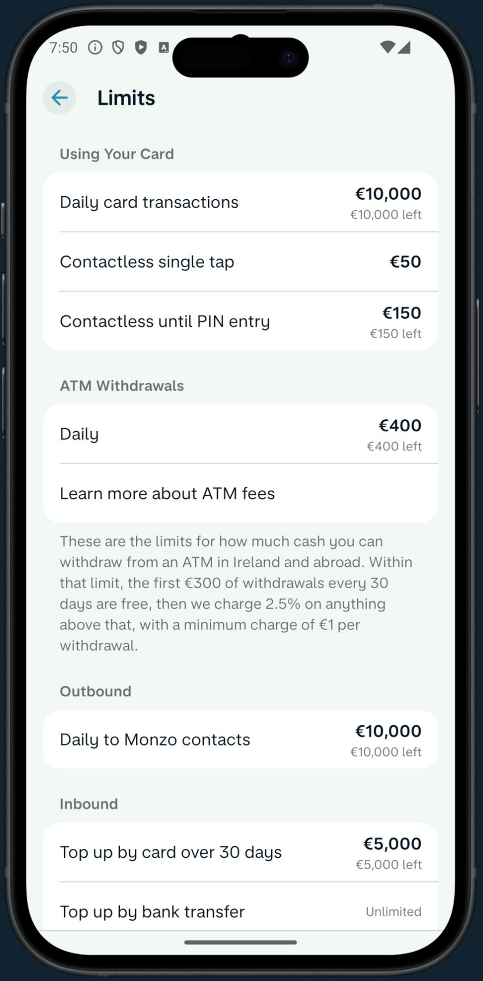
monzo

Behind the scenes of a massive data migration

by Kat Zień-Mendes

monzo



7:50

Limits

Using Your Card

Daily card transactions	€10,000 €10,000 left
Contactless single tap	€50
Contactless until PIN entry	€150 €150 left

ATM Withdrawals

Daily	€400 €400 left

Learn more about ATM fees

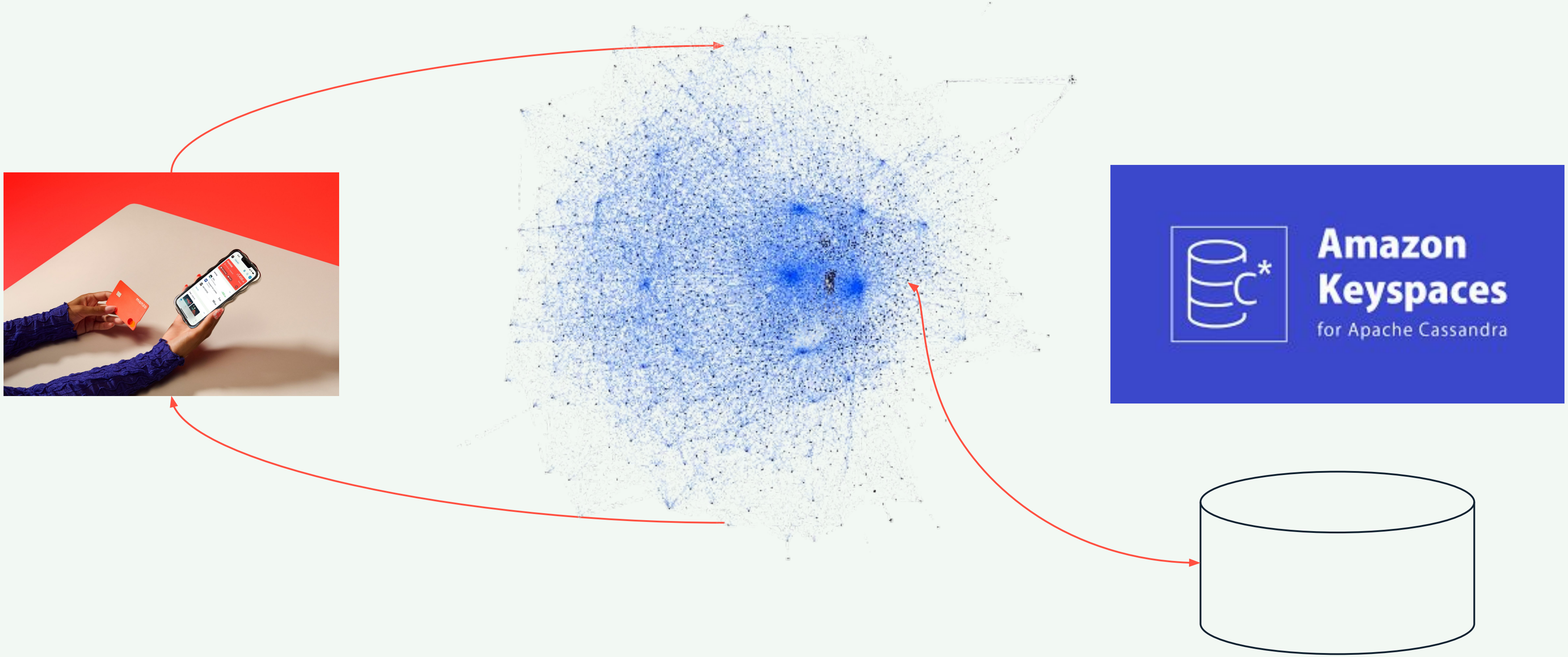
These are the limits for how much cash you can withdraw from an ATM in Ireland and abroad. Within that limit, the first €300 of withdrawals every 30 days are free, then we charge 2.5% on anything above that, with a minimum charge of €1 per withdrawal.

