

Running Large Scale Migrations Continuously

Suhail Patel | @suhailpatel | <https://suhailpatel.com>





Suhail Patel

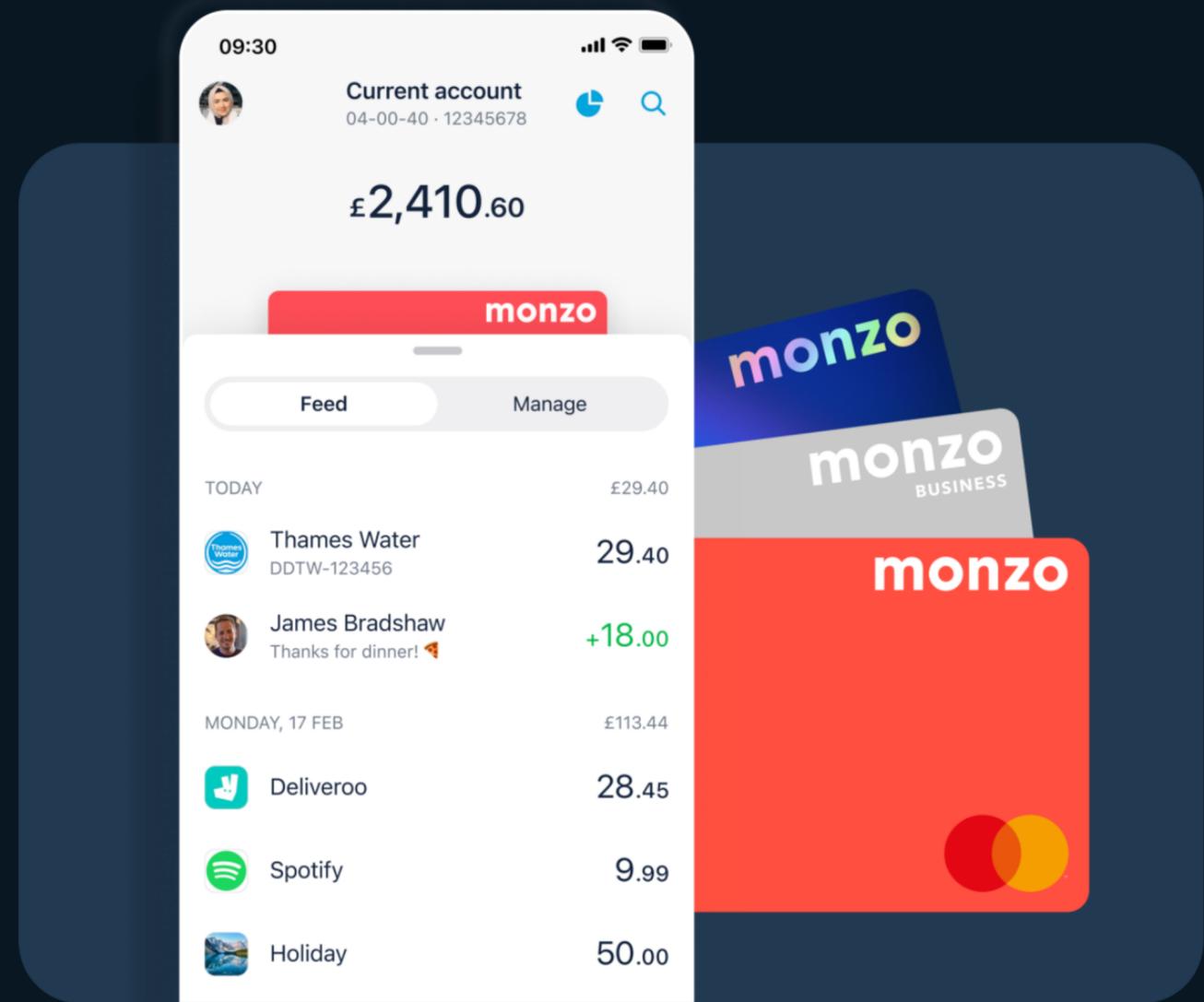
Senior Staff Engineer at Monzo

@suhailpatel

Banking made easy

Spend, save and manage your money, all in one place. Open a full UK bank account from your phone, for free.

