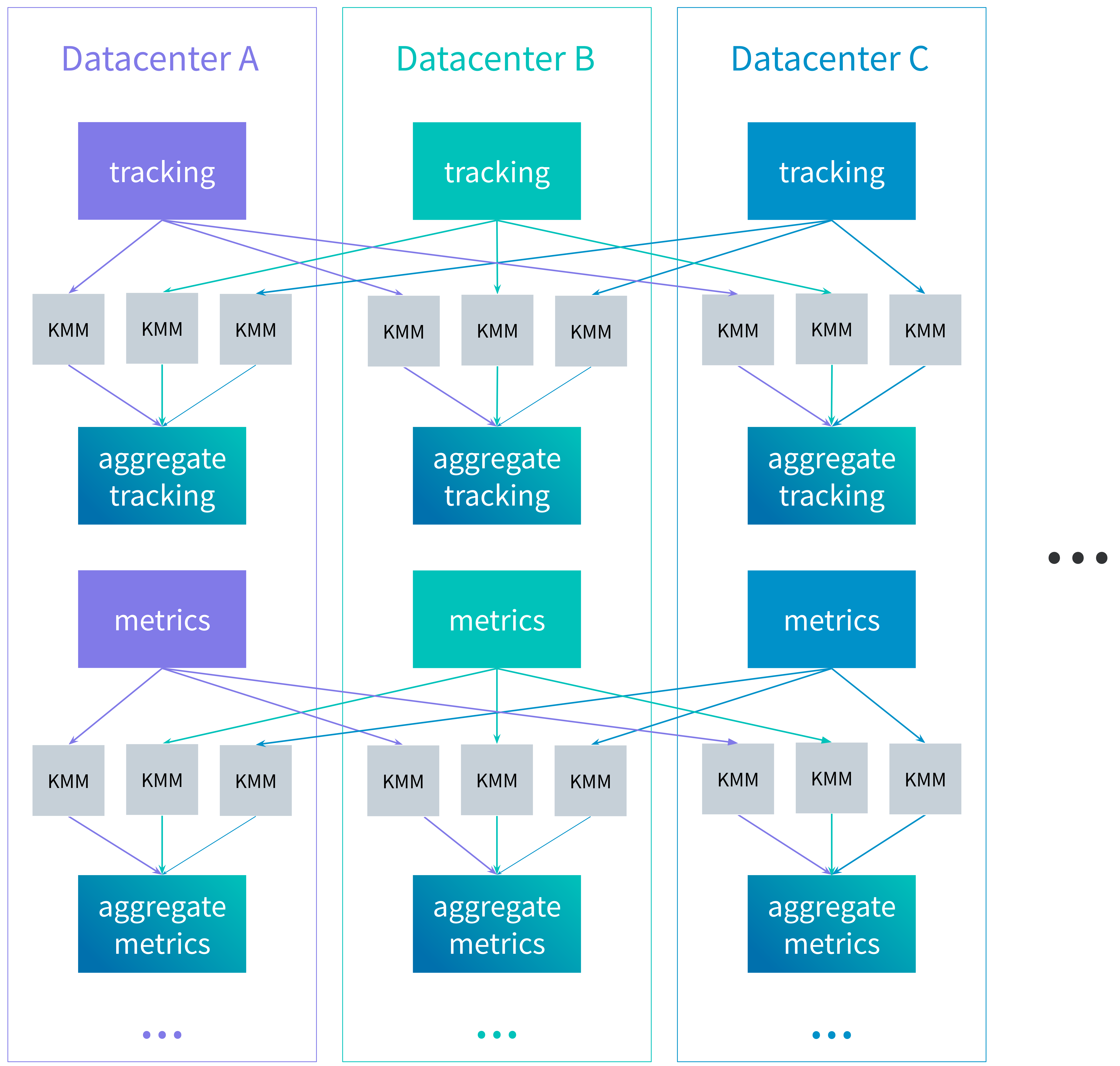
Mirroring Kafka Data

- Aggregating data from all data centers into a centralized place
- Moving data between LinkedIn and external cloud services (e.g. Azure)
- Brooklin has replaced Kafka MirrorMaker (KMM) at LinkedIn
    - Issues with KMM: didn’t scale well, difficult to operate and manage, poor failure isolation

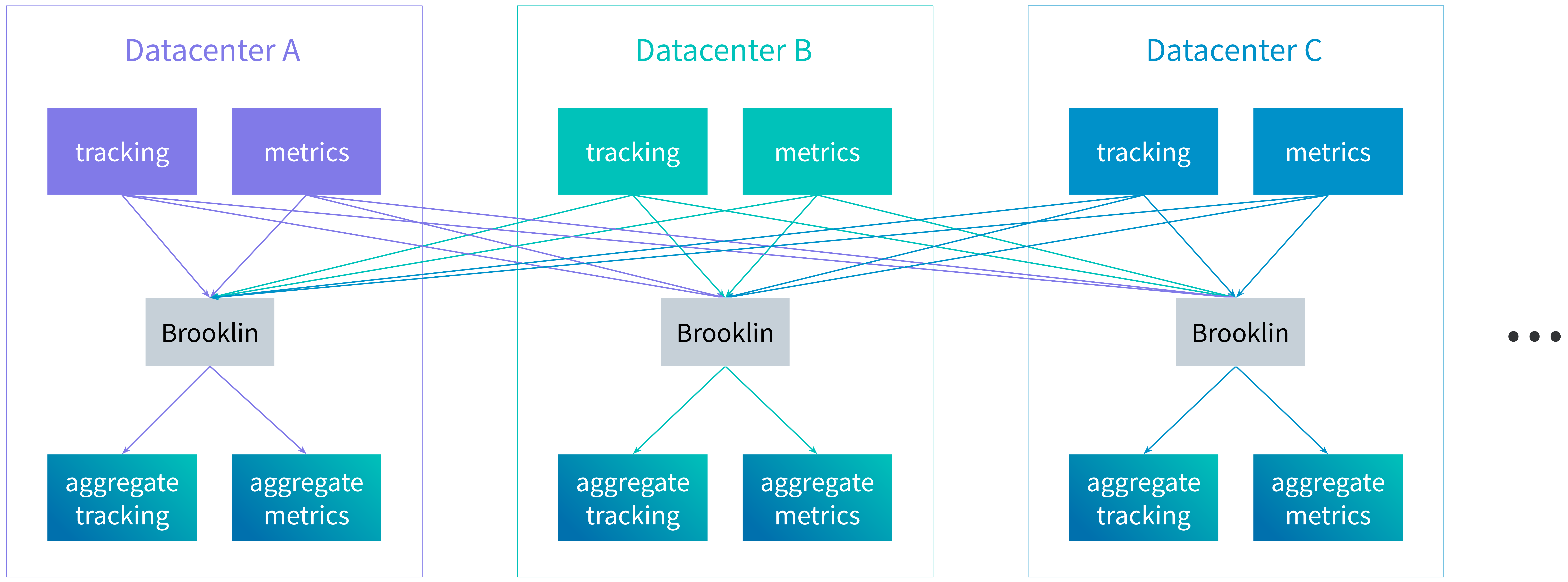
Use Brooklin to Mirror Kafka Data



Kafka MirrorMaker Topology



Brooklin Kafka Mirroring Topology



Brooklin Kafka Mirroring

- Optimized for stability and operability
- Manually pause and resume mirroring at every level
  - Entire pipeline, topic, topic-partition
- Can auto-pause partitions facing mirroring issues
  - Auto-resumes the partitions after a configurable duration
- Flow of messages from other partitions is unaffected