Outbound

Daily to Monzo contacts	€10,000 €10,000 left

Inbound

Top up by card over 30 days	€5,000 €5,000 left
Top up by bank transfer	Unlimited



Amazon Keyspaces
for Apache Cassandra

`paymentlimit.limit_entries`

→ migrate to `paymentlimit.limit_entries_v2`

`paymentlimit.limit_entry_timestamps`

→ migrate to `paymentlimit.limit_entry_timestamps_v2`

`paymentlimit.limit_entry_ledgerinsertions`

→ migrate to `paymentlimit.limit_entry_ledgerinsertions_v2`

`paymentlimit.limit_entry_limitsets`

→ migrate to `paymentlimit.limit_entry_limitsets_v2`

The only difference between V1 and V2 tables is an extra column for limit namespace (*GBR*, *USA*, *ESP* etc.). **This needed to be populated as part of the migration.**

4.88TiB
8.82 Bil

`paymentlimit.limit_entries`

→ migrate to `paymentlimit.limit_entrie`

3.07 TiB
8.82 Bil

`paymentlimit.limit_entry_timestamps`

→ migrate to `paymentlimit.limit_en`

3.54 TiB
7.67 Bil

`paymentlimit.limit_entry_ledgerinsertions`

→ migrate to `paymentlimit.limit_entry_ledgeri` `ertic` `_v2`

3.71 TiB
8.46 Bil

`paymentlimit.limit_entry_limitsets`

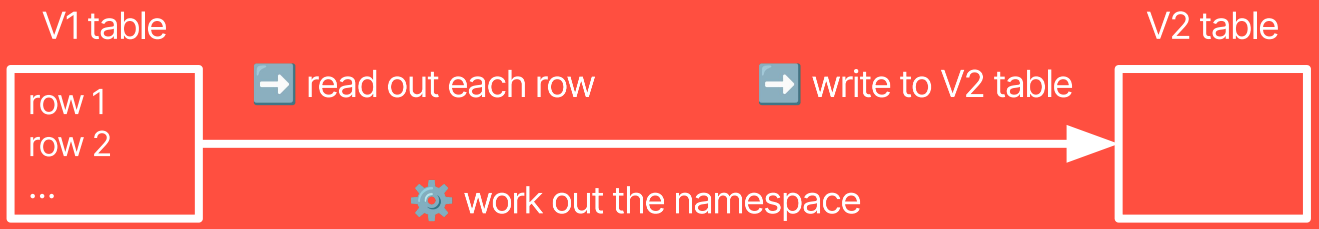
→ migrate to `paymentlimit.limit_entry_limitsets_v2`

15.2 TiB (16.7 TB)
33.77 Bil
(33,770,000,000)

The only difference between V1 and V2 tables is an extra column for limit namespace (*GBR*, *USA*, *ESP* etc.).

This needed to be populated as part of the migration.

Naively...



V1 table

row 1
row 2
...

➡️ read out each row

⚙️ work out the namespace

➡️ write to V2 table

V2 table

10 requests per second ➡️ **104.6 years** to migrate 33 billion rows

1000 requests per second ➡️ **1.05 years** (~382 days) to migrate 33 billion rows

Options 🤔

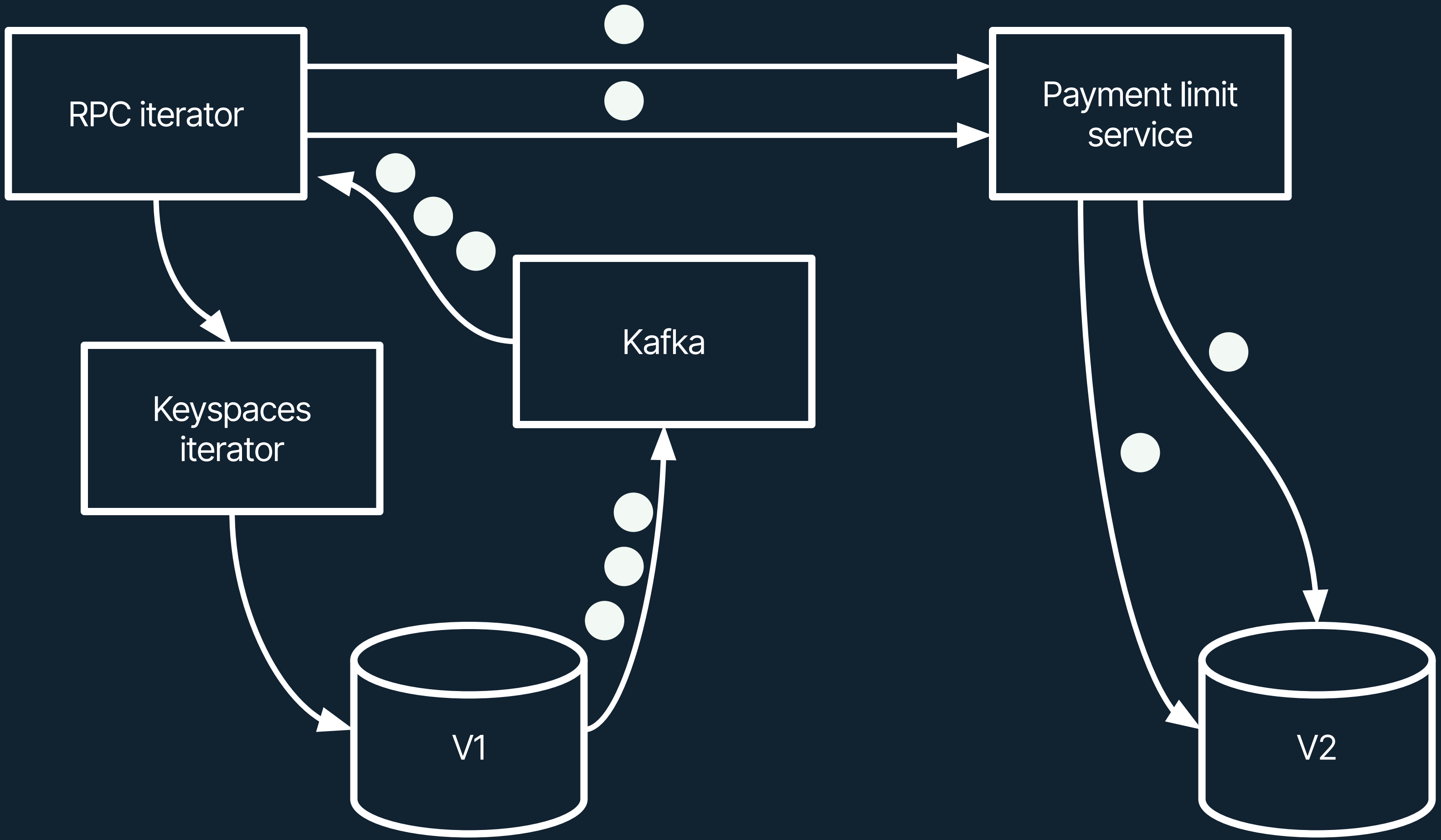
Batch processing?