Open a Monzo account



09:30

Current account
04-00-40 · 12345678

£2,410.60

monzo

Feed Manage

TODAY		£29.40
	Thames Water DDTW-123456	29.40
	James Bradshaw Thanks for dinner! 🍴	+18.00
MONDAY, 17 FEB		£113.44
	Deliveroo	28.45
	Spotify	9.99
	Holiday	50.00



12 Endeavour Square
London
E20 1JN

Tel: +44 (0)20 7066 1000
Fax: +44 (0)20 7066 1099
www.fca.org.uk

FINAL NOTICE

To: TSB Bank plc

Reference
Number: 191240

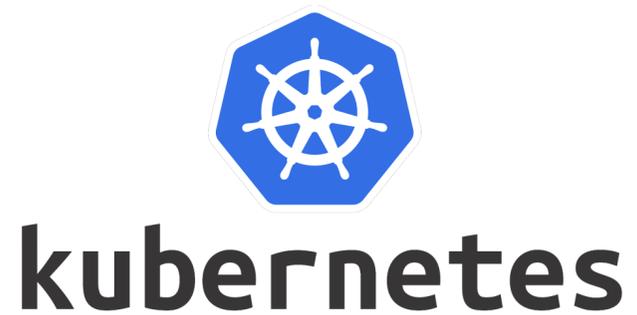
Address: 20 Gresham Street, London EC2V 7JE