Application Use Cases

Application Use Cases

Cache

Application Use Cases

Cache

Search Indices

Application Use Cases

Cache

Search Indices

ETL or Data warehouse

Application Use Cases

Cache

Search Indices

ETL or Data warehouse

Materialized Views or Replication

Application Use Cases

Cache

Search Indices

ETL or Data warehouse

Materialized Views or Replication

Repartitioning

Application Use Cases

Adjunct Data

Application Use Cases

Adjunct Data

Bridge

Application Use Cases

Adjunct Data

Bridge

Serde, Encryption, Policy

Application Use Cases

Adjunct Data

Bridge

Serde, Encryption, Policy

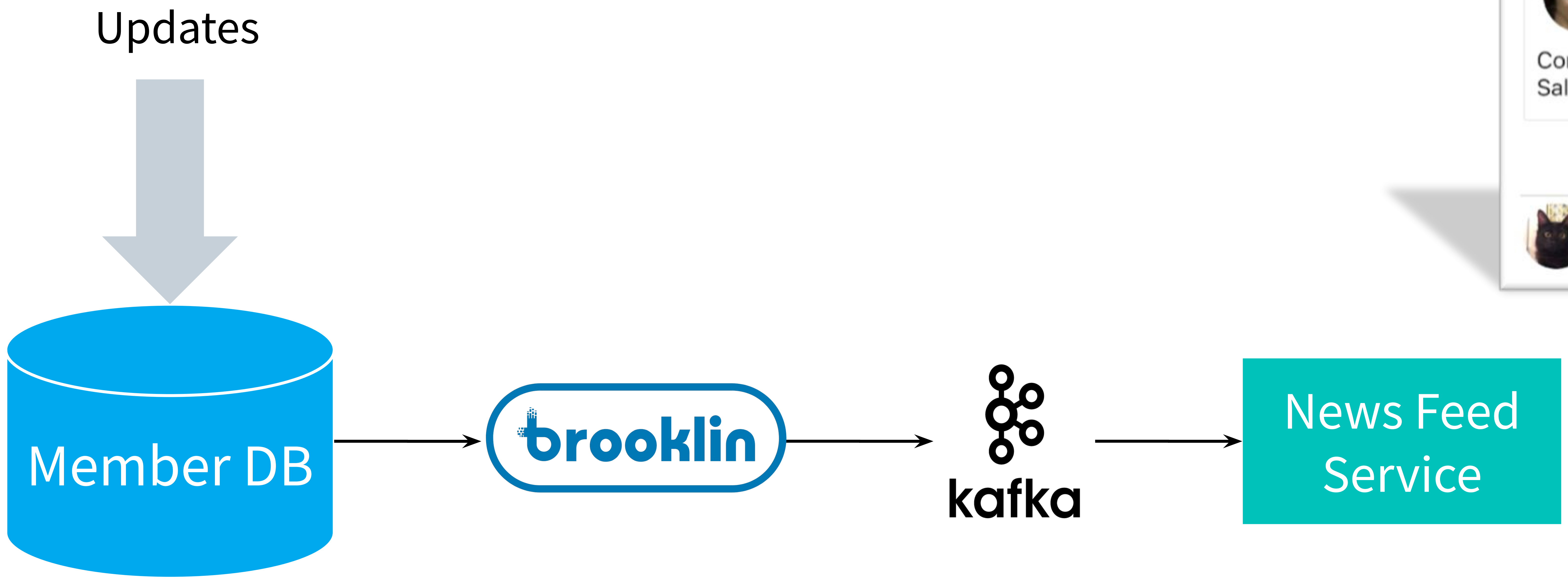
Standardization, Notifications …

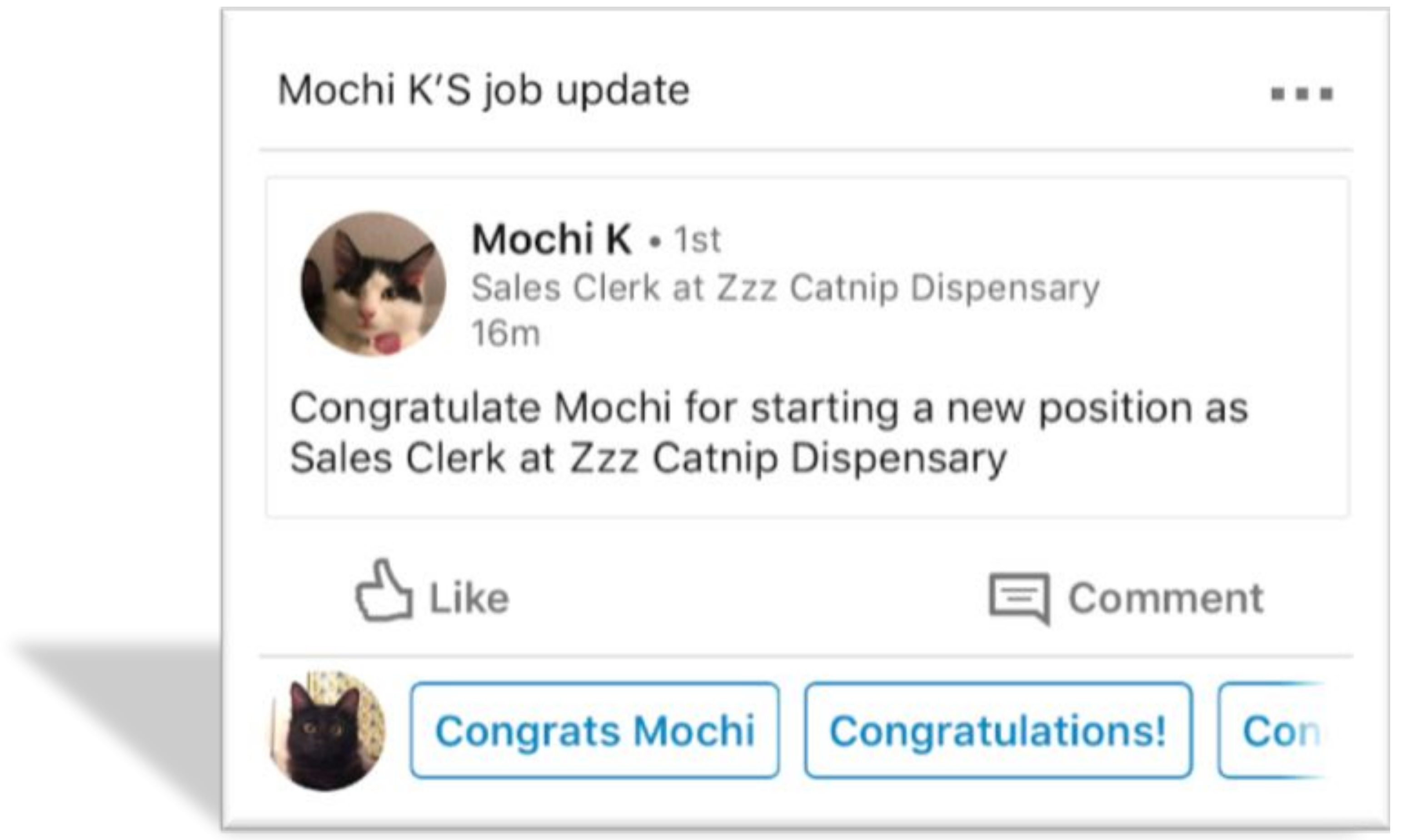
Architecture

Example:

Stream updates made to Member Profile

Capturing Live Updates




Mochi K'S job update

Mochi K • 1st
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16m

Congratulate Mochi for starting a new position as Sales Clerk at Zzz Catnip Dispensary

Example

- **Scenario**: Stream Espresso Member Profile updates into Kafka
    - **Source Database**: Espresso (Member DB, Profile table)
    - **Destination**: Kafka
    - **Application**: News Feed service