At 1000 rows per batch…

10 batch requests per second ➡️ **38.2 days** to migrate 33 billion rows

1000 batch requests per second ➡️ **9.2 hours** to migrate 33 billion rows

Enter: a whole bunch of tools...


RPC iterator
Payment limit service
Kafka
Keyspaces iterator
V1
V2

Costs

Read request units (RRU): $0.125 per million read request units

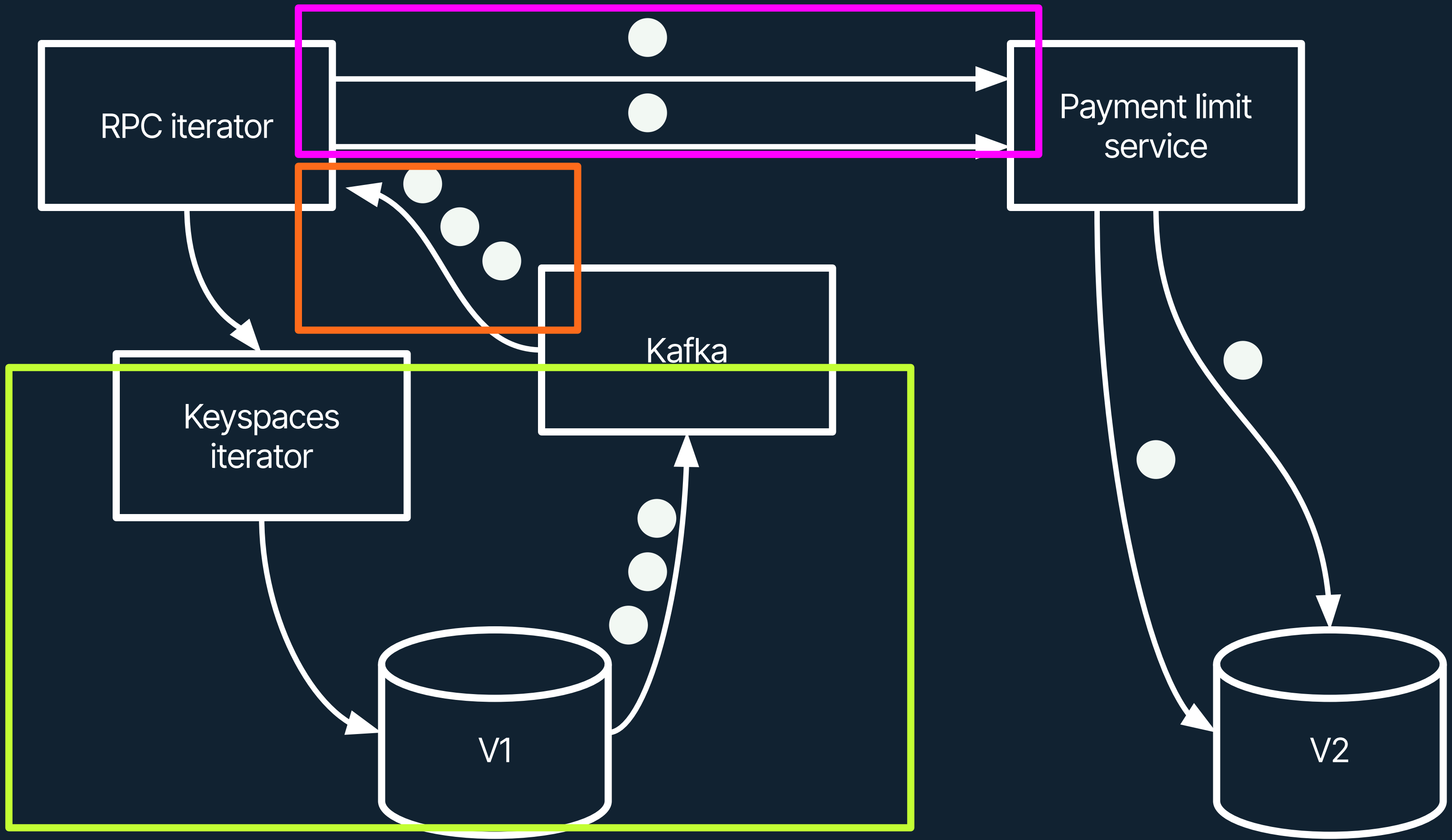
Write request units (WRU): $0.625 per million write request units