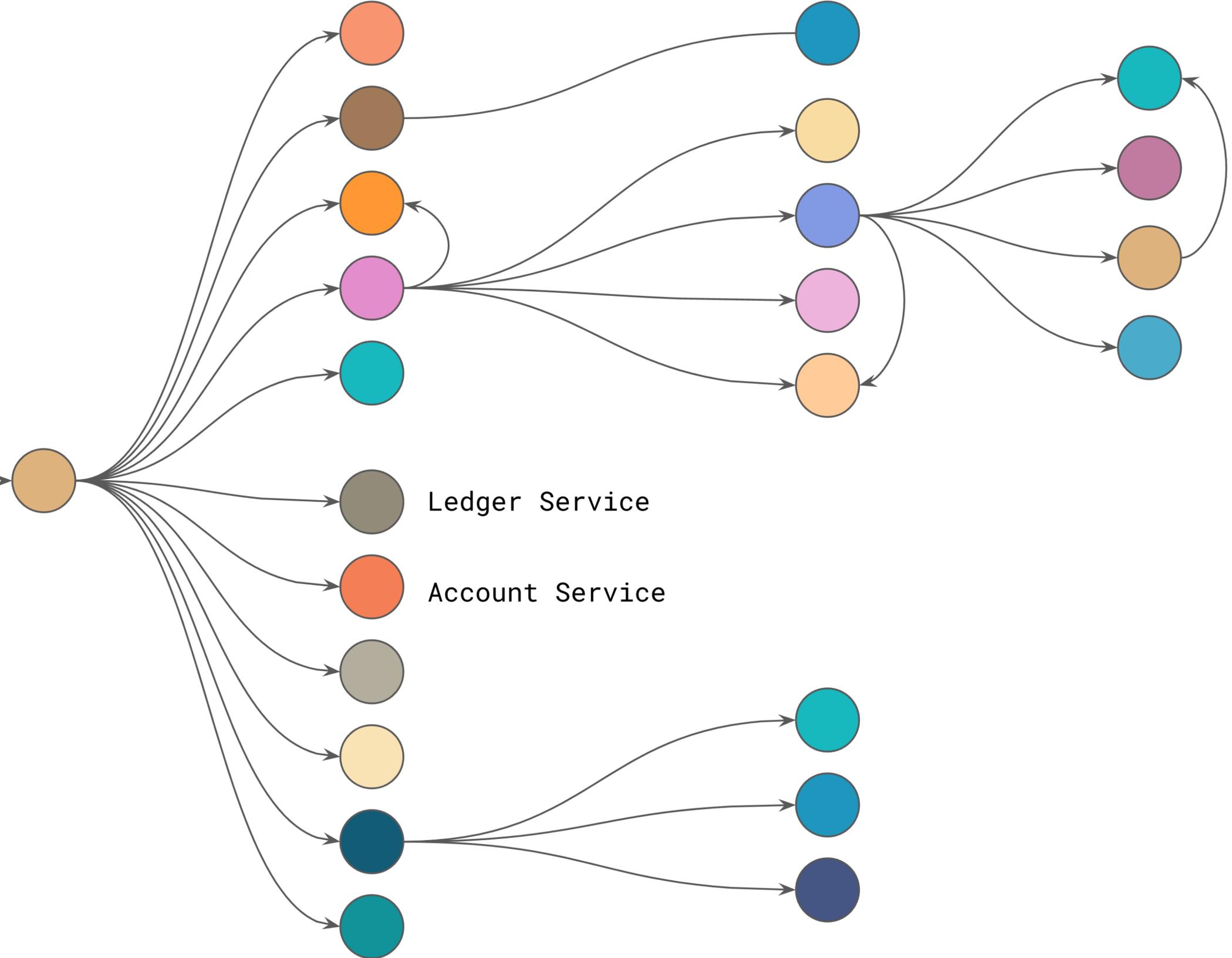
Date: 20 December 2022

1. ACTION

1.1 For the reasons given in this Final Notice, the Authority hereby imposes on TSB Bank plc ("TSB") a financial penalty of £29.75 million pursuant to section 206 of the Act.

1.2 TSB agreed to resolve this matter and qualified for a 30% (stage 1) discount under the Authority's executive settlement procedures. Were it not for this discount, the Authority would have imposed a financial penalty of £42.50 million on TSB.





9 AUGUST 2019

Monzo HQ

We had issues with Monzo on 29th July. Here's what happened, and what we did to fix it.



On the 29th July from about 13:10 onwards, you might have had some issues with Monzo. As we shared in [an update](#) at the time, you might not have been able to:

- Log into the app
- Send and receive payments, or withdraw money from ATMs
- See accurate balances and transactions in your app



Space to experiment

“Have you asked manager X whether we should prioritise this”

“How long will it take”

“We don’t have the expertise or context on this system”



“Is this the most impactful thing to be worked on”

“How much can we put it off”

“How will you unblock dependency X, Y and Z”

Space to experiment

Migration Project

“I will be spending a timeboxed <n> days/weeks investigating the migration from X to Y”

“You can track my progress in this living document here”

Space to experiment



Experiment with no-regrets code in
the shadows

Navigating stakeholders



Run reviews to build consensus, understand issues,
share knowledge and get feedback



Suhail Patel 🙌 17:55



Progressive Rollouts



Proposal: <https://www.notion.so/monzo/Proposal-Progressive-rollout-06cb23b939b845e2b26304ed3888d897>



Summary: Rolling out a new version of a backend service can be risky. We currently use a rolling update strategy that replaces all of the pods for a given service over a short time window. If the deployment introduces an error we have no way of “pausing” or “backing out” the rollout - the bad change will be applied to the entire fleet. This risk is typically mitigated by “canary” deployments (where a change is first validated on a small number of canary instances before being rolled out more widely)



Review Discussion: <https://drive.google.com/file/d/1DqMUt75DVtIXB3eUGr98Y-AkQgPvVtYC/view> (edited)