Datastream

Name: MemberProfileChangeStream

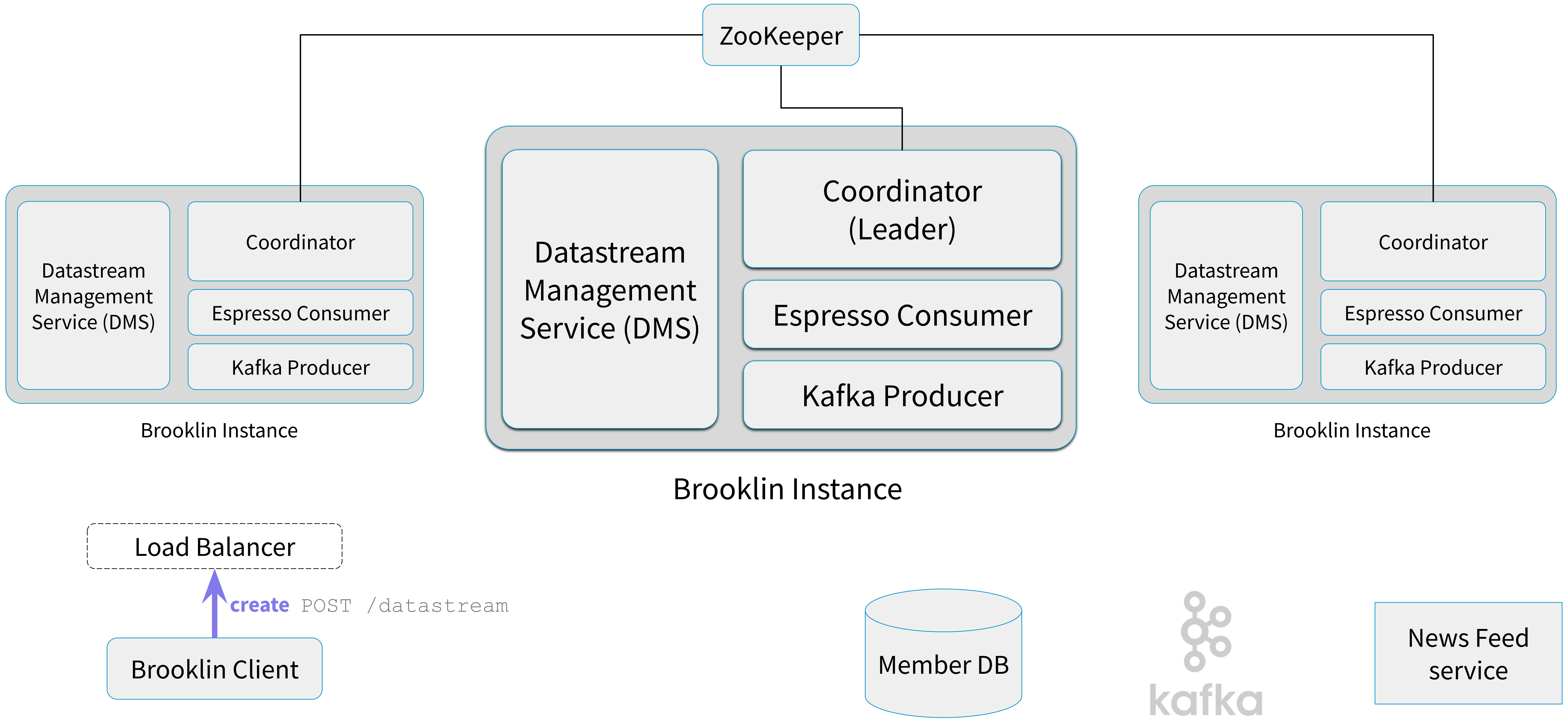
Source: MemberDB/ProfileTable
Type: Espresso
Partitions: 8

Destination: ProfileTopic
Type: Kafka
Partitions: 8

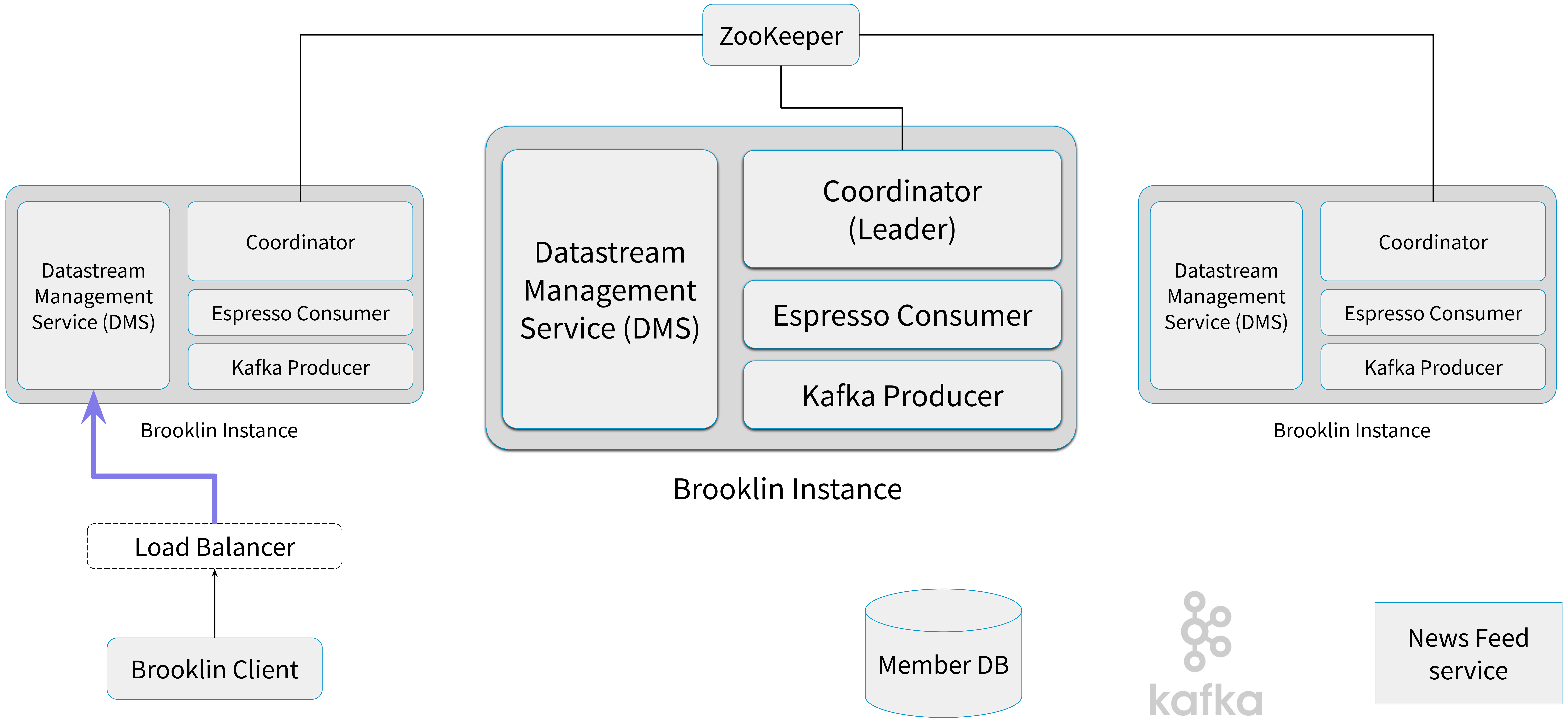
Metadata:
Application: News Feed service
Owner: newsfeed@linkedin.com

- **Describes** the data pipeline
- **Mapping** between source and destination
- Holds the **configuration** for the pipeline

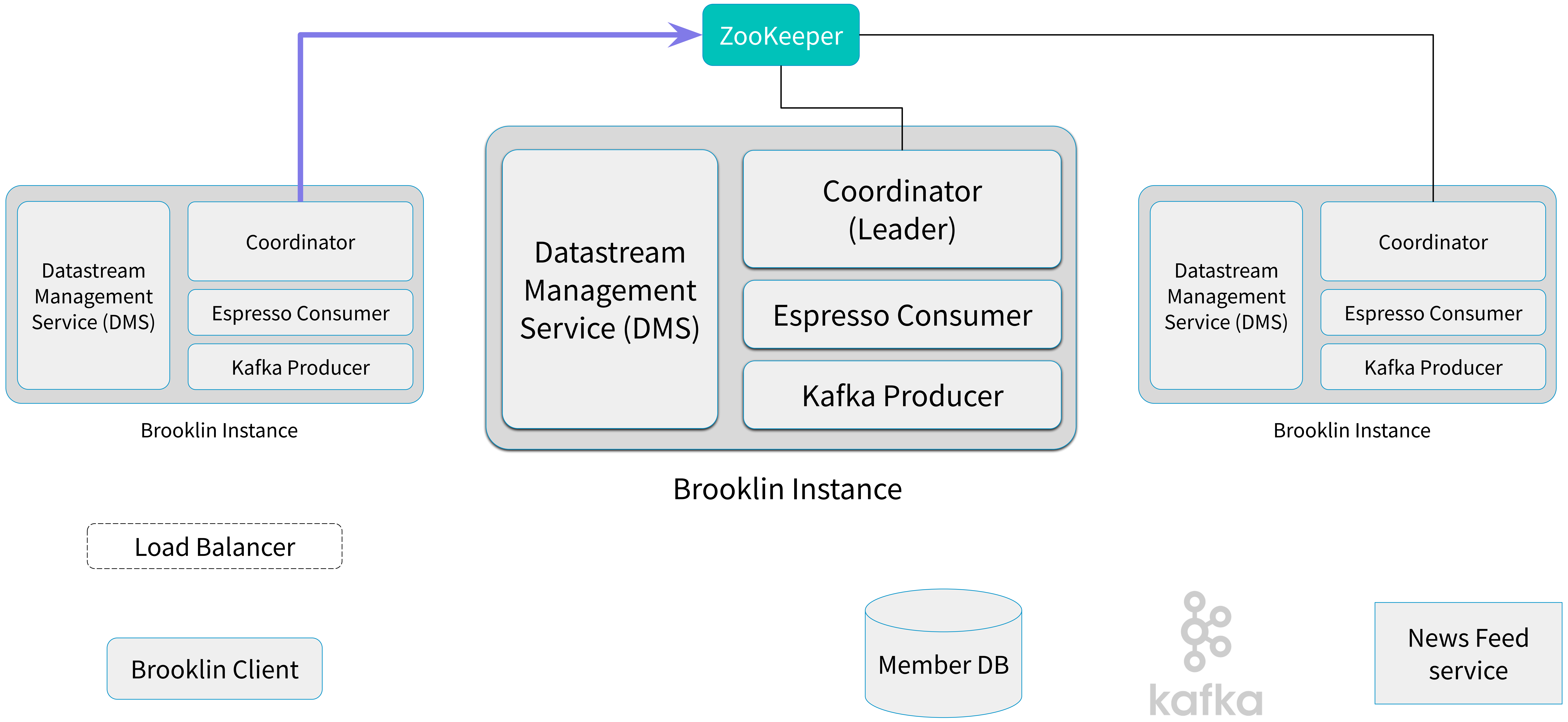
1. Client makes REST call to create datastream