33.77 Bil (33 770 000 000) / 1 000 000 * $0.125 = $4221.25 to read all rows

33.77 Bil (33 770 000 000) / 1 000 000 * $0.625 = $21106.25 to write all rows

Total: $25327.50

⚠️ *You may need to read the rows twice.*


RPC iterator
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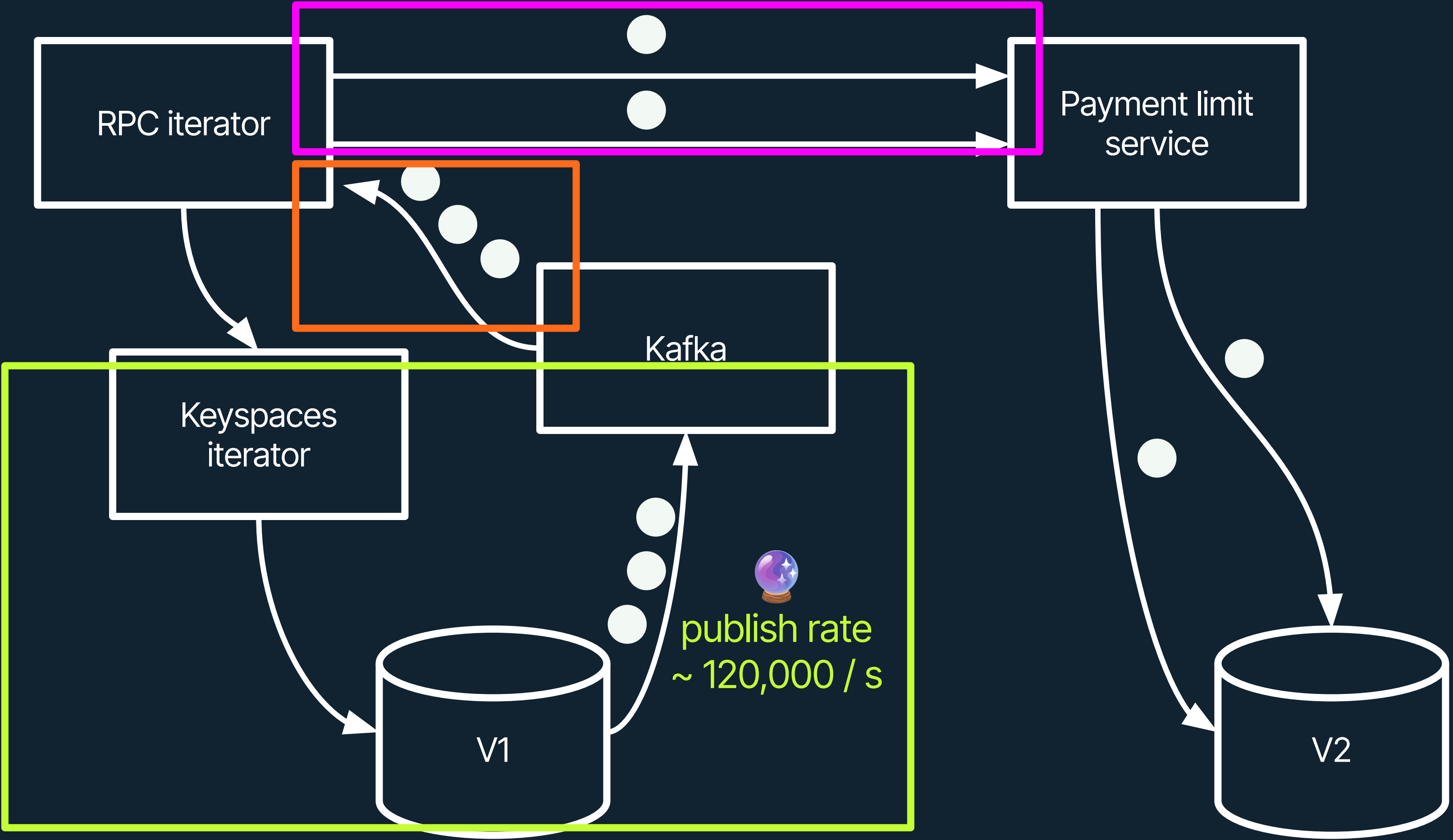
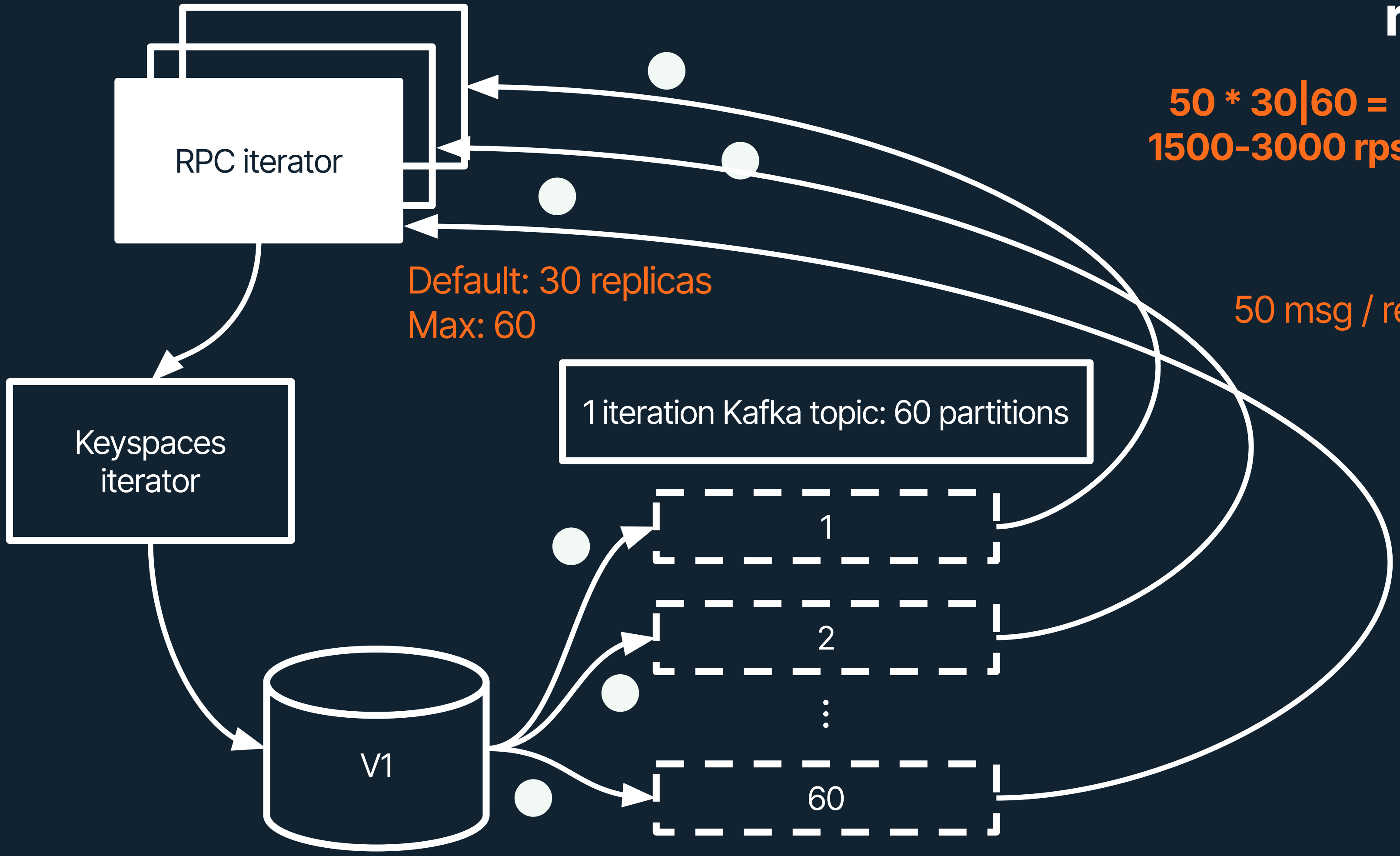