4



1



Navigating stakeholders



Be intentional in space and time to execute

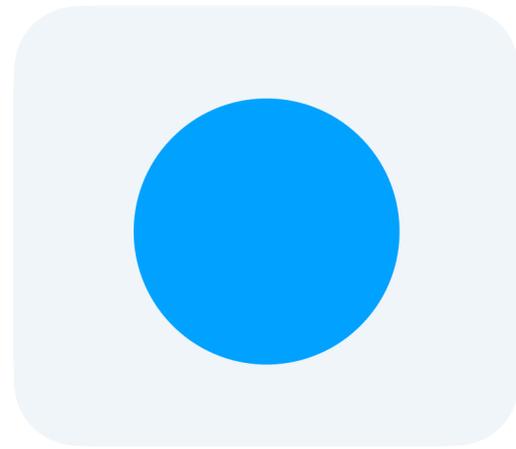
Feedback



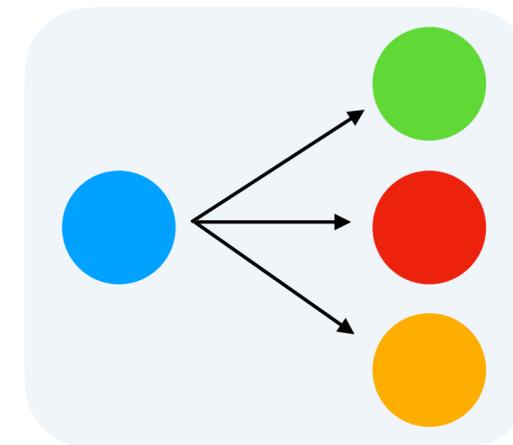
Be very explicit with blocking vs non-blocking feedback



Migration ownership



Centralised Team
handling it all



Fan out to
different teams

This document outlines the steps required to migrate a service from running on our existing Cassandra infrastructure to running on Amazon Keyspaces

Pre-Checks 🛑

Before you select a service for migration, there are some pre-checks to be considered for a service.

Speak to the CODEOWNER team

It's worth notifying the team that owns the service that their service is in line to be migrated.

This is because migrations will be frozen for the service for the duration of the migration and there will be some features they won't be able to use once they've migrated.

Make sure the service is not using unsupported features

There are features not supported in Keyspaces or via the Proxy, notably

- Logged Batches are not supported in Keyspaces or via the Proxy
- TTLs are not supported in Keyspaces
- Frozen collections are not supported in Keyspaces
- User Defined Types (UDT) are not supported in Keyspaces

Migration Process 📦

Once you've run through these pre-checks, you are ready to migrate your Keyspace. This section outlines the step by step to migrate a Keyspace. This process assumes you are migrating

`service.merchant` with keyspace name `merchant`

Make sure the service has been deployed to the latest master revision

The work underpinning the Cassandra library and the integration with the Proxy and configuration of Keyspaces has changed significantly. It is advised that the service is deployed onto the latest master revision to pick up all the relevant changes.

```
$ shipper deploy master service.merchant --prod
```