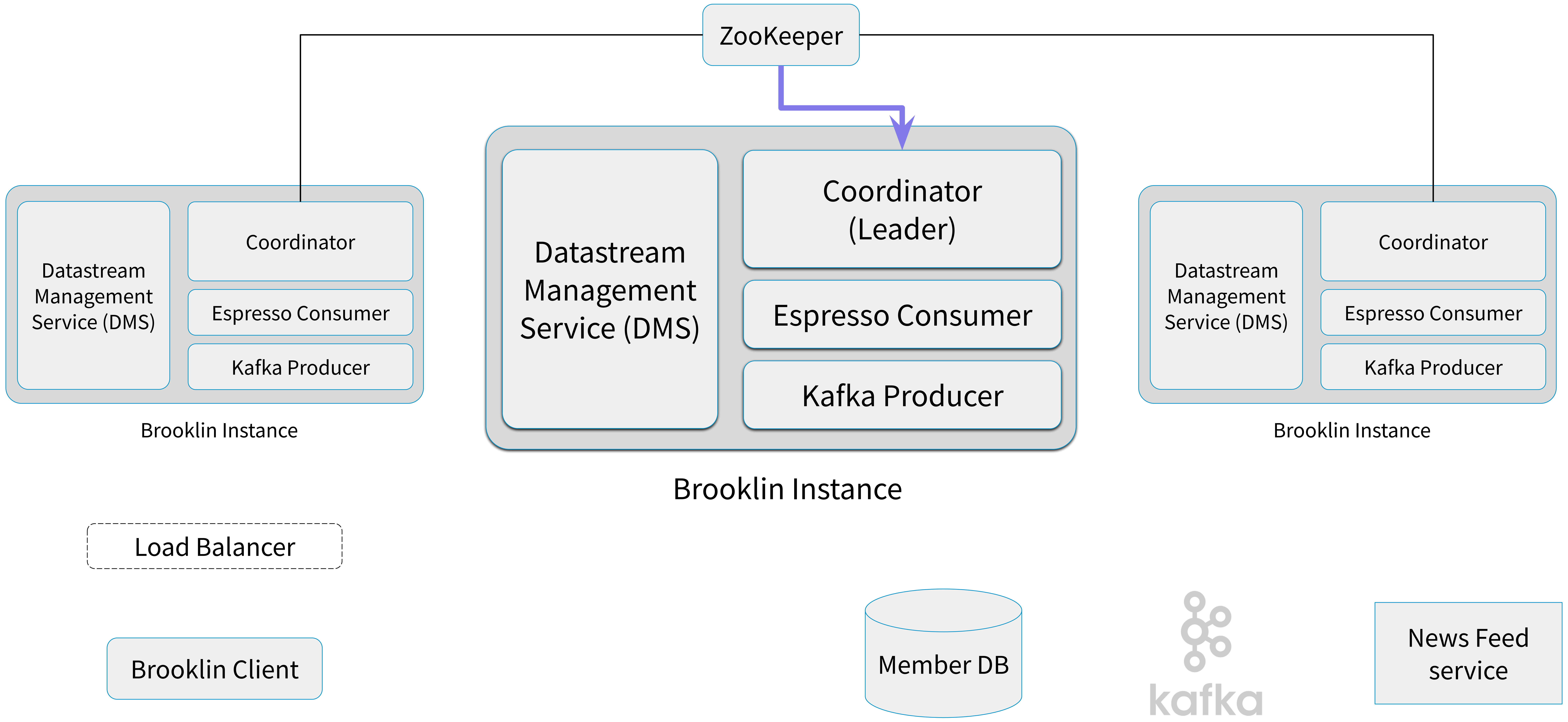
2. Create request goes to any Brooklin instance