🔮 publish rate
~ 120,000 / s

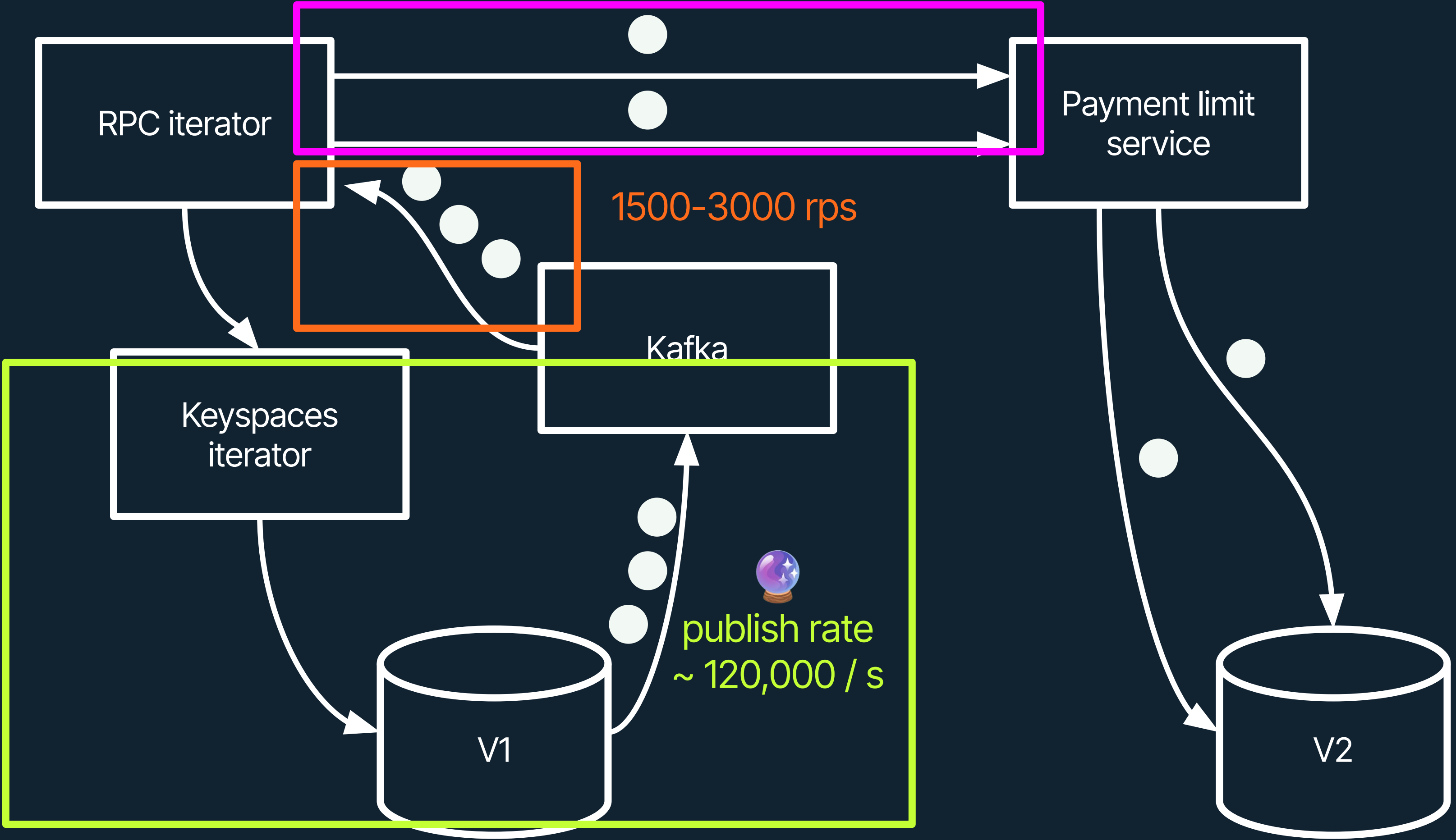


Default: 30 replicas
Max: 60

50 * 30|60 =
1500-3000 rps

50 msg / replica / s

You choose! Recommended: 500 RPC/s, max 1500-3000 RPCs/s



RPC iterator

Payment limit service

1500-3000 rps

Kafka