Migration Procedures



Risks

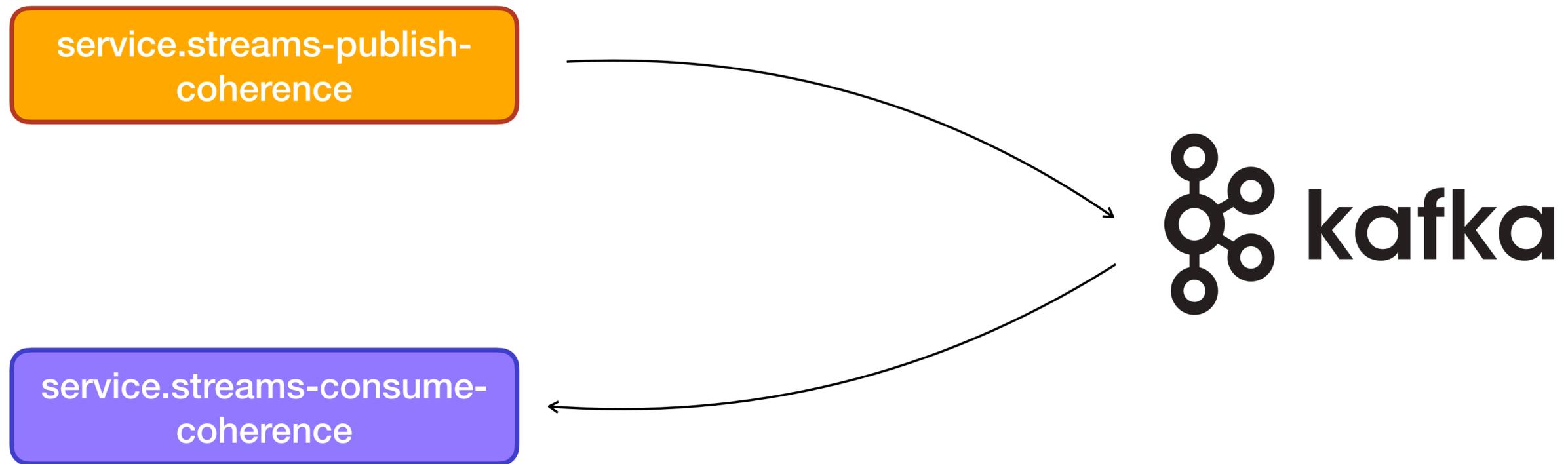


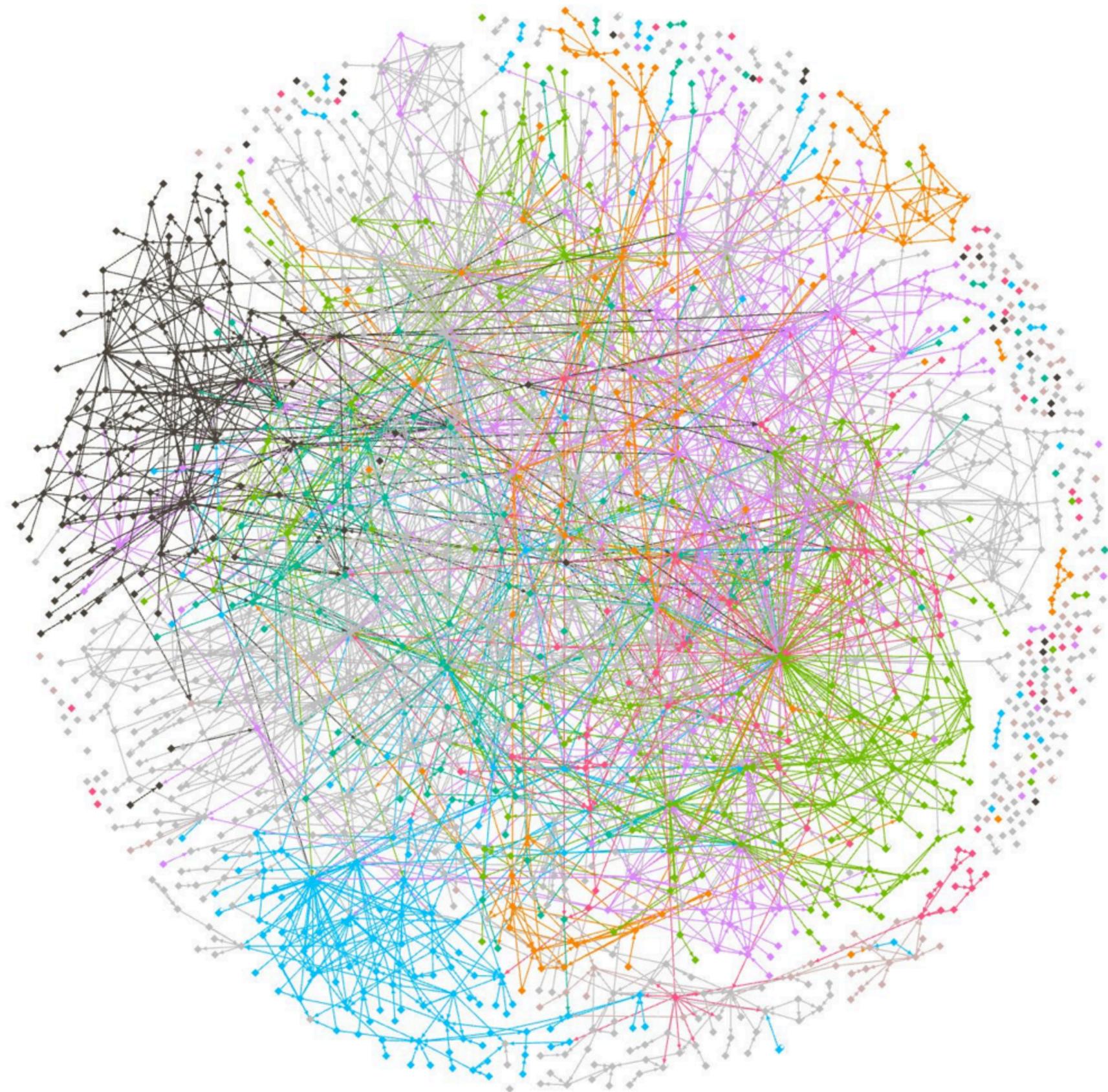
Points of no return



Rollback steps

Coherence checking





rules:

- **id:** no-print-usage

pattern: print(\$X)

message: Use logging.debug() instead of print()

severity: INFO

fix: logging.debug(\$X)

languages:

- python

<https://semgrep.dev>

Automated migration tooling

service.amazon-keyspaces-
migrator



Announce Start of Migration
Validate Service Deployed Recently
Freeze Migrations
Preflight Checks
Create Keyspace
Validate Schema
Initialize Migration Proxy
Enable Shadow Traffic
Validate Shadow Traffic
Send Queries via Proxy
Send Queries via Proxy
Validate traffic
Backfill Data
Switch Database
Wean Queries from Proxy
Unfreeze Migrations
Announce Migration Finish

Automated migration tooling

 **Amazon Keyspaces Migrator Bot** APP 07:00
 Hello from **Amazon Keyspaces Migrator Bot**

A service you are CODEOWNER for is going to be migrated in **production**.

We've successfully migrated **service.ledger-exporter** in **staging** and we'll migrate in **production** next. There's nothing you need to do right away, but if you'd like to read more, [check out the FAQ](#)

If there's a reason we **shouldn't** migrate this service in **production**, please let us know in [#stateful-platform-ask](#).

Otherwise it'll be migrated when it reaches the front of the queue 🚀

? This message was sent here because it is the configured alerts channel for the CODEOWNER of **service.ledger-exporter** in `service.software-catalog`

 1 

 **Amazon Keyspaces Migrator Bot** APP 08:44
 Hello from **Amazon Keyspaces Migrator Bot**

We've just started migrating **service.ledger-exporter** from Cassandra to Amazon Keyspaces in **production** 🚚

 There's nothing you need to do, but if you have questions or concerns, please come and speak to us in [#stateful-platform-ask](#)

 If you haven't seen a scheduling notification for this migration, it's possible it was paused and has just been manually restarted by a human 🙋

 2 

Tiered migration

Tier 3 services

Services that run
behind the scenes

Tier 2 services

Systems that support
our core

Tier 1 services

Services for core
banking needs

Tier 0 services

Systems for running
our platform

Tiered migration

Tier 3 services

Services that run
behind the scenes

Tier 2 services

Systems that support
our core

Tier 1 services

Services for core
banking needs

Tier 0 services

Systems for running
our platform

Tiered migration

Tier 3 services

Services that run
behind the scenes

Tier 2 services

Systems that support
our core

Tier 1 services

Services for core
banking needs

Tier 0 services

Systems for running
our platform

Normalizing incidents

 **Monzo Incident** APP 17:33
Service error when migrated and deployed with progressive rollout

 Reporter: 

 Incident Lead: 

 Status: Resolved

 Started at: 2022-06-09 16:33 UTC

 Ended at: 2022-06-10 11:24 UTC

 Severity: Minor

 Tags: technology

 Document: [Incident 12041](#)

 Comms Channel: [#inc-errors-when-migrating-and-deploying-progressive-rollout-2022-06-09](#)

Need something else?

Normalizing incidents



Your reaction to incidents can make or break trust

Celebrate the wins

platform-leadership-team - 18 Feb 2022 View in channel



Kieran Gorman 🧡 18:10

 Stateful Platform

 We've (finally) migrated `user_event` in production!

This has been our driving project for a while now, forcing us to tackle some really interesting implementation complexities around handling TTLs, as well as dealing with a high throughput service. The last week was a bit of a slog pushing through various bizarre validation edge cases, but we finally got this over the line this afternoon to end the week on a high. *We almost doubled the total data volume we've migrated (from 13TB to 25TB) with this keyspace migrating.* This is 10% of the total volume stored in premium1 right now.

Very, very pleased to see this go through after much wailing and gnashing of teeth for us, but with no interruption at the service level itself. Also great timing for a Friday evening to cap the week off - I'm off now to have an on-call appropriate single can of beer to celebrate 🍺



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Thank you!

Suhail Patel | @suhailpatel | <https://suhailpatel.com>

StaffPlus London 2023