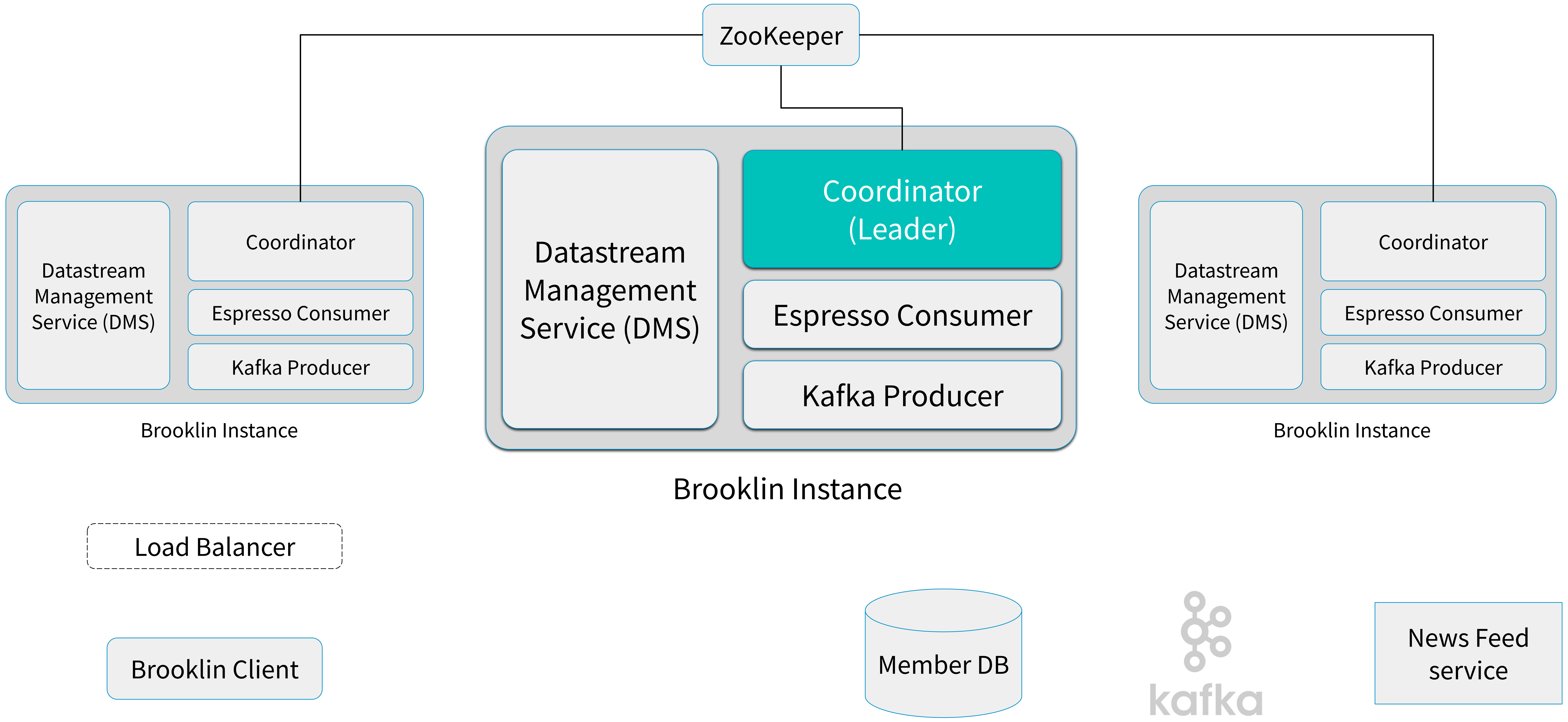
3. Datastream is written to ZooKeeper



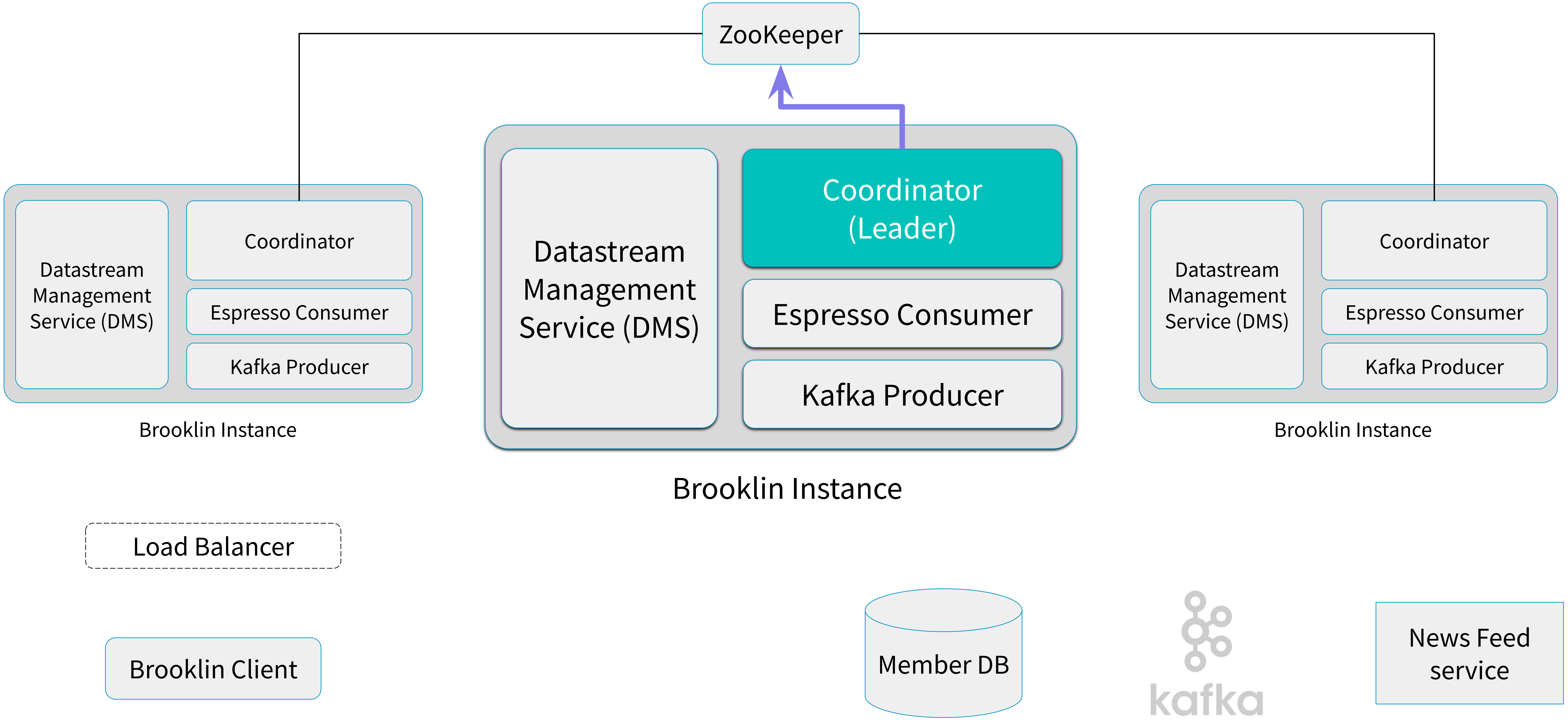
4. Leader coordinator is notified of new datastream



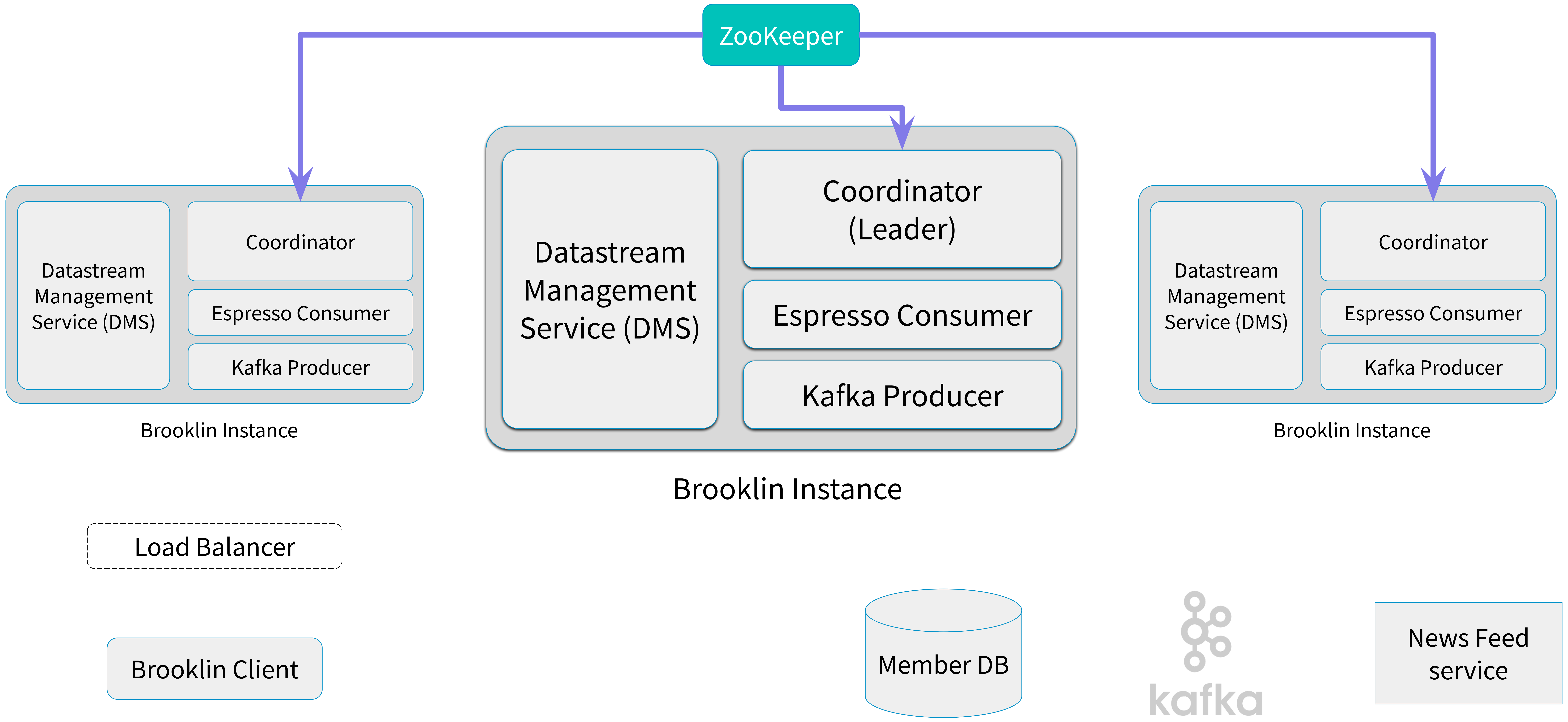
5. Leader coordinator calculates work distribution