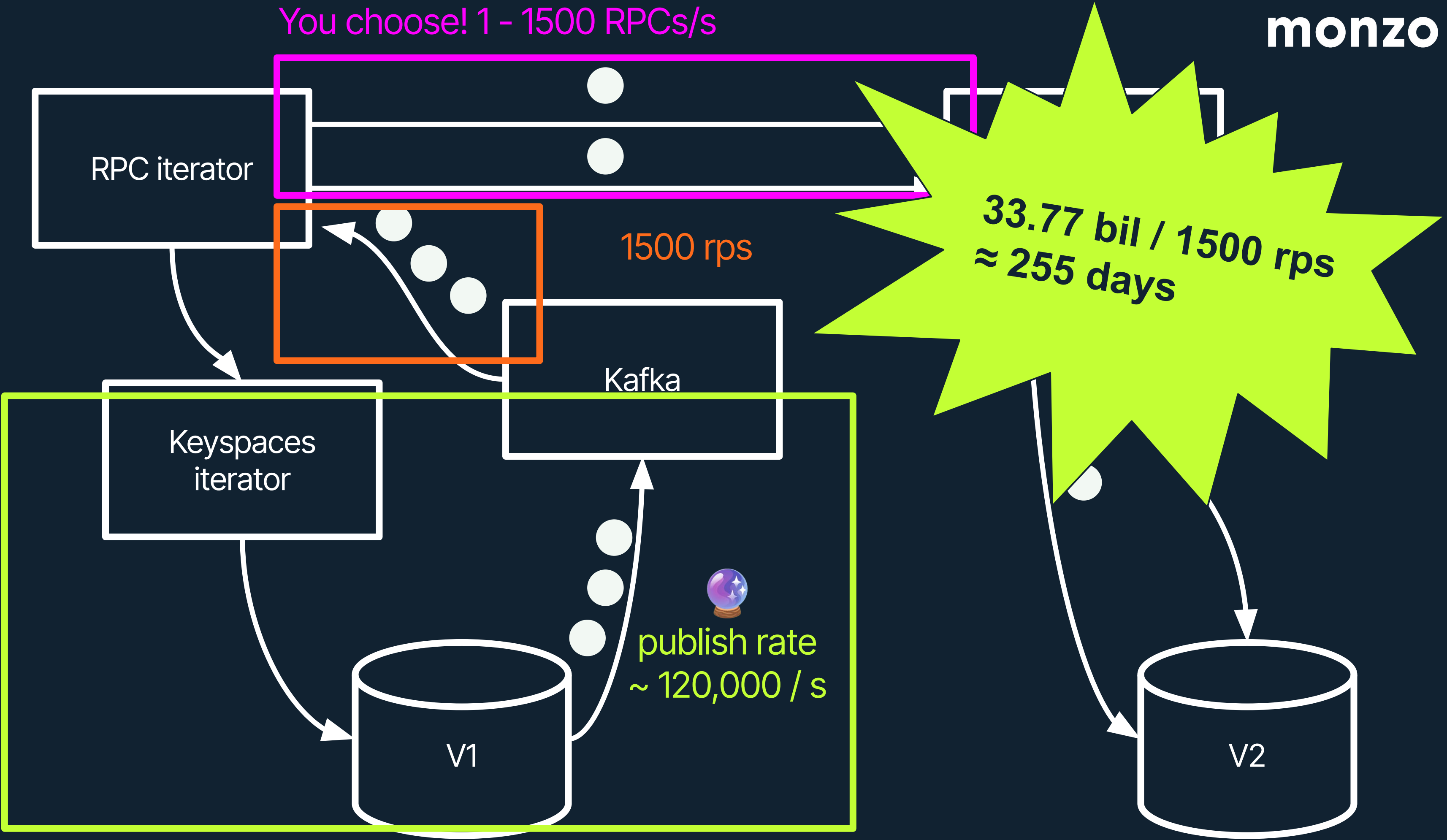
Keyspaces iterator

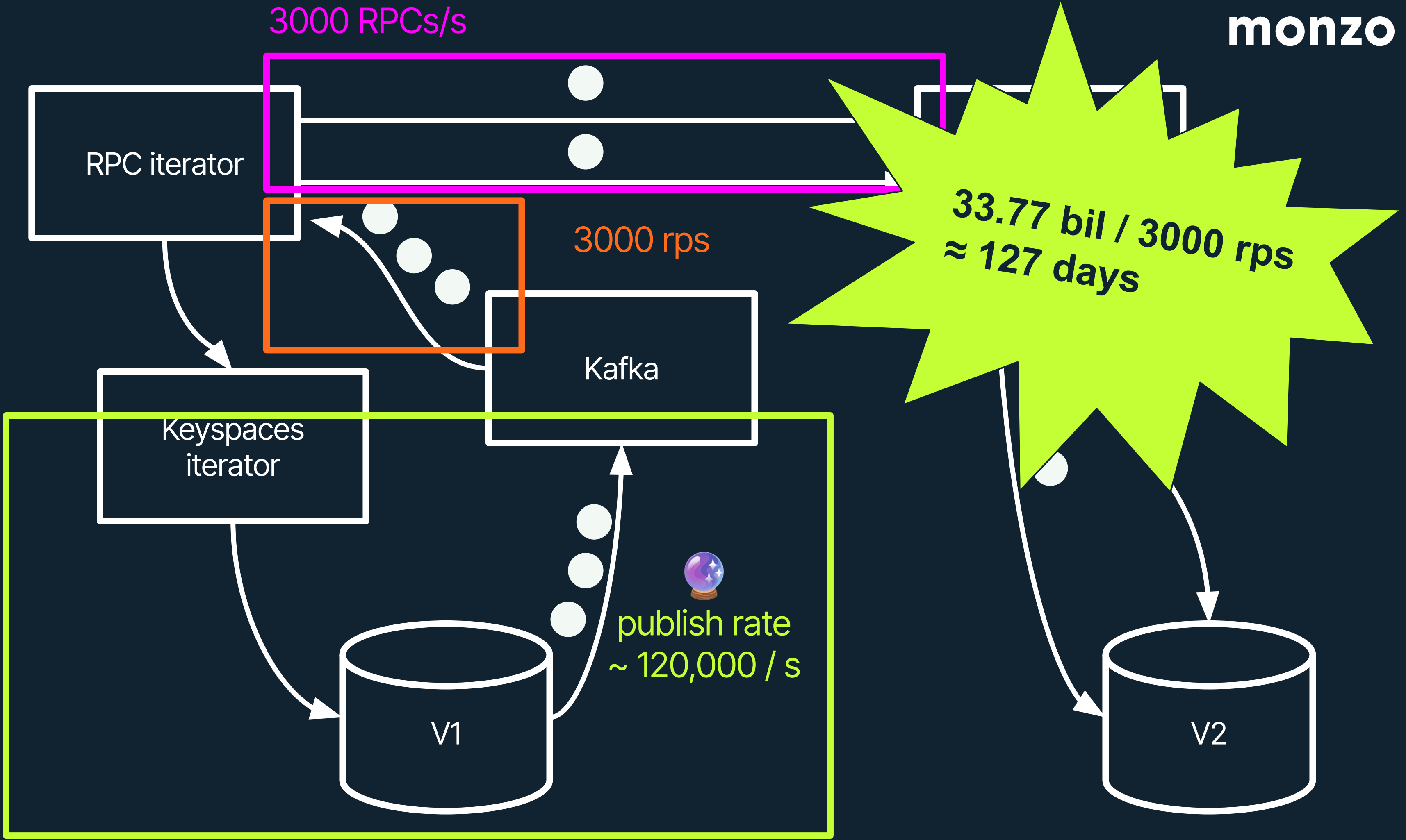
🔮

publish rate
~ 120,000 / s

V1

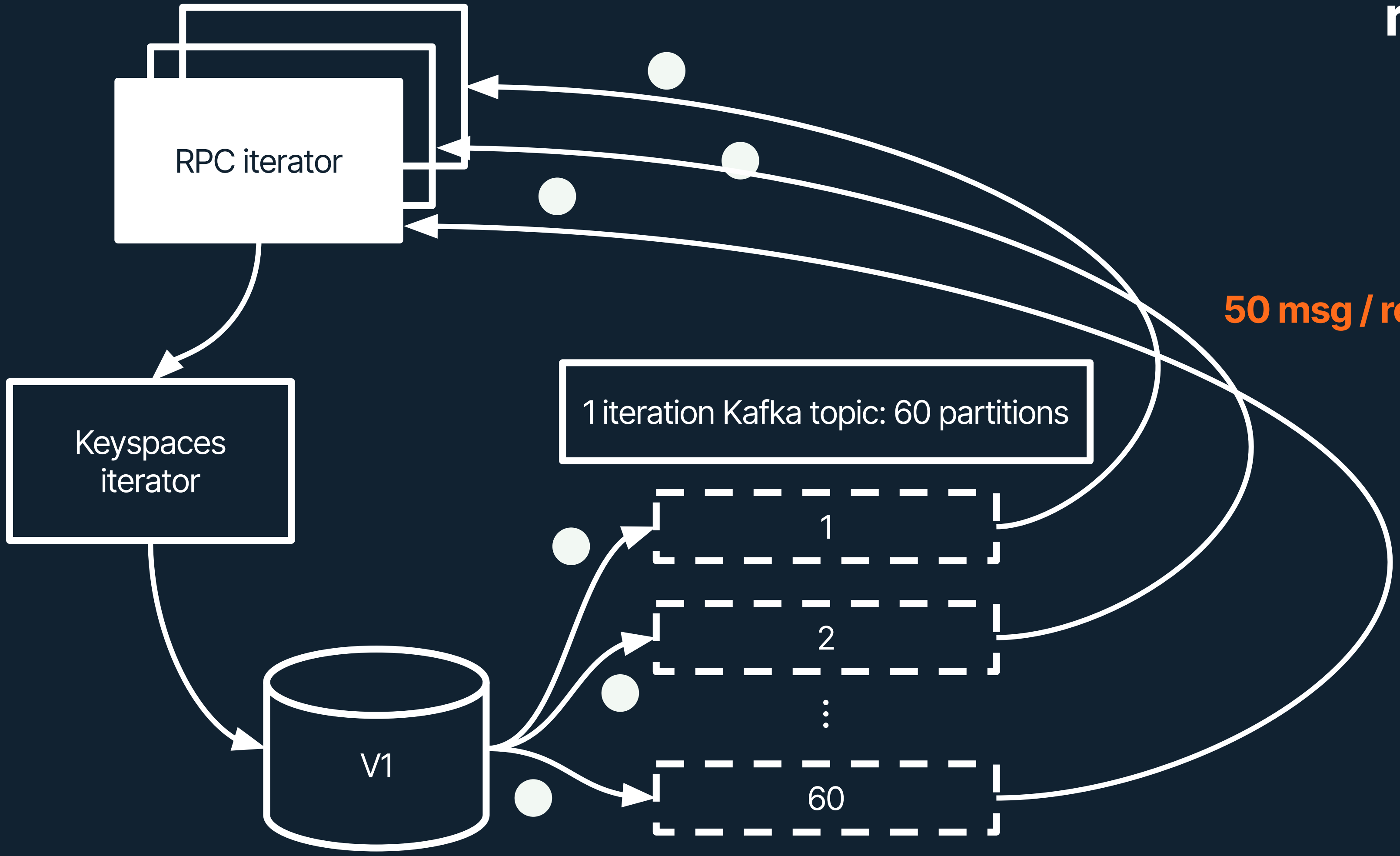
V2


You choose! 1 - 1500 RPCs/s
RPC iterator
1500 rps
Kafka
Keyspaces iterator
V1
🔮
publish rate
~ 120,000 / s
V2
33.77 bil / 1500 rps