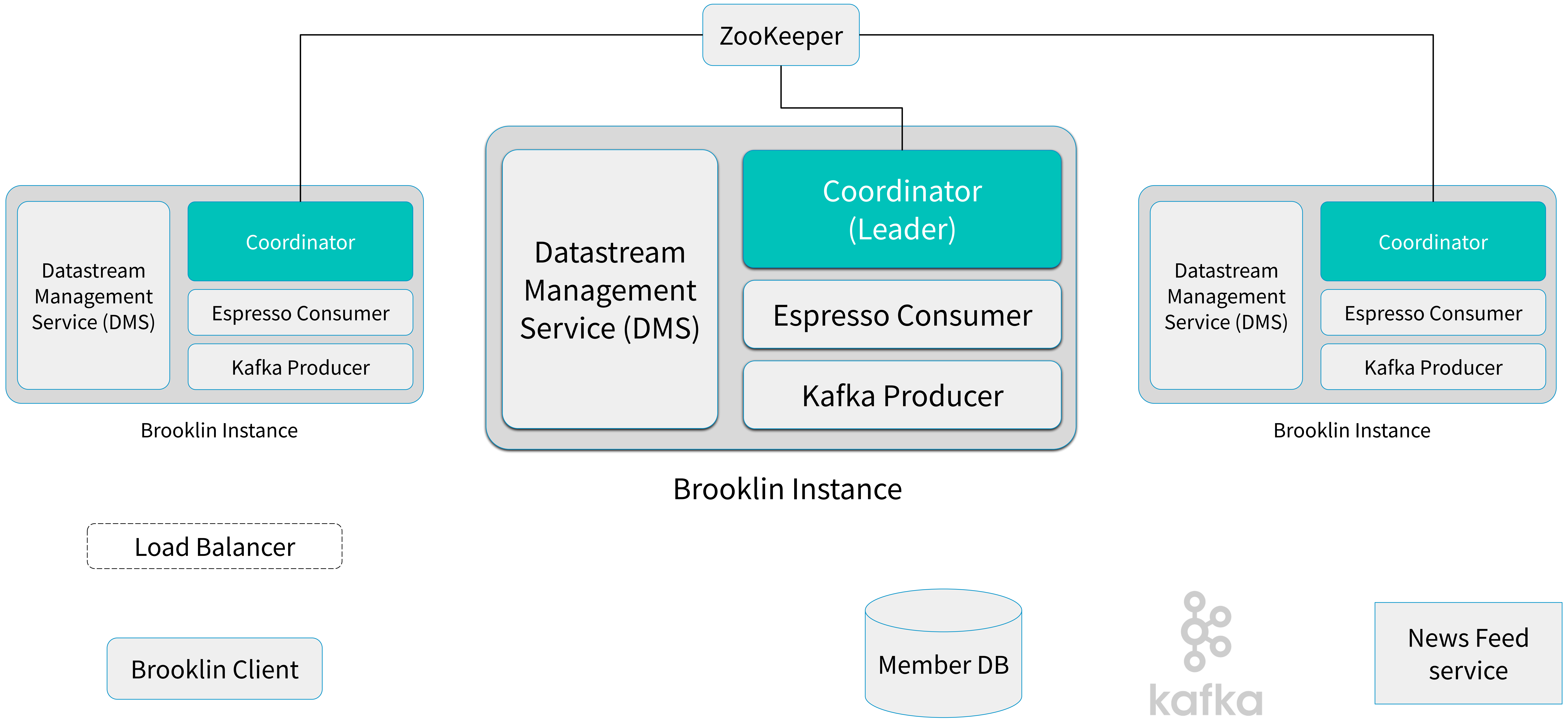
6. Leader coordinator writes the assignments to ZK



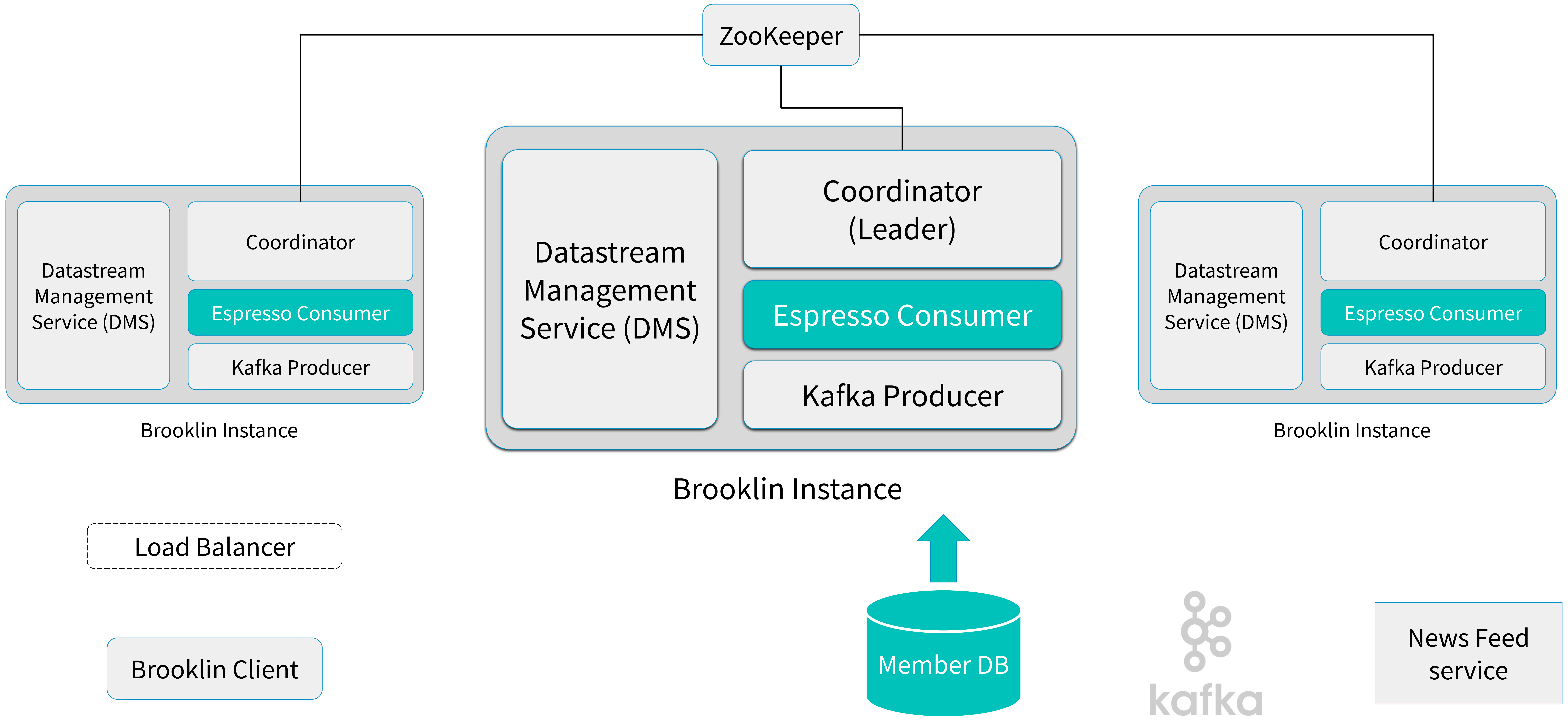
7. ZooKeeper is used to communicate the assignments



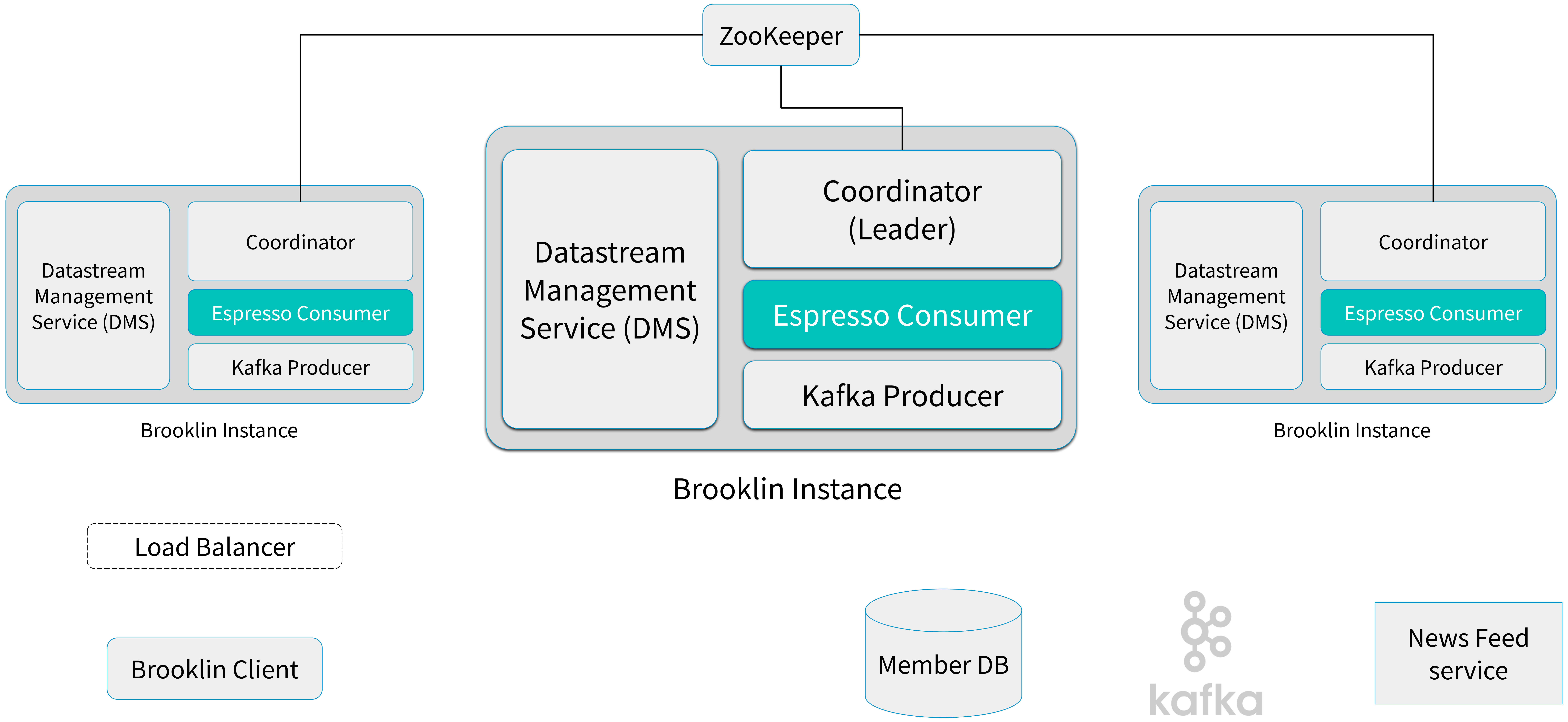
8. Coordinators hand task assignments to consumers



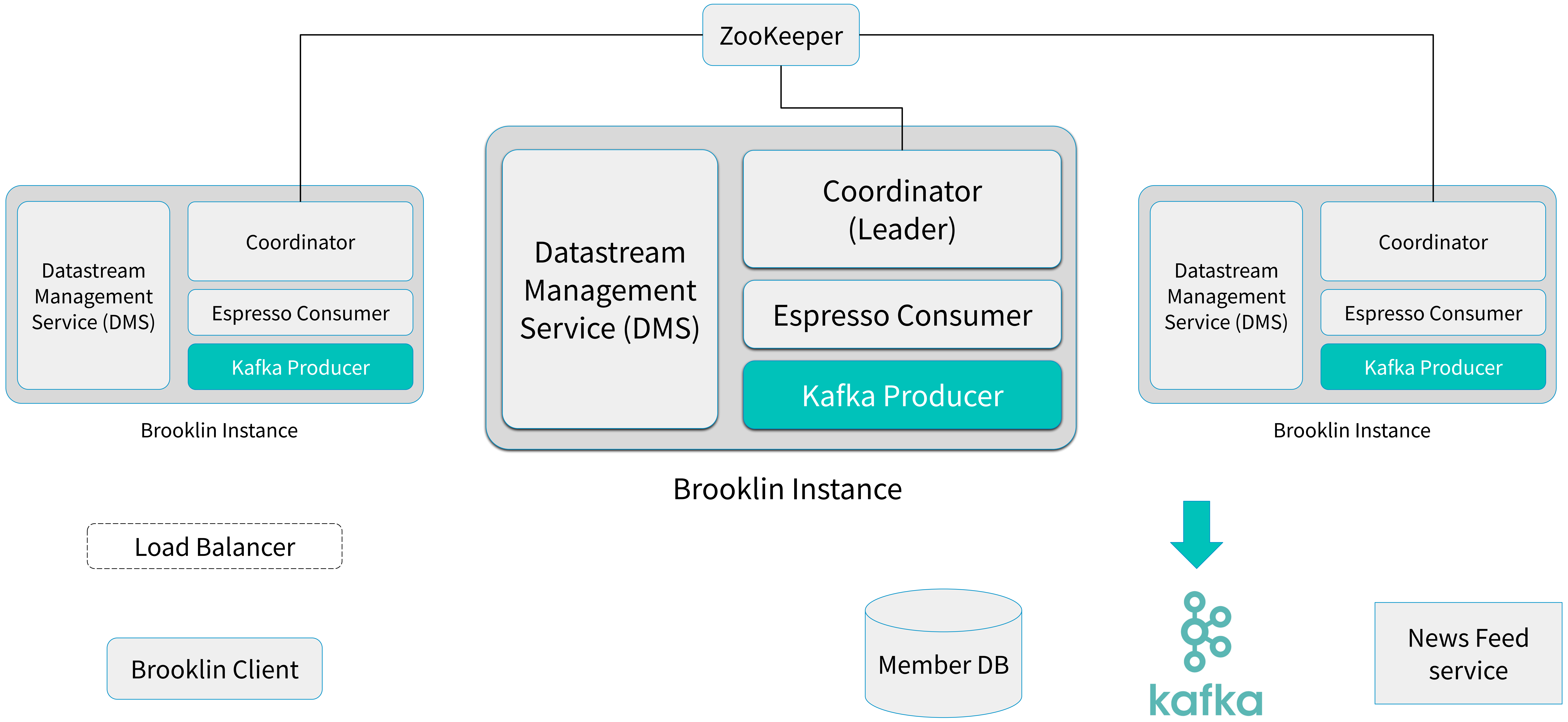
9. Consumers start streaming data from the source



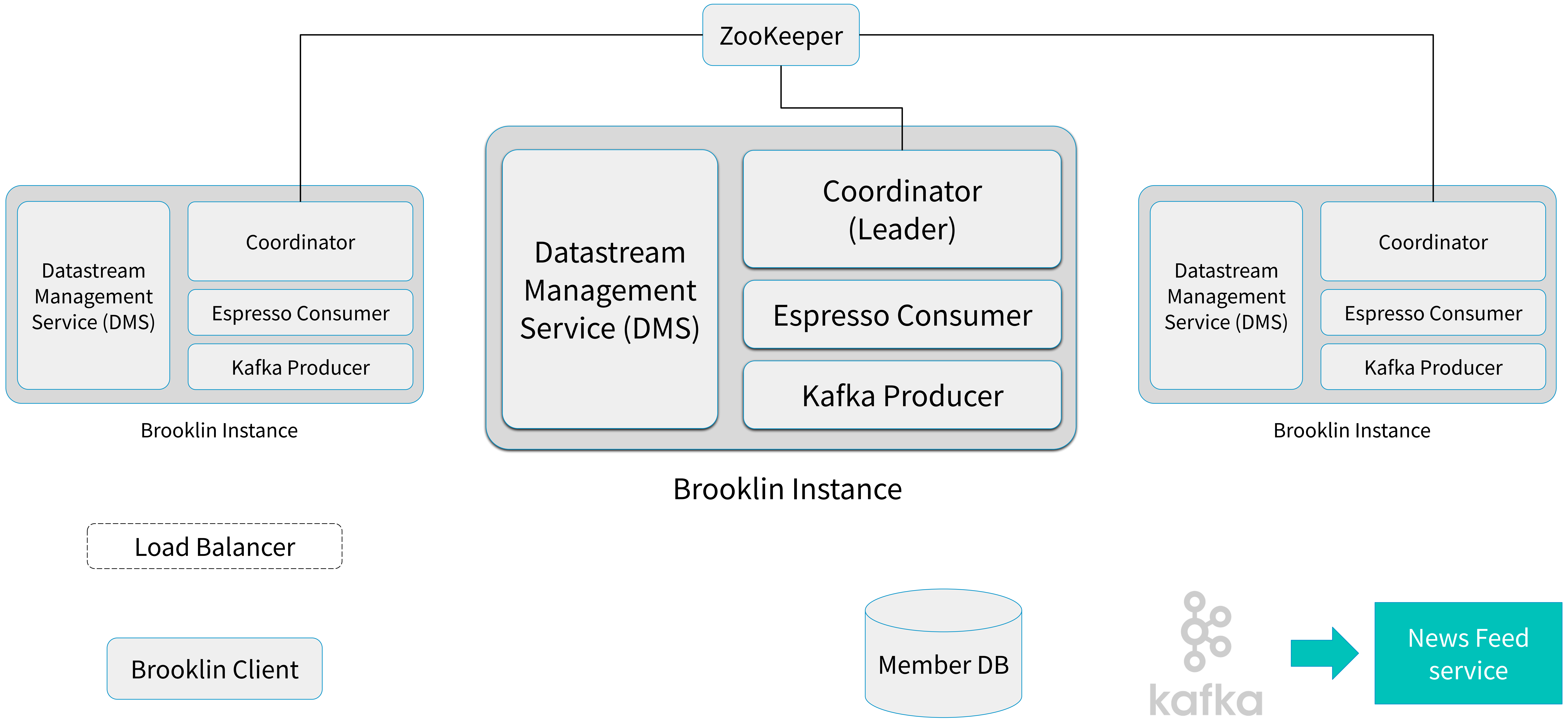
10. Consumers propagate data to producers