≈ 255 days



33.77 bil / 3000 rps
≈ 127 days

Finding upper limits

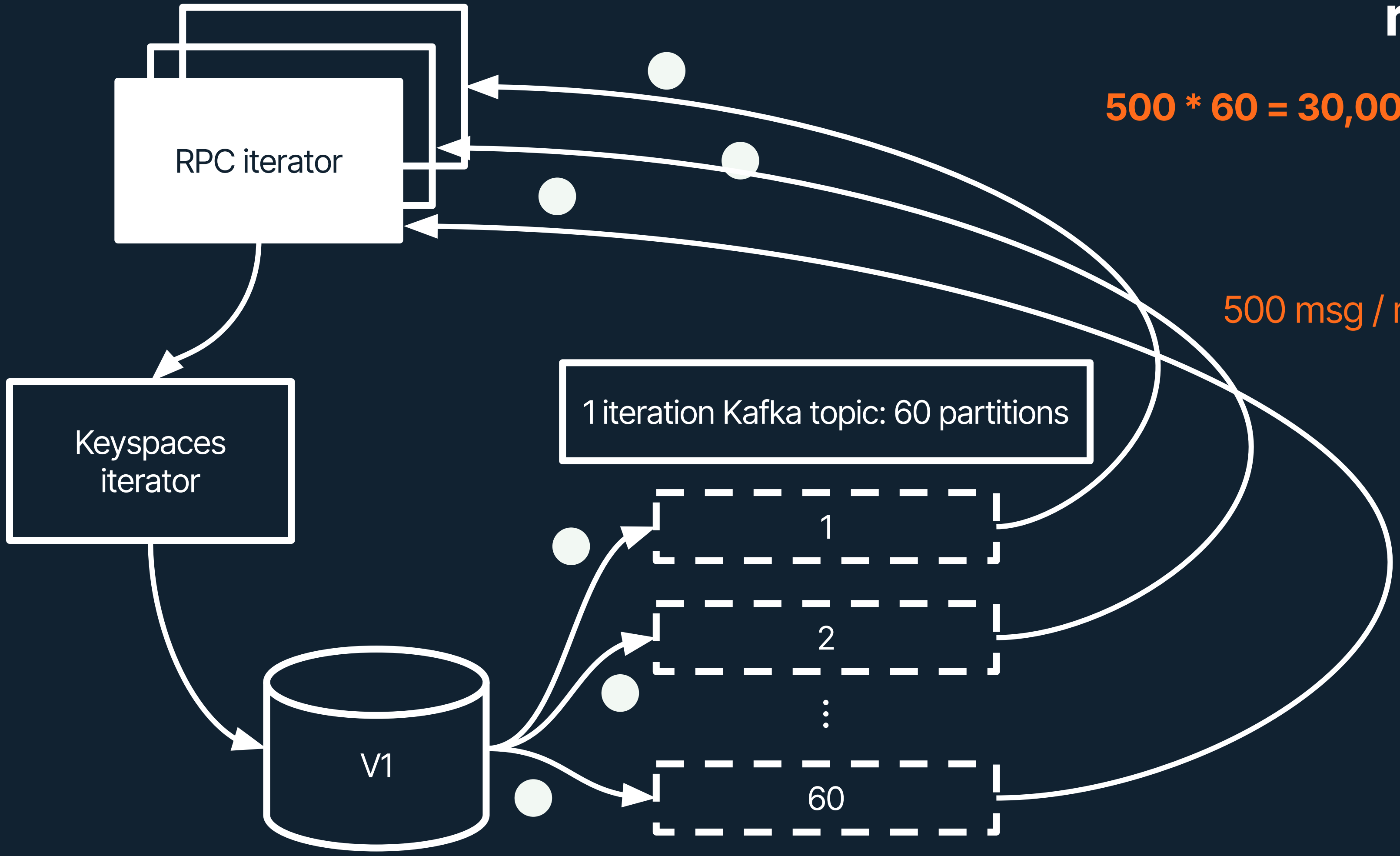


50 msg / replica / s

monzo

500 * 60 = 30,000 rps

500 msg / replica / s



Kat Zien-Mendes 16:46

What 30k rps feels like

Kat Zien-Mendes 15:51

James draining the backlog rn

200w.gif

😅 1

Finished in

~~9,5~~ 23 days

No incidents!

Coherence checking

- ★ Collaboration
- ★ Coordination
- ★ Understand your options (and tools)
- ★ Safety first
- ★ Coherence next
- ★ Document your learnings

Thank you!

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