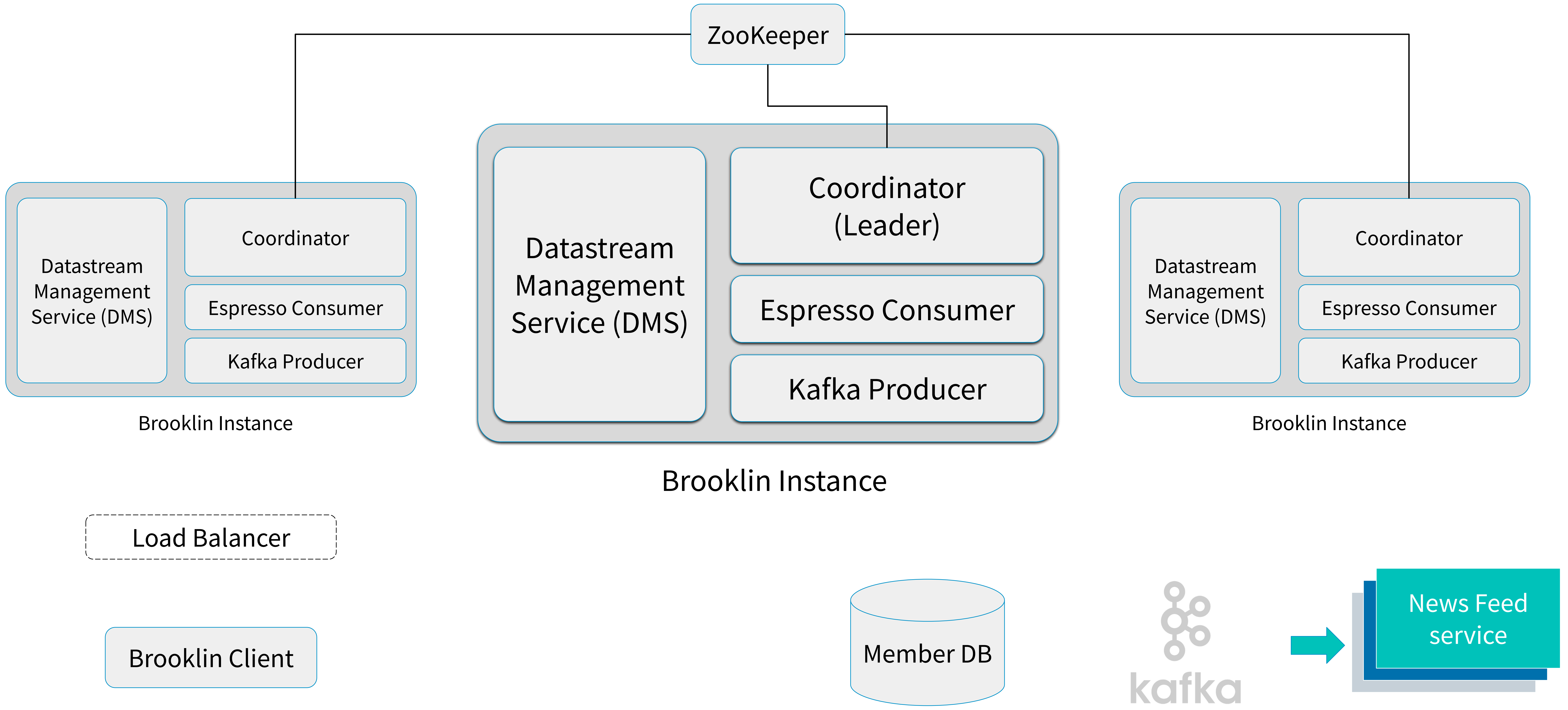
11. Producers write data to the destination



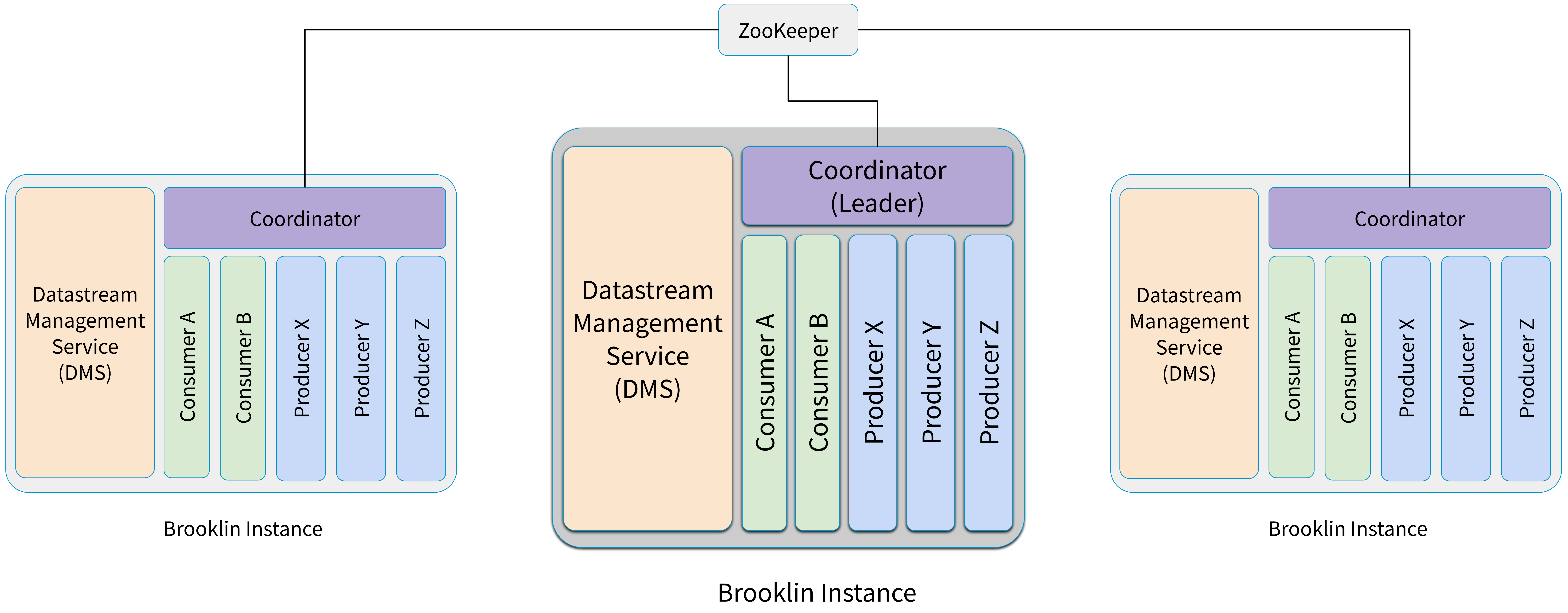
12. App consumes from Kafka



13. Destinations can be shared by apps



Brooklin Architecture



Current & Future

Current

Sources & Destinations

- **Consumers**:
  - Espresso
  - Oracle
  - Kafka
  - EventHubs
  - Kinesis
- **Producers**:
  - Kafka
  - EventHubs
- APIs are standardized to support additional sources and destinations

Features

- **Multitenant**: Can power thousands of datastreams across several source and destination types
- **Guarantees**: At-least-once delivery, order is maintained at partition level
- **Kafka mirroring improvements**: finer control of pipelines (pause/auto-pause partitions), improved latency with flushless-produce mode

Brooklin in Production

Brooklin streams with Espresso, Oracle, or EventHubs as the source

38B
messages/day

2K+
datastreams

1K+
unique sources

200+
applications

Brooklin in Production

Brooklin streams mirroring Kafka data

2T+
messages/day

200+
datastreams

10K+
topics

Future

Sources & Destinations

- **Consumers**:
  - MySQL
  - Cosmos DB
  - Azure SQL
- **Producers**:
  - Azure Blob storage
  - Kinesis
  - Cosmos DB
  - Azure SQL
  - Couchbase

Optimizations

- Brooklin auto-scaling
- Passthrough compression
- Read optimizations: Read once, Write multiple

Open Source

- Plan to open source Brooklin in 2019 (soon!)

Thank you

Questions?

Celia Kung

: ckung@linkedin.com

: /in/celiakkung/

LinkedIn